Global Text

Emerging Perspectives on Learning, Teaching, and Technology

Emerging Perspectives on Learning, Teaching, and Technology

Michael Orey

Copyright © 2010 Micheel Orey

For any questions about this text, please email: drexel@uga.edu

Editor-In-Chief Michael Orey
Associate Editor: Marisa Drexel
Editorial Assistants: Aashka Chaudhari, Jackie Sharman, Whitney Wyatt
Production Assistants: Hillyer Jennings and Peter Sclavos
Proofreader: Catherine Land

The Global Text Project is funded by the Jacobs Foundation, Zurich, Switzerland.

This book is licensed under a Creative Commons Attribution 3.0 License.

This book is licensed under a Creative Commons Attribution 3.0 License

Table of Contents

This book is licensed under a Creative Commons Attribution 3.0 License

About the author

Michael Orey

Dr Michael Orey received both the M.A.Ed. in 1987 and an Ed.D. in 1989 in Curriculum and Instruction from Virginia Polytechnic Institute and State University. Prior to coming to Georgia in 1989, he taught mathematics and computer science in public schools and in a private international school in Venezuela. He is one of the founders of the Learning and Performance Support Lab at the University of Georgia. He has had funded projects related to intelligent tutoring with the US Army Research Institute, project-based learning with at-risk middle school age children, online learning with EpicLearning, and forming partnerships with Universidade Federal do Ceará through a FIPSE-CAPES grant. While he has partnered with the Army Research Institute, Clarke Middle School, iXL, EpicLearning in the past, he is currently partnering with Universidade Federal do Ceará. His current research interests are focused on cognitive applications of technology in the classroom, learning theory, motivation theory, and instructional theory.

This book is licensed under a Creative Commons Attribution 3.0 License

Introduction to Emerging Perspectives on Learning, Teaching, and Technology

Authors: Kristi Leonard, Erin Noh, Michael Orey (The University of Georgia, USA)

This chapter is written for two books. For the *Emerging Perspectives on Learning, Teaching, and Technology* (EPLTT) book, this chapter serves as an introduction. For the *Foundations of Instructional Technology* book, this chapter serves as an overview of learning and instructional theory. Each chapter contains a thorough description of a theory, model, or strategy along with multimedia files that support and illustrate the content. Before discussing the individual chapters, it is necessary to define some of the primary terms that we are using. It is important to understand learning, cognition, and instruction. It is also useful to distinguish between theory, model, and strategy.

Clarifying theories, models, and strategies

Learning

We all know things. How it is that we came to know these things is learning. Learning is how we acquire knowledge. Wikipedia defines learning as: "The acquisition and development of memories and behaviors, including skills, knowledge, understanding, values, and wisdom. It is the goal of education, and the product of experience" (en.wikipedia.org/wiki/Learning). The information processing chapter describes a model for how our mind works. Within this description, the process of elaboration is detailed. Elaboration is a theory about learning. Its focus is on how you come to know things. Similarly, Piaget described a process that involves assimilation, accommodation, and equilibration. These mechanisms together constitute a theory of learning. A few of the chapters in the book are not only instructional strategies, but also describe methods that can help a learner learn new information. The chapter on cognitive tools describes ways in which technology can expand the limitations of a learner's mind, while articulation and reflection are processes that can be performed by the learner to help incorporate new knowledge into existing knowledge resulting in support of learning. The theories that describe how we come to know things is a learning theory; the theories that describe how you can support learning fall more into the instructional camp.

Cognition

Cognition is about how our brain works or how our mind works. Most cognitive theories are more conceptual and therefore it might be more accurate to talk about how the mind works rather than a biological reference to the brain. Wikipedia defines cognition as, "(Latin: cognoscere, 'to know') a faculty for the human-like processing of information, applying knowledge and changing preferences" (en.wikipedia.org/wiki/Cognition). The information processing chapter has an animation that shows how an external stimulus is processed by the human mind. This is a cognitive theory.

Instruction

While some will define instruction in ways that align to direct instruction, we will use a more broad definition. For example, Merrill (1999) states that: “Instructional theory is concerned with two primary considerations: What to teach and how to teach. What to teach has two considerations: selection and representation….how to teach specifies the way that these knowledge components are presented to the student in order to engage the student in an interaction which is appropriate for promoting the acquisition of the knowledge or skill that is the goal of the instruction." (p. 400) This is clearly related to direct instruction. For our purposes, we will define instruction as anything done for, or with a learner, or the learner’s environment to help them acquire new knowledge or learn. Some of those things will be very direct and some will be indirect. Instruction usually implies something one person does to help another person learn. Most of the chapters in this book talk about how to structure an environment to help bring about learning. We believe that most of these ideas fall under the category of a strategy. So, this book can be considered largely an instructional strategies book.

Theory

A theory is a hypothesis that describes, speculates, or defines a relationship between a set of facts or phenomena through a body of principles, policies, beliefs, or assumptions. Using the information processing chapter as an example, you can consider a concept like elaboration to be a theory. It attempts to hypothesize how information is learned based on a large set of research data. Scaffolding is a concept which is covered more fully in chapter 21. It does not attempt to hypothesize how to describe teaching data. Rather, it is more prescriptive. It clearly suggests steps you should follow in trying to support someone while learning. This does not appear to be a theory, but rather a strategy. Some learning theories included in *EPLTT* are Information Processing, Piaget's Constructivism, Vygotsky's Constructivism, Situated Cognition, Social Constructivism, Motivation, Teaching and Learning in Affective Domain, and Creativity.

Taxonomy

The term taxonomy is primarily used in the realm of biology when it comes to the classification of organisms, however it is used in many other fields as a means of dividing concepts into categories and hierarchies of ideas. Bloom's taxonomy, included in *EPLTT*, is probably the most well known taxonomy in education. In addition, Teaching and Learning in Affective Domain includes the Krathwohl taxonomy to categorize the levels and types of learning in the affective domain. While Multiple Intelligences are usually considered a theory about ability, it can also be thought of as a taxonomy of abilities.

Model

A model is an example, description, or analogy that helps a person understand what is not directly observable. Saskatchewan Education’s web publication, Instructional Models, Strategies, Methods, and Skills, describes instructional models as follows: Models represent the broadest level of instructional practices and present a philosophical orientation to instruction. Models are used to select and to structure teaching strategies, methods, skills, and student activities for a particular instructional emphasis. Although the Information Processing (IP) chapter explains the theory of how the mind functions, it uses the computer as a model to illustrate the processes the mind uses when acquiring new information. So, this is interesting in that it is both a theory and a model. Cognitive Apprenticeships suggests a collection of strategies that ought to be employed in instruction. While it is not an analogy or example, it can be considered a description of a complete process of teaching. So, this may rise to the level of a model that has components that are strategies.

Strategy

Merriam-Webster defines the term strategy as, "a careful plan or method". Instructional strategies structure instructional theories for direct application in the learning environment. They provide the instructor with a plan for implementation and are considered more prescriptive, yet flexible enough to accommodate the dynamics of any learning environment. Several chapters included in *EPLTT* are categorized as strategies including Behaviorism; Constructionism, Learning by Design, and Project Based Learning; Problem Based Instruction; I-Search; Case-Based Learning; Cognitive Apprenticeship; Examples of Modeling; Scaffolding; Articulation and Reflection;

This book is licensed under a Creative Commons Attribution 3.0 License

Cooperative Learning; Resource-Based Learning; Six C's of motivation; Cognitive Tools; Computer Mediated Instruction; Learning Communities as an Instructional Model; Reciprocal Teaching; Reading Recovery; and Experiential Learning.

The Adult Learning chapter describes the ideas and motivation brought to the learning environment by adult learners and incorporates several strategies appropriate for this unique group of learners. Conceptual Change and Transformative Learning are also unique in that they are both strategies and theories.

Given these presuppositions, we now turn to a discussion of the chapters in the *EPLTT* with the hopes that this also serves as an overview for students reading this chapter in the Foundations book.

Overview of learning, cognitive and instructional theories and instructional models and strategies

It might help to look at the overall structure of the *EPLTT*. The *EPLTT* book is organized into the following sections:

- Section 1: Learning and Cognitive Theories
- Section 2: Learner-Centered Theories
- Section 3: Inquiry Strategies
- Inquiry Strategies: Tasks
- Inquiry Strategies: Changing Learners' Minds
- Section 4: Tools for Teaching and Learning
- Tools for Teaching and Learning: Changing or Encouraging Human Behaviors
- Tools for Teaching and Learning: Technology Tools
- Section 5: Socially Oriented Theories
- Section 6: Direct Instruction Strategies

The first section outlines some of the most foundational theories in the field. These theories are very good for understanding how people learn, think, and how they accommodate new knowledge. However, these theories are very difficult to adapt for use in the design and structure of a learning environment. The second section is dedicated to theories that focus on the learner. These learner-centered theories describe how learners are motivated, their pre-disposition, and what they bring with them to a particular learning situation. The third section introduces instructional strategies that are much easier to use for designing instruction and has two sub-sections. The first called, Tasks represents the kinds of tasks that we expect students to engage in while learning from an inquiry strategy. Tasks include artifacts, problem-solving, research, and discussion/debate. The second sub-section covers the role of instruction in changing a learner's mind. These strategies focus on engaging the learner in some sort of disorientation while presenting an idea that is an alternative to one they already accept. Section four, entitled Tools for Teaching and Learning consists of two sub-sections as well: Changing or Encouraging Human Behaviors and Technology Tools. The first sub-section's strategies revolve around the methods of Cognitive Apprenticeships, resource-based learning, experiential learning, the six C's of motivation, along with behaviorism. The second sub-section, Technology Tools can be used to extend or support the learners mind or the instructors instruction. The theories included in section five, Socially Oriented Theories, engage the learner or situate the instruction in a social environment. The sixth section covers a few direct instruction strategies including reciprocal teaching and reading recovery, both of which are more commonly used in the K-12 setting.

Section 1: learning and cognitive theories

The theories in this section are fundamental to the other theories included in this book and for many that are not included. They categorize learning and thinking, explain how the mind functions, describe how we organize what we learn, describe learning environments and how knowledge is constructed and recalled. These theories provide a common language for instructors and instructional designers and have been used as the basis for the strategies described in the rest of the book.

Information processing

Information processing (IP) is a theory that explains how the mind functions (Ashcraft, 1994) by using a computer as a model for how the mind works. IP Theory is broken down into three memory stores: sensory register, short-term memory, and long-term memory. The sensory register can be triggered by five senses: hearing (echoic), seeing (iconic), tactile (touch), olfactory (smell), and gustatory (taste). When the sensory register is stimulated, the new information is processed in short-term memory, where thinking is done. Within the short-term memory new information is combined with existing information in long-term memory (LTM). This process can be enhanced through elaboration and repetition.

Piaget's constructivism

Piaget's constructivism, named after Swiss cognitive psychologist Jean Piaget, is a learning theory (though he may be better known for his stage theory). He describes three mechanisms for learning: assimilation, accommodation, and equilibration. According to his theory, what is learned is organized according to schemas. Schemas are mental representations of something tangible or intangible that can be applied to an object, situation, or event. When new schemas are developed, assimilation begins. Assimilation refers to the stage in which new knowledge is processed and added to previously existing schemas. Accommodation is an adaptation process that occurs because the existing schemas are insufficient to incorporate new information. Equilibration is created when assimilation and accommodation reach a balance in the mental structures.

Bloom's taxonomy

In 1948, Benjamin Bloom organized and led a group of educators who, over a period of eight years, classified educational goals and objectives that were eventually named Bloom's Taxonomy. Revised in 2003, Bloom's Taxonomy is categorized into three domains of learning: cognitive, affective (covered in a later chapter), and psychomotor. The cognitive domain is divided into six sequential levels of thinking. The first three levels or lower-order skills include: remembering, understanding, and applying. The last three levels or higher-order skills include: analyzing, evaluating, and creating. According to Bloom and Krathwohl (1956), the purposes for developing this taxonomy were to, "help curriculum builders plan learning experiences and prepare evaluation devices; clarify the meaning of a learning objective (what level of 'understanding' is trying to be achieved); and provide a framework for research on teaching and learning, in terms of remembering, thinking and problem solving" (p. 2-3).

Vygotsky's constructivism

Vygotsky, a developmental psychologist, based his constructivist theory on the fundamental role of social interaction in the development of cognition (Vygotsky, 1978; Wertsch, 1985). Two of Vygotsky's main principles are the more knowledgeable other (MKO) and the zone of proximal development (ZPD). The MKO possesses more knowledge about a particular subject than the learner and can be a teacher, peer, or possibly a computer. The ZPD

This book is licensed under a Creative Commons Attribution 3.0 License

is the area between what the learner can do and cannot do, even with help. While the learner is in the ZPD, the MKO provides support or scaffolding to assist them in acquiring new knowledge. Once the learner is comfortable with the new knowledge, the MKO fades the scaffolding and the ZPD moves to a higher level of difficulty.

Situated cognition

Situated cognition theory represents a major shift in learning theory from traditional, individualistic views to views of learning from the social perspective (Greeno, 1998; Lave & Wenger, 1991; Salomon, 1996). Brown, Collins, and Duguid (1989) are credited as the founders for situated cognition theory and define it as the notion of learning knowledge and skills in contexts that reflect the way they will be used in real life (Collins, 1988, p. 2). Situated cognition theory takes place within a dynamic learning community in which each individual can take on a variety of roles: student, teacher, coach, and expert. Learning communities can exist in many environments including the home, school, business, local community, and the electronic or virtual world community. Because of its emphasis on learning, albeit learning in a specific external context, it is still a learning theory.

Social constructivism

Social constructivists emphasize the importance of culture and environment on the learning process. The basis of the theory of social constructivism assumes that reality is constructed through human activity, knowledge is created through interactions with others, and their environment and learning are more meaningful when the learner is socially engaged. Four perspectives of social constructivism include: cognitive tools perspective, idea-based social constructivism, pragmatic or emergent approach, and transactional or situated cognition.

Section 2: learner-centered theories

Learner-centered theories focus on what the learner brings to the instructional environment. They provide strategies for instructors and instructional designers to work with while considering an individual's characteristics. The adult learning and multiple intelligences sections describe unique characteristics that may exist within any learner while the creativity and motivation sections provide strategies to encourage both. Teaching and learning in the affective domain describes how the intrinsic attributes of the learner can be nurtured to help them achieve learning.

Motivation

Motivation theory explains what causes people to engage in activity and can be categorized as extrinsic and intrinsic. Extrinsic motivation involves the learner’s desire for earning rewards and avoiding punishment, while intrinsic motivation is related to the learner’s curiosity and desire for mastering achievement. Motivation is a goal-directed behavior. While performance goals focus on getting good grades, mastery goals focus on mastering the learning concept and knowledge. Motivation can be improved through encouraging feedback, receiving assistance from expert and non-expert models, and achieving successful experiences.

Multiple intelligences and learning styles

Gardner (1983, 1999) established the taxonomy of multiple intelligences including nine intelligences: verbal/linguistic, logical/mathematical, visual/spatial, bodily/kinesthetic, musical, interpersonal, intrapersonal, naturalistic, and existential. Gardner’s intelligences enable the ability of an individual to, “solve problems, create products or provide services that are valued within a culture or society” (Giles, Pitre, & Womack, 2003). Learning style is directly related to Gardner’s multiple intelligences and is defined by the National Association of Secondary

School Principals as, "the composite of characteristic cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment". The four most common learning styles are visual, aural, reading/writing, and kinesthetic/tactile. Most individuals utilize multiple learning styles when acquiring new knowledge, but have a predisposed preference toward one based on culture, experience, and developmental influence. This strategy can be woven into any of the tasks.

Teaching and learning in affective domain

Smith and Ragan (1999) suggested that, "any 'cognitive' or 'psychomotor' objective has some affective component to it (if at no deeper level than a willingness to sufficiently interact with learning resources to achieve the learning)". Teaching and Learning in the Affective Domain focuses on the learner's attitudes, motivation, and values (Smith & Ragan, 1999). Some of the predominant affective domain learning theories include: Festinger's cognitive dissonance theory; consistency theories such as the Affective-cognitive consistency theory; social judgment theory; social learning theory; and functional theory. The Krathwohl taxonomy, developed by Krathwohl, Bloom, and Masia in 1964 (Smith & Ragan, 1999) categorizes levels and types of learning in the affective domain into five areas: receiving/attending; responding; valuing; conceptualizing/organizing; and characterizing by value.

Creativity

Researchers have defined creativity as the production of both novel and appropriate work. Creativity is affected by a variety of internal and external factors that are classified into two models: process-oriented and systems-oriented. The process-oriented model describes cognitive aspects that affect creativity, while social and individual aspects are described by the systems oriented model. In 1995 and 1996, Sternberg and Lubart designated six attributes that nurture creativity: intellectual processes, knowledge, intellectual styles, personality, motivation, and environmental context. In addition, they also identified three thinking style dichotomies, some of which benefit creativity, while others depress it: legislative (invent rules) vs executive (follow rules), conservative (old approaches) vs. liberal (new approaches), global (general aspects) vs local (detail-oriented).

Adult learning

Merriam & Brockett (1997) define adult education as, "…activities intentionally designed for the purpose of bringing about learning among those whose age, social roles, or self-perception define them as adults". There are five factors used to describe an adult learner: having an independent self-concept and who can direct his or her own learning; having accumulated a reservoir of life experiences that is a rich resource for learning; having learning needs closely related to changing social roles; being problem-centered and interested in immediate application of knowledge; and being motivated to learn by internal rather than external factors (Merriam, 2001, p.5). Adults embarking on any learning experience bring with them their own life experiences, work experiences, learning experiences, performance affecters, as well as environmental factors such as the time between learning interactions and aging (Conlan, Grabowski & Smith, 2003). Several learning theories that are directly related to adult learning include action learning, experiential learning, project-based learning, and self-directed learning, although, Conlan, Grabowski and Smith (2003) believe that "all styles of learning are applicable to both early childhood and adult learning, with differences presenting themselves in regard to the use of the style based on the learning environment".

This book is licensed under a Creative Commons Attribution 3.0 License

Section 3: inquiry strategies, tasks

What is inquiry-based instruction?

Colburn defined inquiry-based instruction (IBI) as, "the creation of a classroom where students are engaged in essentially open-ended, student-centered, hands-on activities" (Colburn, 2000, p. 42). An alternative, more detailed definition offered by Prince and Felder (2007) states that, "in inquiry-based learning (also known as inquiry-guided learning or guided inquiry), students are presented with a challenge (such as a question to be answered, an observation or data set to be interpreted, or a hypothesis to be tested) and accomplish the desired learning in the process of responding to that challenge" (p. 14).

The inquiry strategies that have been included in Emerging Perspectives on Learning, Teaching and Technology have been further categorized into two subtopics. The first category, tasks, includes creating an artifact, solving a problem, doing research, or preparing for a debate/discussion. The second category involves bringing about major changes in perspective as the result of learning. One of these more K-12 focused, called Conceptual Change and the other is more adult learning focused, called Transformative Learning.

Constructionism, learning by design, and project based learning

According to Papert (1993), constructionism is both a learning theory and an educational strategy, although it is categorized as a strategy for the purposes of our book. Based on Piaget's constructivist theory, Papert (1991) explained the difference between constructivism and constructionism by stating: "the word with the v expresses the theory that knowledge is built by the learner, not supplied by the teacher. The word with the n expresses the further idea that happens especially felicitously when the learner is engaged in the construction of something external or at least sharable". In a learning environment in which constructionism is implemented, the teacher acts as a facilitator and guide. When constructionism is implemented in the classroom it can take on two forms: learning by design (LBD) and project-based learning (PBL). LBD requires groups or individual learners to create an artifact that represents their new-found knowledge while PBL is a, "teaching and learning strategy that engages learners in complex activities", that require learners to, "...choose and organize their activities, conduct research, and synthesize information" (Han and Bhattacharya). The task in all three of these models is to build some sort of artifact.

Problem-based instruction

Problem-based instruction requires students to use higher-ordered thinking skills to address and resolve real-world problems. It challenges traditional, teacher-led instruction described by Dossey, Mullis, Lindquist and Champbers (1988), Goodlad (1984), and Wood (1987) as a learning environment whose attributes such as, "orderly conduct and didactic teaching methods in which the teacher dispenses information, has greatly inhibited students' opportunities to think critically". Problem-based instruction is grounded in the learning theories of situated cognition, constructivism, social learning, and communities of practice. The task for learners is to solve the complex problem that often takes days or weeks to solve.

I-search

Choi, Garg, and Kilroy define the I-search strategy as, "the process of searching for answers to questions, which have personal meaning to the writer combined with a metacognitive review of the search process". As compared to the traditional research paper, I-search is the, "story of the search rather than the summary of answers" (Choi et al.). Duncan and Lockhart (2005) introduced I-search to the classroom. They stated that, "through the I-Search unit, teachers can provide an opportunity for students to develop questions, research the answers, record their findings, and illustrate their learning through products while reflecting on and evaluating their learning". The four major steps of the I-search process include: choosing a topic/generating a question; developing a search plan/gathering information; using the information; and developing the final product. The primary task is to do research to answer self-generated questions.

Case-based instruction

Case-based instruction has been defined as an active-learning pedagogy designed for problem analysis and problem-solving, stressing a variety of viewpoints and potential outcomes" (Cranston-Gingrass, Raines, Paul, Epanchin, & Roselli, 1996). Merseth (1996) established three essential elements required of cases used in case-based instruction: (1) they are real, (2) they rely on careful research and study, and (3) they foster the development of multiple perspectives by users. Case-based instruction is an instructional method commonly used in teaching law, business, engineering, education, and medicine; however, it can be modified to most any curriculum (Online Teaching Activity Index (OTAI)). Students who participate in case-based instructional activities will develop the ability to apply theoretical concepts; work in groups; solve problems; gather and analyze information; utilize higher order decision making skills; articulate and present information; and manage time (OTAI). The primary task for the learner is to prepare for a debate or discussion around the case.

Inquiry strategies: changing learners' minds

Conceptual change

The conceptual change strategy is generally defined as learning that changes an existing conception (i.e. belief, idea, or way of thinking) (Davis, 2001). Based on Piaget's theory of disequilibration and accommodation, teachers uncover, "students' preconceptions about a particular topic or phenomenon", and use, "various techniques to help students change their conceptual framework" (Davis, 2001). Students fundamentally change their conceptual framework by solving problems, explaining phenomena, and functioning in their world. Whether you are utilizing conceptual change in education, professional development, or business and industry the standard structure for implementation as defined by Nussbaum and Novick (1982) is as follows: reveal student preconceptions; discuss and evaluate preconceptions; create conceptual conflict with those preconceptions; and encourage and guide conceptual restructuring.

Transformative learning

Cognitive apprenticeship (CA) is a strategy that is derived from situated learning theory and engages learners in authentic problem-solving. CA encourages participation in a community of practice that is developed through goal-oriented activity and social interaction in ways similar to that in craft apprenticeships (McLellan,1994). There are six recursive characteristics in cognitive apprenticeship: modeling, scaffolding, coaching, exploration, articulation, and reflection. One of the benefits of cognitive apprenticeship is that learners are involved in real-world activities that motivate them to experience the knowledge through interaction with expert models possessing a higher level thinking process. The primary concept is to make internal thinking processes external. All the methods use this idea.

This book is licensed under a Creative Commons Attribution 3.0 License

Section 4: tools for teaching and learning: changing or encouraging human behaviors

To support any instruction, you can make use of the theories in this section. Some of the theories focus on what you might call soft technology. That is, these are theories and strategies that you as a teacher might employ to help bring about learning. The second section is about hard technology. Hard technology is essentially computer-based tools to support learning.

This first tools section is the soft technology tools. Cognitive apprenticeship is a theory that details a collection of strategies to support learning. Besides the methods of Cognitive Apprenticeship, we also describe theories such as Resource-Based Learning, Experiential Learning, the Six C's of Motivation, and Behaviorism. Each of these theories describe strategies you might employ while implementing an inquiring strategy and often can be employed with other more direct approaches to teaching and learning as well.

Cognitive apprenticeship

Cognitive apprenticeship (CA) is a strategy that is derived from situated learning theory and engages learners in authentic problem-solving. CA encourages participation in a community of practice that is developed through goal-oriented activity and social interaction in ways similar to that in craft apprenticeships (McLellan,1994). There are six recursive characteristics in cognitive apprenticeship: modeling, scaffolding, coaching, exploration, articulation, and reflection. One of the benefits of cognitive apprenticeship is that learners are involved in real-world activities that motivate them to experience the knowledge through interaction with expert models possessing a higher level thinking process. The primary concept is to make internal thinking processes external. All the methods use this idea.

Examples of modeling

Modeling strategy, an important aspect of cognitive apprenticeship must be complete, direct, and logical. Because the thought process is not observable, models must think out loud to enable students to understand the thinking process. The model must include a complete description of the demonstrated process, choose words and phrases that cannot be misinterpreted, and ensure that the process does not require the performance of two incompatible actions at the same time. When designing a modeling strategy, the process of cognitive tasks must be organized into steps and described in words that use direct action verbs so that learners can monitor the reasoning process.

Scaffolding

The most important and best-known characteristic of cognitive apprenticeship is scaffolding which is a type of coaching. Scaffolding is a strategy that is based on Vygotsky's constructivism. In scaffolding, the MKO provides support to a learner to promote learning a concept or mastering a skill. When the learner successfully grasps the knowledge, the MKO gradually removes the support so that the learner can perform on one's own without assistance, increasing the actual development level. "Scaffolding is actually a bridge used to build upon what students already know to arrive at something they do not know. If scaffolding is properly administered, it will act as an enabler, not as a disabler" (Benson,1997).

Articulation and reflection

Articulation explains how to express one's thought process either in writing or verbally. Reflection enables students to compare the route by which they find answers to the route taken by experts and peers. Articulation is the actual process that a learner goes through to explain to other learners what problem solving activities have occurred. The benefit of articulation and reflection is that it encourages learners to use one's critical thinking skills to communicate their learning process in writing and verbally with others. The challenge is that it is difficult to prove the effectiveness of articulation and reflection due to a lack of research in this field.

Resource-based learning

Resource-based learning is an instructional strategy that engages students through multiple resources. Resources are used to support the instruction, encourage students' motivation, and increase understanding of the subject. Although this strategy is more teacher-centered, the teacher plays the role of coach and uses resources to facilitate instruction in a student-directed learning environment. Resource-based learning can easily be implemented into constructionism, learning by design, and project-based learning environments. When designing resource-based instruction, it is important to thoroughly plan the instruction by identifying the lesson goal, determining acceptable student artifacts, and gathering various resources such as guest speakers, videos, hypermedia presentations and unlimited others. Also planning the timeline for the instruction and providing a rubric and evaluation of the lesson is necessary. Resource-based learning motivates students to explore the subject by enhancing students' usage of encyclopedias, atlases, databases, technology tools and other resources. This strategy can be woven into any of the tasks.

Experiential learning

Oxendine, Robinson, and Willson (2004) define the experiential learning strategy as a, "cyclical process that capitalizes on the participants' experiences for acquisition of knowledge. This process involves setting goals, thinking, planning, experimentation, reflection, observation, and review. By engaging in these activities, learners construct meaning in a way unique to themselves, incorporating the cognitive, emotional, and physical aspects of learning." Within an experiential learning environment, Baker, Jensen, and Kolb (2002) state that there are "two distinct modes of gaining experience that are related to each other on a continuum: concrete experience (apprehension) and abstract conceptualization (comprehension)". In addition, there are also two distinct modes of transforming the experience so that learning is achieved: reflective observation (intension) and active experimentation (extension). There are currently many applications of experiential learning theory such as internships, student teaching, and field experiences. Oxendine, Robinson, and Willson (2004) provide steps to integrating Experiential Learning in the classroom, including: introducing the topic; engaging the learner; discussing the experience; formulating concepts and hypotheses; experimentation with newly formed concepts and experiences; furthering reflection on experimentation.

Six C's of Motivation

The six C's of Motivation, termed by Turner and Paris (1995), is a strategy for promoting motivation. The six C's include choice, challenge, control, collaboration, constructing meaning, and consequences. Students' motivation increases by choosing a meaningful project that is feeling-related and value-related (selecting the construction of meaning). Students who are constantly challenged and who are in control of their project are more intrinsically motivated. Collaborative learning can increase motivation through communication and social interaction. Group members will learn to encourage each other and avoid team conflict by working together towards a common goal and by achieving rewards through group performance. After the assignment is completed, students should have an opportunity to share their work, increasing recognition, and encouraging articulation. Positive feedback, sense of ownership, and achievement can enhance students' self-efficacy and motivation in learning. This strategy fits in with the artifacts and research tasks because choice is a part of these tasks.

Behaviorism

Behaviorism is a strategy that emphasizes the structuring of environments. In fact, Skinner's Teaching Machine is the prototype of the ubiquitous computer-based tutorial. Behaviorism focuses on the measurable and observable changes of behaviors caused by stimuli. B.F. Skinner, one of the principal behaviorists, developed a view of operant conditioning, concluding that both animals and humans would repeat acts that led to favorable outcomes, and suppress those that produced unfavorable results (Shaffer, 2000). Behaviors can be learned, unlearned, and changed by immediate consequences including: positive and negative reinforcement, punishment, modeling, shaping, and cueing. Modeling is the act of demonstrating a skill or disposition while the learner observes. Shaping is a process that results in the gradual change in behavior. Cueing is the act of providing learners with verbal or non-verbal prompts that reinforce or deter behavior.

Tools for teaching and learning: technology tools

Computer mediated instruction

The advent of online learning and computer-mediated communication has, "created a major shift in how educators and students think about teaching and learning" (Daniels & Pethel, 2005). The learning strategy, online learning, is defined as, "any learning experience or environment that relies upon the Internet/WWW as the primary delivery mode of communication and presentation" (Fowles, n.d.). Computer mediated communication is defined as, "any human communication in which digital hardware is used as a medium. Email, Usenet newsgroups and web pages are all forms of CMC" (Women's/Gender Studies Programs University Partnership, n.d.). CMC can happen asynchronously and synchronously. Asynchronous communication is flexible and can accommodate learner's who work or have other obligations that would otherwise deter them from pursuing further education. Synchronous communication allows learners to get immediate feedback and to ask questions as they arise.

Cognitive tools

In the 1980s intelligent tutoring systems (ITS) used computers to deliver direct instruction through tutoring. As the field matured and research of ITS defined its lack of impact, computers began to be used as tools to support constructivist learning theories instead of direct instruction and behaviorist theories. Learners began to, "learn 'with' as opposed to 'from' computers" (Robertson, Elliot, & Washington). In 1993, Lajoie and Derry suggested that, "...the appropriate role for a computer is not that of a teacher/expert, but rather, that of mind-extension 'Cognitive Tool'". Pea (1985) defines cognitive tools as: "Cognitive technologies are tools that may be provided by any medium and that help learners transcend the limitations of their minds, such as memory, thinking, or problem solving limitations. Cognitive tools support learners through five major roles: information seeking, information presentation, knowledge organization, knowledge integration, and knowledge generation." Jonassen (n.d.) described the potential impact of cognitive tools on learners by stating: "When students work WITH computer technology, instead of being controlled by it, they enhance the capabilities of the computer, and the computer enhances their thinking and learning." This strategy can be woven in with any of the four tasks.

Section 5: socially oriented theories

Social oriented theories are based on the theory of social constructivism. These theories focus on the process of learning, and on individuals working together within the learning environment. Cooperative learning encourages groups to work together toward a common goal, while learning communities begin at the curriculum level and bring together students and faculty to work collaboratively through a program of study.

Cooperative learning

Cooperative learning is defined as students working together to "attain group goals that cannot be obtained by working alone or competitively" (Johnson, Johnson, & Holubec, 1986). Students work in small groups to achieve a common goal through an active involvement of understanding, analyzing, and applying the subject in real-life learning. The success of cooperative learning can be determined through motivational and cognitive perspectives, by encouraging other group members ,and acquiring critical thinking skills in discussions to find the best problem solution. The benefits of cooperative learning are that it enhances social interactions, reasoning skills, and oral communication skills through group discussion. It also develops positive attitudes and self-efficacy by learner's receiving encouragement from the instructor and peers in a cooperative environment.

Learning communities as an instructional model

"Simply enrolling students in common courses does not create learning communities. Creating learning communities is an intentional process of redesigning curriculum and bringing faculty and students together to create more coherent and collaborative learning environments" (Levine, n.d.). Gabelnick, MacGregor, Matthews ,and Smith (1990) suggest that a common definition of learning communities is: "Any one of a variety of curricular structures that link together several existing courses—or actually restructure the material entirely—so that students have opportunities for deeper understanding and integration of the material they are learning, and more interaction with one another and their teachers as fellow participants in the learning enterprise." Two approaches of learning that can be implemented within a learning community include: the top-down structure in which the hierarchical structure of teacher (boss, leader) and student (employee, follower) stays intact and the bottom-up structure in which the hierarchical structure is dissolved and all participants can take on the role of teacher or learner at any given time. Buffington explains that, "a bottoms-up approach provides workers and students more control over their environment with the potential of leading to improved results and more efficient decision making practices".

Section 6: Direct instruction strategies

What is direct instruction?

In 1968, as part of a Project Follow Through grant, Siegfried Engelmann developed the Direct Instruction (DI) model under the trade name DISTAR. Grounded in Skinner's behaviorist strategy, Engelmann's theory of instruction states that learning can be greatly accelerated if instructional presentations are clear, rule out likely misinterpretations, and facilitate generalizations (Northwest Regional Educational Laboratory (NREL), 2005). Direct Instruction is highly interactive, exposes essential content via an active presentation of information (Rosenshine, 1995), and the lessons are fast-paced, carefully scripted, and tightly sequenced (NREL, 2005). Through the implementation of the DI model, teachers learn to define tasks clearly, pre-teach sub-concepts and skills, work toward more complex concepts, present highly interactive lessons to large and small groups, elicit frequent oral responses, ensure a high rate of teacher praise for responses, monitor and correct errors immediately, and periodically review skills and concepts (NREL, 2005). While this definition aligns with the computer-based tutorial (Skinner's Teaching Machine), these theories are a bit more contemporary. There are four direct

This book is licensed under a Creative Commons Attribution 3.0 License

instructions strategies/models included in this book: reciprocal teaching, reading recovery, conceptual change, and transformative learning.

Reciprocal teaching

In 1989 Palincsar, Brown, and Campione defined reciprocal teaching as: “a dialogue between teacher and student. This dialogue is described as reciprocal because each learner acts in response to another.” Four basic strategies are used to structure dialogue in reciprocal teaching: predicting, questioning, clarifying, and summarizing. Reciprocal teaching’s foundation is grounded in Vygotsky’s theory of social interaction. Think aloud, scaffolding, and modeling, among other strategies, are necessary for making a reciprocal teaching environment successful. The goal of reciprocal teaching is to use discussion to enhance students' reading comprehension, develop self-regulatory and monitoring skills, and achieve overall improvement in motivation (Borkowski, 1992 as cited in Allen, 2003).

Reading Recovery

Reading Recovery is a strategy that was developed to enable learners to become independent readers. Clay (2005a) who stated reading is a, “message getting, problem-solving activity”, and a, “message sending, problem-solving activity”, developed the program. Cox and Hopkins suggested that Reading Recovery is based on two theoretical principles: reading and writing are connected processes and should be performed in conjunction with each other, and children learn how to read and write by participating in authentic reading and writing tasks on continuous texts. Clay (2005b), and Hobsbaum and Peters (1996) define the process of implementing a Reading Recovery lesson as follows: the child rereads familiar books from previous days; the child reads a book that was introduced and read once the day before; then, for no longer than 2 or 3 minutes, the child works on letters and, as lessons progress over time, words; the child and the teacher compose a story of a sentence or two in a journal; the teacher takes the message and constructs a cut-up sentence from it; the teacher introduces a new text to the student; and the child engages in reading the new book.

Conclusion

Emerging Perspectives on Learning, Teaching, and Technology discusses a number of ideas that are frequently described as learning or instructional theories. While the first section might be described as a collection of learning theories and models, there were some exceptions. The latter part of the book would be best described as a collection of instructional strategies that have been designed with the learning theories in mind. If you initiate an Internet search using the terms “learning theory” or “instructional theory,” literally hundreds of documents are immediately available. This book does not attempt to include all theories or intentionally exclude any theories. Its intention is to provide readers with a strong foundation of learning and instructional theories. Our approach has been to try to do this with a more instructional tone when possible, so the narrative style is a bit less academic on purpose.

References

Allen, S. (2003). An analytic comparison of three models of reading strategy instruction. IRAL: International Review of Applied Linguistics in Language Teaching. 41(4), 319-339.

Ashcraft, M.H. (1994). Human memory and cognition (2nd Ed.). NY: Harper Collins.

Baker, A., Jensen, P., & Kolb, D. (2002). Conversational Learning: An Approach to Knowledge Creation. Wesport: Quorum.

Benson, B. (1997). Scaffolding (Coming to Terms). English Journal, 86(7), 126-127.

Bloom, B. S. & Krathwohl , D. R. (1956). Taxonomy of educational objectives: The classification of educational goals, by a committee of college and university examiners. Handbook 1: Cognitive domain. New York, Longmans.

Brown, J. S., Collins, A., & Duguid, P. (1989). *Situated Cognition and the Culture of Learning*. Educational Researcher, 18(1), 32-42.

Choi, A., Garg, S., & Kilroy, M. I-Search. Retrieved on October 23, 2007, from http://projects.coe.uga.edu/epltt/index.php?title=I-Search.

Clay, M. M. (2005a). Literacy lessons designed for individuals part one: Why? When? and How? Portsmouth, NH: Heinemann.

Clay, M. M. (2005b). Literacy lessons designed for individuals part two: Teaching procedures. Portsmouth, NH: Heinemann.

Colburn, A. (2000). *An Inquiry Primer*. Science Scope, 42-44.

Collins, A. (1988). Cognitive Apprenticeship and Instructional technology. (Technical Report No. 6899). BBN Labs Inc., Cambridge, MA.

Conlan, J., Grabowski, S., & Smith, K. (2003). Adult Learning. Retrieved on October 23, 2007, from http://projects.coe.uga.edu/epltt/index.php?title=Adult_Learning.

Cranston-Gingrass, A., Raines, S., Paul, J., Epanchin B., & Roselli, H. (1996). *Developing and using cases in partnership enviro*nments. Teacher Education and Special Education, 19, 158-168. Daniels, T. & Pethel, M. (2005). Computer Mediated Instruction. Retrieved on October 23, 2007, from http://projects.coe.uga.edu/epltt/index.php?title=Computer_Mediated_Instruction.

Davis, J. (2001). Conceptual Change. Retrieved on October 23, 2007, from http://projects.coe.uga.edu/epltt/index.php?title=Conceptual_Change.

Dossey, J., Mullis, I., Lindquist, M., & Champbers, D. (1988). The mathematics report card: Are we measuring up? Trends and achievement based on the 1986 national assessment. Princeton, NJ: Educational Testing Service.

Duncan, D. & Lockhart, L. (2005). I-Search for Success. New York: Neal-Schuman.

Fowles, C. Glossary of Online Learning Terms: OnlineLearning. Retrieved on October 23, 2007, from http://www.usd.edu/library/instruction/glossary.shtml#o.

Gabelnick, F., & MacGregor, J. Matthews, R., Smith, B. (Eds.). (1990). *Learning Communities: Creating Connections among Students, Faculty, and Disciplines*. New Directions for Teaching and Learning, no. 41. San Francisco: Jossey-Bass.

Gardner, H. (1999). Intelligence reframed: Multiple Intelligences for the 21st century. New York, NY: Basic Books.

Gardner, H. (1983). Frames of mind: the theory of Multiple Intelligences. New York, NY: Basic Books.

Giles, E., Pitre, S., & Womack, S. (2003). Multiple Intelligences and Learning Styles. Retrieved on October 22, 2007, from http://projects.coe.uga.edu/epltt/index.php?title=Multiple_Intelligences_and_Learning_Styles.

Goodlad, J. L. (1984). A place called school. New York: McGraw Hill.

This book is licensed under a Creative Commons Attribution 3.0 License

Greeno, J. G. (1998). *The Situativity of Knowing, learning, and Research*. American Psychologist, 53 (1), 5-26.

Han, S. & Bhattacharya, K. Constructionism, Learning by Design, and Project Based Learning. Retrieved on October 25, 2007, from http://projects.coe.uga.edu/epltt/index.php?title=Constructionism%2C_Learning_by_Design%2C_and_Project_Based_Learning.

Herod, L. (2002). Adult learning from theory to practice. Retrieved on October 23, 2007, from http://www.nald.ca/adultlearningcourse/glossary.htm#t.

Hobsbaum, A. & Peters, S. (1996). *Scaffolding in Reading Recovery*. Oxford Review of Education, 22(1), 17-35.

Johnson, D. W., Johnson, R. T., & Holubec, E. J. (1986). Circles of learning: Cooperation in the classroom. Edina, MN: Interaction Book Company.

Jonassen, D. H. Technology as Cognitive Tools [IT Forum Paper 1]. Retrieved on October 26, 2007, from http://itech1.coe.uga.edu/itforum/paper1/paper1.html.

Lajoie, S. P., & Derry, S. J., (Eds.). (1993). Computers as Cognitive Tools. Hillsdale, NJ: Lawrence Erlbaum Associates Inc.

Lave, J., & Wenger, E. (1991). Situated learning: Legitimate peripheral participation. Cambridge: Cambridge University Press.

Levine, L. LSU: Academic Affairs - What is a Learning Community? Retrieved on October 26, 2007, from http://appl003.lsu.edu/acadaff/aaffairs.nsf/$Content/What+is+a+Learning+Community?OpenDocument.

McLellan, H. (1994). *Situated learning: Continuing the conversation*. Educational Technology 34, 7- 8.

Merriam, S. B. (2001). *Andragogy and self-directed learning: Pillars of adult learning theory*. New Directions for Adult & Continuing Education, 89, 3-14.

Merriam, S. & Brockett, R. (1997) The Profession and Practice of Adult Education. San Francisco: Jossey-Bass.

Merrill, M. D. (1999). Instructional Transaction Theory (ITT): Instructional Design Based on Knowledge Objects. In C. M. Reigeluth (Ed.), Instructional-Design Theories and Models: Volume II (pp. 397-425). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Merseth, K. Cases, Case Methods, and the Professional Development of Educators. Retrieved on October 25, 2007, from http://www.ericdigests.org/1997-2/case.htm.

Northwest Regional Educational Laboratory. (2005). The Catalog of School Reform Models: Direct Instruction Model (K-8). Retrieved on October 23, 2007, from http://www.nwrel.org/scpd/catalog/ModelDetails.asp?ModelID=13.

Nussbaum, J., & Novick, N. (1982). *Alternative frameworks, conceptual conflict, and accommodation: Toward a principled teaching strategy*. Instructional Science, 11, 183-200.

Online Teaching Activity Index. Retrieved on October 25, 2007, from http://www.ion.illinois.edu/resources/otai/CaseStudies.asp.

Oxendine, C., Robinson, J., & Willson, G. (2004). Experiential Learning. Retrieved on October 23, 2007, from http://projects.coe.uga.edu/epltt/index.php?title=Experiential_Learning.

Palincsar, A. S., Brown, A. L., & Campione, J. (1989). Structured dialogues among communities of first-grade learners. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, California.

Papert, S. (1993). The Children's machine: rethinking school in the age of the computer. New York: Basic Books.

Papert, S. (1991). Situating Constructionism. Constructionism, eds. Idit Harel and Seymour Papert.

Pea, R.D. (1985). *Beyond amplification: Using the computer to reorganize mental functioning*. Educational Psychologist, 20 (4), 167-182.

Prince, M. & Felder, R. (2007). *The Many Faces of Inductive Teaching and Learning*. Journal of College Science Teaching, 36 (5), 14-20.

Reigeluth, C. M. (1999). What is Instructional-Design Theory and How is it Changing?. In C. M. Reigeluth (Ed.), Instructional-Design Theories and Models: Volume II (pp. 5-29). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Robertson, B., Elliot, L., & Washington, D. Cognitive Tools. Retrieved on October 25, 2007, from http://projects.coe.uga.edu/epltt/index.php?title=Cognitive_Tools.

Rosenshine, B. (1995). *Advances in research on instruction*. The Journal of Educational Research, 88(5), 262-268.

Salomon, G. (1996). *Unorthodox Thoughts on the Nature and Mission of Contemporary Educational Psychology*. Educational Psychology Review, 8(4), 397-417.

Saskatchewan Education. Instructional Models, Strategies, Methods, And Skills. Retrieved on October 23, 2007, from http://www.sasked.gov.sk.ca/docs/policy/approach/instrapp03.html#models.

Shaffer, D. (2000) Social and Personality Development (4th Ed.). Belmont, CA: Wadsworth/Thompson Learning.

Smith, P. & Ragan, T.J. (1999). Instructional design. New York: John Wiley & Sons.

Sternberg, R.J. & Lubart, T. (1995a). Defying the crowd: cultivating creativity in a culture of conformity. New York: Free Press.

Sternberg, R.J. & Lubart, T. (1995b). An investment approach to creativity. In S.M. Smith, T.B. Ward, and R.A. Finke (eds.) The Creative Cognition Approach. Cambridge: MIT Press.

Sternberg, R.J. & Lubart, T. (1996). *Investing in creativity*. American Psychologist, 51(7), 677-688.

Taylor, E. (1998). The theory and practice of transformative learning: A critical review. Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education. (ERIC Document Reproduction Service No. 423 422).

Turner, J., & Paris, S. G. (1995). *How literacy tasks influence children's motivation for literacy*. The Reading Teacher, 48(8), 662-673.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

This book is licensed under a Creative Commons Attribution 3.0 License

Wertsch, J. V. (1991). Voices of the mind: A sociocultural approach to mediated action. Cambridge: Harvard University Press.

Wood, K. D. (1987). *Fostering cooperative learning in middle and secondary level classrooms*. Journal of Reading, (30), 8, 10-19.

Women's/Gender Studies Programs University Partnership: Iowa State University and Kharkiv National University: Key Concepts and Questions. Retrieved on October 23, 2007 from http://www.las.iastate.edu/WSP_KCGS_Partners/english/modules/Gender%20and%20Virtual%20Images%20in%20the%20internet/key_concepts.htm.

This book is licensed under a Creative Commons Attribution 3.0 License

1. Information processing

Author: Michael Orey, (The University of Georgia, USA)

Introduction

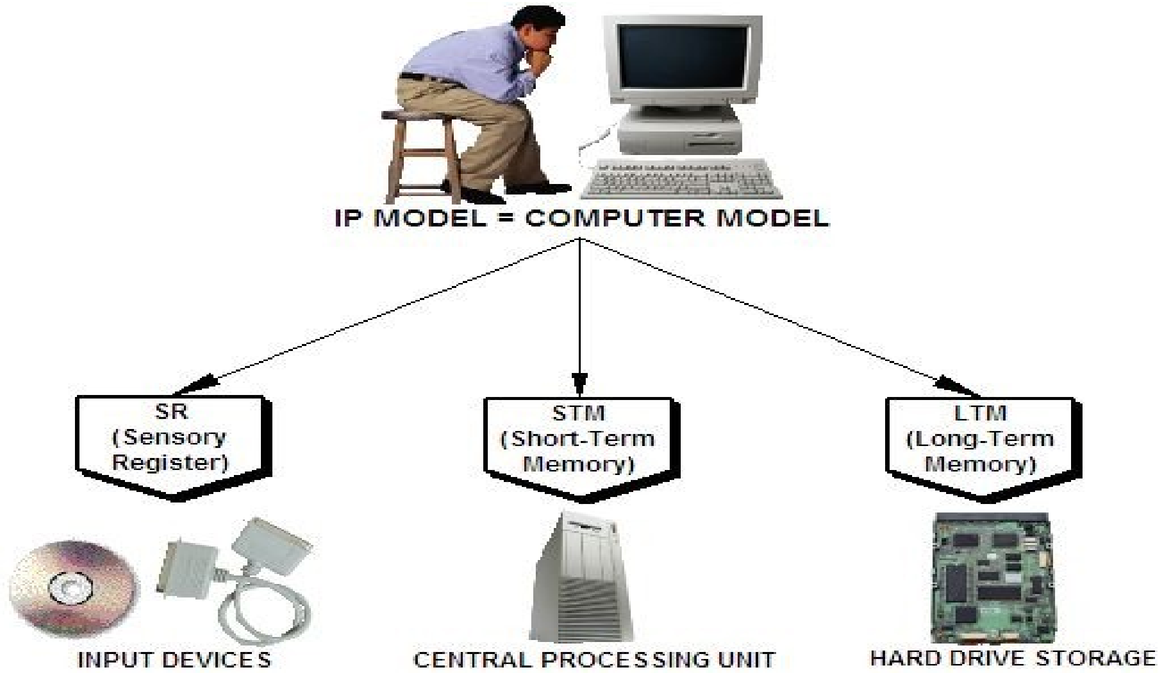

Exhibit 1: The inspiration web above shows how Information Processing can be likened to the model of a computer. The sensory register would include input devices like CDs. Short term memory includes the Central Processing Unit. Long term memory would be viewed as the hard drive or storage. By Tiffany Davis, Meghann Hummel, and Kay Sauers (2006).

Information processing (IP) is a cognitive processing theory (see, Ashcraft, 1994). While other theories in this e-book are learning or instructional in nature, IP theory seeks to explain how the mind functions. Learning components such as rehearsal and elaboration are associated with IP; however, most emphasis is placed on understanding how information is processed rather than how learning happens.

Another aspect of this theory is that it is explicitly analogous to a computer's processor. The basic IP model has three components: sensory register (SR), short-term memory (STM) or working memory, and long-term memory (LTM). The corresponding components of the computer are input devices or registers, the CPU, and hard drive storage, respectively. This metaphor is superficially valid, but as it is taken to its limits, the mechanical comparison breaks down. However, knowing that this model is a cognitive processing model and knowing that the model is based on an explicit metaphor with a computer is helpful in understanding IP theory.

1. Information processing

Let's start with the model and an example. As I write this, I see my cup on my desk. Let's follow this image through the system. The model is depicted below and shows the cup being processed. In the narrative that follows, I will refer back to this cup as it is being cognitively processed.

Sensory registers

The best understanding of the sensory registers (SRs) are for hearing (echoic) and seeing (iconic). Very little is known about tactile (touch), olfactory (smell), and gustatory (taste) SRs. In the cup example, light reflecting off the cup hits my eye; the image is transferred through my optic nerve to the sensory register. If I do not attend to it, it fades from this memory store and is lost. In fact, my cup is on my desk most of the day, and I see it without really "seeing" it many times during the day. Each memory stage has four attributes: representation, capacity, duration, and cause of forgetting. For the visual sensory register, for example, representation is iconic— limited to the field of vision, and lasts for about 250 milliseconds. The main cause of forgetting is decay. Representation in the auditory register, is echoic (based on sound); its duration is 2-3 seconds, it is only limited to the sounds we actually can hear and decay is the primary cause for forgetting. As previously mentioned, much less is known about the other three register types.

Short-term memory

Short-term memory (STM) is also known as working memory and is where consciousness exists. In the cup example, if I attend to the cup, it will be moved into STM. At this point, it is difficult to talk about the cup in STM memory without referring to long-term memory (LTM). For example, I might attend to the cup and think, "That's my cup. It has coffee in it. I poured that coffee 3 hours ago." Each of those statements draws on LTM. I know it is my cup because it is the one that a potter friend of mine made for me. I know it has coffee in it, because I remember getting it this morning. I know that I poured that cup at 9:00 am. The statement that the coffee is 3 hours old required me to look at the current time, and retrieve from LTM that subtracting the current time from pouring time tells me how old the coffee is. Performing the subtraction used no STM processing space, because experience in doing arithmetic allows me to do this automatically.

STM is where the world meets what is already known, and where thinking is done. You perceive and attend to stimuli; that information is then actively processed based on information stored in LTM. In terms of the characteristics of this memory stage, the representation is echoic. It is limited to five to nine items, and it lasts only about 20 seconds. Interference is the principal cause of forgetting. The most important of these characteristics is the five to nine items. A common example of this is calling information for a phone number. After the operator gives you the number, you begin repeating it to keep it in STM. This repetition is termed rehearsal. Rehearsal can also be used to get information into LTM, but it is very inefficient. Rehearsal primarily serves a maintenance function; it can be used to keep information in STM. In the phone number example, if someone interrupts you to ask you a question while you are rehearsing the number, responding interferes with rehearsal, and the phone number is lost. You must call information again.

Long-term memory

The final stage in the IP model is long-term memory (LTM), which is typically termed call memory. LTM is everything we know and know how to do. For most cognitive psychologists, the world of LTM can be categorized as one of three types of memory: declarative, procedural or episodic. Declarative knowledge can be defined as knowledge needed to complete this sentence. "Knowing that..." By contrast, procedural knowledge is, "Knowing

This book is licensed under a Creative Commons Attribution 3.0 License

how..." These two types of knowledge, account for most of what is learned in work and school. The remaining type of knowledge is episodic which might also be called anecdotal. This is memory for specific events in one's life: a memory of your first kiss or of your graduation. The personal stories in our lives comprise episodic memory. While this makes for a neat tautology, some have suggested that it is incomplete.

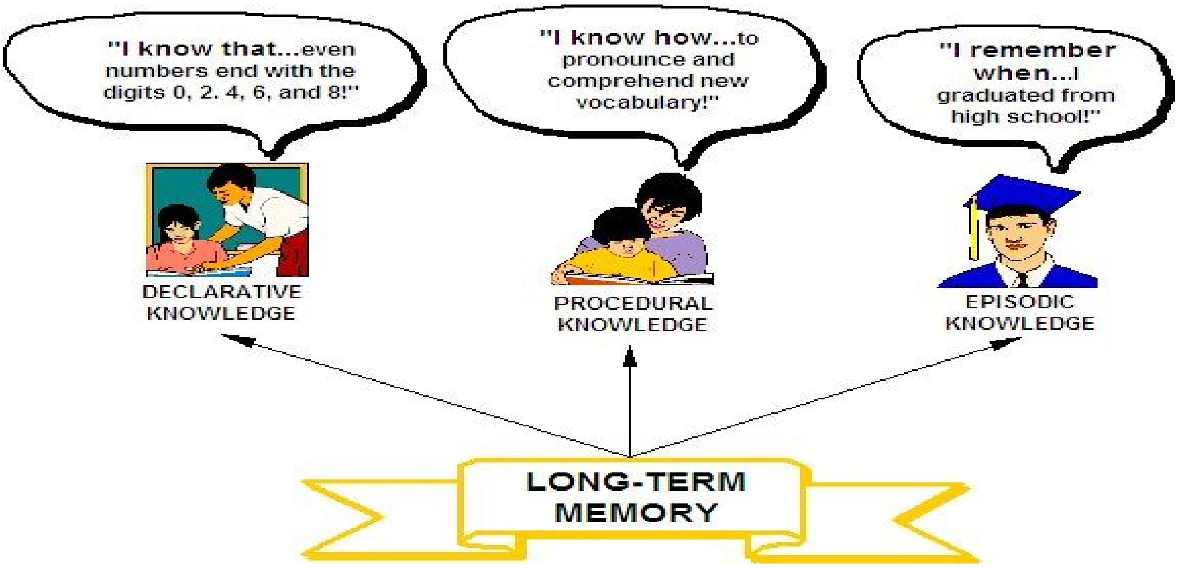

Exhibit 2: This Inspiration web illustrates that Long Term Memory consists of declarative knowledge ("I know that...even numbers end with the digits 0, 2, 4, 6, and 8!"), procedural knowledge ("I know how to pronounce and comprehend new vocabulary!"), and episodic knowledge ("I remember when I graduated from high school!"). By Tiffany Davis, Meghann Hummel, and Kay Sauers (2006).

Pavio (1980) has asserted that memory for images differs from memory for words. He offers a dual coding hypothesis asserting that when we see an image, both the image and a label for that image are stored in memory. He has extended the hypothesis, suggesting that dual codes may exist for the other senses as well. For example, the smell of an orange is stored along with its label, "orange".

Others have suggested that there are mechanisms that control thinking and learning. These control processes are called metacognition. Metacognition often takes the form of strategies. For example, learners attempting to master a complex topic might choose to use a strategy such as drawing pictures to help them understand the complex inter-relationships of the various components of the topic. Strategic readers might stop and mentally summarize what they have just read in order to ensure comprehension.

The 1970s saw great expansion of understanding of human learning. It became clear that there was no one method of teaching that ensured successful learning. Many researchers, especially in the field of second language (L2) acquisition, recognizing this fact, turned their attention to learners, attempting to answer the question, "Why is it that some learners succeed in learning regardless of the methods used to teach them?" Joan Rubin (1975) and H.H. Stern (1975) formulated lists of the characteristics and strategies that "good" language learners use in their study; Rubin and Thompson (1982) offered guidance to foreign language students on how to make themselves better learners. Extensive study of this notion of learning strategies in the 1980s led Michael O'Malley and his associates (1985) to formulate a list of 24 strategies used by English as a Second Language (ESL) students in their study. Perhaps most important, the strategies were classified into three categories, as follows:

Metacognitive strategies is a term borrowed from IP theory. These strategies, according to O'Malley et. al. (cited in Brown, 1987), "indicate an 'executive ' function...that involve planning for learning, thinking about the learning process as it is taking place, monitoring...and evaluating learning (p. 94)..." Metacognitive strategies might include using advance organizers, self-planning, self-monitoring, and self-evaluation.

O'Malley and his colleagues have gone on to suggest that these strategies can be overtly taught to learners, facilitating one of the most important goals of learning, learner autonomy.

Finally, there is another viewpoint that offers the notion of concepts. For example, there exists a concept called "bird", which can be reduced to declarative statements such as: "It has feathers", "It has wings and flies", "It lays eggs", and the like. The concept of "bird" can also include our episodic experiences with birds—the parakeet I had when I was a child, the sparrow I found dead by the fence one morning, etc. It can also include the hundreds of images that we have seen of birds, as well as all instances of real birds we have seen. All of this collectively is what we know of as "bird". It is the concept of bird, the tightly woven collection of knowledge that we have for birds.

In the end, there are five types of knowledge in LTM—declarative, procedural, episodic, imagery, and strategic knowledge; there also exists one collective type called conceptual knowledge. For the LTM stage, the representation is semantic (based on meaning). Capacity and duration are considered unlimited in LTM, and the cause of forgetting is failure to retrieve.

The final issue regarding the IP model is how information gets into LTM. This primarily takes place through a process called **elaboration**. When I think about teaching learners, I need to know what they already know so that they can relate the new information to their existing knowledge. This is elaboration. While teachers can do some of that for learners, elaboration is an active process. The learner must be actively engaged with the material that is to be learned. This does not necessarily mean that the learner must be physically active; rather, it implies that they should be actively relating this new piece of information to other ideas that they already know. LTM is often regarded as a network of ideas. In order to remember something, ideas are linked, one to another until the sought-after information is found. Failure to remember information does not mean that it has been forgotten; it is merely the procedure for retrieval that has been forgotten. With more elaboration, more pathways to that piece of information are created . More pathways make retrieval of the information more likely. If it is found, it is not forgotten.

Scenario, language learning

Author: Pete Roach

Conscious instruction in metacognitive and cognitive learning strategies: a classroom example of the CALLA model

The scene is a sheltered language arts class in a suburban American high school. The 12 students are of mixed language and cultural backgrounds—about half are Spanish speakers from Central and South America; the remainder are from Asia (Pakistan, Korea, and Vietnam). Their grade level is also mixed, as placement in the class is determined by the students' level of language proficiency. The class is early in their study of the Realist school of American literature. Today they will begin Kate Chopin's short story "A Pair of Silk Stockings". On the classroom walls are posters with a Victorian theme—the streets of New York and other cities, as well as large advertisements

This book is licensed under a Creative Commons Attribution 3.0 License

for products of the day—some with contemporary prices, and the well-known Vogue posters. Many of the wall decorations show men and women in the high collars, button shoes, and long dresses of the era.

The class begins with a brainstorming session. The teacher, Mr Van Nostrand, writes down the students' comments. The class is reminded that their prior knowledge about Victorian America will help them to understand the text they are to read. The class is then divided into groups of three to create a "mind map" of what they know about life in America of the 1890s. Because the students have read the historical background for the unit, and have also covered the era in their US history class, a substantial amount of information is generated. After the information has been shared with the class, Mr Van Nostrand directs the class's attention to the "Literature and History" selection in the Literature textbook which discusses the dress of 1890s America. After a brief preview of some vocabulary from the day's listening/reading passage, the class prepares to listen to the first selection.

Mr Van Nostrand then asks the students to examine the artwork in the textbook: the painting A Cup of Tea (showing a Victorian woman sipping tea), several 1879 dollar coins, Mary Cassatt's 1891 print The Fitting (a woman being fitted for a new dress), and clothing advertisements from the historical period. He says, "Before you read a story, you should think about its title and look at the illustrations. Try to guess what will happen in the story—it will help you to understand better. As class members offer their predictions, they are recorded on the board. Mr Van Nostrand reminds the class that, as they read, it is not necessary to understand every word in order to enjoy the story—they can still get the main idea of the selection. An audiotape of the text is to be played as the students read the story in sections. "A Pair of Silk Stockings" is the story of a struggling mother of three who finds herself "the unexpected possessor of fifteen dollars." She had planned to spend this large sum (for the times) on practical items —clothing for her children—but instead (largely on impulse) she spends it all on herself for luxuries.

Although the story is in the course text, students have been given a printed copy that has breaks at strategic points in the narrative. After listening to and reading the first two paragraphs of the story, the students are placed in small groups. Mr Van Nostrand asks the students to predict what Mrs Sommers will do with the money, and to give reasons for their predictions. These predictions are then shared. One student says that she will buy clothing for herself and her family. Another guesses that she will buy toys for her children; A third predicts that she will spend the money on gifts for her husband and children. Again, their responses are recorded for comparison with the actual plot.

Next, Mr Van Nostrand writes on the board: Summarize. Ask Questions. Identify difficulties. Predict. He asks three students to come to the front of the class, and sits with them in a circle. He says, "Each one of us is going to read the first part of "A Pair of Silk Stockings" a section at a time. Then we'll each take turns teaching a section to the rest of the group. Pay close attention to the strategies we use to teach each other." The rest of the class follows along in their story texts as the demonstration progresses. Mr Van Nostrand and his group read the first section of the passage—ending when Mrs Sommers sits down at the counter. Mr Van Nostrand has divided each passage of the story into four sections. The model group reads the first section, and the teacher then teaches it, using the four learning strategies (written on the board). The group then reads the next section, and a student assumes the role of teacher by briefly summarizing, asking one or two questions about the reading and identifying and then discussing any difficulties encountered by group members. Finally, the "teacher" predicts what she thinks will happen next. As the groups work through the story, they complete a set of comprehension questions that involve factual and evaluative questions, as well as items requiring them to infer the meaning of unfamiliar words.

1. Information processing

Mr Van Nostrand instructs each of the groups to select three unfamiliar words. Then, the class, in groups of four, read the rest of the story using the techniques modeled for them. After he writes each group's selections on the board, he asks the students to make guesses about the new words' meanings based on the context of the story.

Mr Van Nostrand reviews with the class the elements of narrative fiction—setting, point of view, characterization, conflict, plot, and theme. Still in their groups, the students complete the Short Story Analysis Sheet.

As a group the class compares and contrasts "A Pair of Silk Stockings" with the other stories in the unit, which is thematically organized and titled "Shackles".

To close the instructional phase of this unit, each student completes a "Learning Log" in which they must assess their success in mastering vocabulary, the genre, and learning strategy use. The results are discussed as a whole class.

Future class sessions will explore the story's main theme (emancipation), as well as alternate plot lines and endings, students will address questions such as:

- When she was spending the money, was Mrs Sommers really free?
- What do you think happened to Mrs Sommers after she went home?

Students will be allowed to explore alternate scenarios by "rewriting" the story:

- What if Mrs Sommers had stopped after she bought the silk stockings?
- What if, at the end of the story, Mrs Sommers had really not gone home?

Analysis

The preceding example portrays the CALLA (Cognitive Academic Language Learning Approach) model of learning, devised by O'Malley and Chamot (1994). Although it is aimed specifically at learners of English as a second Language, it is important to note that it is premised on the idea that students can explicitly be taught to use learning strategies to learn more efficiently.

The instructional sequence of the CALLA model is comprised of five steps, which are explained below as they relate to the above scenario. Multiple cycles of the first three steps on the sequence (preparation, presentation, practice) may be necessary in a single lesson before the final two (assessment and expansion) are reached.

Preparation

In this stage, emphasis is on bringing out and highlighting students' existing knowledge. The posters on Mr Van Nostrand's classroom walls, the textbook artwork, and the brainstorming session are intended to achieve this aim. The model also stresses that the students be alerted that this elicitation of prior knowledge (elaboration) is an effective learning strategy.

Presentation

The second phase of the sequence calls for students to deal with an authentic text—one that has not been modified for ESL students—in this case, the listening text handout of the story. O'Malley and Chamot suggest that student interaction with this text may be in written, audio, or video format; it may involve silent reading or reading aloud. In the vignette above, this occurs when the class reads and hears the first part of the story. Learning strategy instruction is again included when the teacher reminds the class to use graphics and titles to make predictions. Further, the strategies used should be modeled and explained.

This book is licensed under a Creative Commons Attribution 3.0 License

Practice

Here, according to O'Malley and Chamot, learners "discuss, investigate, and reflect on the text they have read, listened to, or viewed". This may involve beginning a composition based on a class discussion, or, as in the scenario, simply completing a set of questions. The authors again include strategy instruction; learners should be made conscious of their thought processes as they work.

Throughout the model, regardless of the subject matter, Cooperative Learning techniques are used whenever possible. In this scenario, the students guide themselves through the text through a method termed Reciprocal Teaching; the learners take turns teaching each other.

Evaluation

In the CALLA model, this stage refers not to conventional assessment of learning through tests, but to self-evaluation of learning through dialogue, journals, self-checklists of achievement, or objectives, which the authors term "Learning Logs". This is consistent with the rest of the model in that students are overtly monitoring and assessing their learning through metacognitive strategies. This occurs in Mr Van Nostrand's class when the reading has been completed, discussed, and compared to other examples from the thematic unit.

Expansion

The final phase of the sequence, as its name implies, allows students to use what they have learned in new contexts. Rewriting or retelling stories, as was done in the case above, are one example; however, CALLA's designers assert that expansion may occur in less structured ways. Students might independently seek out more examples of the same genre, theme, or author. The most important aspect of this phase is that learners think critically and find personal meaning in what they have learned.

Assessment of learning in the CALLA model varies with the subject area under study. For literature and composition, O'Malley and Chamot suggest portfolios that include Learning Logs, "Story Maps" similar to the Short Story Analysis Sheet above, teacher-created assessment forms, and, of course, student writing samples.

Research has yet to prove conclusively and measurably that metacognitive abilities can be significantly improved by instruction. Many studies involve "deconstruction" of mental processes used by already-successful learners. There seems to be agreement that cognitive variations within learners play an important role in successful learners. Because of the almost endless number of possible cognitive variable combinations—learning styles, left- and right-brain functioning, and reflectivity/impulsivity to mention but a few, it does seem sensible to do all that is possible to help students become aware of their metacognitive and cognitive processes as they process information and strive to become independent managers of their own learning.

Teacher practice

Author: Ann LoCicero

Metacognition: One Teacher's Journey

As Mrs Smith walks down the main hall in the middle school where she teaches "computers," she is greeted by a group of energetic seventh-grade girls who simultaneously chime, "Mrs Smith, we want to come back to YOUR class."

1. Information processing

They had been in Mrs Smith's connection class during the previous rotation. Mrs Smith knows that the girls are sincere. She also knows that the reason why students want to come back to her class is because she teaches students how to learn.

You could say that an evolution has occurred in the way Mrs Smith has incorporated metacognitive skills into her lessons using computers over the years. But, it has been a very s-l-o-w evolution at that.

Mrs Smith began teaching in 1991. She taught third grade. There was one computer lab in the school. There were no computers in teachers' rooms. Mrs Smith, like so many other teachers at that time, had no previous experience with computers, let alone using them in instruction. She took her class to the computer lab every week when it was their scheduled time and had students work on skills drill programs in reading and math. There was no "teaching." There certainly were no metacognitive skills being developed either on the part of Mrs Smith or her students.

As time passed and productivity software such as Microsoft Works became available, Mrs Smith moved away from using skills drill programs exclusively and began having her students use the computers to "type-up" final drafts of their creative writing and research papers. Eventually, Mrs Smith began having her students use the programs Hyperstudio and Powerpoint for reports. Still, these programs, like Microsoft Works, were used only in the "publishing" stage of students' writing. They were used to "make a project pretty," but that's all.

Eventually, Mrs Smith was able to get a computer for her classroom. It was a discard, but it was better than nothing. She continued "begging, borrowing, and stealing." until she actually had four computers in her room. And, as more and more software became available, Mrs Smith found programs such as the Living Books for reading, the Math Blaster series for math, and Crosswords and More to help students with their vocabulary in all content areas. She even heard about a program called Co:Writer which she thought would have a positive effect on students' spelling. Mrs Smith felt good about the many "computer" learning opportunities she was providing for her students.

Mrs Smith did not know NOT to feel good. She was using technology more in her classroom than most teachers and receiving kudos from the administration. At that time, the focus on "effective use of computers in the classroom" was years away. Most school districts were still focused on accessibility.

In her professional development classes, Mrs Smith was learning about Cooperative Learning, Thematic Units, and Motivation. She began to examine her own teaching practices. In her classroom, her students (at least most of them) were doing what they were told to do: listening to her lectures, doing the activities that she had planned for them, and then regurgitating the information that they had "learned" on tests. She wanted her students to be more responsible, independent, and self-regulated learners. She decided to make some changes.

She assigned her students to research a topic and do a multimedia presentation using Powerpoint. She thought that this would force her students to be actively involved in their learning. Through experience, she learned differently.

Instead of her students becoming actively involved and taking responsibility for their learning, they wasted an enormous amount of time on the Internet and "played" with the program's fonts, backgrounds, and transitions. They cut and pasted information with little regard for content (or copyright). And, when they were finished, they believed that they had completed quality work (and, of course, that they deserved an "A.")

Mrs Smith began reading everything she could about how to teach students to take responsibility for their own learning. She learned the difference between active and passive learning, and she learned about metacognitive strategies.

This book is licensed under a Creative Commons Attribution 3.0 License

She kept a journal of all of the new activities and lesson plans that she tried out with her class reflecting on the effectiveness of each. She made adjustments to her lesson plans as a result of her reflections.

Years passed and Mrs Smith was offered the opportunity to teach in a computer lab. She began by teaching computing as a survey course. She incorporated basic computer skills into her teaching, and eventually began teaching specific software programs. She still wanted her students to be more responsible, independent, and self-regulated learners, but they weren't. They came to class and did what they were told to do, but they had no spark. They were not actively involved in their learning.

After much trial and error, Mrs Smith decided that teaching "computers" isn't about teaching discrete computer skills, nor is it about teaching specific computer programs. It isn't about teaching discrete metacognitive skills as they apply to computers. It's about setting up learning environments in which computer skills and metacognitive skills become invisible. Both are simply tools that lead to effective learning. The way to set up learning environments in which computer skills and metacognitive skills become invisible is to structure lessons around solid instructional models that have at their foundation the principals of metacognition:

- Connecting new information to former knowledge
- Selecting thinking strategies deliberately
- Planning, monitoring, and evaluating thinking processes

Today, Mrs Smith teaches "computers" by focusing on teaching students how to learn. The content area of her lessons varies: social studies, science, etc. but she plans her lessons with specific instructional models in mind. Why? Because several of the instructional models such as Project-Based learning, Problem-Based learning, Learning by Design, and the Six C's of Motivation focus on making sense of the topic at hand, self-assessment, and reflection; teaching practices that manifest a metacognitive approach to learning. Computer skills and instruction on specific computer programs are taught as needed and in support of the lessons.

Besides planning her lessons with specific instructional models in mind, Mrs Smith also models various metacognitive strategies. She guides her students by "thinking aloud" questions that they should be asking themselves; and eventually will. For example, when a student asks a question that has a factual answer, instead of giving the student the answer, Mrs Smith might respond by saying, "Hmmm, where can I go to get that information? I know! I can do a quick Google search."

Mrs Smith teaches students how to use graphic organizers such as the KWL (what the student Knows, Wants to know, and has Learned) chart to help them access their prior knowledge. As she does so, she talks about thinking and she asks questions about why the KWL chart is helpful and how it can be used in other situations.

To help students plan a writing assignment, Mrs Smith shows them the program, Inspiration. As she does so, she talks about how Inspiration can help you organize your thinking. She asks students how they might use Inspiration in other situations.

Following each project, Mrs Smith guides her students through a debriefing. They review the thought processes that they used as they progressed through a project and evaluate those that were successful and those that were not.

Truly, you could say that an evolution has occurred in the way Mrs Smith has incorporated metacognitive skills into her lessons using computers over the years. In the beginning, her lessons included no metacognitive skills. Now, they provide the foundation of her lessons. Her students are actively involved in their own learning.

Mrs Smith; Mrs Jones wants to know if you have an extra mouse." And, almost in the same breath, Mario says, "Can I come back to YOUR class?”

Summary

Why do students want to be back in Mrs Smith's class? Students want to be back in Mrs Smith's class because she teaches them how to learn. Mrs Smith examined her own teaching methods and decided to make some changes. Those changes led to incorporating metacognitive strategies in her teaching which then led to her students becoming more responsible, independent, and self-regulated learners.

Metacognition, as illustrated in this story, includes both executive control and strategies. Executive control is evident in this story as it tells about one teacher's journey from using computers in her classroom with no thought of incorporating metacognitive skills into her lessons, to an awareness that she could use computers more effectively than she was using them, and finally to making changes in her teaching methods by planning her lessons with specific instructional models such as Problem-Based learning in mind while using metacognitive skills as the foundation.

Examples of the metacognitive strategies used by Mrs Smith with her students include:

- Modeling thinking aloud
- Accessing prior knowledge through the use of graphic organizers (KWL chart)
- Using the program Inspiration in the planning stage of writing
- Debriefing—review the thought processes

References

Ashcraft, M.H. (1994). Human memory and cognition (2nd Ed.). NY: Harper Collins. Brown, H. Douglas (1987). Principles of Language Teaching and Learning (2nd Ed.). Englewood Cliffs, NY: Prentice-Hall.

O’Malley, M., and Chamot, A., 1994. The CALLA Handbook. Reading, MA: Addison-Wesley

O'Malley, Michael, Chamot, Anna U., Stewer-Manzanares, Gloria, Russo, Rocco P., and Kupper, Lisa (1985). Learning strategy applications with students of English as a second language. TESOL Quarterly 19:557-584.

Pavio, A. (1986). Mental representations: A dual coding approach. NY: Oxford Press.

Rubin, Joan (1975). What the "good language learner" can teach us. TESOL Quarterly 9:41-51.

Stern, H. H. (1975). What can we learn from the good language learner? The Canadian Modern Language Review 31:304-318.

Additional resources

Here is a nice chapter from a book by Lloyd Rieber about the IP model and graphics. The title of the chapter is, "Psychological Foundations of Instructional Graphics" Lloyd has also made a nice interactive model for the dual coding theory.

The Information Processing Approach http://chiron.valdosta.edu/whuitt/col/cogsys/infoproc.html

Information Processing Theory http://tip.psychology.org/miller.html

Reciprocal Teaching http://www.ncrel.org/sdrs/areas/issues/students/atrisk/at6lk38.htm

This book is licensed under a Creative Commons Attribution 3.0 License

2. Piaget's constructivism

Authors: Kakali Bhattacharya and Seungyeon Han (The University of Georgia, USA)

Introduction

The research of Swiss cognitive psychologist Jean Piaget has contributed immeasurably to our understanding of the development of learning in children. Piaget suggested many comprehensive developmental theories. However, this chapter will discuss four of Piaget's key concepts that are applicable to learning at any age: assimilation, accommodation, equilibration, and schemas.

Two major principles

According to Piaget, two major principles guide intellectual growth and biological development: adaptation and organization. For individuals to survive in an environment, they must adapt to physical and mental stimuli. Assimilation and accommodation are both part of the adaptation process. Piaget believed that human beings possess mental structures that assimilate external events, and convert them to fit their mental structures. Moreover, mental structures accommodate themselves to new, unusual, and constantly changing aspects of the external environment.

Piaget's second principle, organization, refers to the nature of these adaptive mental structures. He suggests that the mind is organized in complex and integrated ways. The simplest level is the schema, a mental representation of some physical or mental action that can be performed on an object, event, or phenomenon. We now turn to a discussion of these concepts.

Assimilation

Angie sees her own snapshot in a photo album for the first time. Her father asks her, "Who is that, Angie?" She points to the little girl in the picture and replies, "It is a baby, Daddy." She cannot identify herself. The father points out that the picture is of her. He tells her, "Yes Angie. That is a baby, and that baby is you." He then explains how pictures are taken to capture moments.

In order for Angie to make sense of what her father just told her about the picture, she would have had to somehow assimilate the information from her father into her existing internal cognitive structures. She might do this by assuming that her dad was teasing her, and that the picture was of another child; or she could infer that the picture was taken at a different time as explained by her father. In this way, Angie finds a way to fit this external reality with her internal cognitive structures, or schemas. Assimilation occurs when a child perceives new objects or events in terms of existing schemas or operations. Piaget emphasized the functional quality of assimilation, where children and adults tend to apply any mental structure that is available to assimilate a new event, and actively seek to use this newly acquired mental structure.

Accommodation

Accommodation refers to the process of changing internal mental structures to provide consistency with external reality. It occurs when existing schemas or operations must be modified or new schemas are created to account for a new experience. Obviously, accommodation influences assimilation, and vice versa. As reality is assimilated, structures are accommodated.

Consider again the case of Angie. Angie understands that she cannot simultaneously exist in two places. Thus, if her father points out to her that she is the child in the picture, Angie would naturally have to alter her internal mental structures to adjust to the newly discovered external reality. This might mean that Angie would have to believe that photographs represent moments from the past. Therefore, Angie can see herself in the picture and still exist in the present time; in this way, Angie can accommodate her internal mental structures to her external reality.

Equilibration

Returning again to the example of Angie: hearing that she is indeed the baby in the picture causes her some internal conflict, or a state of disequilibration. Angie's natural biological drive would immediately guide her to achieve a state of equilibrium between her external world and her internal mental structures. She would first try to assimilate the information received from the external world into her existing internal cognitive structures. Angie would somehow adjust the stimulus of her photo to account for the fact that she can exist in still form such as in a picture, and at the same time be in motion in real life. To do this, Angie must reinterpret, alter the nature of reality, or change her belief system. This might mean that Angie interprets that her father is teasing her and it is not Angie in the picture, or that it is Angie but that the photo was taken at a different time as her father explained. Either way, Angie must interpret and alter external reality to fit into her internal mental structures until a state of equilibrium is achieved. This internal attempt to make sense of external events according to one's internal events by achieving balance between assimilation and accommodation enables Angie to form new internal mental structures through which she will further evaluate her external world in the future.

Piaget believed that cognitive development in children is contingent on four factors: biological maturation, experience with the physical environment, experience with the social environment, and equilibration. Equilibration refers to the biological drive to produce an optimal state of equilibrium between people's cognitive structures and their environment (Duncan, 1995). Equilibration is an attempt to bring about a state of equilibrium between the first three factors and the reality associated with one's external environment. This state must be present for cognitive development to take place. Equilibration involves both assimilation and accommodation. During each stage of development, people conduct themselves with certain logical internal mental structures that allow them to adequately make sense of the world. When external reality does not match with the logical internal mental structures (disequilibria), equilibration occurs as an effort to bring balance between assimilation and accommodation as the person adapts more sophisticated internal mental structures. Human beings continually attempt to make sense of the world around them by assimilating new information into pre-existing mental schemes and accommodating thought processes as necessary. This effort to maintain a balance, denoted by equilibration, allows for cognitive development and effective thought processes.

Schemata

Piaget defined a schema as the mental representation of an associated set of perceptions, ideas, and/or actions. Piaget considered schemata to be the basic building blocks of thinking (Woolfolk, 1987). A schema can be discrete and specific, or sequential and elaborate. For example, a schema may be as specific as recognizing a dog, or as elaborate as categorizing different types of dogs. As cognitive development proceeds, new schemata are developed, and existing schemata are more efficiently organized to better adapt to the environment. Cognitive development

This book is licensed under a Creative Commons Attribution 3.0 License

becomes evident through changes in behavior as this adaptation takes place. The process of assimilation involves attempts to organize existing schemata for better understanding events in the external world, whereas accommodation involves changing pre-existing schemata to adapt to a new situation.

Piaget's stages

Authors: Kay C. Wood, Harlan Smith, and Daurice Grossniklaus (The University of Georgia, USA)

Introduction

From his observation of children, Piaget understood that children were creating ideas. They were not limited to receiving knowledge from parents or teachers; they actively constructed their own knowledge. Piaget's work provides the foundation on which constructionist theories are based.

Constructionists believe that knowledge is constructed and learning occurs when children create products or artifacts. They assert that learners are more likely to be engaged in learning when these artifacts are personally relevant and meaningful.

In studying the cognitive development of children and adolescents, Piaget identified four major stages: sensorimotor, preoperational, concrete operational, and formal operational. Piaget believed all children pass through these phases to advance to the next level of cognitive development. In each stage, children demonstrate new intellectual abilities and increasingly complex understanding of the world. Stages cannot be "skipped"; intellectual development always follows this sequence. The ages at which children progress through the stages are averages--they vary with the environment and background of individual children. At any given time a child may exhibit behaviors characteristic of more than one stage.

Stages of cognitive development

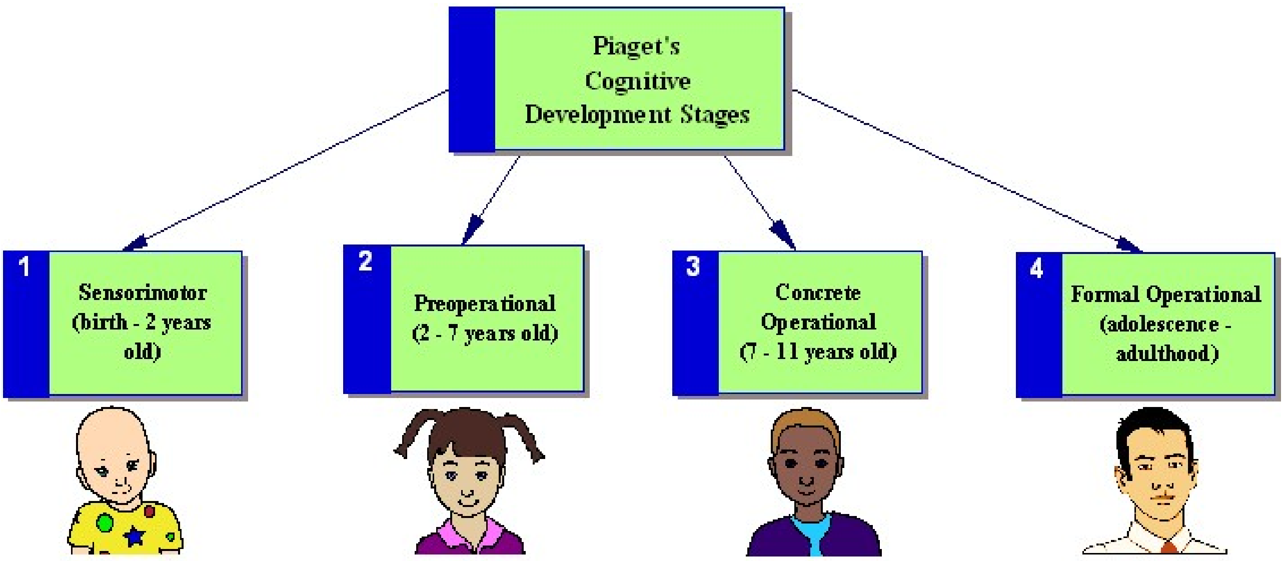

Exhibit 3: The Inspiration web above illustrates Piaget's four cognitive development stages; sensorimotor (birth-2 years), preoperational (2 - 7 years), concrete operational (7 - 11 years), and formal operational (adolescence - adulthood). By Tiffany Davis, Meghann Hummel, and Kay Sauers (2006)

The first stage, **sensorimotor**, begins at birth and lasts until 18 months-2 years of age. This stage involves the use of motor activity without the use of symbols. Knowledge is limited in this stage, because it is based on physical interactions and experiences. Infants cannot predict reaction, and therefore must constantly experiment and learn through trial and error. Such exploration might include shaking a rattle or putting objects in the mouth. As they become more mobile, infants' ability to develop cognitively increases. Early language development begins during this stage. Object permanence occurs at 7-9 months, demonstrating that memory is developing. Infants realize that an object exists after it can no longer be seen.

The **preoperational** stage usually occurs during the period between toddlerhood (18-24months) and early childhood (7 years). During this stage children begin to use language; memory and imagination also develop. In the preoperational stage, children engage in make believe and can understand and express relationships between the past and the future. More complex concepts, such as cause and effect relationships, have not been learned. Intelligence is egocentric and intuitive, not logical.

The **concrete operational** stage typically develops between the ages of 7-11 years. Intellectual development in this stage is demonstrated through the use of logical and systematic manipulation of symbols, which are related to concrete objects. Thinking becomes less egocentric with increased awareness of external events, and involves concrete references.

The period from adolescence through adulthood is the **formal operational** stage. Adolescents and adults use symbols related to abstract concepts. Adolescents can think about multiple variables in systematic ways, can formulate hypotheses, and think about abstract relationships and concepts.

Piaget believed that intellectual development was a lifelong process, but that when formal operational thought was attained, no new structures were needed. Intellectual development in adults involves developing more complex schema through the addition of knowledge.

Educational implications

An important implication of Piaget's theory is adaptation of instruction to the learner's developmental level. The content of instruction needs to be consistent with the developmental level of the learner.

The teacher's role is to facilitate learning by providing a variety of experiences. "Discovery learning" provides opportunities for learners to explore and experiment, thereby encouraging new understandings. Opportunities that allow students of differing cognitive levels to work together often encourage less mature students to advance to a more mature understanding. One further implication for instruction is the use of concrete "hands on" experiences to help children learn. Additional suggestions include:

- Provide concrete props and visual aids, such as models and/or time line.
- Use familiar examples to facilitate learning more complex ideas, such as story problems in math.
- Allow opportunities to classify and group information with increasing complexity; use outlines and hierarchies to facilitate assimilating new information with previous knowledge.
- Present problems that require logical analytic thinking; the use of tools such as "brain teasers" is encouraged.

Huitt and Hummel (1998) assert that "only 35 per cent of high school graduates in industrialized countries obtain formal operations; many people do not think formally during adulthood". This is significant in terms of developing instruction and performance support tools for students who are chronologically adults, but may be limited in their understanding of abstract concepts. For both adolescent and adult learners, it is important to use these instructional strategies

This book is licensed under a Creative Commons Attribution 3.0 License

- Use visual aids and models.
- Provide opportunities to discuss social, political, and cultural issues.
- Teach broad concepts rather than facts, and to situate these in a context meaningful and relevant to the learner.

Criticisms of Piaget's theory

Researchers during the 1960s and 1970s identified shortcomings in Piaget's theory. First, critics argue that by describing tasks with confusing abstract terms and using overly difficult tasks, Piaget under estimated children's abilities. Researchers have found that young children can succeed on simpler forms of tasks requiring the same skills. Second, Piaget's theory predicts that thinking within a particular stage would be similar across tasks. In other words, preschool children should perform at the preoperational level in all cognitive tasks. Research has shown diversity in children's thinking across cognitive tasks. Third, according to Piaget, efforts to teach children developmentally advanced concepts would be unsuccessful. Researchers have found that in some instances, children often learn more advanced concepts with relatively brief instruction. Researchers now believe that children may be more competent than Piaget originally thought, especially in their practical knowledge.

When the parent reads to the child about dogs, the child constructs a schema about dogs. Later, the child sees a dog in the park; through the process of assimilation the child expands his/her understanding of what a dog is. When the dog barks, the child experiences disequilibria because the child's schema did not include barking. Then the child discovers the dog is furry, and it licks the child's hand. Again, the child experiences disequilibria. By adding the newly discovered information to the existing schema the child is actively constructing meaning. At this point the child seeks reinforcement from the parent. The parent affirms and reinforces the new information. Through assimilation of the new information the child returns to a state of equilibrium.

The process of accommodation occurs when the child sees a cat in the park. A new schema must be formed, because the cat has many traits of the dog, but because the cat meows and then climbs a tree the child begins to actively construct new meaning. Again the parent reinforces that this is a cat to resolve the child's disequilibria. A new schema about cats is then formed and the child returns to a state of equilibrium.

Conclusion

Cognitive development is a complex process comprising three principal concepts affecting the development process: assimilation, accommodation and equilibration. All three are associated with the formation of schemata and their modification in order to attain a balanced sense of understanding of the external world.

References

Driscoll, M. P. (2000). Psychology of Learning for Instruction (2nd Ed.). Needham Heights, MA: Allyn & Bacon.

Duncan, R. M. (1995). Piaget and Vygotsky revisited: Dialogue or assimilation? Developmental Review, 15, 458-472.

Schunk, D. H. (2000). Learning Theories: An Educational Perspective (3rd Ed.). Upper Saddle River, NJ: Prentice-Hall.

Woolfolk, A.E. (1987). Educational Psychology (3rd Ed). Englewood Cliffs, NJ: Prentice-Hall.

Additional resources

Articles

De Lisi, R. (2002, Winter2002). From Marbles to Instant Messenger™: Implications of Piaget's Ideas About Peer Learning. Theory Into Practice, 41(1), 5.

Abstract by Nicole Goddard, April 2009

Flavell, J. (1996, July). Piaget's legacy. Psychological Science, 7(4), 200-203.

Siegler, R., & Ellis, S. (1996, July). Piaget on childhood. Psychological Science, 7(4), 211-215.

Videos

Piaget's Developmental Theory: An Overview – Davidson Films Summary: This video highlights some of the things that influenced the work of Piaget. Additionally, a discussion of sensorimotor stage, preoperational stage, concrete operations, and formal operations follows a brief history of his childhood.

Websites

Jean Piaget Archives - Web site for the University of Geneva's collection of Piaget's writings as well as secondary literature "inspired by the School of Geneva in the field of developmental psychology." Online materials are bibliographic records (citations) and only available in French.

Jean Piaget Society – Web site for the Jean Piaget Society (JPS); contains information regarding the life, work and impact of Jean Piaget. Also provides information regarding JPS's journal, book and newsletter publications.

This book is licensed under a Creative Commons Attribution 3.0 License

3. Bloom's Taxonomy

Contributor: Mary Forehand (The University of Georgia)

Introduction

One of the basic questions facing educators has always been "Where do we begin in seeking to improve human thinking?" (Houghton, 2004). Fortunately we do not have to begin from scratch in searching for answers to this complicated question. The Communities Resolving Our Problems (CROP) recommends, "One place to begin is in defining the nature of thinking. Before we can make it better, we need to know more of what it is" (Houghton, 2004).

Benjamin S. Bloom extensively contemplated the nature of thinking, eventually authoring or co-authoring 18 books. According to a biography of Bloom, written by former student Elliot W Eisner, "It was clear that he was in love with the process of finding out, and finding out is what I think he did best. One of Bloom's great talents was having a nose for what is significant" (2002).

Although it received little attention when first published, Bloom's Taxonomy has since been translated into 22 languages and is one of the most widely applied and most often cited references in education. (Anderson & Sosniak, 1994, preface), (Houghton, 2004), (Krathwohl, 2002), (oz-TeacherNet, 2001). As of this writing, three other chapters in this e-book make reference to Bloom's Taxonomy, yet another testament to its relevance.

History

In 1780, Abigail Adams stated, "Learning is not attained by chance; it must be sought for with ardor and attended to with diligence" (quotationspage.com, 2005). Learning, teaching, identifying educational goals, and thinking are all complicated concepts interwoven in an intricate web. Bloom was arduous, diligent, and patient while seeking to demystify these concepts and untangle this web. He made "the improvement of student learning" (Bloom 1971, Preface) the central focus of his life's work.

Discussions during the 1948 Convention of the American Psychological Association led Bloom to spearhead a group of educators who eventually undertook the ambitious task of classifying educational goals and objectives. Their intent was to develop a method of classification for thinking behaviors that were believed to be important in the processes of learning. Eventually, this framework became a taxonomy of three domains:

- **The cognitive -** knowledge based domain, consisting of six levels
- **The affective -** attitudinal based domain, consisting of five levels, and
- **The psychomotor -** skills based domain, consisting of six levels.

In 1956, eight years after the group first began, work on the cognitive domain was completed and a handbook commonly referred to as "Bloom's Taxonomy" was published. This chapter focuses its attention on the cognitive domain.

While Bloom pushed for the use of the term "taxonomy," others in the group resisted because of the unfamiliarity of the term within educational circles. Eventually Bloom prevailed, forever linking his name and the term. The small volume intended for university examiners "has been transformed into a basic reference for all educators worldwide. Unexpectedly, it has been used by curriculum planners, administrators, researchers, and classroom teachers at all levels of education" (Anderson & Sosniak, 1994, p. 1). While it should be noted that other educational taxonomies and hierarchical systems have been developed, it is Bloom's Taxonomy which remains, even after nearly fifty years, the de facto standard.

What is Bloom's Taxonomy?

Understanding that "taxonomy" and "classification" are synonymous helps dispel uneasiness with the term. Bloom's Taxonomy is a multi-tiered model of classifying thinking according to six cognitive levels of complexity. Throughout the years, the levels have often been depicted as a stairway, leading many teachers to encourage their students to "climb to a higher (level of) thought". The lowest three levels are: knowledge, comprehension, and application. The highest three levels are: analysis, synthesis, and evaluation. "The taxonomy is hierarchical; [in that] each level is subsumed by the higher levels. In other words, a student functioning at the 'application' level has also mastered the material at the 'knowledge' and 'comprehension' levels." (UW Teaching Academy, 2003). One can easily see how this arrangement led to natural divisions of lower and higher level thinking.

Clearly, Bloom's Taxonomy has stood the test of time. Due to its long history and popularity, it has been condensed, expanded, and reinterpreted in a variety of ways. Research findings have led to the discovery of a veritable smörgåsbord of interpretations and applications falling on a continuum ranging from tight overviews to expanded explanations. Nonetheless, one recent revision (designed by one of the co-editors of the original taxonomy along with a former Bloom student) merits particular attention.

Revised Bloom's Taxonomy (RBT)

During the 1990's, a former student of Bloom's, Lorin Anderson, led a new assembly which met for the purpose of updating the taxonomy, hoping to add relevance for 21st century students and teachers. This time "representatives of three groups [were present]: cognitive psychologists, curriculum theorists and instructional researchers, and testing and assessment specialists" (Anderson, & Krathwohl, 2001, p. xxviii). Like the original group, they were also arduous and diligent in their pursuit of learning, spending six years to finalize their work. Published in 2001, the revision includes several seemingly minor yet actually quite significant changes. Several excellent sources are available which detail the revisions and reasons for the changes. A more concise summary appears here. The changes occur in three broad categories: terminology, structure, and emphasis.

Terminology changes

Changes in terminology between the two versions are perhaps the most obvious differences and can also cause the most confusion. Basically, Bloom's six major categories were changed from noun to verb forms. Additionally, the lowest level of the original, knowledge was renamed and became remembering. Finally, comprehension and synthesis were retitled to understanding and creating. In an effort to minimize the confusion, comparison images appear below.

This book is licensed under a Creative Commons Attribution 3.0 License

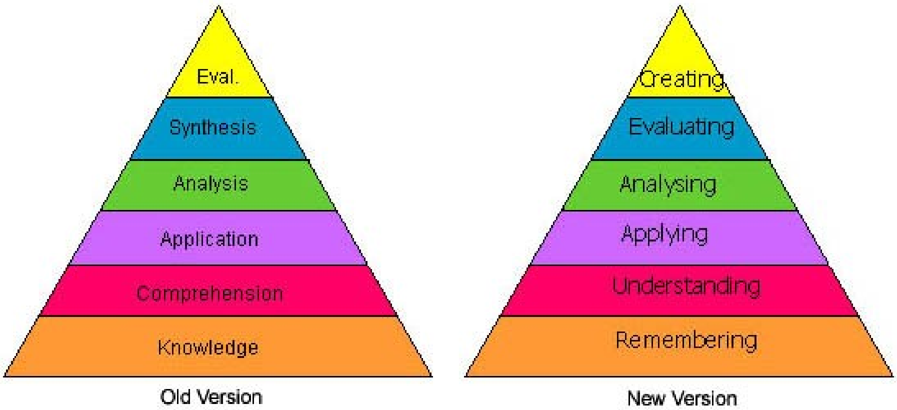

Exhibit 4: **Terminology changes** "The graphic is a representation of the NEW verbage associated with the long familiar Bloom's Taxonomy. Note the change from Nouns to Verbs [e.g., Application to Applying] to describe the different levels of the taxonomy. Note that the top two levels are essentially exchanged from the Old to the New version." (Schultz, 2005) (Evaluation moved from the top to Evaluating in the second from the top, Synthesis moved from second on top to the top as Creating.)

Source: http://www.odu.edu/educ/roverbau/Bloom/blooms_taxonomy.htm

The new terms are defined as:

- **Remembering**: Retrieving, recognizing, and recalling relevant knowledge from long-term memory.
- **Understanding**: Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining.
- **Applying**: Carrying out or using a procedure through executing, or implementing.
- **Analyzing**: Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing.
- **Evaluating**: Making judgments based on criteria and standards through checking and critiquing.
- **Creating**: Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing.

(Anderson & Krathwohl, 2001, pp. 67-68)

Structural changes

Structural changes seem dramatic at first, yet are quite logical when closely examined. Bloom's original cognitive taxonomy was a one-dimensional form. With the addition of products, the Revised Bloom's Taxonomy takes the form of a two-dimensional table. One of the dimensions identifies The Knowledge Dimension (or the kind of knowledge to be learned) while the second identifies The Cognitive Process Dimension (or the process used to learn).

Each of the four Knowledge Dimension levels is subdivided into either three or four categories (e.g. Factual is divided into Factual, Knowledge of Terminology, and Knowledge of Specific Details and Elements). The Cognitive Process Dimension levels are also subdivided with the number of sectors in each level ranging from a low of three to a high of eight categories. For example, Remember is subdivided into the three categories of Remember, Recognizing, and Recalling while the Understanding level is divided into eight separate categories. The resulting grid, containing 19 subcategories is most helpful to teachers in both writing objectives and aligning standards with curricular. The "Why" and "How" sections of this chapter further discuss use of the Taxonomy Table as well as provide specific examples of applications.

Changes in emphasis

Emphasis is the third and final category of changes. As noted earlier, Bloom himself recognized that the taxonomy was being "unexpectedly" used by countless groups never considered an audience for the original publication. The revised version of the taxonomy is intended for a much broader audience. Emphasis is placed upon its use as a "more authentic tool for curriculum planning, instructional delivery and assessment" (oz-TeacherNet, 2001).

Why use Bloom's Taxonomy?

As history has shown, this well known, widely applied scheme filled a void and provided educators with one of the first systematic classifications of the processes of thinking and learning. The cumulative hierarchical framework consisting of six categories each requiring achievement of the prior skill or ability before the next, more complex, one, remains easy to understand. Out of necessity, teachers must measure their students' ability. Accurately doing so requires a classification of levels of intellectual behavior important in learning. Bloom's Taxonomy provided the measurement tool for thinking.

With the dramatic changes in society over the last five decades, the Revised Bloom's Taxonomy provides an even more powerful tool to fit today's teachers' needs. The structure of the Revised Taxonomy Table matrix "provides a clear, concise visual representation" (Krathwohl, 2002) of the alignment between standards and educational goals, objectives, products, and activities.

Today's teachers must make tough decisions about how to spend their classroom time. Clear alignment of educational objectives with local, state, and national standards is a necessity. Like pieces of a huge puzzle, everything must fit properly. The Revised Bloom's Taxonomy Table clarifies the fit of each lesson plan's purpose, "essential question," goal or objective. The twenty-four-cell grid from Oregon State University that is shown above along with the printable taxonomy table examples can easily be used in conjunction with a chart. When used in this manner the "Essential Question" or lesson objective becomes clearly defined.

How can Bloom's Taxonomy be used?

A search of the World Wide Web will yield clear evidence that Bloom's Taxonomy has been applied to a variety of situations. Current results include a broad spectrum of applications represented by articles and websites describing everything from corrosion training to medical preparation. In almost all circumstances when an instructor desires to move a group of students through a learning process utilizing an organized framework, Bloom's Taxonomy can prove helpful. Yet the educational setting (K-graduate) remains the most often used application. A brief explanation of one example is described below.

The educational journal Theory into Practice published an entire issue on the Revised Bloom's Taxonomy. Included is an article entitled, "Using the Revised Taxonomy to Plan and Deliver Team-Taught, Integrated, Thematic Units" (Ferguson, 2002).

The writer describes the use of the revised Bloom's Taxonomy to plan and deliver an integrated English and history course entitled "Western Culture." The taxonomy provided the team-teachers with a common language with which to translate and discuss state standards from two different subject areas. Moreover, it helped them to understand how their subjects overlapped and how they could develop conceptual and procedural knowledge concurrently. Furthermore, the taxonomy table in the revised taxonomy provided the history and English teachers with a new outlook on assessment and enabled them to create assignments and projects that required students to operate at more complex levels of thinking (Abstract, Ferguson, 2002).

Additionally, The Encyclopedia of Educational Technology website contains an excellent and extensive description of the use of the Revised Taxonomy Table in writing, examining and revising objectives to insure the alignment of the objectives with both the standards and the assessments. Three charts can be found on the site one of which compares "Unclear Objectives" with "Revised Objectives".

Bloom's group initially met hoping to reduce the duplication of effort by faculty at various universities. In the beginning, the scope of their purpose was limited to facilitating the exchange of test items measuring the same educational objectives. Intending the Taxonomy "as a method of classifying educational objectives, educational experiences, learning processes, and evaluation questions and problems" (Paul, 1985 p. 39), numerous examples of test items (mostly multiple choice) were included. This led to a natural linkage of specific verbs and products with each level of the taxonomy. Thus, when designing effective lesson plans, teachers often look to Bloom's Taxonomy for guidance.

Likewise the Revised Taxonomy includes specific verb and product linkage with each of the levels of the Cognitive Process Dimension. However, due to its 19 subcategories and two-dimensional organization, there is more clarity and less confusion about the fit of a specific verb or product to a given level. Thus the Revised Taxonomy offers teachers an even more powerful tool to help design their lesson plans.

As touched upon earlier, through the years, Bloom's Taxonomy has given rise to educational concepts including terms such as high and low level thinking. It has also been closely linked with multiple intelligences (Noble, 2004) problem solving skills, creative and critical thinking, and more recently, technology integration. For example, currently, the State of Georgia K-12 Technology Plan has included in its website an excellent graphic depicting technology alignment using Bloom's Taxonomy with learning through the two axes of instructional approach and authenticity.

Using the Revised Taxonomy in an adaptation from the Omaha Public Schools Teacher's Corner, a lesson objective based upon the story of Goldilocks and the Three Bears is presented for each of the six levels of the Cognitive Process as shown on the Revised Taxonomy Table.

Remember: Describe where Goldilocks lived.

Understand: Summarize what the Goldilocks story was about.

Apply: Construct a theory as to why Goldilocks went into the house.

Analyze: Differentiate between how Goldilocks reacted and how you would react in each story event.

Evaluate: Assess whether or not you think this really happened to Goldilocks.

Create: Compose a song, skit, poem, or rap to convey the Goldilocks story in a new form.

Although this is a very simple example of the application of Bloom's taxonomy the author is hopeful that it will demonstrate both the ease and the usefulness of the Revised Taxonomy Table.

Conclusion

Countless people know, love and are comfortable with the original Bloom's Taxonomy and are understandably hesitant to change. After all, change is difficult for most people. The original Bloom's Taxonomy was and is a superb tool for educators. Yet, even "the original group always considered the [Taxonomy] framework a work in progress, neither finished nor final" (Anderson & Krathwohl 2001 p. xxvii). The new century has brought us the Revised Bloom's Taxonomy which really is new and improved. Try it out; this author thinks you will like it better than cake.

Below is an animation illustrating how Bloom's Bakery has put all the puzzle pieces together to make one tasty, hot out of the oven, (recently revised), taxonomy treat.

References

Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives: Complete edition, New York: Longman.

Anderson , L.W., & Sosniak, L.A. (Eds.). (1994). Bloom's taxonomy: a forty-year retrospective. Ninety-third yearbook of the National Society for the Study of Education, Pt.2., Chicago, IL, University of Chicago Press.

Bloom, Benjamin S. & David R. Krathwohl. (1956). Taxonomy of educational objectives: The classification of educational goals, by a committee of college and university examiners. Handbook 1: Cognitive domain. New York , Longmans.

Cruz, E. (2004). Encyclopedia of Educational Technology: Bloom's Revised Taxonomy. Retrieved March 19, 2005 from http://coe.sdsu.edu/eet/Articles/bloomrev/

Eisner, E.W. (2002) Benjamin Bloom 1913-99, Retrieved March 31, 2005 from International Bureau of Education: UNESCO, http://www.ibe.unesco.org/International/Publications/Thinkers/ThinkersPdf/bloome.pdf

Ferguson , C. (2002). Using the Revised Taxonomy to Plan and Deliver Team- Taught, Integrated, Thematic Units. Theory into Practice, 41 (4), 239-244.

Georgia Department of Education (2005). Georgia Department of Education: Office of information technology, Atlanta Georgia : Educational technology & media: Technology integration plan: Introduction, Retrieved March 24, 2005 from http://techservices.doe.k12.ga.us/edtech/TechPlan.htm

Houghton, R.S.. (2004. March 17). Communities Resolving Our Problems (C.R.O.P.): the basic idea: Bloom's Taxonomy - Overview. Retrieved March 12, 2005 from http://www.ceap.wcu.edu/Houghton/Learner/think/bloomsTaxonomy.html

Krathwohl, D. R. (2002). A revision of bloom's taxonomy: An overview. Theory into Practice, 41 (4), 212-218.

Noble, T. (2004). Integrating the revised bloom's taxonomy with multiple intelligences: A planning tool for curriculum differentiation, Teachers College Record (Vol. 106, pp. 193): Blackwell Publishing Limited.

Omaha Public Schools, (2005) Teacher's corner: Comprehension: Bloom's taxonomy. Retrieved March 21, 2005 from http://www.ops.org/reading/blooms_taxonomy.html

Oregon State University . (2004). OSU extended campus: Course development: Instructional design -The Taxonomy Table. Retrieved April 3, 2005 from http://oregonstate.edu/instruct/coursedev/models/id/taxonomy/

oz-TeacherNet. (2001). oz-TeacherNet: Teachers helping teachers: Revised Bloom's Taxonomy. Retrieved March 19, 2005 from

Paul, R. W. (1985a). Bloom's taxonomy and critical thinking instruction, Educational Leadership (Vol. 42, pp. 36): Association for Supervision & Curriculum Development.

This book is licensed under a Creative Commons Attribution 3.0 License

Quotations Page (2005). The Quotations Page: Quotation Details: Quotation #3073 from Laura Moncur's Motivational Quotations, Retrieved March 20, 2005 from http://www.quotationspage.com/quote/3072.html

Schultz, L. (2005, January 25). Lynn Schultz: Old Dominion University: Bloom's taxonomy. Retrieved March 5, 2005, from http://www.odu.edu/educ/roverbau/Bloom/blooms_taxonomy.htm

South Carolina State Department of Education (2005). Myscschools.com: South Carolina State Department of Education: Taxonomy for teaching, learning, and assessing: (A revision of Bloom's Taxonomy of educational objectives). Retrieved March 12, 2005 from http://www.myscschools.com/offices/cso/enhance/Taxonomy_Table.htm

UW Teaching Academy Short-Course. (2003). Exam question types & student competencies: How to measure learning accurately: Bloom's Taxonomy. Retrieved October 1, 2007 from http://teachingacademy.wisc.edu/archive/Assistance/course/blooms.htm

This book is licensed under a Creative Commons Attribution 3.0 License

4. Vygotsky's constructivism

Author: Chad Galloway (The University of Georgia, USA)

Vygotsky's theories

The work of Lev Vygotsky and other developmental psychologists has become the foundation of much research and theory in developmental cognition over the past several decades, particularly of what has become known as social development theory. Vygotsky's theories stress the fundamental role of social interaction in the development of cognition (Vygotsky, 1978; Wertsch, 1985), as he believed strongly that community plays a central role in the process of "making meaning". Unlike Piaget's notion that children's development must necessarily precede their learning, Vygotsky argued, "learning is a necessary and universal aspect of the process of developing culturally organized, specifically human psychological function" (1978, p. 90). In other words, social learning tends to precede development.

The MKO

In order to gain an understanding of Vygotsky's theories on cognitive development, one must understand two of the main principles of Vygotsky's work: the More Knowledgeable Other (MKO) and the Zone of Proximal Development (ZPD). The MKO is somewhat self-explanatory; it refers to someone who has a better understanding or a higher ability level than the learner, with respect to a particular task, process, or concept. Although the implication is that the MKO is a teacher or an older adult, this is not necessarily the case. Many times, a child's peers or an adult's children may be the individuals with more knowledge or experience. (For example, who is more likely to know more about the newest teenage music groups, the "raddest" skateboarding skills, how to win at the most recent Nintendo game, or how to correctly perform the newest dance craze-a child or his parents?!)

In fact, the MKO need not be a person at all. Some companies, to support employees in their learning process, are now using electronic performance support systems. Electronic tutors have also been used in educational settings to facilitate and guide students through the learning process. The key to MKOs is that they must have (or be programmed with) more knowledge about the topic being learned than the learner does.

The ZPD

The concept of the More Knowledgeable Other is integrally related to the second important principle of Vygotsky's work, the Zone of Proximal Development. Taken together, the MKO and the ZPD form the basis of the scaffolding component of the cognitive apprenticeship model of instruction. Vygotsky (1978) defines the ZPD as the distance between the "actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86). Vygotsky believed that when a student is at the ZPD for a particular task, providing the appropriate assistance (scaffolding) will give the student enough of a "boost" to achieve the task. Once the student, with the benefit of scaffolding, masters the task, the scaffolding can then be removed and the student will then be able to complete the task again on his own.

The ZPD is the area between the things that a learner can do on her own and the things that she cannot yet do, even with assistance. As we learn, this zone shifts to the right because we are able to do more and more things on our own. A key concept here is that the learner does the "whole" task with support as opposed to breaking tasks down into component skills to be learned in isolation.

Example of ZPD

Maria just entered college this semester and decided to take an introductory tennis course. Her class spends each week learning and practicing a different shot. Weeks go by and they learn how to properly serve and hit a backhand. During the week of learning the forehand, the instructor notices that Maria is very frustrated because she keeps hitting her forehand shots either into the net or far past the baseline. He examines her preparation and swing. He notices that her stance is perfect, she prepares early, she turns her torso appropriately, and she hits the ball at precisely the right height. However, he notices that she is still gripping her racket the same way she hits her backhand, so he goes over to her and shows her how to reposition her hand to hit a proper forehand, stressing that she should keep her index finger parallel to the racquet. He models a good forehand for her, and then assists her in changing her grip. With a little practice, Maria's forehand turns into a formidable weapon for her!

In this case, Maria was in the Zone of Proximal Development for successfully hitting a forehand shot. She was doing everything else correctly, but just needed a little coaching and scaffolding from a "More Knowledgeable Other" to help her succeed in this task. When that assistance was given, she became able to achieve her goal. Provided with appropriate support at the right moments, so too will students in our classrooms be able to achieve tasks that would otherwise be too difficult for them.

References

Wertsch, J. V. (1991). Voices of the mind: A sociocultural approach to mediated action. Cambridge: Harvard University Press.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

This book is licensed under a [Creative Commons Attribution 3.0 License]

5. Situated cognition

Author: Jennifer M. Brill (The University of Georgia, USA)

Definition

Emerging from anthropology, sociology, and cognitive science, situated cognition theory represents a major shift in learning theory from traditional psychological views of learning as mechanistic and individualistic, and moves toward perspectives of learning as emergent and social (Greeno, 1998; Lave & Wenger, 1991; Salomon, 1996). Brown, Collins, and Duguid (1989) are often credited with developing situated cognition or situated learning theory. Collins (1988) defines situated learning as the notion of learning knowledge and skills in contexts that reflect the way they will be used in real life. Thus, situated cognition theory encourages educators to immerse learners in an environment that approximates as close as possible to context in which their new ideas and behaviors will be applied (Schell & Black, 1997).

Cognitive apprenticeship practices are practical educational approaches that reflect a situated perspective by seeking to contextualize learning (Brown et al., 1989). For example, tennis students not only practice basic skills such as the serve, backhand, and forehand but watch experts model these skills, receive expert coaching, and most importantly, put these skills into practice by participating in matches governed by the rules of the game.

Regarded as leaders in the situated cognition movement, Lave and Wenger (1991), describe learning as an integral part of generative social practice in the lived-in world (p. 35). Their definition bears analysis: generative implies that learning is an act of creation or co-creation; social suggests that at least a portion of learning time occurs in partnership with others; and lived-in world connotes real-world practices and settings that make learning more relevant, useful, and transferable. From the standpoint of situated cognition proponents, foreign language acquisition will be more successful if the learners are immersed in conversational and cultural activities of increasing complexity and diversity, rather than concentrating on discrete-grammar exercises using recitation or paper-and-pencil worksheets.

Dynamic communities of practice are seen as a critical element of situated cognition theory's sociological view of learning (Lave & Wenger, 1991). Thus, learning not only involves teacher and student but also assorted others, such as other experts from the school, from the business and local community, and the electronic world community. Further, learning communities are dynamic in that members assume various roles at different times depending on the needs of the learner. For example, a student may be a learner, instructor, or coach at any given time during the learning episode. Having previously learned how to scan and place images on a project web page, a student may instruct and coach others (fellow students, parents, or friends) through this same process.

Real-world examples

Lave provides numerous examples of learning as a situated phenomenon. A classic example involves members of a Weight Watchers program problem-solving to determine appropriate food servings. As Lave (1988) describes: "Dieters were asked to prepare their lunch to meet specifications laid out by the observer. In this case, they were to fix a serving of cottage cheese, supposing that the amount allotted for the meal was three-quarters of the two-thirds cup the program allowed. The problem solver began the task muttering that he had taken a calculus course in college. Then after a pause he suddenly announced that he had “got it!” He filled a measuring cup two-thirds full of cottage cheese, dumped it out on a cutting board, patted it into a circle, marked a cross on it, scooped away one quadrant, and served the rest" (p. 165). This example well illustrates how individuals frequently use cues and tools from the environment (the wording of a problem, three-quarters of two-thirds; the cutting board and cup) to create artifacts (the patty of cottage cheese) in order to solve puzzles encountered in daily living much more often than by directly calling on formally-learned knowledge and skills. As Lave (1988) observed, at no time did the Weight Watcher check his procedure against a paper and pencil algorithm [3/4 x 2/3 = 1/2]. Instead, problem, setting, and enactment were the means by which checking took place (p. 165).

Other studies demonstrate how children also make use of context to successfully solve problems. Carraher, Carraher, and Schliemann (1985) observed Brazilian children solving simple mathematical problems as they sold produce on the street. These same children failed to solve the same problems when they were presented out of context in conventional mathematical form. One nine-year-old child answered a customer's question regarding the price of three coconuts by counting aloud, "40, 80, 120." Yet, this same child arrived at a result of 70 when confronted with "3 x 40" on a formal test. Context and artifacts seemed to support the child's ability to work through the same problem more effectively again speaking to the situated nature of human knowledge and learning.

Benefits

Collins (1988) notes four benefits of situated cognition as a theoretical basis for learning. First, students learn about the conditions by applying knowledge. Second, students are more likely to engage in invention and problem-solving when they learn in novel and diverse situations and settings. Third, students can see the implications of knowledge. Finally, students are supported in structuring knowledge in ways appropriate to later use by gaining and working with that knowledge in context.

Case study in situated cognition

Robert has just graduated from high school. Although it took him a year longer than most to finish school, he graduated with a decent average that will allow him to attend a community college in his area. Robert's academic successes have always been hindered by a bevy of life factors including: having to provide care for his younger sister and brother, holding down a 20 hour a week part-time job, the influence his peer group had on his commitment to academic work, and finally, the lack of value his parents placed on education. While this is not an exhaustive list, it is apparent that these primary factors have affected Robert's past academic performance. They are also good indicators that unless major changes are made to overcome these acculturated life factors, the traditional classroom education that he has been exposed to for 12+ years will continue to disappoint him in his pursuit of further learning.

Realizing that a high school diploma is just not enough to be competitive in today's job market, Robert trudged his way over to his local community college positive that he was destined for two to three more years of the same non-stimulating, materials-based, classroom learning that he just endured. To his surprise however, he discovered that the program which awaited him was much more than he expected.

At his community college on the first day of class, Robert didn't immediately notice any departures from the learning environments he was used to in high school. Robert was seated in a 25 person classroom in what

This book is licensed under a Creative Commons Attribution 3.0 License

appeared to be a work group configured classroom with 5 people in each group. From where Robert was seated, he was able to see the faces of all of the other students seated with him. There was ample work space both at the center of the work table and towards the outer edges to facilitate working with a partner or as a small group.

No lectern existed in the classroom and Robert wondered where the teacher would stand to deliver lectures. He also notice that no matter where the teacher stood, he or she would be lecturing to some poor student's back and he hoped that he would not have to continually strain to see the teacher.

The door to the classroom opened and in came four older adults, anyone of which could be the instructor. The students were not quite able to tell what was going to happen next.

The door closed, and one of the older adults introduced himself. The speaker introduced himself as Dr. Jim Wood, the student's Physics Instructor for the term. The other three instructors introduced themselves as well. Dr. Lynn Mack taught Math, Dr. Kit Adkins taught Business Communications, and Tim Peterson taught Chemistry.

Dr Wood went on to explain that the educational setting they had grown used to was about to change. He announced that there would be no lectures in the coming months, a notion that seemed to please most of the students in the class. Dr. Wood explained that the students in this room comprised this term's cohort, and that this set of students would be taking all of their courses together. Additionally, he continued to explain that the four instructors had co-planed the instructional activities which had: 1) real world and real workplace foci, 2) authentic learning tasks using the tools and resources that they will find in the workplaces being simulated, and 3) a team-building and professional group communications emphasis which will help develop students into well-rounded employees that can adapt easily to new work environments.

Continuing, Dr. Wood explained that there would be very little (or no) direct teacher lead instruction. Rather, students would be asked to overcome and solve six global workplace problems that will bring into action, the skills that employers wanted from students that graduated from this community college.

He further explained that Robert, and all of the students, were now participants in a learning community. It would be up to them to get involved and work together as a team to solve problems and learn together, all the while doing so under the auspices of a real work environment.

After fielding a few questions, Dr. Wood passed out an introductory team building activity for the groups to consider. The activity was specifically designed to give the students a concrete experience that would set the stage for the rest of their learning in this program designed around situated cognition. (see Figure 1)

Robert, after completing his new program, benefited greatly from the situated cognition approach the community college took in offering their courses. He benefited by understanding how he might apply his current knowledge to tackle new problems. He was given the opportunity to learn in new and diverse situations and settings. He was also able to see the implications of his new knowledge. Finally, he was able to use his new and existing knowledge within a specific context which further developed his knowledge and skill base. The benefits Robert received through his experiences associated with the application of situated cognition theory within his learning environment have been described in detail in the research of A. Collins (1988).

5. Situated cognition

Additionally, social interaction plays a critical role in situated learning environments. As students become accustomed to working within groups, they benefit from the familiarity the group provides over time. This enhances the students learning and provides Robert with an ideal foundation to take with him as he enters the workforce.

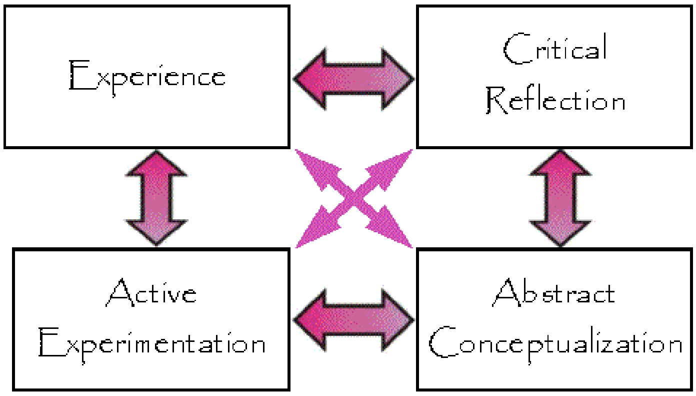

Exhibit 5: A non-linear, idiosyncratic process occurs as an individual learns in a situated cognition model. Real experiences help the individual learn advanced abstract concepts. The experiences might result in paths, which allow the individual to actively collect information to learn and become a member of the community of practice. Perhaps critical thinking and reflection may refine ideas or lead the individual to consider alternate possibilities. Each phase potentially leads to another and builds upon the former. In a situated cognition setting, learners should feel empowered to traverse these learning phases to garner new knowledge that ultimately leads to deep and thorough understanding. (This is the Experiential Learning Model described in this book.) By Frank LaBanca (2008).

References

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated Cognition and the Culture of Learning. Educational Researcher, 18(1), 32-42.

Carraher, T.N., Carraher, D.W., & Schliemann, A.D. (1985). Mathematics in the Streets and in Schools. British Journal of Developmental Psychology, 3, 21-29.

Collins, A. (1988). Cognitive Apprenticeship and Instructional technology. (Technical Report No. 6899). BBN Labs Inc., Cambridge, MA.

Greeno, J. G. (1998). The Situativity of Knowing, Learning, and Research. American Psychologist, 53(1), 5-26.

Lave, J. (1988). Cognition in practice: Mind, mathematics and culture in everyday life. Cambridge: Cambridge University Press.

Lave, J., & Wenger, E. (1991). Situated learning: Legitimate peripheral participation. Cambridge: Cambridge University Press.

Salomon, G. (1996). Unorthodox Thoughts on the Nature and Mission of Contemporary Educational Psychology. Educational Psychology Review, 8(4), 397-417.

This book is licensed under a Creative Commons Attribution 3.0 License

Schell, J. W., & Black, R. S. (1997). Situated learning: An inductive case study of a collaborative learning experience. Journal of Industrial Teacher Education, 34, 5-28.

Situated Cognition and the Culture of Learning. Available at http://www.educ.msu.edu/DWongLibrary/CEP900/Library/BrownCollinsDuguid1989.pdf

Situated Learning & Situated Cognition: A Brief Summary of WWW-based Resources. Available online at (http://homepage.mac.com/scottlab/situated.html)

This book is licensed under a Creative Commons Attribution 3.0 License

6. Social constructivism

Author: Beaumie Kim (The University of Georgia, USA)

Social constructivism vignette

Scenario

by Roy Jackson, Jessica Karp, Ellen Patrick, Amanda Thrower (2006)

Mrs Smith is a high school English teacher who struggled for years when it came to teaching Shakespeare to her students. In the past, students became bored immediately with reading any of the plays aloud in class and consistently complained that the language was too difficult to understand. Desperate for any degree of engagement, Mrs Smith decided to take a social constructivist approach to Shakespeare's *Hamlet* with her students.

Instead of reading the play aloud in class, allowing the students to remain passive and uninvolved with the text, Mrs Smith divided the class into five cooperative groups and assigned each group one act of the play. She then explained that each group was to turn their assigned act into a modern-day puppet show. The groups were to read, interpret, and translate their act into modern language (they were even encouraged to use common slang when appropriate.) They were also required to create puppets to represent the characters and ultimately perform their act for the rest of the class. Each group worked together with Mrs Smith's guidance to create a shared understanding of their assigned act and use that shared understanding as a basis for their construction of the modern-day puppet show. In the end, they produced a product that was created through a social learning process.

The class was divided into groups of four. Because each group was comprised of various learners with diverse interests and backgrounds, each member had something unique to offer in their group's construction of the puppet show. One particular group was assigned Act I of *Hamlet*. They included Henry, who moved from the US state of Louisiana last year after Hurricane Katrina, Suzanne who loves hip-hop music, Nia, who loves to write, and Juan who enjoys comic books and likes to draw. All four were excited about different aspects of the project but would have been very uncomfortable trying to understand their assigned act of the play and turn it in to a modern puppet show on their own.

At the first meeting, the group decided it was best to start by reading and discussing Act I together; Nia offered her writing skills to the task of making notes about the progression of the plot and the characters' actions as the group interacted and constructed meaning out of what they read. Once they felt as though they had a firm understanding of Act I, they shared their findings and notes with Mrs Smith who, in turn, provided feedback.

At the next meeting, they moved on to the more creative aspects of the project, where everyone was able to contribute their own personal skills and talents. The group decided to present their act in a Cajun dialect. Growing up in New Orleans, Henry was very familiar with the Cajun dialect and culture, so he and Nia joined forces in writing a script for the puppet show. For background music, they decided hip-hop would fit well with the Cajun influence; Suzanne agreed to work on finding hip-hop selections that would work well with the story. Juan gladly volunteered to take on the creation of the puppets. He wanted to use what he had learned about the characters through the group's previous interactions and create modern interpretations with a comic book influence.

By the time the product was constructed, each group member's mark was on the final outcome, so each had a sense of ownership. The intersubjectivity the students experienced through this group project allowed them to extend their understanding of Shakespeare's *Hamlet*. In addition to completing the part each agreed to do, the students had to communicate, share, and negotiate to create the final product. The students brought their diverse interests and collaborated to create their finished product. Mrs Smith's use of the social constructivist approach to this lesson proved successful as the students came to a clear and engaged understanding of *Hamlet*, her ultimate goal.

What is social constructivism?

Social constructivism emphasizes the importance of culture and context in understanding what occurs in society and constructing knowledge based on this understanding (Derry, 1999; McMahon, 1997). This perspective is closely associated with many contemporary theories, most notably the developmental theories of Vygotsky and Bruner, and Bandura's social cognitive theory (Shunk, 2000).

Assumptions of social constructivism

Social constructivism is based on specific assumptions about reality, knowledge, and learning. To understand and apply models of instruction that are rooted in the perspectives of social constructivists, it is important to know the premises that underlie them.

Reality: Social constructivists believe that reality is constructed through human activity. Members of a society together invent the properties of the world (Kukla, 2000). For the social constructivist, reality cannot be discovered: it does not exist prior to its social invention.

Knowledge: To social constructivists, knowledge is also a human product, and is socially and culturally constructed (Ernest, 1999; Gredler, 1997; Prat & Floden, 1994). Individuals create meaning through their interactions with each other and with the environment they live in.

Learning: Social constructivists view learning as a social process. It does not take place only within an individual, nor is it a passive development of behaviors that are shaped by external forces (McMahon, 1997). Meaningful learning occurs when individuals are engaged in social activities.

Intersubjectivity of social meanings

Intersubjectivity is a shared understanding among individuals whose interaction is based on common interests and assumptions that form the ground for their communication (Rogoff, 1990). Communications and interactions entail socially agreed-upon ideas of the world and the social patterns and rules of language use (Ernest, 1999). Construction of social meanings, therefore, involves intersubjectivity among individuals. Social meanings and knowledge are shaped and evolve through negotiation within the communicating groups (Gredler, 1997; Prawat & Floden, 1994). Any personal meanings shaped through these experiences are affected by the intersubjectivity of the community to which the people belong.

Intersubjectivity not only provides the grounds for communication but also supports people to extend their understanding of new information and activities among the group members (Rogoff, 1990; Vygotsky, 1987). Knowledge is derived from interactions between people and their environments and resides within cultures (Shunk, 2000; McMahon, 1997). The construction of knowledge is also influenced by the intersubjectivity formed by cultural and historical factors of the community (Gredler, 1997; Prawat & Floden, 1994). When the members of the

This book is licensed under a Creative Commons Attribution 3.0 License

community are aware of their intersubjective meanings, it is easier for them to understand new information and activities that arise in the community.

Social context for learning

Some social constructivists discuss two aspects of social context that largely affect the nature and extent of the learning (Gredler, 1997; Wertch, 1991):

Historical developments inherited by the learner as a member of a particular culture. Symbol systems, such as language, logic, and mathematical systems, are learned throughout the learner's life. These symbol systems dictate how and what is learned.

The nature of the learner's social interaction with knowledgeable members of the society is important. Without the social interaction with more knowledgeable others, it is impossible to acquire social meaning of important symbol systems and learn how to use them. Young children develop their thinking abilities by interacting with adults.

General perspectives of social constructivism on learning

Social constructivists see both the context in which learning occurs and the social contexts that learners bring to their learning environment as crucial. There are four general perspectives that inform how we could facilitate the learning within a framework of social constructivism (Gredler, 1997):

Cognitive tools perspective: Cognitive tools perspective focuses on the learning of cognitive skills and strategies. Students engage in those social learning activities that involve hands-on project-based methods and utilization of discipline-based cognitive tools (Gredler, 1997; Prawat & Folden, 1994). Together they produce a product and, as a group, impose meaning on it through the social learning process.

Idea-based social constructivism: Idea-based social constructivism sets education's priority on important concepts in the various disciplines (e.g. part-whole relations in mathematics, photosynthesis in science, and point of view in literature, Gredler, 1997, p.59; Prawat, 1995; Prawat & Folden, 1994). These "big ideas" expand learner vision and become important foundations for learners' thinking and on construction of social meaning (Gredler, 1997).

Pragmatic or emergent approach: Social constructivists with this perspective assert that the implementation of social constructivism in class should be emergent as the need arises (Gredler, 1997). Its proponents hold that knowledge, meaning, and understanding of the world can be addressed in the classroom from both the view of an individual learner and the collective view of the entire class (Cobb, 1995; Gredler, 1997).

Transactional or situated cognitive perspectives: This perspective focuses on the relationship between the people and their environment. Humans are a part of the constructed environment (including social relationships); the environment is in turn one of the characteristics that constitutes the individual (Bredo, 1994; Gredler, 1997). When a mind operates, its owner is interacting with the environment. Therefore, if the environment and social relationships among group members change, the tasks of each individual also change (Bredo, 1994; Gredler, 1997). Learning thus should not take place in isolation from the environment.

Social constructivism and instructional models

Instructional models based on the social constructivist perspective stress the need for collaboration among learners and with practitioners in the society (Lave & Wenger, 1991; McMahon, 1997). Lave and Wenger (1991) assert that a society's practical knowledge is situated in relation among practitioners, their practice, and the social organization and political economy of communities of practice. For this reason, learning should involve such knowledge and practice (Lave & Wenger, 1991; Gredler, 1997). Social constructivist approaches can include reciprocal teaching, peer collaboration, cognitive apprenticeships, problem-based instruction, WebQuests, anchored instruction, and other methods that involve learning with others (Shunk, 2000).

Sorting out variations on the terms "constructionism" and "constructivism"

Introductory comments by Gregory Clinton

Several of the important perspectives about learning discussed in this e-book are really *epistemologies*—that is, sets of beliefs about the nature of knowledge. What we believe about knowledge determines a great deal of what we believe about learning; and thus even the loftiest philosophical perspectives can have practical implications for how we approach teaching and learning.

One difficulty is that often the same or similar terms are used in different ways by different scholars. The table below presents several variants of the terms "constructivism" and "constructionism." Four of these are essentially philosophical perspectives about how we as learners come to know what we know, i.e. epistemologies; and one (Papert's Constructionism) is a theory of learning tied to a particular instructional strategy. However, all of the terms presented below relate to the belief that learning is "constructed" by learners (individually or socially) rather than simply receiving knowledge from an instructor or other source.

Another potential difficulty is that the differences between the perspectives listed below can be very subtle. Social constructionism and social constructivism, for example, appear to be two different ways to talk about the same thing. However, constructivism generally allows the possibility that people can derive meaning from objects in the environment as well as from social interactions; social constructionism denies that deriving meaning directly from objects is possible (Crotty, 1998).

One important point to note is the distinction between *epistemology*, a set of beliefs about knowing, and *ontology*, a set of beliefs about what exists or what is real. While constructionist or constructivist epistemologies generally insist that individuals construct their own realities, and no two persons' realities will be the same, this does not necessarily mean that those who hold these views believe multiple realities *exist*. Belief about the nature of the external world is not the same as belief about knowledge (Crotty, 1998).

Thus being a constructionist or constructivist does not require you to believe that there are multiple versions of the universe all floating around at the same time. It does mean, however, that each of us has a uniquely constructed version of reality that we carry around with us in our day-to-day experience as human beings. Two people looking at something together never actually see the same thing in the same way.

(As stated in this chapter, some constructionists and constructivists state that they believe reality does NOT exist apart from being socially invented by people. However, usually this may be taken as an epistemological statement, not an ontological statement. Few individuals would deny, for example, that if mankind were to someday succeed in self-annihilation, the planet and the rest of the universe would continue to exist apart from our meaning-making activity.)

Table 1: Sorting out variations on the terms "Constructionism" and "Constructivism"

Table by Beth Clark, Jessie Griffin, and Dana Turner (Fall, 2007)

Philosophical perspective/theory	**Key points**	**Practical implications**

This book is licensed under a Creative Commons Attribution 3.0 License

Social Constructionism (epistemology) (also called simply Constructionism)	• There is no meaning in the world until we construct it. • We do not find meaning, we make it. • The meaning we make is affected by our social interpretation of the thing. • The meaning we derive for objects arises in and out of the interactive human community.	Even if you bump into a tree, you cannot get meaning directly from the tree because you have ingrained social interpretations of the tree. You will assign meaning to the tree based on your social background and it will be a different meaning than the tree will get from any other person.
Social Constructivism (epistemology)	• Reality is constructed through human activity • Members of a society together invent the properties of the world. • People create meaning through their interactions with each other and the objects in the environment. • Learning is a social process. It occurs when people are engaged in social activities. • Associated in part with the work of Richard Prawat	A group of students are given a difficult WebQuest Math problem to work through. By using the different perspectives they have gained from their different backgrounds, they can help each other solve the problem more effectively that if they had worked alone.
Vygotsky's Constructivism (epistemology)	• Social interaction in development of cognition • Social learning precedes development • MKO (More Knowledgeable Other) • ZPD–distance between the actual development level as determined by the independent problem solving and level of potential development as determined through problem solving under MKO	Struggling students in a Math class are assigned a peer tutor (MKO). The peer tutor helps their partner work through problems by providing hints and instruction (scaffolding). Struggling students will stop relying on MKO as they work through ZPD levels. The amount of help from the peer tutor can be gradually reduced until they are no longer needed or relied on (fading). The struggling students have reached the MKO level and no longer are struggling.

6. Social constructivism

	• In ZPD provide scaffolding– masters task remove (fading) • Social interaction leads to increased knowledge	
Piaget's Constructivism (epistemology)	• Knowledge is actively constructed • More of a "theory" on how a child's thinking evolves over time • Focuses on the commonality of learning stages • Needed for equilibrium • Detached observation	At a certain stage of development all children will become aware of "self". A mother places a mark on a child's face without the child's knowledge. She then places the child in front of a mirror. If the child has self-awareness, he will reach to his face and touch the mark. However, if he has not developed self-awareness, he will reach out to the mirror and try to touch the mark. He is unaware that it is his image in the mirror.
Papert's Constructionism (also called simply Constructionism)	• Not an epistemology but "a theory of learning and a strategy for education" (Kafai & Resnick, 1996, p. 1). • Knowledge is actively constructed • Learning to learn • Focuses on the variance of individual and the environment • Dynamics of change • Engagement – Learning occurs through interaction and reflection • Learners can create meaning by building artifacts	In the University of Georgia's Instructional Design & Development master's program, the Design & Development Tools class invites students to choose *any* multimedia development project they personally find meaningful (within reasonable social and professional norms). The project is not required to be instructional in nature. They are then required to reflect on the design process via readings in design literature and writing an online design journal; and structures are put into place to promote interaction about the design process among peers. Finally, finished artifacts are displayed at the end of each semester in a public showcase event.
Seymour Papert on constructivism and (Papert's) constructionism: "The word with the v expresses the theory that knowledge is built by the learner, not supplied by the teacher. The word with the n expresses the further idea that happens especially felicitously when the learner is engaged in the construction of something external or at least sharable" (Papert, 1991, p.3).		

References

Bredo, E. (1994). Reconstructing educational psychology: Situated cognition and Deweyian pragmatism. Educational Psychologist, 29(1), 23-25.

This book is licensed under a Creative Commons Attribution 3.0 License

Cobb, P. (1995). Continuing the conversation: A response to Smith. Educational Researcher, 24(6), 25-27.

Cognitive perspectives on peer learning (pp. 197-211). Mahwah, New Jersey: Lawrence Erlbaum Associates.

Crotty, M. (1998). The foundations of social research: Meaning and perspective in the research process. London: Sage Publications

Derry, S. J. (1999). A Fish called peer learning: Searching for common themes. In A. M. O'Donnell & A. King (Eds.),

Ernest, P. (March 23, 1999). Social Constructivism as a Philosophy of Mathematics: Radical Constructivism

Gredler, M. E. (1997). Learning and instruction: Theory into practice (3rd ed). Upper Saddle River, NJ: Prentice-Hall.

Kafai, Y., & Resnick, M. (1996). Constructionism in practice: Designing, thinking, and learning in a digital world. Mahwah, NJ: Lawrence Erlbaum Associates.

Kukla, A. (2000). Social Constructivism and the Philosophy of Science. New York: Routledge.

Lave, J., & Wenger, E. (1991). Situated learning: Legitimate peripheral participation. Cambridge, UK: Cambridge University Press.

McMahon, M. (1997, December). Social Constructivism and the World Wide Web - A Paradigm for Learning. Paper presented at the ASCILITE conference. Perth, Australia.

Prawat, R. S. (1995). Misleading Dewey: Reform, projects, and the language game. Educational Research, 24(7), 13-27.

Prawat, R. S., & Floden, R. E. (1994). Philosophical Perspectives on Constructivist Views of Learning. Educational Psychologist, 29(1), 37-48.

Rehabilitated?, [Internet]. Available: http://www.ex.ac.uk/~PErnest/soccon.htm [2001, March 28].

Rogoff, B. (1990). Apprenticeship in thinking: cognitive development in social context. New York, NY: Oxford University Press.

Additional resources

Social Constructivist Theory http://viking.coe.uh.edu/~ichen/ebook/et-it/social.htm

Social Constructivism and the World Wide Web - A Paradigm for Learning http://www.ascilite.org.au/conferences/perth97/papers/Mcmahon/Mcmahon.html

This book is licensed under a Creative Commons Attribution 3.0 License

7. Connectivism

Authors: Clarissa Davis, Earl Edmunds, Vivian Kelly-Bateman

Introduction

Just like anything else that involves human experience or interaction, the act of learning does not happen in a vacuum. It is at the intersection of prior knowledge, experience, perception, reality, comprehension, and flexibility that learning occurs. In years past, the traditional learning paradigms of behaviorism, cognitivism, and constructivism have been the benchmarks against which the learning process has been measured. What happens, though, when you throw into the mix all the technological advancements that have come about over the last 40-50 years? These theories certainly do not become obsolete by any means, but they do need to be used in a very different way to be able to incorporate the attributes of a 21st century learning environment. In today's technology-rich society, it has become increasingly important to learn how to learn. Vail put it simply by declaring that learning must be a way of being (1996).

Half-life of knowledge

New technology forces the 21st century learner to process and apply information in a very different way and at a very different pace from any other time in history. As a result, the span of time between learning something new, being able to apply it, and finding that it is outdated and no longer useful continues to decrease. This phenomenon is what Gonzalez refers to as the "half-life" of knowledge—the time span from when knowledge is gained until it becomes obsolete (2004). Since the advent of technology, from the radio to the internet, the half-life of knowledge has decreased significantly. Gone is the era when it takes days, weeks, months, or years for something to catch on with the general population. Something that may have taken that long just ten years ago can now reach literally millions of people around the world within a matter of seconds.

Components of connectivism

At its core, George Siemens' theory of connectivism is the combined effect of three different components: chaos theory, importance of networks, and the interplay of complexity and self-organization.

Chaos Theory

The idea behind Chaos Theory is that, regardless of how unrelated events may seem, when studied together, they create a pattern that can show relevance beyond the individual events themselves (Salmon, 1999, para. 5). This creates what Gleick refers to as a "sensitive dependence on initial conditions" (1987, p.8). Basically, if the underlying conditions used to make decisions change, the decision itself is no longer as correct as it was at the time it was made. "The ability to recognize and adjust to pattern shifts, therefore, becomes a key learning task" (Siemens, 2005, para. 18).

Importance of networks

According to Siemens, "considering technology and meaning-making as learning activities begins to move learning into the digital age" (2005, para. 15). Inherent to this new viewpoint on learning is the idea that we can no longer personally experience everything there is to experience as we try to learn something new. We must create networks which, simply defined, are connections between entities. By using these networks - of people, of technology, of social structures, of systems, of power grids, etc. - learning communities can share their ideas with others, thereby "cross-pollinating" the learning environment (Siemens, 2005, para. 21).

Complexity and self organization

Heylighen (2008) describes the delicate interplay between complexity and self-organization as follows: "Complexity cannot be strictly defined, only situated in between order and disorder. A complex system is typically modeled as a collection of interacting agents, representing components as diverse as people, cells or molecules. Because of the non-linearity of the interactions, the overall system evolution is to an important degree unpredictable and uncontrollable. However, the system tends to self-organize, in the sense that local interactions eventually produce global coordination and synergy. The resulting structure can in many cases be modeled as a network, with stabilized interactions functioning as links connecting the agents" (p. 1). In addition, Luis Mateus Rocha (1998) defines self-organization as the "spontaneous formation of well organized structures, patterns, or behaviors, from random initial conditions" (p.3).

Connectivism defined

According to Siemens, "connectivism is driven by the understanding that decisions are based on rapidly altering foundations. New information is continually being acquired and the ability to draw distinctions between important and unimportant information is vital. Also critical is the ability to recognize when new information alters the landscape based on decisions made yesterday" (Siemens, 2005, para. 24).

Principles of connectivism

Based on the above definition, Siemens posits the following principles of connectivism:

- Learning and knowledge rest in diversity of opinions.
- Learning is a process of connecting specialized nodes or information sources.
- Learning may reside in non-human appliances.
- Capacity to know more is more critical than what is currently known.
- Nurturing and maintaining connections is needed to facilitate continual learning.
- Ability to see connections between fields, ideas, and concepts is a core skill.
- Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.

Decision-making itself is a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision (Siemens, 2005, para. 24).

A comparison

How does connectivism compare to other learning theories? How does it differ from established paradigms? The chart below illustrates both the similarities and differences between connectivism and three major philosophical perspectives on learning.

This book is licensed under a Creative Commons Attribution 3.0 License

Table 2: Similarities and differences between connectivism and three major philosophical perspectives on learning

Questions	Behaviorism	Cognitivism	Constructivism	Connectivism
How does learning occur?	Black box-observable behavior main focus	Structured, computational	Social, meaning created by each learner (personal)	Distributed within a network, social. Technologically enhanced, recognizing and interpreting patterns
What factors influence learning?	Nature of reward, punishment, stimuli	Existing schema, previous experiences	Engagement, participation, social, cultural	Diversity of network
What is the role of memory?	Memory is handwriting of repeated experiences – where reward and punishment are most influential	Encoding storage, retrieval	Prior knowledge remixed to current context	Adaptive patterns. Representative of current state, existing in networks
How does transfer occur?	Stimulus, response	Duplication knowledge constructs of "knower"	Socialization	Connecting to (adding nodes)
What types of learning are best explained by this theory?	Task-based learning	Reasoning, clear objectives, problem solving	Social, vague ("ill defined")	Complex learning, rapid changing core, diverse knowledge sources
Source: (Ireland, 2007, para. 7)				

Critics of connectivism

Is Connectivism a new learning theory? As a fundamental criticism of connectivism, some argue that it is a pedagogical view, not a learning theory. An outspoken critic of the theory, Pløn Verhagen, Professor of Educational Design at the University of Twente believes connectivism to be relevant on a curricular level as it speaks to what people should learn and the skills they should develop. To be relevant at the theoretical level, connectivism should explore the processes of how people learn. Verhagen does not believe the latter to be the case (Verhagen, 2006). Other critics have been less austere. Invited by George Siemens to present at to the Connectivism Online Conference in February, 2007, Bill Kerr offered limited support for connectivism. According to Kerr, connectivism fails to qualify as a theory based on three criteria.

They are:

- Connectivism does not contribute to a theory or learning reform, due to its use of "language and slogans that are sometimes 'correct' but are too generalized to guide new practice at the level of how learning actually happens,"
- Connectivism does "contribute to a general world outlook," and
- Connectivism "misrepresents the current state of established alternative learning theories such as constructivism, behaviorism and cognitivism, so this basis for a new theory is also dubious" (Kerr, 2006, para. 5-7).

Conclusion

The debate on the status of Siemens' theory of connectivism will undoubtedly continue for some time, and the ultimate outcome remains to be seen. However, one of connectivism's defining principles states that what we consider to be right today may tomorrow be considered wrong (Siemens, 2005). So then, perhaps, "tomorrow" the debate could lead to a prevailing view that connectivism is the leading learning theory of the time.

References

Driscoll, M. (2000). Psychology of learning for instruction. Needham Heights, MA: Allyn & Bacon.

Fisch, K., McLeod, S., & Brenman, J. (2008). Did you know?. Retrieved December 8, 2008, Web site: http://uk.youtube.com/watch?v=jpEnFwiqdx8&feature=related

Gleick, J. (1987). Chaos: The making of a new science. New York, NY: Penguin Books.

Gonzalez, C. (2004). The role of blended learning in the world of technology. Retrieved November 1, 2008 from http://www.unt.edu/benchmarks/archives/2004/september04/eis.htm

Heylighen, F. (2008). Complexity and self-organization. Encyclopedia of Library and Information Sciences, Retrieved November 3, 2008, from http://pespmc1.vub.ac.be/Papers/ELIS-complexity.pdf

Ireland, T. (2007). Situating connectivism. Retrieved November 7, 2008, from http://design.test.olt.ubc.ca/Situating_Connectivism

Kerr, B. (December 2006). A challenge to connectivism. Retrieved November 11, 2008, from wwwhttp://billkerr2.blogspot.com/2006/12/challenge-to-connectivism.html

Rocha, L. M. (1998). Selected self-organization and the semiotics of evolutionary systems. Retrieved November 9, 2008 from http://informatics.indiana.edu/rocha/ises.html

Salmon, V. (1999). Chaos in the composition classroom: Why do some classes fail to function?. Inquiry, 4, Retrieved December 1, 2008, from http://www.vccaedu.org/inquiry/inquiry-fall99/i-42-salmon.html

Siemens, G. (2005, January). Connectivism: A learning theory for the digital age. International Journal of Instructional Technology & Distance Learning, Retrieved November 03, 2008, from http://www.itdl.org/Journal/Jan_05/article01.htm

Vaill, P. B., (1996). Learning as a way of being. San Francisco, CA: Jossey-Bass Inc.

Verhagen, P. (2006, November). Connectivism: a new learning theory?. elearning, Retrieved November 4, 2008, from http://.surfspace.nl/nl/Redactieomgeving/Publicaties/Documents/Connectivism%20 a %20new%20theory.pdf

This book is licensed under a Creative Commons Attribution 3.0 License

8. Motivation: a general overview of theories

Author: Shiang-Kwei Wang (The University of Georgia, USA)

Editor: Michael Orey (The University of Georgia, USA)

Goals

Definition of goals

A goal is "something that the person wants to achieve"(Locke & Latham, 1990, p.2). A teacher's goal might be "to help students understand the concept of an ellipse within one week"; A typical goal for a student could be "earning an 'A' in foreign language class".

Formation of goals

Long and short-term goals

Long-term goals keep behavior directed toward an ultimate target, while short-term goals are the stepping stones to the long-term goals (Alderman 1999). Bandura and Schunk's research (Bandura & Schunk, 1981) on proximal motivation indicated that this sub-dividing of accomplishable short-term goals would help students to progress at a more rapid pace. They concluded that self-motivation can best be created and sustained by attainable sub-goals that lead to the larger goals.

An example of goal formations might be:

Long-term goal:	I want to be a good piano player.
Proximal goals and progress:	Prepare for concert.
	Practice 2 hours every day.

Goal setting

Expressions such as "intend to" or "desire to" are often used in setting goals. For example, "I intend to run a marathon this year". Goal setting is simply defined as "a specific outcome that an individual is striving to achieve" (Alderman 1999).

Maslow's Hierarchy of Needs stresses personal growth and development. Goals are set to satisfy needs. Psychologist Abraham Maslow developed the Hierarchy of Needs to classify human needs into five general categories. Those needs that are higher in the hierarchy are considered more important, and cannot be satisfied unless the needs below them in the hierarchy are satisfied first. Understanding Maslow's Hierarchy of Needs can help explain differences in behavior between individuals.

Goal difficulty

A sub-goal does not imply an easier goal. Locke & Latham (1990) suggested that more difficult goals will enhance performance level, especially when the task is performed voluntarily. Setting up rigid and realistic goals based on the learner's competence, therefore, is more effective than setting easy goals.

Feedback

Feedback on learning or training progress helps learners know if their goals are being met, and if not, how to improve achievement of goals. Bandura (1993) suggested that positive feedback enhances motivation, while negative feedback that emphasizes deficiencies will lower the self-efficacy of learners.

Goal orientation theories

Performance goals vs mastery goals

According to Ames' study (1988), when performance goals are involved, there is a concern with having one's ability judged. Success is evidence of ability, shown by outperforming others, or by achieving success with little effort. With a mastery goal, importance is attached to developing new skills. The process of learning itself is valued, and the attainment of mastery is seen as dependent on effort.

Here is an example comparing mastery and performance goals:

Mastery goal: Understanding the class materials is more important than earning a high grade, and that's why I work hard to learn. My performance is better than it was at the beginning of the semester.

Performance goal: I want to avoid mistakes so I can get a good grade. That's the reward for studying hard; my performance is better than other students.

The positive cognitive effect on learners adopting mastery goals has been verified in many research studies (Pintrich, 1996, p. 241).

Ames (1992) created a matrix to present the classroom structure and instructional strategies supporting a mastery goal as shown below:

Table 3: Classroom structure and instructional strategies supporting a mastery goal

<table>
<tr><th>Structure</th><th>Instructional strategies</th><th>Motivation patterns</th></tr>
<tr><td>Task</td><td>• Focus on the meaningful aspects of learning activities
• Design tasks for novelty, variety, diversity, and student interest
• Design tasks that offer reasonable challenge to students
• Help students establish short-term, self-referenced goals
• Support the development and use of effective learning strategies</td><td rowspan="2">• Focus on effort and learning
• High intrinsic interest in activity
• Attributions to effort
• Attributions to effort-based strategies
• Use of effective learning and other self-regulatory strategies
• Active engagement
• Positive affect on high effort tasks
• Feelings of belongingness
• "Failure-tolerance"</td></tr>
<tr><td>Authority</td><td>• Focus on helping students participate in the decision making
• Provide "real" choices where decisions are based on effort, not ability evaluations
• Give opportunities to develop responsibility and independence</td></tr>
</table>

This book is licensed under a Creative Commons Attribution 3.0 License

	• Support development and use of self-management and monitoring skill	
Evaluation/ Recognition	• Focus on individual improvement, progress, and mastery • Make evaluation private, not public • Recognize students' effort • Provide opportunities for improvement • Encourage view of mistakes as part of learning	
Source: Ames, C. (1992). Classrooms: Goals, structures, and student motivation. Journal of Educational Psychology, V. 84, N.3, p. 261-271		

Self-efficacy

Definition

Self-efficacy affects some of the factors that predict motivation. According to Bandura (1982), self-efficacy is a self-judgment of one's ability to perform a task in a specific domain. However, a high degree of self-efficacy in one domain does not necessarily transfer to other areas of endeavor. High self-efficacy positively affects performance; this good performance will in turn enhance self-efficacy .

Sources of self-efficacy

Bandura (1997) identified four phenomena that affect self-efficacy:

- Mastery experiences

Mastery experience is one's personal experience with success or failure. For example, the positive experience of a good performance on the previous math exam, will influence the perception of one's ability in math.

- Vicarious experiences

Self-efficacy can be affected by observing the experiences of others. Students who observe a model successfully perform in a threatening situation are more likely to develop the expectation that they can acquire the same skill (Alderman, 1999). The learners can imitate their models' skills, or copy the strategies that the models use.

- Verbal persuasion

Learners can be motivated by using verbal feedback to convince or encourage them to accomplish their tasks. For example, simply telling students, "you can do it" is a commonly used strategy. However, instructors should be conscious of the messages that they use. Bandura pointed out that negative messages have an even greater effect on lowering efficacy expectations than do positive messages to increase it.

- Physiological state

Anxiety, nervousness, rapid heart rate, sweating; these symptoms often occur when learners face challenges that require competence to overcome. Such physical or mental states reflect learner perceptions of their self-efficacy; these in turn affect their performance.

Improving self-efficacy

There are various means of strengthening Self-efficacy.

Feedback: Encouragement and in-depth, informative feedback from teachers are important in its influence on self-efficacy. The teachers should also emphasize the rationale of why some strategies that the learners use are successful and why some fail.

Model: Exposing learners to an non-expert model (peer model) conquering the challenges successfully can help learners increase their motivation and self-efficacy. Another approach to enhance self-efficacy is learners observing the expert model solving problems with specific strategies or skills.

Successful experience: It is the teachers' responsibility to help learners achieve academic success by providing challenging, yet attainable tasks. Successful experience is the most important source of fostering self-efficacy.

Attribution theory

Definition of attributions

"Why did I successfully accomplish this task?"

"Why did Jack fail math?"

The answers to these questions reflect personal beliefs about the causes of results. Attribution theory is the study of how individuals explain events in their lives (Bruning, Schraw & Ronning, 1999, p.137). Knowing learners' attributional beliefs can help instructors to address the value of effort.

Motivational dimensions of attributions

Weiner (1979) proposed that attribution can be explained through a three-dimensional classification of causality, with each class expressed in a continuum linking extremes. These three categories of attribution are:

- Locus of control: internal-external

Causation for events may be placed in a continuum ranging from conditions completely within to those completely outside of the individual's influence. Locus of control refers to the degree to which results are due to factors inside (internal locus of control) or outside (external locus of control) an individual. For instance, factors such as mood and ability are internal causes; luck and teacher bias are external causes.

- Stability: stable-unstable

Stability refers to an unchanging cause. Consider the following statement: "I'm good at playing guitar because I've practiced for more than a year". In this case, the ability to play guitar is a stable cause for this person. Or this: "I got an A in math this time because the test was very easy. Almost everyone made an A". Such a belief suggests that the successful performance resulted from chance; the easy test is an inconsistent or unstable cause.

- Controllability: controllable-uncontrollable

Controllability refers to those factors that can be controlled to influence results. Skill and competence are classified as controllable, while luck and mood are classified as uncontrollable.

The attributional process

From a review of attributional theories, Pintrich and Schunk (1996) generated a model to present the attributional process. This model provides the effect of attribution on motivational, affective, and behavioral consequences. The incidents can be classified as either environmental or personal factors. An individual will attribute these incidents to the perceived causes and different causal dimensions. These causes will affect an individual's psychological consequences and influence behaviors. The overview of the general attributional model can help in gaining an understanding of the attributional process.

This book is licensed under a Creative Commons Attribution 3.0 License

Table 4: Attributional process

<table>
<tr><th>Antecedent conditions</th><th>Perceived causes</th><th>Causal dimensions</th><th>Psychological consequences</th><th>Behavioral consequences</th></tr>
<tr><td>Environmental factors
• Specific information
• Social norms
• Situational Features</td><td rowspan="2">Attributions for Ability
Effort
Luck
Task difficulty
Teacher
Mood
Health
Fatigue, etc.</td><td rowspan="2">Stability
Locus
Control</td><td rowspan="2">Expectancy for success
Self-Efficacy
Affect</td><td rowspan="2">Choice
Persistence
Level of effort
Achievement</td></tr>
<tr><td>Personal factors
• Causal schemas
• Attributional bias
• Prior knowledge
• Individual differences</td></tr>
<tr><td colspan="5">Source: Pintrich, P. R., & Schunk, D. H. (1996). Attributional processes. Motivation in Education: Theory, Research, and Applications. New Jersey: Prentice-Hall, p. 103-152</td></tr>
</table>

An example

Allen is a gifted student, and usually performs well on exams. Last week, however, he failed a physics exam. Will he still invest his time in studying physics, and enjoy doing it?

In Allen's case, he studied hard but performed poorly on the physics exam; the majority of the class failed the exam as well. After Allen had learned the class average for the exam and received feedback from the teacher (specific information), he attributed his failure to task difficulty rather than of a lack of effort. Thus, the cause of his failure is unstable, external, and uncontrollable. Given this causal information, his self-efficacy in physics would not decrease. He would continue to expect success, and to study physics.

Self-regulation and volition

Definition

Some independent learners require little attention from their teachers. They know how to adopt learning strategies, they understand their competencies in specific domains, and will commit to their academic goals. These students have volition and can be described as "self-regulated" learners. Zimmerman (1989) pointed out that students can be described as self-regulated to the degree that they are metacognitively, motivationally, and behaviorally active participants in their own learning processes. Three assumptions are involved in the definition: self-regulated learning strategies, self-efficacy perceptions of skill performance, and a commitment to academic goals.

Self-regulated learning is determined by personal, environmental, and behavioral events:

Personal influences - students' knowledge and goals Behavioral influences--self-observation, self-judgment, and self-reaction Environmental influences--verbal persuasion and modeling

Possible selves

A vision of a possible self is the first step in developing self-regulation (Alderman, 1999). Possible selves are how one "images" the self and the future. Possible selves represent individuals' ideas of what they might become, what they would like to become (positive possible selves), and especially what they are afraid of becoming (negative possible selves) (Markus & Ruvolo, 1989). Examples of positive possible selves might be earning a master's degree, becoming a good baseball player, or getting an "A" on a math exam. Negative possible selves could include fear of becoming homeless or failing a physics exam. Developing a positive view of the future helps learners enhance their motivation and commitment to academically support personal goals.

In his review of the literature, Alderman (1999) indicated that the formation of possible selves is influenced by developmental factors, sociocultural factors, attributional history and self-efficacy judgments. For example: John has an interest in media. He is influenced by his music teacher and decides to become a keyboard player. John tries to enhance his keyboard playing skills; his playing continually improves with practice. Encouragement from others and the positive experience of playing the keyboard increase his self-efficacy, which helps him to develop a concrete goal for the future. John attributes his success to internal, controllable, and stable causes. He stresses the value of effort over other factors.

Volition

Volition is one of the most important factors contributing to self-regulation. According to Corno (1994, p. 229), volition is "the tendency to maintain focus and effort toward goals despite potential distractions". For some reason, some learners overcome barriers and difficulties to ensure that academic goals are reached.

Corno and Zimmerman (1994) developed a volitional control activities list as below:

Activities in volitional enhancement curriculum

- Teacher and students list possible distractions when studying.
- Teacher and students make a master list of the most frequent distractions and categorize them as to where they occur or if they were distracting thoughts.
- Teacher and students list ways that students usually handle distractions; then match the response with the distraction and evaluate how well it works. The most effective way is to refocus on the task.
- The teacher models and demonstrates both effective and ineffective responses to a distracting situation.
- The teacher leads students through a 20-item quiz requiring identification and classification of more effective strategies.
- Using written scenarios, small groups of students role play more effective strategies for handling distractions. A peer audience evaluates the actors' strategies.
- The teacher reminds students that he or she will be looking for evidence of the students using strategies to handle distractions and do their work. The teacher selects key tasks to observe and records the amount of time on task by groups and individuals. Students self-evaluate; then results are discussed with students. [1]

---

1 Corno, L. (1994). Student volition and education: Outcomes, influences, and practices. In B. J. Zimmerman & D. H. Schunk (Eds.), Self-regulation of learning and performance (pp. 229-254). Hillsdale, NJ: Lawrence Erlbaum Associates.

This book is licensed under a Creative Commons Attribution 3.0 License

Self-regulation is not a fixed characteristic of learners. Employing appropriate strategies can help learners to develop self-regulation and volition to learn. Zimmerman (1998) designed a table to compare experts' methods of self-regulation across different disciplines. Familiarity with these self-regulated methods is not only useful in learning, but once mastered, the techniques can be useful throughout life to function effectively in informal contexts.

Table 5: Self-regulatory process

Area of Expertise

Self-regulatory Processes	Writers	Athletes	Musicians	Students
Goal setting	Setting daily word or page goals	Setting specific and quantifiable daily goals for training	Setting daily practice session goals	Making lists to accomplish during studying
Task strategies	Creating outcomes or generative cues	Knowing how and what to practice, for example, taking periodic breaks and slow execution	Playing a piece slowly and softly	Creating mnemonics to remember facts
Imagery	Imagining a plot in visual detail	Visualizing yourself successfully making the shot	Imagining the presence of an audience	Imagining the consequences of failing to study
Self-instruction	Saying aloud what will be written	Self-verbalizing confidence statements, for example, "let's go!"	Verbally praising or prompting oneself	Rehearsing steps in solving a math problem
Time management	Scheduling daily writing, especially time in the morning	Setting up regular practice times, eating times, and relaxation and preparation periods	Scheduling daily practice to avoid extremes	Scheduling daily studying and homework time
Self-monitoring	Keeping records of literary production	Keeping a daily record of goal accomplishment or filming matches for replay	Keeping daily records of performance, for example, stress levels	Keeping records of completed assignments
Self-evaluation	Putting off self-judgments during creation	Breaking game into components and evaluating yourself after	Listening to self-recording, setting realistic standards	Checking work before handing it to the teacher

		each performance		
Self-consequences	Putting off pleasurable events until writing is completed	Grade yourself after every match	Refusing to end practice until passage is played flawlessly	Making TV or telephoning contingent on homework completion
Environmental structuring	Controlling writing setting and conditions	Building practice facility designed to develop weak part of one's game	Performing with specific tools or instruments, i.e., a metronome	Studying in a secluded place
Help seeking	Obtaining literary advice or feedback from colleague	Returning to teacher when flaws develop in one's game	Returning to teachers when techniques slip	Using a study partner
Source: Zimmerman, B. J. (1998). Academic studying and the development of personal skill: a self-regulatory perspective. Educational Psychologist, 33(2/3), p.73-86.				

Self-regulated learning strategies

Zimmerman and Martinez-Pons (1988) isolated the effective self-regulated learning strategies shown in the table below:

Table 6: Self regulated learning strategies

1. Self-evaluating	Statements indicating student-initiated evaluations of the quality or progress of their work; e.g. "I check over my work to make sure I did it right".
2. Organizing and transforming	Statements indicating student-initiated overt or covert rearrangement of instructional materials to improve learning; e.g. "I make an outline before I write my paper."
3. Goal-setting and planning	Statements indicating students' setting of educational goals or sub-goals, and planning for sequencing, timing, and completing activities related to those goals; e.g. "First, I start studying two weeks before the exams, and I pace myself".
4. Seeking information	Statements indicating student-initiated efforts to secure further task information from nonsocial sources when undertaking an assignment; e.g., "Before beginning to write the paper, I go to the library to get as much information as possible concerning the topic".
5. Keeping records and monitoring	Statements indicating student-initiated efforts to record events or results; e.g. "I took notes of the class discussions"; "I kept a list of the words I got wrong".

This book is licensed under a Creative Commons Attribution 3.0 License

6. Environmental structuring	Statements indicating student-initiated efforts to select or arrange the physical setting to make learning easier, e.g, "I isolate myself from anything that distracts me"; "I turn off the radio so I can concentrate on what I am doing".
7. Self-consequating	Statements indicating student arrangement or imagination of rewards or punishment for success or failure; e.g."If I do well on a test, I treat myself to a movie".
8. Rehearsing and memorizing	Statements indicating student-initiated efforts to memorize material by overt or covert practice; e.g. "In preparing for a math test, I keep writing the formula down until I remember it".
9-11. Seeking social assistance	Statements indicating student-initiated efforts to solicit help from peers (9), teachers (10), and adults (11); e.g. "If I have problems with math assignments, I ask a friend to help".
12-14. Reviewing records	Statements indicating student-initiated efforts to reread notes (12), tests (13), or textbooks (14) to prepare for class or further testing; e.g. "When preparing for a test, I review my notes".
Source: Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning., Journal of Educational Psychology, 81(3), p. 337.	

Result: In general, self-regulated learners are aware of effective learning strategies for enhancing learning performance.

Intrinsic motivation

Definitions

People often choose to invest considerable time in activities without apparent reward. The cause underlying such behaviors is intrinsic motivation. Intrinsic motivation is defined as engagement in actions for their own sake with the only tangible benefit being outcomes such as pleasure, learning, satisfaction, interest, or challenge. On the other hand, extrinsic motivation occurs when learners engage in activities for the purpose of attaining rewards, such as praise or high grades (Alderman, 1999). Engaging in behavior to avoid punishment is also regarded as an extrinsic motivation.

Enhancing intrinsic motivation

Some researchers believe that intrinsic motivation can be enhanced through the use of particular strategies, and have sought a correlation between the design of specific educational materials and an increase in learning performance. Thus far, studies have found no evidence to establish that the interest value of material is a determinant—as opposed to a consequence—of learning (Parker & Lepper, 1992). However, some useful strategies that can promote intrinsic motivation have been proposed.

Lepper and Hodell (1989) suggest four methods for enhancing intrinsic motivation:

Challenge: Design challenging activities which convey the message to the learners that they have competitive skills. It is essential to find a balance between learner competence and the difficulty of the goals. Overly difficult goals are unlikely to increase learner motivation to continue the task if the learners perceive they will never reach the goal. Likewise, goals that are too easily attained do not sufficiently challenge learners to encourage skill development.

Curiosity: Activities that create disequilibria for the learners can elicit curiosity. Presenting discrepant ideas—those that conflict with their prior knowledge or beliefs—can prompt students to seek information that will resolve the discrepancy. As with challenge, moderate discrepancies are most effective because they are easily incorporated into an individual's mental framework; large discrepancies may be rapidly discounted (Pintrich & Schunk, 1996, p.277).

Control: A sense of responsibility will be better fostered in learners if they are allowed to make meaningful choices in the learning process.

Fantasy: The design of simulations and games that involve fantasy can increase intrinsic motivation.

Flow

Csikszentmihalyi (1985) used flow theory to explain cases in which subjects describe their experiences as intrinsically rewarding. When individuals engage in activities and lose awareness of time and space, they are involved with flow experiences.

References

Alderman, M. K. (1999). Goals and goal setting. Motivation for achievement: possibilities for teaching and learning. New Jersey: Lawrence Erlbaum Associates.

Ames, C., & Archer, J. (1988). Goals in the classroom: students' learning strategies and motivation processes. Journal of Educational Psychology, 80(3), 260-267.

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. Journal of Educational Psychology, 84(3), p. 261-271

Bandura, A., & Schunk, D. H. (1981). Cultivating competence, self-efficacy, and intrinsic interest through proximal motivation. Journal of Personality and Social Psychology, 41, 586-598.

Bandura, A., (1993). Perceived self-efficacy in cognitive development and functioning. Educational Psychologist, 28(2), 117-148.

Bandura, A., (1982). Self-efficacy mechanism in human agency. American Psychologist, 37, p. 122-147.

Bandura, A. (1997). Self-efficacy: The exercise of control. New York: Freeman.

Bruning, R. H., Schraw, G. J., & Ronning, R. R. (1999). Cognitive psychology and instruction. 3rd ed. New Jersey: Prentice-Hall.

Corno, L. (1994). Student volition and education: Outcomes, influences, and practices. In B. J. Zimmerman & D. H. Schunk (Eds.), Self-regulation of learning and performance (pp. 229-254). Hillsdale, NJ: Lawrence Erlbaum Associates.

Csikszentmihalyi, M. (1985). Emergent motivation and the evolution of the self. In D. Kleiber and M. H. Maehr (Eds.), Motivation in Adulthood (pp. 93-119). Greenwich, CT: JAI Press.

Lepper, M. R., & Hodell, M. (1989). Intrinsic motivation in the classroom. In C. Ames & R. Ames (Eds.), Research on motivation in education (Vol. 3, PP 73-105). San Diego: Academic Press.

Locke, E. A., & Latham, G. P. (1990). A theory of goal setting and task performance. Englewood Cliffs, NJ: Prentice-Hall.

This book is licensed under a Creative Commons Attribution 3.0 License

Markus, H. & Ruvolo, A. (1989). Possible selves: Personalized representations of goals. In L. Pervin (Ed.)., Goal concepts in personality and social psychology. (pp. 211-241). Hillsdale,NJ: Erlbaum

Motivation http://chiron.valdosta.edu/whuitt/col/motivation/motivate.html

Parker, L. E., & Lepper, M. R. (1992). Effects of fantasy contexts on children's learning and motivation: making learning more fun., Journal of Personality and Social Psychology, 62(4), 625-633.

Pintrich, P. R., & Schunk, D. H. (1996). The role of goals and goal orientation. Motivation in Education: Theory, Research, and Applications. New Jersey: Prentice-Hall.

Weiner, B. (1979). A theory of motivation for some classroom experiences., Journal of Educational Psychology, 71(1), 3-25.

Steers, R. M., Mowday, R. T., & Shapiro, D. L. (2004). The future of work motivation theory. *Academy of Management Review*, *29(3).*

Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning., Journal of Educational Psychology, 81(3), p. 329-339.

Zimmerman, B. J. (1998). Academic studying and the development of personal skill: a self-regulatory perspective. Educational Psychologist, 33(2/3), p.73-86.

Zimmerman, B. J., & Martinez-Pons, M. (1988). Construct validation of a strategy model of student self-regulated learning. Journal of Educational Psychology, 80, p. 284-290.

Additional resources

These are additional resources of self-efficacy:

- Critical Issue: Working Toward Student Self-Direction and Personal Efficacy as Educational Goals: Collection of many resources (including video clips) on how to enhance student self-efficacy.
- Information on self-efficacy: Professor Albert Bandura's web site on self-efficacy. This site collects many learning theories and models in relation to self-efficacy.

This book is licensed under a Creative Commons Attribution 3.0 License

9. Multiple intelligences and learning styles

Authors: Emily Giles, Sarah Pitre, Sara Womack (The University of Georgia, USA)

Editor: Michael Orey (The University of Georgia, USA)

Introduction

Various theories on learning have been developed with increasing frequency in the last few decades. In order to understand the relationship between these theories, Curry's onion model (Curry, 1983) was developed with four layers—personality learning theories, information processing theories, social learning theories, and multidimensional and instructional theories.

Personality learning theories define the influences of basic personality on preferences to acquiring and integrating information. Models used in this theory include Myers-Briggs Type Indicator, which measures personality in dichotomous terms—extroversion versus introversion, sensing versus intuition, thinking versus feeling, and judging versus perception, and the Keirsey Temperament Sorter, which classifies people as rationals, idealists, artisans, or guardians.

Information processing theories encompass individuals' preferred intellectual approach to assimilating information, and includes David Kolb's model of information processing, which identifies two separate learning activities: perception and processing.

Social learning theories determine how students interact in the classroom and include Reichmann's and Grasha's types of learners: independent, dependent, collaborative, competitive, participant, and avoidant.

Multidimensional and instructional theories address the student's environmental preference for learning and includes the Learning Style Model of Dunn and Dunn and the multiple intelligences theory of Howard Gardner. This chapter focuses on this type of learning theory by Howard Gardner.

Multiple intelligences

Multiple intelligences scenario

Ms Cunningham, a seventh grade American History Teacher, is preparing a unit on the American Civil Rights Movement of the 1950s and 1960s. The teacher has created a succession of lessons to be completed over a two-week period to enhance her students' understanding of the events, organizations, and individuals that were crucial to the movement. When the unit is over, Ms Cunningham wants her students to have a complete picture of the historical period. She designs a variety of activities that give the students the opportunity to explore historical and cultural aspects of the 1950s and 1960s, and to fully identify with those who were involved in the Movement. In order to reach her instructional goals, the students will read selected excerpts from the textbook and listen to various lecturers about the Movement. In addition to the aforementioned, the students will complete several exploratory tasks about the Civil Rights movement as well.

9. Multiple intelligences and learning styles

To begin the unit the teacher uses a KWL chart on the overhead to spur discussion and start the students' "juices" flowing. A KWL chart is a visual representation of what students already know, what they want to know, and what they learned at the end of a lesson. This activity is completed as a class. The students take turns sharing the tidbits of information that they already know about the Civil Rights movement. This information is on major figures, events and places involved in the Civil Rights movement. Upon establishing what basic prior knowledge the students possess, it is now time to begin discovering new information and confirming previously held information about the Civil Rights movement. Ms Cunningham then lectures on the basic events, people, and places involved in the majority of the Civil Rights movement in order to provide students some framework within which to begin placing their new information.

She closes the first lesson by asking the students to create a time line using the dates of events she has provided. This will be a working outline to be used throughout the unit. During a subsequent lesson, students are asked to share their outlines with their classmates in small groups. They should make corrections and comments on the outlines as needed. Ms Cunningham gains class consensus of the proper order for their working outline as she places an enlarged version on the classroom wall.

The culmination of this unit will be a final project in which students create a portfolio containing work on three mini-projects. All students will listen to the same guest lecturers, view the same videotaped footage and participate in the same class discussions during the first half of each class. The remainder of each class period will be reserved for work on personal exploration pertaining to their portfolio pieces. Ms Cunningham has provided a list of possible activities and a rubric for each suggested activity in order to support and to guide the student's work. She has also arranged her room so that "art" materials are in a central location; mapping and graphing information is grouped together and there is a section replete with reading and research materials.

Ms Cunningham's students will have many options for creating something that can be included in their portfolios. Students will have the option to write letters to members of the community who were teenagers during the Civil Rights Movement, asking them to share their memories and experiences about life during the time period. Students may work in teams to prepare speeches based on period issues for their fellow classmates. Students may consult with the school's Media Specialist or more knowledgeable others to find resources for the class, including popular music from the time period. They may also learn and share dances that were popular during the 1950s and 1960s. If they choose, students may include music in the plays they write and act out for their classmates. With the assistance of the Art instructor, students may opt to work together to create a mural that represents key figures of the Civil Rights Movement such as Rosa Parks and Martin Luther King Jr., with accompanying biographical information about each leader. Students may also create a map representing key events. Students may also work in groups to prepare short plays to enact for the class based on the readings and what they learn from the guest speakers. Afterwards, Ms Cunningham will moderate discussion sessions about the plays. All students will keep a record of their thoughts and feelings about the mini-lessons they completed. This journaling process will provide a synthesis of the materials with which they dealt. As one final measure, students present their portfolios to their classmates.

James, a student whose proclivities lean towards creative visual projects expresses interest in working on the mural of Civil Rights leaders. Ms Cunningham feels that James needs to shift gears and concentrate on other activities in the classroom. The teacher suggests that James work on creating the map and/or time line. At the teacher's encouragement, James begins to work on the other projects, but his attention continues to drift towards

This book is licensed under a Creative Commons Attribution 3.0 License

the students painting the mural. He contributes some excellent ideas and shows so much interest in the details and creation of the mural, that the teacher allows him to shift his focus back towards the visual project.

In another seventh grade classroom, Mr Smith taught a unit on the Civil Rights Movement by assigning textbook readings and lecturing the students on the historical events surrounding the Movement. Students were given sentence completion pop quizzes throughout the course of the lesson. The teacher showed videotaped programs to the class and each student wrote a short research paper about a Civil Rights leader or prominent figure. At the end of the unit, students were given a multiple choice and essay test.

What is multiple intelligences theory?

Howard Gardner's theory of Multiple Intelligences utilizes aspects of cognitive and developmental psychology, anthropology, and sociology to explain the human intellect. Although Gardner had been working towards the concept of Multiple Intelligences for many years prior, the theory was introduced in 1983, with Gardner's book, *Frames of Mind*.

Gardner's research consisted of brain research and interviews with stroke victims, prodigies, and individuals with autism. Based on his findings, Gardner established eight criteria for identifying the seven separate intelligences. The eight criteria used by Gardner to identify the intelligences are listed below:

- Isolation by brain damage/neurological evidence
- The existence of prodigies, idiot savants, and exceptional individuals
- Distinguishable set of core operations
- Developmental stages with an expert end state
- Evolutionary history and plausibility
- Susceptibility to encoding in a symbol system
- Support from experimental psychological tasks
- Support from psychometric research

For a more detailed look at these eight criteria, visit http://surfaquarium.com/MI/criteria.htm.

Originally, the theory accounted for seven separate intelligences. Subsequently, with the publishing of Gardner's *Intelligence Reframed* in 1999, two more intelligences were added to the list. The intelligences are Verbal/Linguistic, Logical/Mathematical, Visual/Spatial, Bodily-Kinesthetic, Musical, Interpersonal, Intrapersonal, Naturalistic, and Existential.

Gardner's theory challenges traditional, narrower views of intelligence. Previously accepted ideas of human intellectual capacity contend that an individual's intelligence is a fixed entity throughout his lifetime and that intelligence can be measured through an individual's logical and language abilities. According to Gardner's theory, an intelligence encompasses the ability to create and solve problems, create products, or provide services that are valued within a culture or society. Originally, the theory accounted for seven separate intelligences. Subsequently, with the publishing of Gardner's *Intelligence Reframed* in 1999, two more intelligences were added to the list. The nine intelligences are outlined in more detail in the section below. Listed below are key points of Gardner's theory:

- All human beings possess all nine intelligences in varying degrees. Each individual has a different intelligence profile.
- Education can be improved by assessment of students' intelligence profiles and designing activities accordingly.

- Each intelligence occupies a different area of the brain.
- The nine intelligences may operate in consort or independently from one another.
- These nine intelligences may define the human species.

Gardner, a Professor of Education at Harvard University, and other researchers and educators continue to work towards a more holistic approach to education through Project Zero. For more information on the projects and research involved in Project Zero, visit the website at http://www.pz.harvard.edu.

Although the theory was not originally designed for use in a classroom application, it has been widely embraced by educators and enjoyed numerous adaptations in a variety of educational settings. Teachers have always known that students have different strengths and weaknesses in the classroom. Gardner's research was able to articulate that and provide direction as to how to improve a student's ability in any given intelligence. Teachers were encouraged to begin to think of lesson planning in terms of meeting the needs of a variety of the intelligences. From this new thinking, schools such the Ross School in New York, an independent educational institution, and the Key Learning Community, a public magnet school in Indianapolis emerged to try teaching using a Multiple Intelligences curriculum. The focus of this part of the chapter will be on lesson design using the theory of Multiple Intelligences, and providing various resources that educator's may use to implement the theory into their classroom activities.

The eight intelligences

Verbal/Linguistic

Verbal/Linguistic intelligence refers to an individual's ability to understand and manipulate words and languages. Everyone is thought to possess this intelligence at some level. This includes reading, writing, speaking, and other forms of verbal and written communication. Teachers can enhance their students' verbal/linguistic intelligence by having them keep journals, play word games, and by encouraging discussion. People with strong rhetorical and oratory skills such as poets, authors, and attorneys exhibit strong Linguistic intelligence. Some examples are T.S. Elliot, Maya Angelou, and Martin Luther King Jr. Traditionally, Linguistic intelligence and Logical/Mathematical intelligence have been highly valued in education and learning environments.

Logical/Mathematical

Logical/Mathematical intelligence refers to an individual's ability to do things with data: collect, and organize, analyze and interpret, conclude and predict. Individuals strong in this intelligence see patterns and relationships. These individuals are oriented toward thinking: inductive and deductive logic, numeration, and abstract patterns. They would be a contemplative problem solver; one who likes to play strategy games and to solve mathematical problems. Being strong in this intelligence often implies great scientific ability. This is the kind of intelligence studied and documented by Piaget. Teachers can strengthen this intelligence by encouraging the use of computer programming languages, critical-thinking activities, linear outlining, Piagetian cognitive stretching exercises, science-fiction scenarios, logic puzzles, and through the use of logical/sequential presentation of subject matter. Some real life examples of people who are gifted with this intelligence are Albert Einstein, Niehls Bohr, and John Dewey.

Visual/Spatial

Visual/Spatial intelligence refers to the ability to form and manipulate a mental model. Individuals with strength in this area depend on visual thinking and are very imaginative. People with this kind of intelligence tend to learn most readily from visual presentations such as movies, pictures, videos, and demonstrations using models

This book is licensed under a Creative Commons Attribution 3.0 License

and props. They like to draw, paint, or sculpt their ideas and often express their feelings and moods through art. These individuals often daydream, imagine and pretend. They are good at reading diagrams and maps and enjoy solving mazes and jigsaw puzzles. Teachers can foster this intelligence by utilizing charts, graphs, diagrams, graphic organizers, videotapes, color, art activities, doodling, microscopes and computer graphics software. It could be characterized as right-brain activity. Pablo Picasso, Bobby Fischer, and Georgia O'Keefe are some examples of people gifted with this intelligence.

Bodily/Kinesthetic

Bodily/Kinesthetic intelligence refers to people who process information through the sensations they feel in their bodies. These people like to move around, touch the people they are talking to and act things out. They are good at small and large muscle skills; they enjoy all types of sports and physical activities. They often express themselves through dance. Teachers may encourage growth in this area of intelligence through the use of touching, feeling, movement, improvisation, "hands-on" activities, permission to squirm and wiggle, facial expressions and physical relaxation exercises. Some examples of people who are gifted with this intelligence are Michael Jordan, Martina Navratilova, and Jim Carrey.

Naturalistic

Naturalistic intelligence is seen in someone who recognizes and classifies plants, animals, and minerals including a mastery of taxonomies. They are holistic thinkers who recognize specimens and value the unusual. They are aware of species such as the flora and fauna around them. They notice natural and artificial taxonomies such as dinosaurs to algae and cars to clothes. Teachers can best foster this intelligence by using relationships among systems of species, and classification activities. Encourage the study of relationships such as patterns and order, and compare-and-contrast sets of groups or look at connections to real life and science issues. Charles Darwin and John Muir are examples of people gifted in this way.

Musical intelligence

Musical intelligence refers to the ability to understand, create, and interpret musical pitches, timbre, rhythm, and tones and the capability to compose music. Teachers can integrate activities into their lessons that encourage students' musical intelligence by playing music for the class and assigning tasks that involve students creating lyrics about the material being taught. Composers and instrumentalists are individuals with strength in this area. Wolfgang Amadeus Mozart and Louis Armstrong are examples.

Interpersonal

Although Gardner classifies Interpersonal and Intrapersonal intelligences separately, there is a lot of interplay between the two and they are often grouped together. Interpersonal intelligence is the ability to interpret and respond to the moods, emotions, motivations, and actions of others. Interpersonal intelligence also requires good communication and interaction skills, and the ability show empathy towards the feelings of other individuals. Teachers can encourage the growth of Interpersonal intelligences by designing lessons that include group work and by planning cooperative learning activities. Counselors and social workers are professions that require strength in this area. Some examples of people with this intelligence include Gandhi, Ronald Reagan, and Bill Clinton.

Intrapersonal

Intrapersonal intelligence, simply put, is the ability to know oneself. It is an internalized version of Interpersonal intelligence. To exhibit strength in Intrapersonal intelligence, an individual must be able to understand their own emotions, motivations, and be aware of their own strengths and weaknesses. Teachers can assign reflective activities, such as journaling to awaken students' Intrapersonal intelligence. Its important to note that this intelligence involves the use of all others. An individual should tap into their other intelligences to completely express their Intrapersonal intelligence. Authors of classic autobiographies such as Jean Paul Satre and Frederick Douglas are examples of individuals who exhibited strong Interpersonal intelligence in their lifetimes.

There is a ninth intelligence that has yet to experience full acceptance by educators in the classroom. This is Existential intelligence, which encompasses the ability to pose and ponder questions regarding the existence—including life and death. This would be in the domain of philosophers and religious leaders.

The table below summarizes the strengths, learning preferences, and needs that correspond to the intelligences.

Table 7: Summary of the eight intelligences

Intelligence Area	Strengths	Preferences	Learns best through	Needs
 **Verbal / Linguistic**	Writing, reading, memorizing dates, thinking in words, telling stories	Write, read, tell stories, talk, memorize, work at solving puzzles	Hearing and seeing words, speaking, reading, writing, discussing, and debating	Books, tapes, paper diaries, writing tools, dialogue, discussion, debated, stories, etc.
Mathematical/ Logical	Math, logic, problem-solving, reasoning, patterns	Question, work with numbers, experimenting, solve problems	Working with relationships and patterns, classifying, categorizing, working with the abstract	Things to think about and explore, science materials, manipulative, trips to the planetarium and science museum, etc.
Visual / Spatial	Maps, reading charts, drawing, mazes, puzzles, imagining things, visualization	Draw, build, design, create, daydream, look at pictures	Working with pictures and colors, visualizing, using the mind's eye, drawing	LEGOs, videos, movies, slides, art, imagination games, mazes, puzzles, illustrated books, trips to art museums, etc.
Bodily / Kinesthetic	Athletics, dancing, crafts, using tools, acting	Move around, touch and talk, body language	Touching, moving, knowledge through bodily sensations,	Role-play, drama, things to build, movement, sports

This book is licensed under a Creative Commons Attribution 3.0 License

			processing	and physical games, tactile experiences, hands-on learning, etc.
Musical	Picking up sounds, remembering melodies, rhythms, singing	Sing, play an instrument, listen to music, hum	Rhythm, singing, melody, listening to music and melodies	Sing-along time, trips to concerts, music playing at home and school, musical instruments, etc.
Interpersonal	Leading, organizing, understanding people, communicating, resolving conflicts, selling	Talk to people, have friends, join groups	Comparing, relating, sharing, interviewing, cooperating	Friends, group games, social gatherings, community events, clubs, mentors/ apprenticeships, etc.
Intrapersonal	Recognizing strengths and weaknesses, setting goals, understanding self	Work alone, reflect, pursue interests	Working alone, having space, reflecting, doing self-paced projects	Secret places, time alone, self-paced projects, choices, etc.
Naturalistic	Understanding nature, making distinctions, identifying flora and fauna	Be involved with nature, make distinctions	Working in nature, exploring living things, learning about plants and natural events	Order, same/different, connections to real life and science issues, patterns

Multiple intelligences in the classroom

There are many ways to incorporate Multiple Intelligences theory into the curriculum, and there is no set method by which to incorporate the theory. Some teachers set up learning centers with resources and materials that promote involving the different intelligences. For example, in the above scenario, Ms Cunningham creates an area with art supplies in her classroom. Other instructors design simulations that immerse students into real life situations. Careful planning during the lesson design process will help to ensure quality instruction and valuable student experiences in the classroom.

Other instructional models, such as project-based and collaborative learning may be easily integrated into lessons with Multiple Intelligences. Collaborative learning allows students to explore their Interpersonal intelligence, while project-based learning may help structure activities designed to cultivate the nine intelligences. For instance, Ms Cunningham uses aspects of project-based learning in her classroom by allowing students to plan, create, and process (through reflection) information throughout the Civil Rights unit, while also integrating activities that teach to the intelligences. This particular instructional model allows students to work together to explore a topic and to create something as the end product. This works well with Multiple Intelligences theory, which places value on the ability to create products. By collaborating with the Media Specialist to give students the opportunity to choose from a variety of resources to complete their assignments, Ms Cunningham uses aspects of resource-based learning, an instructional model that places the ultimate responsibility of choosing resources on the student.

It is important for teachers to carefully select activities that not only teach to the intelligences, but also realistically mesh with the subject matter of the lesson or unit. The Multiple Intelligences theory should enhance, not detract from what is being taught.

The Concept to Classroom website, initially funded by the Disney Learning Partnership, Tapping into Multiple Intelligences suggests two approaches for implementing Multiple Intelligences theory in the classroom. One is a teacher-centered approach, in which the instructor incorporates materials, resources, and activities into the lesson that teach to the different intelligences. The other is a student-centered approach in which students actually create a variety of different materials that demonstrate their understanding of the subject matter. The student-centered approach allows students to actively use their varied forms of intelligence. In a teacher-centered lesson, the number of intelligences explored should be limited to two or three. To teach less than two is nearly impossible since the use of speech will always require the use of one's Verbal/Linguistic intelligence. In a student-centered lesson, the instructor may incorporate aspects of project-based learning, collaborative learning, or other inquiry-based models. In such a case, activities involving all nine intelligences may be presented as options for the class, but each student participates in only one or two of the tasks.

Ms Cunningham incorporates both student-centered and teacher-centered activities into her unit on the Civil Rights Movement. The teacher-led lecture is a standard example of a teacher-centered activity. The lecture teaches to students' Verbal/Linguistic intelligence. The viewing of the videotape is another example of a teacher-centered activity. This activity incorporates Visual/Spatial intelligence into how the unit is learned. It is important to note that many activities, although designed to target a particular intelligence, may also utilize other intelligences as well. For example, in Ms Cunningham's classroom the students may work together on creating a mural of Civil Rights Leaders. This is a student-centered activity that directly involves Visual/Spatial intelligence, but also gives students a chance to exercise their Interpersonal intelligence. The journal assignment, also a student-centered activity, is designed to enhance students' Intrapersonal intelligence by prompting them to reflect on their feelings and experiences in relation to the Civil Rights movement. This activity also taps into Verbal/Linguistic intelligence. The time line and map assignments are student-centered activities that are designed to enhance students' Logical/Mathematical intelligence, but they also delve into Visual/Spatial intelligence. Students must collect and organize information for both the time line and the map therefore using their Logical/Mathematical intelligence. In creating these items, students must think visually as well. By incorporating dance into one lesson, Ms Cunningham is able to promote awareness of her students' Bodily-Kinesthetic intelligence. By showing videos of popular dances from the time period, or inviting an expert from the community to talk about the social aspects of dance, Ms Cunningham might incorporate a teacher-centered activity. Having students learn and perform dances is a student-centered way of teaching through Bodily-Kinesthetic intelligence. The short plays that students prepare involve Bodily-Kinesthetic intelligence, as well as Interpersonal and Verbal/Linguistic intelligences. Class discussions provide an opportunity for students to exercise both areas of their personal intelligences, as well as to reinforce the subject matter.

Planning and implementing student-centered lessons

This type of lesson revolves around student created materials. The types of activities and assignments that support student-centered lessons can be easily designed in concert with many of the inquiry-based models discussed in the text of this book. One of the most important aspects of student-centered lessons is allowing students to make choices. Teachers should encourage students to exercise their weaker intelligences, but allow them to explore their stronger areas as well. In Ms Cunningham's class, the student named James is very strong in Visual/Spatial intelligence and always leans towards this type of project. The teacher encourages James to participate in other activities, but when it is obvious that his interest lies in working on the mural Ms Cunningham allows him to work on the project.

Listed below are steps to implement a student-centered lesson or unit.

- Carefully identify instructional goals, objectives, and instructional outcomes.
- Consider activities that you can integrate into the lesson or unit that teach to the different intelligences. Teachers need not incorporate all nine intelligences into one lesson.
- When gathering resources and materials, consider those which will allow students to explore their multiple intelligences.
- Specify a time frame for the lesson or unit.
- Allow for considerable element of student choice when designing activities and tasks for the intelligences
- Design activities that are student-centered, using inquiry-based models of instruction.
- Provide a rubric for student activities. You might consider having students help create rubrics.
- Incorporate assessment into the learning process.

In an effort to maximize students' interest in both the subject matter and their own learning proclivities, teachers may wish to teach their students a little bit about Multiple Intelligences. Teachers can brief the class about each type of intelligence and then follow up with a self-assessment for each student. In this way, students will be able to capitalize on their strengths and work on their weaker areas. The Concept to Classroom Tapping into Multiple Intelligences website includes a self-assessment.

Planning and implementing a teacher-centered lesson

Structured, teacher-centered activities provide an opportunity for teachers to introduce material and establish prior knowledge and student conceptions. Teachers may lecture students, show informational videos and posters, perform drills, pose problem-solving exercises, arrange museum visits, and plan outings to concerts. There are all examples of teacher-centered activities. All of these activities integrate the Multiple Intelligences into the subject matter being taught. Teacher-centered lessons should be limited to a few activities that provide a foundation for students to later complete more exploratory tasks in which they can demonstrate understanding of the material. A teacher may choose to start an instructional unit or lesson with teacher-centered activities and then follow up with subsequent student-centered lessons. Teachers may follow these steps when designing and implementing a teacher-centered lesson:

- Identify instructional goals and objectives
- Consider teacher-centered activities that teach to students' Multiple Intelligences. In a teacher-centered lesson, limit the number of activities to two or three.
- Consider what resources and materials you will need to implement the lesson. For example, will you need to schedule a museum visit or to consult the Media Specialist for videos or other media?
- Specify a time frame for the lesson or unit.
- Provide an opportunity for reflection by students.
- Provide a rubric to scaffold student activities.
- Integrate assessment into the learning process.

Assessment is one of the biggest challenges in incorporating Multiple Intelligences in the classroom. Ms Cunningham's students are given the option of working on several mini-projects during the course of the Civil Rights unit. At the end of the unit, their performance is assessed through a portfolio that represents their work on these projects. It is very important for assessment to be integrated into the learning process. Assessment should give students the opportunity to demonstrate their understanding of the subject matter. One of the main goals of acknowledging and using Multiple Intelligences in the classroom is to increase student understanding of material by allowing them to demonstrate the ways in which they understand the material. Teachers need to make their expectations clear, and may do so in the form of a detailed rubric.

Benefits of multiple intelligences

Using Multiple Intelligences theory in the classroom has many benefits:

- As a teacher and learner you realize that there are many ways to be "smart"
- All forms of intelligence are equally celebrated.
- By having students create work that is displayed to parents and other members of the community, your school could see more parent and community involvement.
- A sense of increased self-worth may be seen as students build on their strengths and work towards becoming experts in certain areas
- Students may develop strong problem solving skills that they can use real life situations

Table 8: Multiple Intelligences: Classroom Application (Table added by Brandy Bellamy and Camille Baker, 2005)

	Teacher centered	**Student centered**
 **Verbal/ Linguistic**	• Present content verbally • Ask questions aloud and looks for students feedback • Interviews	• Student presents material • Students read content and prepare a presentation for his/her classmates • Students debate over an issue
	• Provide brain teasers or challenging questions to begin lessons.	• Students categorize information in logical sequences for organization. • Students create graphs or charts to

This book is licensed under a Creative Commons Attribution 3.0 License

Logical/ Mathematical	• Make logical connections between the subject matter and authentic situations to answer the question "why?"	explain written info. • Students participate in web quests associated with the content
 **Bodily/ Kinesthetic**	• Use props during lecture • Provide tangible items pertaining to content for students to examine • Review using sports related examples (throw a ball to someone to answer a question)	• Students use computers to research subject matter. • Students create props of their own explaining subject matter (shadow boxes, mobiles, etc...) • Students create review games.
 **Visual/Spatial**	• When presenting the information, use visuals to explain content: PowerPoint Slides, Charts, Graphs, cartoons, videos, overheads, smartboards	• Have students work individually or in groups to create visuals pertaining to the information: • Posters, timelines, models, PowerPoint slides, maps, illustrations, charts, concept mapping
 **Musical**	• Play music in the classroom during reflection periods • Show examples or create musical rhythms for students to remember things	• Create a song or melody with the content embedded for memory • Use well known songs to memorize formulas, skills, or test content
 **Interpersonal**	• Be aware of body language and facial expressions • Offer assistance whenever needed • Encourage classroom discussion	• Encourage collaboration among peers • Group work strengthens interpersonal connections • Peer feedback and peer tutoring • Students present to the class • Encourage group editing

 **Intrapersonal**	• Encourage journaling as a positive outlet for expression • Introduce web logging (blogs) • Make individual questions welcome • Create a positive environment.	• Journaling • Individual research on content • Students create personal portfolios of work
 **Naturalistic**	• Take students outside to enjoy nature while in learning process (lecture) • Compare authentic subject matter to natural occurrences. • Relate subject matter to stages that occur in nature (plants, weather, etc)	• Students organize thoughts using natural cycles • Students make relationships among content and the natural environment (how has nature had an impact?) • Students perform community service

Learning styles scenario

A group of four city planners in Boston are working together on a project to improve the methods of repairing streets. They have spent a lot of time in the field looking at streets and learning about the stresses they receive, how engineers currently deal with those problems, and the public's perceptions of street conditions. Some improvements have been made including a new system of diagnosing problems and new methods of repairing the streets. The final stage of their project is to determine how to educate the city's employees on these improvements.

Jessica believes that showing maps of where the various sidewalks in various states of decay would be helpful. She also wants to use a flow chart to represent the new repair process. Maybe a computer instruction guide could be utilized in the employee education program.

Patrick feels that the planners need to discuss these improvements with the city's employees. A question and answer session could also be implemented in an attempt to answer any questions concerning the new system of diagnosing problems and new methods of repairing the streets.

Will has already begun work on an extensive training manual, which will provide a concrete resource to guide employees in training and for later reference. The manual will be available in hard copy and on the web.

Claire thinks that the city employees would benefit the most from a multimedia presentation as well as a CD-ROM with links to other useful information. She also wants the employees to go into the field and see some of the streets that were used as models in the new program. If that is not possible, pictures could be provided as examples to give the employees a concrete idea of the improvements.

Learning styles

The term "learning styles" is commonly used throughout various educational fields and therefore, has many connotations. In general, it refers to the uniqueness of how each learner receives and processes new information through their senses. The National Association of Secondary School Principals defines learning style as, "the

This book is licensed under a Creative Commons Attribution 3.0 License

composite of characteristic cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment". Other phrases are used interchangeably with learning styles. Some include perceptual styles, learning modalities, and learning preferences.

Each person is born with certain preferences toward particular styles, but culture, experience, and development influence these preferences. The four most common learning styles are visual, aural, reading/writing, and kinesthetic/tactile. Most people learn through all modalities, but have certain strengths and weaknesses in a specific modality. Some people have an equal propensity for more than one style, which is titled as the multi-modal style. This preference can be determined through various testing instruments. Once a person's learning style is ascertained, accommodations can be made to increase academic achievement and creativity, as well as improve attitudes toward learning.

What is your learning style? Take the VARK Questionnaire!

The visual learning style

Visual learners process information most effectively when the information is seen. Depictions can include charts, graphs, flow charts, and all the symbolic arrows, circles, hierarchies and other devices that instructors use to represent what could have been presented in worlds. These learners think in pictures and have vivid imaginations. Most people are classified as visual learners.

Jessica is a visual learner. Her suggestions focus on the use of visual aids to increase information processing.

The aural learning style

Aural learners process information most effectively when spoken or heard. These learners respond well to lectures and discussions and are excellent listeners. They also like to talk and enjoy music and dramas. When trying to recall information, aural learners can often "hear" the way someone told them the information.

Patrick is an aural learner. His need to discuss the new improvement points to the benefits of obtaining information in an oral language format.

The reading/writing learning style

Reading/Writing learners process information most effectively when presented in a written language format. This type of learner benefits from instructors that use the blackboard to accent important points or provide outlines of the lecture material. When trying to recall information, reading/writing learners remember the information from their "mind's eye." Many academics have a strong preference for the reading/writing style.

Will is a reading/writing learner. His comprehensive training manual allows the employees to utilize the written language format.

The kinesthetic/tactile learning style

Kinesthetic/Tactile learners process information actively through physical means. Kinesthetic learning refers to whole body movement while tactile learning refers only to the sense of touch. These learners gesture when speaking, are poor listeners, and lose interest in long speeches. Most students that do not perform well in school are Kinesthetic/Tactile learners. The crux of this learning style is that the learner is connected to real situations through experience, example, practice, or simulation.

Claire is a Kinesthetic/Tactile learner. Her method of instruction utilizes "hands on" demonstrations and field experiences.

Learning strategies for each learning style

The Visual Learning Style

- Replace words with symbols or initials.
- Translate concepts into pictures and diagrams.
- Underline or highlight your notes or textbooks with different colors.
- Practice turning your visuals back into words.
- Make flashcards of key information with words, symbols, and diagrams.

The Aural Learning Style

- Attend lectures and tutorials.
- Discuss topics with your instructor and other students.
- Put summarized notes on tape and listen to them.
- Join a study group or have a "study buddy."
- Tape record your lectures.
- When recalling information or solving problems, talk out loud.

The Reading/Writing Learning Style

- Write out important information again and again.
- Read your notes silently.
- Organize any diagrams into statements.
- Rewrite the ideas and principles in other words.
- Make flashcards of words and concepts that need to be memorized.

The Kinesthetic/Tactile Learning Style

- Sit near the instructor in classroom situations.
- Read out loud from your textbook and notes.
- Copy key points onto large writing surfaces (i.e. chalkboard or easel board).
- Copy key points using word processing software.
- Listen to audiotapes of your notes while exercising.
- Take in information through field trips, laboratories, trial and error, exhibits, collections, and hands-on examples.
- Put real life examples into your notes summary.
- Recall experiments and role-play.
- Use pictures and photographs that illustrate an idea.

Educational implications for learning styles

Teachers that rely on learning styles have opened their classrooms to more than one approach to intellectual work. The activities planned by these teachers are more student-centered than traditional activities and have engaged in learning-style based instruction.

The first step in implementing learning style-based instruction is diagnosing the individual learning styles of each student. A variety of methods exist for testing learning styles in a relatively quick manner. Many are available online, like the VARK Questionnaire listed above.

This book is licensed under a Creative Commons Attribution 3.0 License

The second step is profiling group preferences and weaknesses. Are most of the students visual learners? Does your class have very few kinesthetic/tactile learners?

The third step is assessing current instructional methods to determine whether they are adequate or require more flexibility. If modifications need to be made, various activities can be developed and/or adapted to conform with learning styles. Three techniques have been proposed.

1. Teachers can add alternative activities that could replace or supplement ones. This could create increased opportunities for students to use different styles. For example, hands on activities can be conducted after a lecture to confirm abstract concepts.
2. Teachers can also challenge students to develop skills in other areas by completing assignments that utilize all learning styles. For example, the students can complete multidimensional packets, which contain activities from each learning style.
3. Another approach to include learning styles in an education curriculum is to organize activities around complex projects. These projects would require that students use all learning styles. An example of a complex activity would be a project-based learning project.

When teaching an individual, teachers should present the most difficult concepts in the preferred style. Easier concepts should be introduced in a different style. When teaching an entire class, teachers should use all learning styles in their presentations if they are to reach every student. This can be fairly simple.

For example, Mrs Erwin, a fifth grade teacher is going to teach a unit on *Charlotte's Web*. In order to accommodate all learning styles, she will have the students read sections of the book silently and out loud to others, act out various scenes, and complete a time line of events on the bulletin board. Mrs Erwin understands that students must be exposed to the concepts in a variety of ways to ensure full comprehension.

References

Armstrong, T. (1994). Multiple Intelligences in the classroom. Alexandria, VA: Association for Supervision and Curriculum Development.

Campbell, L., & Campbell, B. (1992). Teaching and learning through Multiple Intelligences. Seattle, WA: New Horizons for Learning.

Curry, Lynn. (1983). An organization of learning style theory and constructs. ERIC Document, 235, 185.

Dunn, R., and Dunn, K. (1978). Teaching students through their individual learning styles. Reston, VA: Reston Publishing Company, Inc.

Fogarty, R. (1997). Problem-based learning and other curriculum models for the Multiple Intelligences classroom. Arlington Heights, IL: IRI/Skylight Training and Publishing.

Gardner, H. (1983). Frames of mind: the theory of Multiple Intelligences. New York, NY: Basic Books.

Gardner, H. (1999). Intelligence reframed: Multiple Intelligences for the 21st century. New York, NY: Basic Books.

Zhang, Li-Fang. (2002). Thinking styles: Their relationships with modes of thinking and academic performance. Educational Ps.

Additional resources

Concept to Classroom: Cooperative and Collaborative Learning

Concept to Classroom: Tapping into Multiple Intelligences

9. Multiple intelligences and learning styles

Education World: Multiple Intelligences: A Theory for Everyone

Gardner's Eight Criteria for Identifying Multiple Intelligences

Multiple Intelligences

Project Zero

Technology and Multiple Intelligences

This book is licensed under a Creative Commons Attribution 3.0 License

10. Teaching and learning in affective domain

Author: Mary Miller (The University of Georgia, USA)

Editor: Damon Anderson

Introduction

When instructional designers consider the affective domain, they frequently think only in terms of a student's motivation to learn. As Smith and Ragan (1999) have pointed out, "any 'cognitive' or 'psychomotor' objective has some affective component to it (if at no deeper level than a willingness to sufficiently interact with learning resources to achieve the learning)" (p. 250). Motivation is certainly important, as "a student's attitude toward a given course or subject area can be a contributing factor to his achievement in it" (Edwards & Porter, 1970, p. 107). Previous chapters in this book have elaborated upon instructional strategies to increase motivation. This chapter will explore other aspects of instruction related to the affective domain.

Even when they are not explicitly stated, attitude objectives are pervasive in school work (Smith & Ragan, 1999). In each of the following examples, affective learning outcomes are linked to explicit cognitive goals. Although they may not always be aware of it, most teachers are involved in some form of attitude teaching. In some cases, attitude learning is the main objective of instruction. Anti-drug campaigns and corporate diversity training are examples of this type of attitude-focused instruction. Whether attitude learning is one component, or the central focus of instruction, specific instructional strategies may be employed to bring it about.

Examples of instructional strategies

- Every year, Mr Saunders teaches his Introduction to American Government classes about the 19th Amendment, which guarantees all American women the right to vote, and the *Voting Rights Act of 1965*, which reinforces the United States' 15th Amendment's nationwide guarantee of the right to vote. Mr Saunders wants his students to remember and be able to describe and discuss these legal landmarks. In addition, he wants them to understand the importance of participation of all Americans in the democratic process. He hopes they will appreciate the struggle by women, African Americans, and other previously disenfranchised groups to overcome barriers to such participation, and that they will also register to vote if they have not already done so.
- Ms Wallace's 4th grade students are learning about ecology and the environment. They are reading about the damage that pollution can cause to fragile ecosystems. During the week that they are studying this topic, nothing in her class is thrown away. Each student has a bag by his or her desk in which they place the things they would normally toss into the trash can. By the end of the week, the room is becoming a cluttered and somewhat smelly place. Ms Wallace wants her students to be able to explain how plants, animals, and the environment interrelate. She also wants them to understand their own role in changing the environment and to become more thoughtful citizens of the planet.

- Mrs Gibson is teaching her students about foods and nutrition. They learn which nutrients are found in which foods, why human bodies need these nutrients, how much of each nutrient is needed, how fat, protein, and carbohydrates should be balanced, and what can happen if nutritional needs are not met. Mrs Gibson will ask her students to list and discuss the material they have learned on a test, but she also hopes that they will recognize the importance of a healthy diet and improve their eating habits.

Definition of terms

Affective learning outcomes: Affective learning outcomes involve attitudes, motivation, and values. The expression of these often involves statements of opinions, beliefs, or an assessment of worth (Smith & Ragan, 1999).

Attitudes: Attitudes are learned or established predispositions to respond (Zimbardo & Leippe, 1991). Today, most researchers agree that attitudes are acquired and therefore "subject to fairly predictable change" (Simmons & Maushak, 2001, p. 84), although some researchers do believe that some attitudes may be innate or may have biological origins (Eagly & Chaiken, 1993). Attitudes are systems or constructs that are composed of four interrelated qualities: affective responses, cognitions, behavioral intentions, and behaviors. They vary in direction (positive or negative), degree (amount of positive or negative feeling), and intensity (the level of commitment the individual has to the position). Attitudes are not directly observable, but the actions and behaviors to which they contribute may be observed (Bednar & Levie, 1993). Although the cognitive and affective "domains interact significantly in instruction and learning" (Martin & Briggs, 1986, p. 3), any behavior that has an emotional component lies within the affective domain.

Attitude change: Attitude change is any alteration in the direction, degree, or intensity of an attitude. A change in one component of a given attitude may produce change in other components. Moreover, attitudes about one object may be connected to attitudes about another object, and change in one attitude may lead to change in others (Zimbardo & Leippe, 1991).

Theories of attitude formation and change

Learning theories of attitude change, no longer as popular as they once were, focus on reinforced behavior as the primary factor responsible for attitude development. Early research on attitude change drew on Festinger's **cognitive dissonance theory**, which posits that, when a person is persuaded to act in a way that is not congruent with a pre-existing attitude, he or she may change the attitude to reduce dissonance (Smith & Ragan, 1999). To use dissonance to produce attitude change, the persuader must first establish the dissonance, and then provide a method to reduce it. Ideally, this will involve making the chosen alternative attractive, showing a social group with the desired attitude, demonstrating the issue's importance, providing free choice, and establishing a wide latitude of acceptance through successive approximation (Martin & Briggs, 1986).

Similarly, **consistency theories** assume that individuals need to have consistency between and among their attitudes and behaviors and will modify one or both to achieve this balance (Zimbardo & Leippe, 1991). **Affective-cognitive consistency theory** examines the relationship between attitudes and beliefs and posits that individuals are in an unstable state when their attitudes toward an object, event or person and their knowledge about that object, event, or person are inconsistent (Simonson & Maushak, 2001). The theory suggests that the affective component of the attitude system may be changed by providing new information (changing the cognitive component) via a persuasive message. Once the individual has processed the new information, he or she will undergo an attitude change to bring the knowledge and affect into harmony. Processing the message requires that

This book is licensed under a Creative Commons Attribution 3.0 License

the audience pay attention to and comprehend the message, then accept and retain it (Zimbardo & Leippe, 1991). Affective-cognitive consistency theory suggests that the affective component of the attitude system may be changed by first changing the cognitive component through providing new information. It does not matter how the new cognition is produced, only that it occurs. Thus, any of the learning theories discussed in this e-book may be used in conjunction with this approach.

Although the fact that attitudes are stored separately from their related cognitions means that a person may experience a feeling without remembering the information or event that triggered it, attitudes will generally be stronger when the link between their cognitive and affective components is consciously recalled (Zimbardo & Leippe, 1991). For this to work, of course, the recipient must attend to the message providing that information. A tendency toward passive viewing of mediated messages may be reduced by instructing students to attend and alerting them to the fact that the content will be tested (Wetzel et al., 1994). According to Zimbardo and Leippe (1991), "a persuasive message is most likely to cause attitude and behavior change if it can shape both beliefs about its topic and beliefs about what important individuals and social groups think about the topic and how they behave toward it" (p. 188). The most effective persuasive messages are those "that get the audience to think about an issue or object in concrete, vivid images that have definite implications for behavior" (Zimbardo & Leippe, 1991, p. 194).

Social judgment theories emphasize the role of prior attitudes in shaping attitude formation and change. They describe attitude as a kind of spectrum with a "latitude of acceptance" surrounding a current attitude; a new position is more likely to be accepted if it falls within this latitude and less likely to be accepted if it does not (Smith & Ragan, 1999). This theory suggests that change in attitude position might be greater in response to the presentation of a moderate persuasive position than in response to a more extreme message. As with dissonance theory, social judgment theory presents attitude change as a response to the receipt of a message that is not entirely congruent with the currently held attitude. Acceptance of the new position is contingent upon its falling within the latitude of acceptance of the receiver. "The use of successive approximations can expand the latitude of acceptance and thereby permit greater attitude change than might otherwise be possible" (Bednar & Levie, 1993, p. 295). The latitude of acceptance is analogous to the zone of proximal development in social development theory as discussed in the chapter on Vygotsky's Constructionism.

Social learning theory focuses on the development of cognitions related to the expected outcome of behavior. This theory suggests that an individual learns attitudes by observing the behaviors of others and modeling or imitating them (McDonald & Kielsmeier, 1970). An observed behavior does not have to be reinforced to be learned (Zimbardo & Leippe, 1991), and the model "can be presented on film, by television, in a novel, or by other vicarious means" (Martin & Briggs, 1986, p. 28). The model must be credible to the target audience (Bednar & Levie, 1993). Credibility is largely a function of expertise and trustworthiness. Observational learning is greater when models are perceived as powerful and/or warm and supportive, and "imitative behavior is more likely when there are multiple models doing the same thing" (Zimbardo & Leippe, 1991, p. 51). While "attitudes formed through direct experience with the attitude object or issue are more predictive of behavior than those formed more indirectly" (Zimbardo & Leippe, 1991, p. 193), "media can be substitutes for many live experiences" (Wetzel et al., 1994, p. 26). Thus, observing a model via video is a viable method of learning a new attitude. For passive learners, instruction delivered by media may facilitate the rapid acquisition of complex affective behaviors more effectively than live demonstrations (McDonald & Kielsmeier, 1970). However, receivers may attend mediated messages less closely than those presented directly, thereby diminishing their effectiveness (Bednar & Levie, 1993). Social learning theories of attitude change are closely related to theories that emphasize the role of social learning in cognitive development. See the chapters on “Social constructivism” and “Cognitive apprenticeship”, for example, for discussions on the importance of the social context for cognitive development. Social learning theory also shares cognitive apprenticeship's emphasis on modeling as a way of sharing knowledge.

Finally, **functional theories** suggest that attitudes serve a variety of psychological needs and that changing an attitude requires an understanding of its purpose in the life of the individual who holds it. The utility of this theory is limited by the fact that attitude research in this area has not produced a consistent set of categories relating attitudes to psychological needs (Bednar & Levie, 1993). Research has shown that attitudes related to self-concept frequently perform an ego-defensive function and that ego-defensive attitudes are particularly difficult to change (Zimbardo & Leippe, 1991).

There have been several attempts to classify types and levels of learning in the affective domain. Perhaps the best-known classification was developed by Krathwohl, Bloom, and Masia in 1964 (Smith & Ragan, 1999). The Krathwohl taxonomy, as it is known, has five major categories, each with several sub-categories. These levels are:

- Receiving/Attending - willingness to become aware
- Responding - appreciating or internalizing
- Valuing - accepting, preferring, becoming committed to
- Conceptualizing/Organizing - incorporating into a value system
- Characterizing by value - orientation toward/identification with.

Learning in a given level depends on prior learning in lower levels (Atherton, 2004).

The following table provides an overview of the basic premises and key instructional implications of these theories.

Table 9: Overview of the theories of aptitude formation and change

Theory	Basic premise(s)	Suggested intervention(s)
Behavioral	Learning occurs when behavior is positively reinforced	• Have learner act out behaviors consistent with desired attitude • Provide positive reinforcement
Cognitive dissonance	Unstable state created when attitudes inconsistent with behavior	• Create dissonance • Provide means to reduce dissonance - free to make attractive choice
Affective cognitive consistency	Unstable state created when attitudes inconsistent with knowledge	• Change cognitive component first by providing new information
Social judgment	Existing attitudes surrounded by latitude of acceptance	• Incremental provision of messages within (ever-shifting) latitude of acceptance
Social learning	Individual learns attitudes by observing and imitating the behavior of others	• Provide powerful model • Multiple models doing same thing

This book is licensed under a Creative Commons Attribution 3.0 License

Functional	Purpose attitude serves for person who holds it determines best method for changing it	• Acknowledge ego-defensive role of attitudes related to self-concept
Krathwohl's taxonomy	Intensity of given attitude built through successive stages	• Learning at a given level depends on prior learning at lower levels

Research on attitudes and attitude change

Simonson and Maushak (2001) have found that there is a dearth of good instructional technology research on attitudes:

"It is obvious that attitude study is not an area of interest or importance in mainstream instructional technology research. Of the hundreds of studies published in the literature of educational communications since [1979] less than 5 % examined attitude variables as a major area of interest" (p. 996).

Moreover, there are several flaws common to many of the attitude studies that have been undertaken. These include poor definition of the construct (attitude) in question, poor measurement practices, including the failure to document development of the measurement instrument, and tacking on an attitude variable after data collection has occurred rather than considering attitudes at the onset of the research (Simonson & Maushak, 2001). In contrast, attitude research has been popular in the social sciences, particularly in social psychology since the 1920s, and continues to remain central to the discipline (Eagly & Chaiken, 1993).

Because attitudes cannot be directly observed, they are inferred from behavior, usually in the form of verbal responses or observable actions (Bednar & Levie, 1993). Most of the existing measurement instruments for assessing attitudes and attitude change employ quantitative survey scales with the assumption that different respondents will interpret items in a similar manner (Zimbardo & Leippe, 1991). Research has shown that even rigorously tested measures of attitude such as the Quick Discrimination Index (QDI) may only be valid measures for members of a specific group (Burkard et al., 2002).

Instructional technology research findings do generally suggest that "mediated instruction does contribute to desired attitudinal outcomes in learners, especially when the instruction is designed specifically to produce certain attitudes or attitude changes" (Simonson & Maushak, 2001, p. 1000, emphasis in original). These findings also indicate that the three most important qualities of such instruction are: the use of follow-up activities and open-ended questions; the use of realistic types of media devoid of contradictory cues; and the creation of an aroused state in the learner through emotional and intellectual involvement.

A 1984 study by Ball-Rokeach et al. found that uninterrupted home viewers of a persuasive half-hour television program called “The Great American Values Test” showed significant change in attitudes toward race, gender equality, and environmental protection, and that residents in the experimental viewing area were 60 per cent more likely to respond positively to solicitations from groups associated with those issues than were residents of the control city (where the experimental program was not broadcast). This demonstration of media potency as a tool for attitude change—and related research which suggested the power could be used for good or for ill—so impressed the researchers that they considered not publishing their findings.

Findings from several studies of workplace diversity training reveal that instruction in the affective domain can have unintended negative outcomes. Hood et al. (2001) reported on a quantitative study designed to evaluate the changes in attitudes of university students resulting from the completion of a required course in organizational behavior. They found that white Anglo males are less likely than other groups to show positive changes as a result of diversity training initiatives and may in fact exhibit worse attitudes than they had before the intervention. This disturbing finding was echoed by Alderfer et al. (1992), who found that white Anglo males of middle-management status at a given corporation who were required to participate in a diversity workshop exhibited negative attitude changes, and by Ungerleider and McGregor (n.d.), who found similar negative effects in studies of anti-racist teaching of police and teachers. Given the potential of negative outcomes, it is essential that this type of affective domain instruction be carefully designed and that learning be closely monitored and rigorously assessed.

Instructional design for attitude change

Simonson and Maushak (2001) have drawn on findings from a number of studies to create a series of six guidelines for effective design of attitude instruction. These are:

- make the instruction realistic, relevant, and technically stimulating
- present new information
- present persuasive messages in a credible manner
- elicit purposeful emotional involvement
- involve the learner in planning, production, or delivery of the message
- provide post-instruction discussion or critique opportunities

Smith and Ragan (1999) focus on the behavioral aspect of attitude learning and emphasize the importance of three key instructional approaches:

- demonstration of the desired behavior by a respected role model
- practice of the desired behavior, often through role playing
- reinforcement of the desired behavior

Bednar & Levie (1993) make similar recommendations: when designing instruction for attitude change, "three approaches emerge from the theoretical literature: providing a persuasive message; modeling and reinforcing appropriate behavior; and inducing dissonance between the cognitive, affective, and behavioral components of the attitude. These approaches are ideally used in tandem" (p. 286).

There is, at present, no firm agreement about the optimal order in which to present the various cognitive and affective messages contained in a given unit of instruction. Some researchers have found that "knowledge about a topic was often a necessary prerequisite for a positive attitude position toward the idea" (Simonson & Maushak, 2001, p. 1010). Others suggest that "more educated people are better equipped to counter argue and hence less likely to accept or be persuaded by new information" (Ansolabehere et al., 1993, p. 151). The former theory would suggest that learners will experience more attitude change if the cognitive aspects of a lesson are presented before the affective aspects are introduced, while the latter suggests the opposite effect. The ability of a persuasive message to produce attitude change is closely linked to its strength, and "dry statistical information has less effect than vivid and concrete examples" (Zimbardo & Leippe, 1991, p. 337). However, studies of home television viewing have shown that stories that "deal with topics about which viewers already have some knowledge tend to be remembered better" (Wetzel et al., 1994, p. 53). Presenting first the general and then the particular, first the abstract and then the concrete, would seem to be sound instructional design for both cognitive and affective domains.

This book is licensed under a Creative Commons Attribution 3.0 License

Since the presentation of credible and persuasive messages is a key component of attitude instruction, further exploration of what makes instruction persuasive and credible may be of use. Acceptance of a given message is "not so much about the content of the message as the cognitions—in the form of evaluative responses—that the receiver has in response to it" (Zimbardo & Leippe, 1991, p. 150). If a given topic is of low salience or high complexity, message acceptance and attitude formation is often guided by a heuristic, most commonly the source's credibility. The effectiveness of a persuasive message is contingent upon the receiver's perception of the source's credibility, and credibility is a function of expertise and trustworthiness. A source or model who appears to argue against his or her self-interest is often perceived as relatively trustworthy.

When the information presented is important to the viewer and familiarity is low, an intellectual message will likely be more persuasive, and encouraging objectivity can help overcome resistance to attitude change. Conversely, when the message's importance is relatively low and familiarity is higher, emotional appeals are more successful. "Emotional images need the sight, sound, and movement quality that TV offers" (Zimbardo & Leippe, 1991, p. 149).

"The trick with designing the ideal persuasive message is that it has to be of such quality that the recipients' own cognitive responses to it are numerous as well as favorable" (Zimbardo & Leippe, 1991, p. 182). For example, studies (e.g., Allison, 1966; Wade and Pool, 1983; Bage, 1997) have found that persuasive videos were more likely to produce attitude change when post-viewing discussions were held. If the instructional unit begins with an emphasis on cognitive outcomes, continues with the persuasive media message, and concludes with a discussion session, then students will be challenged with several opportunities to develop and express their own cognitive responses to the information presented. Each phase of the instruction should present "plausible, important messages with new information [in order to] provoke more cognitions and hence increase attitude change" (Zimbardo & Leippe, 1991, p. 150). Thus, the persuasive component should not merely restate the information provided earlier, but should elaborate and expand upon it.

One advantage of mediated instruction is its exact replicability: the same affective attitude instruction can be delivered exactly to multiple groups (McDonald & Kielsmeier, 1970). Following the cognitive and persuasive components with a discussion may help to make the attitude change more permanent, since self-generated messages are more memorable than received ones (Zimbardo & Leippe, 1991). "People become more mindful when they encounter novel stimuli that do not fit established categories and when they are motivated to engage in systematic thinking, rather than lapse into mindless processing" (Zimbardo and Leippe, 1991, p. 259). The importance of this cognitive engagement for attitude change should not be underestimated. "Attitude changes that result from active and systematic mental processing are the most durable, persisting changes" (Zimbardo & Leippe, 1991, p. 181).

As discussed above, affective components are often already present in many lesson plans. Adding affective objectives to other instruction need not take an overwhelming amount of time. A meta-analysis of attitude change studies relating to bias and prejudice has shown that shorter treatments generally produced more attitude change than did longer ones. In other words, "less treatment time was apparently more conducive to prejudice reduction" (McGregor, 1993, p. 222). The implications of this finding are greatest for interventions where attitude change is the principal goal.

If a teacher perceives that his or her students' attitudes are already aligned with the objectives, he or she may be tempted not to address the affective component of the lesson. However, reinforcement remains important. "Lack of resistance [to persuasion] is likely when attitudes and beliefs are still in formative stages or when the individual is cast into a new and vastly different social environment" (Zimbardo & Leippe, 1991, p. 225). Thus, the importance of confirming and strengthening existing positive attitudes should not be overlooked. The more thought-through an attitude is, the more resistant it is to change (Zimbardo & Leippe, 1991). By motivating students to reflect on their attitudes, instruction may lead to an increase in their intensity and permanence.

While general attitudes are good predictors of general behaviors, and specific attitudes are good predictors of specific behaviors, the general does not reliably predict the specific, nor the specific the general (Simonson & Maushak, 2000). Therefore, in assessing attitude learning, any Likert-type scales or similar close-ended measurements should be used in tandem with more open-ended instruments.

Although the teachers in our introductory scenarios have not had formal training in teaching for attitude change, their classroom experiences and observations have enabled them to formulate some effective strategies to achieve their attitudinal objectives.

Examples of instructional strategies revisited

- In Mr Saunders' political science class, the unit on voting rights begins with a lecture. Because of the demographics of his university, Mr Saunders' classes are usually more than fifty percent female. His students are often appalled to realize how recently women in the United States won the rights of full citizenship, and they have an emotional response to the information presented. In the next class, they watch an episode of the PBS series "Eyes on the Prize" entitled "Mississippi: Is this America?" This program depicts the efforts of black and white college student volunteers to help African American Mississippians register to vote during the "Freedom Summer of 1964." These student workers serve as role models for the student viewers. In particular, white viewers are able to relate to the positive actions of students like themselves, rather than only seeing the negative actions by white racists. The information shown in the video is more extreme than that delivered by the lecture, but the lecture set the stage by expanding the latitude of acceptance. Finally, the class discusses what they have learned through the lecture and video. They are able to voice positive statements about the importance of voting rights and to have these statements reinforced. This lesson has used the presentation of new information to create cognitive dissonance, incremental presentation of stronger messages, positive role models, emotional presentations, and opportunities to exhibit and receive reinforcement for desired attitudes and behaviors.
- In Ms Wallace's ecology class, students are gradually forced to confront the accumulating consequences of their trash production. They research alternatives to disposable packaging and create a display of environmentally conscious choices. The overflowing trash bags create cognitive dissonance, and their research helps them develop attractive dissonance-reducing choices. By creating the display, they have publicly advocated and modeled positive attitudes and behaviors, thus becoming more likely to internalize them.
- Mrs Gibson realizes that even when her students know the importance of making healthy food and exercise choices, they may not have the freedom to act on this knowledge. Some of her students write letters to the local school board about a proposed reduction in physical education classes at their school. Others compare the nutritional quality of school lunch programs in their area and present recommendations for improvement to their school board. The entire class works together to write and film a rap video about the importance of good nutrition and exercise. The video is shown at a PTA meeting, and each student receives

This book is licensed under a Creative Commons Attribution 3.0 License

a copy to take home. The video helps the students model healthy habits to their parents and may inspire the parents to provide healthy food choices for their children. Students whose diet and exercise habits were not consistent with good health probably experienced cognitive and affective dissonance during the lessons. For example, a student may have believed that orange soda and french fries were healthy fruit and vegetable choices. Whether they are advocating physical education classes and fresh fruit in the lunchroom, or writing and filming a rap about healthy habits, students are behaving in ways that are consistent with positive attitude change toward diet and exercise. These behaviors are reinforced when adults listen and respond to them.

Lesson plans for attitudinal objectives

The Gateway to Educational Materials GEM provides numerous examples of lesson plans that include instructional goals in the affective domain. The following discussions of these instructional approaches are this author's interpretations and were not found on the Web sites provided.

The "Voices for Votes - Suffrage Strategies" lesson plan for 4th through 6th graders at the United States' Library of Congress American Memory site has students research the history of suffrage for women before creating their own messages to promote voting in current elections. The suffragists the students learn about serve as models for pro-voting behavior. Once the students have articulated their own pro-voting messages, dissonance-avoidance will lead them to personally accept those messages.

The Educator's Reference Desk Lesson Plan for Louis Sachar's "Holes" includes attitude-change objectives based on the idea that readers will identify with characters in the book and model their own behavior on that of the characters. It is hoped that the credibility and attractiveness of the characters to adolescents will likely make them authoritative models, although reluctant readers may not engage sufficiently with the material to experience the latent persuasion of the message.

PBS presents a study guide to accompany its film "Family Name." The film recounts a father's experiences with his own prejudices and the way he was able to confront himself and change. The message should be reinforced by discussion questions to support the learners' identification with the characters, provoke a variety of related cognitions, and provide the learners with a variety of opportunities to make observations related to the affective aspects of the presentation.

PBS's lesson plans to accompany the "Journey into Amazonia" video include a lesson on "Chico Mendes of Brazil" that depicts Mendes as a hero who fought to save the rain forests. Readings, discussions, and activities all reinforce the message of the video, including the importance of sustainable use of rain forest resources and the valuable contributions made by Mendes and others like him. One activity calls for students to prepare a news story about Mendes. Since Mendes serves as an attractive and credible role model, this opportunity to make a public statement supporting the desired attitude should facilitate attitude adoption as an alternative to dissonance. Although Mendes' murder may seem like the harshest of negative reinforcement, careful leadership during the discussion can mitigate this by pointing out the fact that he is remembered as a hero.

Conclusion

Attitudinal components are present in many, if not most, instructional plans, whether or not they are stated explicitly. Although much research is still needed, it is clear that there are effective instructional strategies to promote attitude formation and change. Effective attitude instruction presents a persuasive message containing new information which relates to something the learner already knows. It involves the learner emotionally, for example, by presenting a credible role model demonstrating a behavior that is consistent with the desired attitude and that is positively reinforced. Finally, it provides learners with an opportunity to express or act out the target attitude, and responds to that expression with positive reinforcement. Any instruction that includes these qualities is likely to result in the desired attitude formation or change.

References

Alderfer, C.P., Alderfer, C.J., Bell, E.L. & Jones, J. (1992). The race relations competence workshop: Theory and results. Human Relations, 45 (12), 1259-1291.

Allison, R.W. (1966). The effect of three methods of treating motivational films upon attitudes of fourth-, fifth-, and sixth-grade students toward science, scientists, and scientific careers (doctoral dissertation, Pennsylvania State University, 1966). Dissertation abstracts 28 , 994-A.

Ansolabehere, S., Behr, R. and Iyenger, S. (1993). The media game: American politics in the television age . Don Mills, Ontario: Maxwell Macmillan Canada.

Atherton, J.S. (2004). Teaching and Learning: Bloom's taxonomy [On-line] UK: Available: http://www.learningandteaching.info/learning/bloomtax.htm Accessed: 17 April 2005.

Bage, G. (1997). How can we teach history through television? Journal of Educational Media, 23 (2-3), 203-214.

Ball-Rokeach, S.J., Rokeach, M., &Grube, J.W. (1984). The great American values test. New York: Free Press.

Bednar, A. & Levie, W.H. (1993). Attitude-change principles. In M. Fleming & W.H. Levie (Eds.), Instructional message design: Principles from the behavioral and cognitive sciences (pp. 283-304). Englewood Cliffs, NJ: Educational Technology Publications.

Burkard, A., Jones, J. & Johill, M. (2002). Hierarchical factor analysis of the quick discrimination index. Educational and Psychological Measurement, 62 (1), 64-78.

Eagly, A.H. & Chaiken, S. (1993). The psychology of attitudes. Orlando: Harcourt Brace Jovanovich.

Edwards, A.L. & Porter, B.C. (1972). Attitude measurement. In The affective domain: A resource book for media specialists (pp. 107-126). Washington, DC: Gryphon House.

Hood, J., Muller, H. & Seitz, P. (2001). Attitudes of Hispanics and Anglos surrounding a workforce diversity intervention. Hispanic Journal of Behavioral Sciences, 23 (4) 444-58.

Martin, B.L. & Briggs, L.J. 1986). The cognitive and affective domains: Integration for instruction and research. Englewood Cliffs, NJ: Educational Technology Publications.

McDonald, F. & Kielsmeier, C. (1972). Social learning theory and the design of instructional systems. In The affective domain: A resource book for media specialists (pp. 93-106). Washington, DC: Gryphon House.

McGregor, J. (1993). Affectiveness of role playing and antiracist teaching in reducing student prejudice. Journal of Educational Research, 86 (4), pp. 215-226.

Simonson, M. and Maushak, N. (2001). Instructional technology and attitude change. In D. Jonassen (Ed.), Handbook of research for educational communications and technology (pp. 984-1016). Mahway, NJ: Lawrence Erlbaum Associates.

Simonson, M. (1980). Instructional media, attitude formation and change: a critical review of the literature. ((ERIC Document Reproduction Service NO. ED 194 073)

This book is licensed under a Creative Commons Attribution 3.0 License

Smith, P. & Ragan, T.J. (1999). Instructional design. New York: John Wiley & Sons.

Underleiger, C.S. & McGregor, J. (n.d.) Training police for intercultural sensitivity: A critical review and discussion of the research. Cited in McGregor (1993). Affectiveness of role playing and antiracist teaching in reducing student prejudice. Journal of Educational Research, 86 (4), pp. 215-226.

Underleiger, C.S. & McGregor, J. (n.d.) . Teacher education and racism awareness education. Cited in McGregor (1993). Affectiveness of role playing and antiracist teaching in reducing student prejudice. Journal of Educational Research, 86 (4), pp. 215-226.

Wade, B. & Poole, R.A. (1983). Responses to educational television: A case study. Journal of Educational Television, 9 (1), 21-32.

Wetzel, C.D., Radtke, P.H. & Stern, H.W. (1994). Instructional effectiveness of video media. Hillsdale, NJ: Lawrence Erlbaum Associates.

Zimbardo, P.G. & Leippe, M.R. (1991). The psychology of attitude change and social influence . New York: McGraw-Hill.

This book is licensed under a Creative Commons Attribution 3.0 License

11. Creativity

Authors: Vernice James, Reena Lederman Gerard, Beate Vagt-Traore (The University of Georgia, USA)
Editor: Michael Orey (The University of Georgia, USA)

Introduction

Creativity—a magical talent, a sign of intelligence, or a skill to learn? The difficulty in approaching this field is that the topic is still relatively new but already rich with many theories, as well as a certain mystique (Sternberg & Lubart, 1996). The purpose of this chapter is to shed light on the concept of creativity and its implications for teaching and learning. Within the concept of creativity, we provide a portrait of what creativity may look like, a definition of creativity, an overview on some creative-thought models, and discussion of how the models and definitions fit the introductory example of creativity. In addressing the implications for teaching and learning, we offer an example of creativity in the classroom followed by a discussion of targeted strategies for teaching towards creativity in the classroom.

The concept of creativity

"The very essence of the creative is its novelty, and hence we have no standard by which to judge it."

(Carl R Rogers, On Becoming a Person)

Portrait of creativity: meet Mr Dabo

Consider the following scenario: Imagine a small country in West Africa just south of the Sahara. Most of the rural population is engaged in subsistence agriculture or stock raising. General cash flow is low.

Now follow us to a small village with a local elementary school. The school is relatively new, and it has about 100 desks and even a small library has been built. However, the teacher, Mr Dabo, is not happy. Although the village has many school aged children, only about 15 to 20 percent of these have been enrolled by their parents. National campaigns from the Ministry of Education as well as local campaigns from non-governmental organizations could not change this attitude. Of course, there are always explanations as to why these villagers just do not want to enroll their children: traditional values, rejection of the foreign based education, plain ignorance, or simple stubbornness. And often it is overlooked that these people do not have the financial means to pay for the materials and supplies needed by their children.

After being a teacher in that small rural community for more than four years, Mr Dabo proposed an idea to solve the low enrollment rates. He suggested the establishment of a special exchange, where villagers could trade their agricultural products against school supplies. Mr Dabo presented his idea to a local non-governmental organization which then helped in organizing the financial means, so that the project could be realized. Today the enrollment rates are rising from year to year, and the concept is spreading further in the country.

How did Mr Dabo come up with this solution? After being in his community for several years, he observed that each year the local market price for grain was at the lowest level around the time when a new school year was about to start. Farmers needed to sell huge amounts of their agricultural products in order to buy the necessary school materials for their children. Consequently, farmers themselves did not have enough grain left to serve their own needs before the next harvest. This in turn hampered the school enrollment of children. Today the agricultural products that are exchanged for school materials are stored until the market price reaches the highest level and then the products are sold. It turns out to be a win-win situation for all parties involved. Can Mr Dabo's actions be seen as creativity in action?

What is creativity?

There is consensus among researchers that creativity should be defined as the production of both novel and appropriate work (Sternberg & Lubart, 1996; Lubart, 2000). Novel refers to original work, work that could not be predicted. Appropriate simply concerns the usefulness of the product towards a certain need. Lubart (1999) points out that this is a product-oriented, "western" definition of creativity. Furthermore, the assessment of creative work can only be done in the social and historical context of its making (Lubart, 1999; Amabile, 1983; Csikszentmihalyi, 1996; Sternberg & Lubart, 1995 in Sternberg, 2001, p.361).

Novel and appropriate products do not arise in a vacuum. Finding the factors that influence creativity thus drives most of current research efforts. In recent years, two approaches predominate the research literature (Lubart, 2000): process-oriented models of creativity (e.g. Finke, Ward, Smith, 1992; Mumford, Mobley, Reiter-Palmon, Uhlman, Doares, 1991); and systems-oriented models (Amabile, 1983; Sternberg & Lubart, 1995; Csikszentmihalyi, 1996). The two approaches focus on different facets of creativity. Yet, they can be seen as complementing each other (Sternberg & Lubart, 1995; Finke, Ward & Smith, 1992).

Process-oriented models concentrate on cognition aspects of creativity. What and how do creative people think? What are the thought structures during the creative process? Lubart (2000) summarizes the research efforts on cognitive sub-processes that are seen as crucial to creativity potential:

- Problem finding, formulation, and redefinition
- Divergent thinking
- Synthesis and combination of information (bisociation, Janusian thinking, homospatial thinking, articulation, analogy and metaphor, remote association, emotional resonance, and feature mapping)
- Idea combinations through random or chance-based processes

A more recent approach to identify the cognitive processes and structures involved in creative thinking is the Geneplore model (Finke, Ward & Smith, 1992). It distinguishes between generative processes and explorative processes during creative cognition. Generative processes consist of retrieval, association, synthesis, transformation, analogical transfer, and categorical reduction. These processes result in mental representations called "preinventive" structures of a potential final product. In the explorative phase, these initial representations are interpreted through attribute finding, conceptual interpretation, functional inference, contextual shifting, hypothesis testing, and searching for limitations. Finke, Ward & Smith (1992) do not insist that all of these processes and "preinventive" structures are necessary during creative cognition. However, the likelihood of a creative product is interdependent to the extent to which these processes and structures occur. The difference between creative cognition and problem-solving is thus gradual.

Systems-oriented models take a broader approach to creativity that involves non-cognitive factors as well. Systems-oriented approaches range from more social oriented views (Csikszentmihalyi, 1996, 1999) to more individual oriented views (Sternberg & Lubart, 1996; Amabile, 1983).

This book is licensed under a Creative Commons Attribution 3.0 License

Csikszentmihalyi essentially sees creativity as a social construct that is the result of an "interaction between the producer and the audience" (1999, p. 314). Important aspects in his model are the individual (personal background), the field (society), and the domain (culture). Interaction between domain and individual transmits information; interaction between field and domain selects novelty; and interaction between the individual and the field stimulates novelty.

Although Amabile recognizes that creativity is "culturally and historically bound" (1983, p. 34), it is not explicitly mentioned in her three componential model. The relevant factors working together are domain-relevant skills (or expertise), creative-thinking skills, and motivation. Creative potential relies on expertise because new insights in a domain can only be gained through prior knowledge of the domain. The importance of expertise is accepted by most researchers (Amabile, 1983; Csikszentmihalyi, 1996; Sternberg & Lubart, 1996). Creative-thinking skills relate to cognition as well as personality characteristics. Motivation looks at the reasons why a person engages in a task and the attitudes one might have toward the task. Amabile has identified intrinsic motivation as more likely to produce creative results than extrinsic motivation (see also motivation chapter).

Sternberg & Lubart (1995, 1996) undertake a type of goal setting approach. They compare creativity to a thriving investment process of buying low and selling high. Creative people purposefully engage in foremost unknown or unpopular ideas (buying low) in order to successfully disseminate them later (selling high). Sternberg & Lubart (1995, 1996) identify six resources that contribute to creativity: intellectual processes, knowledge, intellectual styles, personality, motivation, and environmental context. Note the differentiation between intellectual processes and styles. Processes refer to problem definitions, use of analogies and metaphors, synthesis, etc; things that are commonly recognized within cognition approaches. Intellectual styles relate to the preference for how thought processes are applied. Sternberg & Lubart (1995, 1996) identify three main dichotomies in thinking styles with the assumption that some styles are more conducive to creativity than others are: legislative (invent rules) vs executive (follow rules), conservative (old approaches) vs liberal (new approaches), global (general aspects) vs local (detail-oriented). Furthermore, they identify a monarchic style which means the sequential completion of tasks.

Shedding light on Mr Dabo's creativity: a discussion

Mr Dabo's contribution matches the creativity criteria of novelty and appropriateness. The solution was new, and it was appropriate because it fit the needs of everybody involved. Although we do not know the exact thought processes involved it can be assumed that Mr Dabo was equipped with perceptual and cognitive abilities (knowledge) and creative thinking skills (analysis, synthesis, etc.) in order to solve the low school enrollment problem in his community. Furthermore, as the teacher of the school, Mr Dabo was decidedly motivated to improve the school enrollment rate in his community. Amabile explains, "an inner passion to solve the problem at hand leads to solutions for more creativity than do external rewards, such as money" (1999, p. 78).

Of course, a problem's solution will be constrained through the existential needs of the population, and the creator must consider this constraint. In Csikszentmihalyi's (1996) terms, this is seen as the interactivity of the individual with society and culture. Then again, it also leads us back to the cognitive processes that are involved. Product constraints have an important impact within the creative thinking processes as defined in the Geneplore model (Finke, Ward, & Smith, 1992, p. 20). However, product constraints do not need to be present at the very beginning of idea generations; they might arise at any point during the generative or exploratory phases of "preinventive" structures (Finke, Ward, & Smith, 1992, p. 26).

11. Creativity

Coming back to Mr Dabo, it cannot conclusively be determined at what point in his thinking processes this constraint took form. Apparently, at some point in his reasoning he concluded that the problem should not be seen from the low enrollment perspective but from the perspectives of the people who need to buy school supplies. Problem construction or redefinition of a problem is seen as a crucial factor towards creative thinking (Mumford et. al., 1991; Sternberg & Lubart, 1995, 1996).

Mr Dabo's four years of experience provided him with an invaluable understanding of the community and its needs. Amabile (1983) refers to this expertise as "domain relevant knowledge", which is one of three components in her model of creativity as discussed above. Mr Dabo's domain-relevant knowledge helped him develop a creative solution. Finally, he came forward with his ideas and made them public. This points to his courage of his own conviction. According to Sternberg & Lubart (1996), this and other personality attributes are important aspects that contribute to the distinction of creative potential and creativity.

Implications for teaching and learning

"Any activity becomes creative when the doer cares about doing it right, or doing it better."

(John Updike)

The Cool Project

This project focused on an urban school's home economics course. Responding to Glasgow's very low health score, as researched and compared to the rest of Europe, The Cool Project's objective was to "encourage pupils to think about healthy eating and discuss that healthy eating can also be fun" (Learning and Teaching Scotland, 2004, p.14, "The Cool Project").

The project required eighth grade students to create an original ice cream that met specifications outlined in a design brief as well as the dietary requirements that originally stimulated the project. In planning this hands-on project, the teacher was taking a constructivist approach to what might otherwise have been an instructivist lesson in nutrition, which would be rather uninspiring. The teacher facilitated the students' work by functioning as a subject matter expert, asking questions, providing encouragement, and modeling creative and project management skills important to the students' projects.

Student groups worked independently in pairs and groups, making decisions, and taking risks. The teacher remained the "guide on the side". They organized themselves and assigned responsibility within the group for various tasks. Students had the opportunity to speak with experts in business. They learned what types of health and safety problems could occur when developing a food product. Students also studied the constraints imposed upon businesses, from health regulations to financial requirements. Through contact with these subject matter experts, the students gained an appreciation of the business world. All the steps of working in a group—sharing, brainstorming, compromising, and deciding—helped them learn to work together. After developing some of their ideas further, the groups tested them in a systematic manner. This trial and error process guided the students in making choices about taste, color, texture, and aroma. In the end, each Cool Project team had an original, final product—ice cream!

Through competition to make the best ice cream and the most engaging packaging students used their mistakes to evaluate what worked and what did not. This critical analysis helped them make better choices and produce a better product. When something went wrong they were often disappointed; however, the teacher, as a facilitator, offered encouragement. Moreover, as More Knowledgeable Other

This book is licensed under a Creative Commons Attribution 3.0 License

(MKO), the teacher was able to guide students in more constructive directions. The little successes and difficulties students experienced while creating their new ice cream made the achievement that much more satisfying (Learning and Teaching Scotland, 2004, pp. 14-16, "The Cool Project").

Enhancing creativity

This chapter offers a multi-faceted view of creativity that can only begin to look at the concept. Within the field, there are some factors generally accepted as essential to the development of creativity; motivation is one of these factors. Because motivation is a strong driver of creativity (Sternberg & Lubart, 1996), and perhaps more easily influenced than other contributing factors (Amabile, 1983), we will focus on how creativity is developed through higher levels of intrinsic motivation. Six strategies may influence intrinsic motivation: challenge, freedom, resources, work-group features, supervisory encouragement, and organizational support (Amabile, 1999). Some of these strategies parallel those found in the Six C's of Motivation and as such are perhaps the most important. While Amabile frames her terms with a business perspective, they are equally applicable to an educational setting, and align with Sternberg and Lubart's (1995, 1996) work. For simplicity, we will use Amabile's terms. The Cool Project by Notre Dame High School in Glasgow, Scotland offers a good example of teachers enhancing students' creativity using those six strategies.

Challenge

Challenge is the stretch between being able to do something with great ease and being unable to achieve an objective. Somewhere in the gap is an ideal learner state in which the student has just enough knowledge, ability, or skills to make considerable progress in pursuing the goal, and yet not feel overwhelmed by the task. This is known as the Zone of Proximal Development or ZPD. Within that ZPD, a learner benefits from someone more knowledgeable and experienced who provides him or her with just the right amount of assistance at just the right time to facilitate the learner's development and at the same time optimize challenge. Vygotsky identifies this person as a More Knowledgeable Other or MKO (Galloway, 2001). We can see that a challenge tests one's abilities to resolve a problem, and in its very nature is motivating, interesting (Editors of The American Heritage Dictionaries, 2000), and hopefully fun.

Sternberg and Lubart (1996) believe there are five essential attributes within our personalities that enhance creativity: tolerance of ambiguity, perseverance, willingness to grow, openness to experience, and willingness to take risks. These attributes are useful in further understanding why challenge is a strategy for developing creativity. Sternberg's and Lubart's attributes are essential to approaching something difficult and staying the course.

The Cool Project is rich in challenges. "In designing an assignment that was achievable, the children had a sense of achievement and provided awareness that challenging tasks are worth undertaking, and bring their own rewards" (Learning and Teaching Scotland, 2004, p.15, "The Cool Project"). Because it is a hands-on task that requires integrating specific dietary guidelines, the students were faced with "real world" goals not usually found in classroom projects. Not only did the students need to do research on nutrition, but on packaging and marketing too. Simply inventing an ice cream was not enough. The groups had to develop appropriate packaging and marketing plans to become the ice cream of choice, or gain market share. Being 13 years-old hardly made the students savvy product managers. However, there can be no doubt that given the kind of exposure most kids have to advertising through various media, they had a visual literacy in product promotion.

Because of the constructivist grounded problem-based learning approach the students went through a trial and error process while developing their solutions. Within the Cool Project, students' mistakes became challenges to overcome. When something failed to work as they had planned, the students discussed what happened, sought solutions, and received encouragement from their teacher.

Freedom

In the Six C's of Motivation this strategy corresponds to choice and control. When people have autonomy over how they reach their goal, they will be more creative. Conversely, control over the actual goal is not as critical to fostering creativity. In fact, providing clearly defined goals can boost creativity (Amabile, 1999). To support students' autonomy during the learning process, research suggests that teachers may offer more choices in activities, minimize algorithmic solutions, and provide support and feedback (Driver, 2001). "Freedom about process also allows people to approach problems in ways that make the most of their expertise and creative-thinking skills" (Amabile, 1999, p.82). The Cool Project students worked in pairs or groups to develop their ice cream product, but the process of how they worked together was their own. Through teaming, sharing, compromising, and decision-making the students established their own process and reorganized their previous knowledge, new expertise, and new cognitive skills to solve the problem.

Another aspect of the creative process is the problem-finding or problem-selecting that occurs (Csikszentmihalyi, 1996). There are many strategies to help with thinking and problem solving skills in general. These strategies can be used in problem solving in a general sense and are not specific to creativity. However, it may be argued that creativity is just another form of problem solving, so that applying those strategies would also help develop creativity. Once you consider creativity as problem-solving then "problem discovery is an important part of much creative activity" (e.g., Campbell, 1960; Getzels & Csikszentmihalyi, 1976; Souriav, 1881 in Amabile, 1983, p.33). Rather than a teacher presenting students with rigidly designed problems, the freedom to define their own problem to be solved maybe the most creative phase in the work.

"Henle (1976) argued that “the perception of dynamic gaps' incites the creative process": And yet posing the right question may be the most creative part of the whole process' "(Glover, et. al, 1989, p. 23). The Cool Project's general goal was predetermined and the project was organized so that students managed themselves as they researched, asked questions, and learned from their mistakes. This methodology required that students investigate and define the problem as they saw it. It would have also dictated how they went about their work. Students exercised autonomy as exhibited by their self-evaluation skills and self-management skills (Orey, 2001) necessary to manage performance through each product iteration. Each ice cream trial and error cycle resulted in the groups reconsidering how they had been working and whether they needed to make changes. They evaluated their strengths and weaknesses and made intelligent decisions based on the information. The freedom to guide their own work allowed students to make discoveries and learn directly from their experiences (Nickerson, 1999).

Resources

One of Sternberg & Lubart's (1995, 1996) six resources that contribute to creativity is environmental context. Environment can include the political atmosphere, the interpersonal relationships, the physical space, or even the equipment and supplies available for a project. These are the resources, and they can be difficult to supply. However, students and teachers can short-circuit their resources too. When students are excited to jump right in and start producing their product, and the teachers begin to feel the pressures of "getting through the book" or rush

This book is licensed under a Creative Commons Attribution 3.0 License

through the year's curriculum to meet external requirements, the simplest resource, time, can be overlooked. Teachers should allow time to explore ideas, but not so much that the project stagnates. They need to balance the need for this exploration with the costs of time. Additionally, it is important to provide the physical space needed to work comfortably in groups (Amabile, 1999). An environment needs to be conducive to the students' style of work, whether working individually or in collaboration. Interestingly, while both Sternberg & Lubart (1995, 1996) and Amabile (1999) discuss the importance of context for a student's work, in terms of environment and resources respectively, The Project Cool case study does not mention much of the context. We know that the project took place in Glasgow, but we don't know how much time they had to work, if supplies were sufficient, whether they worked in the classroom or a lab, or if the government initiative was actually funded.

Work-group features

Diversity in the team makeup will foster creativity (Amabile, 1999; Simonton, 2000; De Souza & Fleith, 2000). When teams are comprised of like-minded students, they will reach their conclusions quickly and feel good about the process (Amabile, 1999), but will fail to explore and debate other ideas, because they did not bring them to the table. A diversity of people means a variety in expertise, creative-thinking styles, and cognitive abilities. This opens the group dynamics and discussions, and encourages sharing and exploring divergent ideas. Hearing an opinion from someone of a different economic background or a linear thinker rather than a global thinker might be just the "whack on the side of the head" (Von Oech, 1998, p.1) needed to produce innovative solutions.

Other work-group features that enhance creativity are excitement, a commitment to the project being a team effort, and mutual respect for the team members (Amabile, 1999). In The Cool Project, the diversity of work-groups may or may not have been realized. Achieving diversity in the classroom can be difficult depending on the community makeup. Glasgow, an urban setting, has Indian, Chinese, Pakistani, African, and Caribbean communities that contribute to the city's diversity and, thus, may contribute positively to the formation of diverse teams in the classroom. Unlike the diversity feature, the work-group feature of excitement is easy in this instance. Ice cream! What a great project to raise everyone's excitement level and thereby increase the intrinsic motivation that enhances creativity. Team members were quite excited to delve into this project as demonstrated by their high attendance rates and improved relations between each other and with their teacher. Mutual respect and commitment were evidenced as students worked together and practiced skills in "helping each other, learning from each other, listening to each other, and accepting group decisions" (Learning and Teaching Scotland, 2004, pp.14-16, "The Cool Project").

Supervisory encouragement

Supervisory encouragement can take many forms, such as offering feedback, boosting a student's confidence, or providing structure to a student overwhelmed by the task. Teachers provide the encouragement or positive support that their learners need to move forward. Creativity develops when teachers encourage curiosity, exploration, confidence, risk-taking, and balance.

Curiosity and a desire to explore even things taken for granted seem to be some of the important factors that build towards creativity. For example, Einstein often took a childlike approach in questioning the world around him. Csikszentmihalyi (1996) also states that the first step towards more creativity is the cultivation of curiosity. Teachers can support and reward exploration to enhance creativity.

Having self-confidence helps learners persevere. It enables them to champion their point of view and work. While success builds confidence, failure can tear it down. Fearful people, lacking confidence in their abilities, will often fail to produce creative work. Therefore, encouragement for all work, not just successful efforts, is important. It engenders a sense of safety for risk taking without fear of repercussions for making mistakes (De Souza & Fleith, 2000).

Balance in the classroom structure can encourage creativity. Students can benefit from some external organization in their processes, and a teacher should not hesitate to intercede. This does not contradict earlier statements regarding autonomy over the process, but rather offers a realistic view that some students need assistance in how they attack their work. However, the amount of support provided should be moderated by students' needs for spontaneity and imagination. "While creativity can be stifled by a repressive environment, it is not necessarily fostered by total lack of constraint (Marjoram, 1988); too little structure can be as inhibiting of creativity as too much (Runco & Okuda, 1993)" (Nickerson, 1999, p. 418).

Project Cool provided supervisory encouragement through its learner-centered approach. The teacher was the More Knowledgeable Other, MKO (Galloway, 2001), acting as a guide and sometimes subject matter expert. As a MKO, the teacher offered prompts to expand their ideas, information on technical and organizational skills, and encouragement to develop confidence, self-esteem, self-motivation, critical reflection, and informed decision-making. Some strategies used by the teacher included brainstorming and questioning sessions and provided more structure to the students' discussion which in turn encouraged some risk-taking in ideas. When faced with problems in their project, students were further encouraged to explore the issues through reflection and discussion, develop a new approach, and to learn from their experiences. Throughout Project Cool, the students made good decisions and readily assumed responsibilities, all of which confirmed their enthusiasm and happiness with the project (Learning and Teaching Scotland, 2004, pp. 14-16, "The Cool Project").

Organizational support

This strategy requires a school, district, city, or state to support the educational efforts at a more global level. In the case of The Cool Project, it was supported at the national level through The Creativity in Education initiative under Learning Teaching Scotland, which oversees The National Grid for Learning. This government-sponsored initiative was designed to enhance education and lifelong learning for all Scots. Part of the initiative's focus has been on creativity because "creativity is vitally important and should feature across all school activity. [Creativity in Education Online] encourages the nurturing, fostering and teaching of creativity and looks at the implications and challenges facing schools" (Creativity in Education, 2004, 1-3.). Support can include mandating communication, creating new work environments, or passing a bill to support new funding. The field is wide open for the form that organizational support might take. What is critical is that the organization's leaders "put in place appropriate systems or procedures and emphasize values that make it clear that creative efforts are a top priority" (Amabile, 1999, p.84).

Conclusion

"Everything that is really great and inspiring is created by the individual who can labor in freedom."

(Albert Einstein, Out of My Later Years, 1950)

Who needs creativity? We all do. It is the foundation of change and innovation. It is the solution to many problems. Therefore, it is the responsibility of education to foster creativity in our students. This chapter has

This book is licensed under a Creative Commons Attribution 3.0 License

offered some suggestions on how to accomplish this on a small, classroom scale, but there is no reason why the same ideas cannot be scaled to a much broader audience, such as an entire university. The concepts behind enhancing creativity are easily integrated in problem-based instruction, resource-based learning, experiential learning, and collaborative learning (see chapter 14, 23, 25). As a field of study, creativity is still young and growing. With further research may come more recommendations for classroom teachers and hopefully changes in school organizations, curriculum, and facilities. Creativity research could change how we look at schools—that is exciting!

Quick tips for enhancing creativity in the classroom

- Provide in-class time for individuals and groups to just think and let their ideas marinate.
- Reward creative ideas and products through public recognition - even if the ideas are still developing or perhaps fail.
- Encourage students to take unique and different approaches in their work and reward any efforts in this direction.
- Allow mistakes and model positive, supportive responses to mistakes. Encourage learning from their mistakes.
- Encourage mental flexibility - taking other viewpoints that they might not usually take.
- Explore the environment to stimulate curiosity about their world.
- Question students' assumptions and guide them to dig deeper and consider their beliefs and others' to expose students to other ideas.
- Stop evaluating or judging too soon. There is a time and place when ideas and their constraints need to be considered, but not too soon or the process will flounder.
- Foster cooperation rather than competition.
- Offer choices.
- Encourage dissent and diversity.
- Regularly provide positive feedback.

References

Amabile, T.M. (1983). The social psychology of creativity. New York:Springer-Verlag New York Incorporated.

Amabile, T.M. (1999). How to kill creativity. Harvard Business Review, September-October, 1998, 77-87.

Creativity in Education. (n.d.). Retrieved April 21, 2004, from http://www.ltscotland.org.uk/creativity/

Csikszentmihalyi, M. (1996). Creativity: flow and the psychology of discovery and invention. New York: Haper Collins.

Csikszentmihalyi, M. (1999). Implications of a systems perspective. In R.J. Sternberg (ed.) Handbook of Creativity. Cambridge: Cambridge University Press.

De Souza Fleith, D. (2000). Teacher and student perceptions of creativity in the classroom environment. Roeper Review, 22(2), 148-158.

Driver, Michaela (2001). Fostering creativity in business education: developing creative classroom environments to provide students with critical workplace competencies. Journal of Education for Business, 77 (1), 28-33.

11. Creativity

Editors of The American Heritage Dictionaries (Ed). (2000). The American heritage dictionary of the English language. Boston: Houghton Mifflin Company. Retrieved April 25, 2004, from http://dictionary.reference.com/search?q=challenge&r=67.

Edwards, B. (2004, April 28). The legacy of school busing: part 1: a qualified success in Charlotte, N.C. [Radio broadcast]. Morning edition. Washington D.C.: National Public Radio for Athens and Northeast Georgia.

Finke, R.A., Ward, T.B., & Smith, S.M. (1992). Creative cognition. Cambridge: MIT Press.

Galloway, C.A. (2001). Vygotsky's learning theory. In M. Orey (Ed.), Emerging perspectives on learning, teaching, and technology [Electronic version]. Retreived April 29, 2004 from Website: http://projects.coe.uga.edu/epltt/index.php?title=Vygotsky%27s_constructivism

Glover, J.A., Ronning, R.R., & Reynolds, C.R. (Eds.). (1989). Handbook of creativity. New York: Plenum Press

Learning and Teaching Scotland (2004). Creativity counts: portraits in practice [Electronic version]. Retrieved October 2, 2007 from http://www.ides.org.uk/Images/portraitsofpracticelts2004_tcm4-122010.pdf

Lubart, T.I. (1999). Creativity across cultures. In R.J. Sternberg (ed.) Handbook of Creativity. Cambridge: Cambridge University Press.

Lubart, T.I. (2000). Models of the creative process: past, present and future. Creativity Research Journal, 13(3/4), 295-303.

Mumford, M.D., Mobley, M.I., Uhlman, C.E., Reiter-Palmon, R., & Doares, L.M. (1991) Process analytic models of creative capacities. Creativity Research Journal, 4, 91-122.

Nickerson, R. S. (1999). Enhancing creativity. In R. J. Sternberg (Ed.), Handbook of Creativity. Cambridge: Cambridge Press.

Orey, M. (2001). Information processing. In M. Orey (Ed.), Emerging perspectives on learning, teaching, and technology. Available Website: http://projects.coe.uga.edu/epltt/index.php?title=Information_processing. (Kristi Bearden, editor)

Simonton, D. K. (2000). Creativity: cognitive, personal, developmental, and social aspects. American Psychologist, 55(1), 151-158.

Sternberg, R.J. (2001). What is the common thread of creativity: its dialectical relation to intelligence and wisdom. American Psychologist, 56, 360-362.

Sternberg, R.J. & Lubart, T. (1995a). Defying the crowd: cultivating creativity in a culture of conformity. New York: Free Press

Sternberg, R.J. & Lubart, T. (1995b). An investment approach to creativity. In S.M. Smith, T.B. Ward, and R.A. Finke (eds.) The Creative Cognition Approach. Cambridge: MIT Press.

Sternberg, R.J. & Lubart, T. (1996). Investing in creativity. American Psychologist, 51(7), 677-688.

Toure's Story. (2002). Retrieved October 2, 2007 from http://www.netaid.org/inspiration/from-the-field/toures-story.html.

Von Oech, R. (1998) A whack on the side of the head. New York:Warner Business Books

This book is licensed under a Creative Commons Attribution 3.0 License

Notes

Following below we provide selected online resources related to Creativity.

http://www.apa.org/monitor/nov03/creativitytoc.html Articles from American Psychological Association

http://www.buffalostate.edu/library/collections/creative.asp E. H. Butler Library - Creative Studies Library

http://www.ltscotland.org.uk/creativity/ Creativity in Education - Learning and Teaching Scotland

http://www.ncaction.org.uk/creativity/ Creativity: find it; promote it - National Curriculum in Action

This book is licensed under a Creative Commons Attribution 3.0 License

12. Adult learning

Authors: Julie Conlan, Sarah Grabowski, Katie Smith (The University of Georgia, USA)

Editor: Michael Orey (The University of Georgia, USA)

Learning objectives:

- andragogy
- variables affecting adult learning
- toolkit for facilitators of adult learning
- learning theories related to adult learning
    - action learning
    - experiential learning
    - project based learning
    - self-directed learning

Introduction

There are conflicting perspectives on adult learning as it relates to and separates itself from early childhood development practices and overall approaches to learning. It is the belief of the authors that all styles of learning are applicable to both early childhood and adult learning, with differences presenting themselves in regard to the use of the style based on the learning environment.

Andragogy

Andragogy is the art and science of helping adults learn. Malcolm Knowles is the father of andragogy as he proposed five factors involved in adult learning.

The five assumptions underlying andragogy describe the adult learner as someone who:

- has an independent self-concept and who can direct his or her own learning
- has accumulated a reservoir of life experiences that is a rich resource for learning
- has learning needs closely related to changing social roles
- is problem-centered and interested in immediate application of knowledge
- is motivated to learn by internal rather than external factors (Merriam, 2001, p.5)

Knowles used these principles to propose a program for the design, implementation, and evaluation of adult learning. Since the development of his theory, Knowles has acknowledged that the principles he outlined did not apply solely to adult education. The development of the theory simply illustrates that the designer "should involve learners in as many aspects of their education as possible and in the creation of a climate in which they can most fruitfully learn" (Merriam, 2001, p.7). Knowles' main focus with the development of andragogy was the notion of the material being very learner centered and the learner being very self-directed.

Principles:

- Adults need to be involved in the planning and evaluation of their instruction.

- Experience (including mistakes) provides the basis for learning activities.
- Adults are most interested in learning about subjects that have immediate relevance to their job or personal life.
- Adult learning is problem-centered rather than content-oriented.

Case study

The adults are first given an introduction to the class in personal computer training. They are told what they are going to learn and more importantly, why they are learning specific operations (functions, etc.). The learners are given task-oriented instruction as well as real-world assignments to test their skills such as creating a basic resume or a to-do list in Microsoft Word. The instructor will take into account the wide range of backgrounds of learners. The learning materials and activities should allow for different levels/types of previous experience with computers. Attention will be paid to individual levels and goals. The instructor's role is as facilitator and expert to present the tasks and assist the learners if mistakes are made or help is requested.

Advantages/strengths:

Andragogy is very self-directed and allows the learner to take control of his or her learning.

Andragogy is very broad based and the method can be implemented in a variety of educational situations.

Disadvantages/weaknesses:

Although the principles behind andragogy are very applicable in most adult learning situations it is not necessarily limited to implementation within adult learning.

Historically, andragogy has been hard to classify. It has been referred to as "a theory of adult education, theory of adult learning, theory of technology of adult learning, method of adult education, technique of adult education, and a set of assumptions".

Variables affecting adult learning

Learning opportunities for adults exist in a variety of settings ranging from a formal institution to a place of employment. It is important to acknowledge prior knowledge and experiences of learners, including their ability to recognize their own skills as lifelong learners (Merriam, 1999).

Considerations for adult development and learning include biological and psychological development (including deterioration and disease processes that may occur) and sociocultural and integrative perspectives on development (Merriam, 1999). While the most common reason for adults to place themselves in a learning environment is a life-changing event, once in that environment there are many factors that affect the learning experience. The most significant is referred to here as the briefcase brought with them.

Briefcase may include:

- life experience (including life altering events that affect cognitive abilities)
- work experience (including development of thinking patterns based on this experience)
- positive/negative previous adult learning experiences
- performance affectors, including cognitive abilities
- time between learning interactions
- aging factors

This book is licensed under a Creative Commons Attribution 3.0 License

Toolkit for facilitators of adult learning

Much of adult learning occurs in a corporate environment involving a variety of training processes. In addition to applying the various learning styles discussed in previous e-book chapters, trainers/facilitators in such environments need to have a working skill set to meet the demands of fast-paced, changing environments. New trends involve instructional designers and facilitators becoming long-term assets to training departments. Expectations are for trainers to arrive not only with delivery skills, but also with design experience and application of learning theories in a variety of settings (Meyer, 2003).

The most significant trend that continues to make an impact on facilitators is the demand for the incorporation of technology into the content and delivery of professional development (King, 2003).

The professional development toolkit for trainers should include:

- the basics of design and delivery— needs assessment, developing objectives, creating an agenda, selecting appropriate activities, providing for transfer, and designing and conducting evaluation activities
- an understanding of diverse clients and their different learning styles
- the ability to read the context, assess needs, and select or create appropriate mini-learning sessions that are often delivered as just in time learning
- the use of reflective practice skills to make sense of their situation, tailoring learning solutions to their own and other local learning needs, and developing and nurturing collaborative communities of practice
- the ability to coordinate university-based certificate, and in-service programs designed as learning laboratories
- the ability to develop activities that increasingly involve active experiential learning and debriefings
- the ability to use more than one delivery system, particularly online and eLearning
- the use of learner-centered instruction, especially self-directed learning, means trainers will need to create better ways to include opportunities for reflection, clarification, and guidance

Professional development of facilitators of adults should promote dialogue, reflection, and quality. The integrative approach to professional development involves key elements (Lawler, 2003).

Professional development:

- is adult education
- is learner centered
- is transformative learning
- needs to address motivation
- needs to address technology learning

Training is critical in five areas today (Riddle, 2000). These areas—stimulating creativity, assessing innovation options, focusing on the customer, designing new services, and implementing change—require a broad range of skills on the part of the trainer. Development of trainers should include demonstrating multiple approaches to delivering the same information.

Learning theories related to adult learning

Action learning

"Emphasize action learning. Classroom training is inefficient. Half the people in the room are secretly working on their "real" jobs; half are so relieved not to be doing their real jobs, they've turned their minds entirely off. Half already know half the stuff being taught and are playing Buzzword Bingo on their Palms; half will never need to know more than half of it (Stewart, 2001, p.184)."

Action learning is a commonly used term in many discussions regarding adult learning in a variety of business settings. It holds many similarities to learning communities, discussed at length in the e-book chapter on Learning Communities. If it is to be distinguished, action learning is basically the small components that create the main team involved in a learning community. Action learning has been compared with project work, learning communities, and various forms of simulation used in management development. It has been more widely used recently for organizational problems (Yorks, 2000).

"Action learning is defined as an approach to working with, and developing people, which uses work on a real project or problem as the way to learn. Participants work in small groups or teams to take action to solve their project or problem, and learn how to learn from that action. A learning coach works with the group in order to help them learn how to balance their work, with the learning from that work (O'Neil, 2000, p.44)."

Components of action learning:

- The first part of action learning is creating action groups based on programmed learning, "the expert knowledge" and learning or real world experiences. These are small groups, generally consisting on 3 or 4 people.
- Emphasis is placed on diversifying these small groups so that each group is best equipped to contribute to the learning community.
- A learning coach is designated for each group. Together, the learning coaches also form a group.
- From there, a project group leader is chosen. Both the project group leader and the learning coaches act as organizers, facilitators, and overall motivators for the action groups (O'Neil, 2000).
- Action learning involves learning from experience through reflection and action with the support group.
- It is important that the groups remain constant and have duration, meaning the opportunity to establish themselves over a solid time period (Wade, 1999).

Case study

Public Service Electric & Gas (PSE&G), the nation's sixth largest combined electric and gas company, developed an action learning program in order to help the distribution department learn how to be successful in the new competitive environment that was quickly replacing its former regulated world.

The following objectives were established for the program:

- Enhance the way people communicate and interact with one another
- Weave quality tools and behaviors into the fabric of the organization
- Develop and use problem-solving and coaching skills
- Develop an environment of openness and trust, and get conflict on the table

Over two years, there were nine separate sessions with more than 250 participants. Each session averaged 28 participants, formed into four action learning groups of seven participants each. A learning coach worked with each group. The four learning coaches also formed a learning coach team. Each action learning group addressed an actual business project, sponsored by a senior leader in the organization. During the program, the action learning groups met for a minimum of six and a half days over a six-week period with

This book is licensed under a Creative Commons Attribution 3.0 License

their learning coach and additional days on their own. At the end of the session, each action learning group proposed recommendations to the entire senior leadership team. Many of these groups were involved in the implementation of their recommendations after the end of the session. Some of the outcomes included savings in the hundreds of thousands of dollars through work restructuring, improved relationships with the community through outreach programs, and a transformed view of company-customer interactions, from providing customer satisfaction to that of building customer loyalty (O'Neil, 2000).

During the beginning of these sessions, participants were overwhelmed and apprehensive about the learning approach. After working through sessions, by the end, participants were surprised at the revelations that occurred during the learning process. They reported being challenged by the learning coach and establishing a rich camaraderie with their team members.

Advantages/strengths:

- process used in forming groups
- balanced and diverse groups enhance the learning process and allow significant contributions to the learning community
- utilization of group dynamics

Disadvantages/weaknesses:

- struggle constantly with the balance between accomplishing their task and learning from it
- difficult to ensure consistency across groups and across sessions of any program
- challenge of group dynamics

Experiential learning

"Tell me, and I will forget. Show me, and I may remember. Involve me, and I will understand."

(Confucius, circa 450 BCE)

Experiential learning is a learning theory that is learner-centered and operates on the premise that individuals learn best by experience. A good way to describe this theory is "learning by doing". Experiential learning thus has the learner directly involved with the material being studied instead of just thinking and talking about that material.

Experiential learning:

- is a cyclic process involving setting goals, thinking, planning, experimenting and making decisions, and finally action, followed by observing, reflecting, and reviewing
- uses participants' own experience and their own reflection about that experience, rather than lecture as the primary approach to learning. Experiential learning theory allows for the generation of understanding and allows for the transfer of skills and knowledge.
- involves doing something and discovering what it is like, how it made the learner feel, what it meant to the learner, i.e. experiential learning is their experience and no one else's.
- is, therefore, particularly effective in adult education as it addresses the cognitive, emotional, and the physical aspect of the learner

Case study

A group of oncology nurses is participating in a three day in-service training course. The nurses' training sessions were conducted using the experiential learning theory. The nurses were each presented with a real-life scenario involving a challenge that an oncology nurse might face. The problem is presented to them in a real-life simulation. Once the challenge has been laid out for them each nurse must search out resources for information that might help them deal with the particular situation. Once each nurse has done the research to his/her satisfaction he/she must then face the scenario and deal with the challenge as effectively as he/she can. When each nurse has completed the scenario, the group comes back together for a group discussion about what methods worked and what methods did not work. The nurses then evaluate themselves on the effectiveness of their research as well as the effectiveness of the implementation of the research. On the final day of the in-service each nurse is given the chance to face the challenge again after the discussion and reflection.

Advantages/strengths:

- Experiential learning theory builds on experience. This is especially important in adult learning because simply by living, adults bring a wealth of experience to every learning situation they face.
- Experiential learning theory is a holistic learning approach.
- Experiential learning theory is most effective when the learning has intrinsic motivation which is a common characteristic in adult learning.

Disadvantages/weaknesses:

- Experiential learning theory does not take into account differences in cultural experiences or conditions.
- It is less clear where elements of learning such as goals, purpose, and intentions fit into experiential learning theory.
- It may not help us understand and explain change and new experiences.

Project based learning

In Project based learning, students work in groups to solve challenging problems that are authentic and often interdisciplinary. Learners decide how to approach a problem and what activities to pursue. This is comparable to the project based learning strategies as discussed in the e-book chapter Constructionism, Learning by Design, and Project Based Learning.

- The learners gather information from a variety of sources and synthesize, analyze, and derive knowledge from it.
- The learning is inherently valuable because it is connected to something real and involves adult skills such as collaboration and reflection.
- At the end, the learners demonstrate their newly-acquired knowledge and are judged by how much they have learned and how well they communicate it.
- Throughout this process, the teacher's role is to guide and advise, rather than to direct and manage student's work.

Case study

The instructor of a pre-GED class wanted to get her students motivated to become involved in their communities. Their first step was to discuss and write about what a community was. They talked about

This book is licensed under a Creative Commons Attribution 3.0 License

the issues that affected the students' communities. The students took turns stating problems they thought were affecting the community the most. Through group discussion the list was narrowed down to the most pressing problems. The class then put together a survey to get input from the community on these topics. This group work helped the students develop not only literacy but also social skills. The class compared the answers from neighborhood to neighborhood, looking for the biggest issues. The students decided that they would like to put together a forum for the junior high school students.

Advantages/strengths:

- PBL gives the learner a chance to work on real-life scenarios that would be implausible on a real scale (i.e. management training in restructuring corporations).
- It allows for cooperative learning situations which build teamwork and collaboration skills important in many adult learning situations.

Disadvantages/weaknesses:

- PBL might not always be the best learning method when dealing with many different cultures and backgrounds because problem solving methods vary from culture to culture.

Self-directed learning

"Informal and incidental learning is at the heart of adult education because of its learner-centered focus and the lessons that can be learned from life experience (Marsick, 2001, p.25)." Self-directed learning is an example of informal learning. It is defined as the process in which individuals take on the responsibility for their own learning process by diagnosing their personal learning needs, setting goals, identifying resources, implementing strategies, and evaluating the outcomes. In 1999, more than 95 per cent of adults participated in self-directed learning. Typical learners spend an average of 15 hours per week on a self-directed learning project (Rager, 2003).

There are three categories involved with self-directed learning: the goals, the process, and the learner. In an adult learning context, the goals are generally self-determined, as is the process. Self-directed learning can be enhanced with facilitation, particularly through providing resources. Motivation is key to a successful self-directed learning experience. This is very similar to the motivation that takes place in children during a self-regulated learning experience as mentioned in the "Motivation" chapter of the e-book.

Adult learners are motivated by the opportunity to:

- gain new skills, knowledge, and attitudes to improve their work performance
- improve family life and health, enjoy the arts and physical recreation, participate in a hobby, or simply increase their intellectual capital

Case study

183,000 women are diagnosed with breast cancer each year. For many, self-directed learning becomes a means to learn about their condition and provides a method for coping with it. Resources obtained through doctors, support groups, libraries, and the Internet facilitate their learning. From this information, the learners gain a sense of control and direction over their own well-being, and are able to make informed decisions about treatment options.

Advantages/strengths:

- integrated with daily routines
- triggered by an internal or external motivation

- an inductive process of reflection and action
- linked to learning of others

Disadvantages/weaknesses:

- Learners are self-directed depending on the situation. They will not necessarily be self-directed in all situations.
- Not all adults prefer the self-directed option, and even the adults who practice self-directed learning also engage in more formal educational experiences such as teacher-directed courses.
- Because it is unstructured, learners can easily be distracted by their own needs, assumptions, values, and misperceptions.
- Research has shown that some adults are unable to engage in self-directed learning because they lack independence, confidence, or resources.
- In recent years, less research has been conducted on self-directed learning.

Conclusion

There are a multitude of theories applicable to adult learning. For each theory, there are many independent factors brought to the environment by the learner. Based on the research by the authors, the theories listed in this chapter were found to be the most relevant for current trends in adult learning. However, all theories should be taken under consideration by facilitators and learners.

Table 10: Adults are students too

Learning theories related to adult learning - table created by Mandy McEntyre and Jenn Pahl (2006).

	Theory summary	Pros of the theory	Cons of the theory	Theory in practice
 Action learning Action Learning (continued)	Participants work in small groups on a real project/problem and learn how to learn from that activity.	• Small groups learn by solving a real world problem. • Diverse group dynamics include members with expert knowledge which allows each member to significantly contribute. • Group members benefit from learning coaches who act as organizers, facilitators, and overall motivators.	• Challenges imposed by group dynamics. • Difficulty ensuring consistency across groups and maintaining groups across sessions in a learning program. • Difficulty balancing accomplishing the work with learning from the work.	Researchers for an information services company undergo training to help them increase their data acquisition numbers. Small groups are formed and an outside consultant/learning coach assists them in brainstorming and developing new techniques for gathering data from industry sources. As the techniques are developed the groups test them on

This book is licensed under a [Creative Commons Attribution 3.0 License]

				their sources and refine them. Every four weeks the groups convene to discuss their progress and what they have learned. The end result is a new set of improved data gathering techniques and an overall group understanding of how to use them.
 Experiential learning	A holistic learning approach in which the learner utilizes his/her experiences and learning strengths in the process of constructing knowledge. More commonly referred to as “learning by doing”.	• Learning takes place through direct involvement and reflection. • Learners bring their own life experiences to the learning situation. • “Hands-on” aspect increases motivation and material retention.	• Time and resource intensive for student and instructor. • Learners may bring differing cultural experiences or perspectives to the learning experience. • Theory does not aid in understanding or explaining change and new experiences.	An audio/visual equipment company recently hired several sales representatives, all of whom have sales experience in other industries. As part of their training, each new sales representative is paired with a mentor who is a veteran with the A/V company. The A/V mentors take the new sales reps to assist on sales calls. This allows the new sales reps to learn the industry by interacting with customers during the sales process. It also assists the new sales reps in determining how they can use their previous

				sales experience to advance themselves in their new positions.
 Project based learning	Participants work in small groups to solve a challenging, interdisciplinary problem using group chosen strategies and activities.	• Allows for participants to participate in cooperative learning activities which help to build teamwork and collaboration skills. • Participants are able to participate in learning scenarios directly applicable to the real-world.	• Problem solving skills may differ among cultures, causing problems among group members during PBL activities. • PBL activities may prove to be time consuming in terms of both planning and applying.	A city has recently been awarded a government grant to build a park. The city has charged a class at a local community college with the job of creating a plan that efficiently uses available space and funds. In groups the students search out possible plans for the park through surveys, studies, etc. Each group then presents their plan to the council for a vote to decide upon a plan for the park.
 Self-directed learning	An informal learning process in which an individual takes on the responsibility for his/her learning process by identifying their learning needs, setting goals, finding resources, implementing	• Can be easily implemented in daily activities. • Students are motivated by internal/ external motivation. • Self-Directed Learning is a reflective and action-oriented process.	• Some situations lend themselves to self-directed learning better than others. • Self-directed learning needs to be combined with other learning methods for content to be fully learned.	Bob would like to buy a new car. He wants to ensure that he gets the best car for his budget, so he begins to conduct research on cars, their gas mileage, size, and financing plans. By searching for information online, visiting numerous

This book is licensed under a Creative Commons Attribution 3.0 License

strategies, and evaluating their results.	• Learning can be linked with other students.	• Since self-directed learning is unstructured and independent, it is easy for students to become unproductive.	dealerships and obtaining brochures, Bob is able to expand his knowledge and make an educated decision as to which car he will purchase.

References

Arlington, D. & Duzer, C. (1998). Project-based learning for adult English language learners. Retrieved on October 1, 2007 from http://www.cal.org/caela/esl_resources/digests/ProjBase.html.

Carlson, R. (1989). Malcolm Knowles: Apostle of andragogy. [Electronic version]. *Vitae Scholasticae*, *8(1)*.

Cooper, L. & Von Kotze, A. (2000). Exploring the transformative potential of project based learning in university adult education. Studies in the Education of Adults, v. 32, no. 2, p. 212-229.

Johnson, D. L. (1998). Turning obstacles into opportunities. Focus on Basics, v. 2, issue D. October 10, 2003. http://www.gse.harvard.edu/%7Encsall/fob/1998/johnson.htm.

King, K.P. & Lawler, P.A. (2003). Trends and issues in the professional development of teachers of adults. New Directions for Adult & Continuing Education, v. 98, p. 5-13.

Knowles, M. (2002). Lifelong learning: A Dream. Creating the Future: Perspectives on Educational Change, v. January. October 10, 2003. http://www.newhorizons.org/future/Creating_the_Future/crfut_knowles.html.

Lawler, P.A. & King, K.P. (2003). Changes, challenges, and the future. New Directions for Adult and Continuing Education, v. 98, p. 83-91.

Marsick, V. J. & Watkins, K. E. (2001). Informal and incidental learning. New Directions for Adult & Continuing Education, v. 89, p. 25-34.

Merriam, S. B. (2001). Andragogy and self-directed learning: Pillars of adult learning theory. New Directions for Adult & Continuing Education, v. 89, p. 3-14.

Merriam, S. B. & Caffarella, R.S.(1999). Learning in adulthood: A comprehensive guide. San Francisco, CA: Jossey- Bass Inc.

Meyer, S.R. & Marsick, V.J. (2003). Professional development in corporate training. New Directions for Adult & Continuing Education, v. 98, p. 75-82.

Mok, Y. F. (1999). Experiential Learning: Functional attributes and effectiveness. Studies in Continuing Education, v. 21, no. 1, p. 57-73.

O'Neil, J. & Lamm, S.L. (2000). Working as a learning coach team in action learning. New Directions for Adult & Continuing Education, v. 87, p. 43-52.

Pickles, T. (2000). Experiential Learning … on the Web. October 10, 2003. http://www.reviewing.co.uk/research/experiential.learning.htm.

Pilling-Cormick, J. (1997). Transformative and self-directed learning in practice. New Directions for Adult and Continuing Education, v. 74, p. 69-77.

Rager, K. B. (2003). The self-directed learning of women with breast cancer. Adult Education Quarterly. v. 53, no. 4, p. 277-293.

Riddle, D. (2000). Innovate: How services exporters survive and thrive in the new millennium. International Trade Forum, v. 4, p. 17.

Smith, M. K. (2001). David A. Kolb on experiential learning. The Encyclopedia of Informal Education. October 10, 2003. http://www.infed.org/biblio/b-explrn.htm.

Smith, M. K. (2002). Malcolm Knowles, informal adult education, self-direction and andragogy. The Encyclopedia of Informal Education. October 10, 2003. http://www.infed.org/thinkers/et-knowl.htm.

Stewart, T. (2001). Mystified by training? Here are some clues. Fortune, v. 143, p. 184.

Wade, S. & Hammick, M. (1999). Action learning circles: Action learning in theory and practice. Teaching in Higher Education, v. 4, p. 163-179.

Yorks, L. (2000). The emergence of action learning. Training and Development, v. 54, p. 56.

Additional resource

Focuses on a scenario in strategies for Middle School and High School Faculty Development in Media and Technology: Training strategies

This book is licensed under a Creative Commons Attribution 3.0 License

13. Constructionism, Learning by Design, and Project-Based Learning

Authors: Seungyeon Han and Kakali Bhattacharya (The University of Georgia, USA)

Constructionism: instructional model scenerio

The trainers at Performance Solutions were excited. Finally, a workshop on designing and delivering effective web-based instruction was being offered! When they first heard about the workshop, the trainers thought it odd. Management had explained that clients are more impressed with better design and delivery for web-based instruction, which leads to better buy-in for product sales. Typically, the trainers just followed the company protocol. They really had no strategies for effectively delivering web-based instruction. Now, with this conference, they felt that they could look forward to learning techniques and strategies to improve delivery and increase their well-deserved commission. The training was designed to comprise one face-to-face introductory meeting, followed by web-based instruction for the remainder of the six-week course.

The workshop, held on a Saturday, was composed of attendees who were trainers who normally consulted with clients, and those who trained their trainers and managers. Kayla Johnson, a veteran in this type of instruction, facilitated the workshop on "How to Design and Deliver Effective Web-Based Instruction". Performance Solutions had hired her because of her ability to make instruction more creative, personalized, hands-on, meaningful, and effective for the participants.

As the meeting began, the participants settled down. Kayla, who was dressed in casual, business attire, had a friendly yet professional attitude. She provided some time for the participants to pair up and learn about each other so introductions could be exchanged. As the participants introduced each other, Kayla asked insightful questions about the participants' backgrounds, their clients, and what they hoped to take away from the class. She carefully noted facts when appropriate. After the introductions, Kayla previewed the activities she had planned for the day and opened the floor to questions. Realizing that it was too early for the participants to begin, she announced a ten-minute break before continuing with the next part of her instruction.

After the participants returned from the break, Kayla asked the audience for their ideas about effectively designing and delivering web-based instruction, while encouraging the participants to elaborate with examples from their own experience. As ideas were offered, Kayla recorded them on a flip chart. Among the ideas generated were preparation, multiple assessment strategies, learner assessment, knowledge of the topic, flexibility, and functional interface design. Kayla, after listening to and recording all the responses, highlighted common themes and salient points, which were integrated into her PowerPoint presentation. At the end of her presentation, Kayla again opened the floor to questions. After answering a few questions with anecdotal examples, Kayla suggested they break for lunch.

After lunch, Kayla anticipated that the participants might be lethargic. She began the afternoon session by engaging them in an exercise that would be meaningful and energizing for the afternoon's tasks. Kayla guided the attendees through examples of a variety of web-based instruction as the learners observed their own strengths, weaknesses and functionality of the sites. Kayla made a list of their observations and provided a copy to each participant of the workshop.

Kayla moved very quickly to the next task that she had prepared for the participants. Each participant was to design a plan for a web-based instruction. The project should be one they were currently working on for their own clients. Instruction was to follow tips and guidelines from handouts she had provided. The participants would determine the form of media used and were free to use the software on their workstation computers or from the Internet if appropriate. The components to be present in the planning stage of their selected projects were: learner analysis, time frame, interface metaphor, multiple modes of presentation, assessment strategies, variety of learning tasks, and creation of a learner-centered environment. The participants were to work first individually and then in groups to discuss their plans, obtain feedback, and make necessary modifications and re-evaluations. Then, each group would choose one plan to be presented to the class. The participants would have an opportunity to offer feedback based on the guidelines provided in the handout. They could choose to deliver their presentation through concept models, oral explanation, flip charts, PowerPoint presentations, or the Internet. The process was interactive, and the participants were thoroughly engaged. Ideas were plentiful as the participants planned and designed their own projects considering ways to deliver and evaluate them. Ongoing feedback was provided to group members by both Kayla and group peers. Kayla circulated, listened to ideas, helped with questions and cleared up any confusion that arose.

By the time presentations began, the groups were excited about hearing each other's thoughts and ideas. After each presentation, comments and questions were solicited from the audience. Ample feedback was provided in the areas of navigation issues, various communication tools, web-course management tools, multiple modes of presentation, and how to relate to learners on a personal level. Realizing that the participants had probably been overloaded with information, Kayla proposed a break after the last presentation.

When the workshop reconvened, participants were generally in high spirits as they discussed the presentations. They discussed their own design ideas and sought more feedback. Kayla started the session again by asking for a reflective discussion to guide the session. She asked the participants to relate their experiences, noting what stood out for them, what they had learned, and what they would do differently. Kayla received rich feedback from this discussion. Sam offered that planning for an authentic project--one that he was working on rather than a meaningless mini-project chosen by the instructor--was particularly helpful for him. Brainstorming and generating great ideas made him feel that he was now ahead of the game. Sonia found listening to others to be the greatest benefit to her; it helped her to generate new ideas about her own project. She asserted that she had learned more that day from the hands-on work than in previous, boring workshops. She mentioned that Kayla's interest in the participants' experiences had made her feel valued as an adult learner and had encouraged her participation.

Kayla was pleased with all the reflective comments. She provided some additional Internet resources and handouts for the participants. Kayla reminded them that the communication for remaining sessions between the participants would be done mainly via e-mails, chat sessions, and bulletin board discussions which would allow the participants to share their ideas and learn from each other. At the end of four weeks, they would do their first pilots and gather feedback to guide necessary modifications. A pilot of their final product would be shared with the class

This book is licensed under a Creative Commons Attribution 3.0 License

and their intended target audience at the end of six weeks. Feedback from the instructor, peers, and clients would be used to make the final modifications to their projects. She offered some time slots for the participants to sign up for chat sessions to discuss ongoing topics and issues regarding the projects. Finally, she thanked everyone for their cooperation and asked them to remember that instruction is only effective when the learners can relate personally and take something away from it. The process of constructing a product as a learning outcome to engage learners was emphasized as an important hands-on activity. After this comment, Kayla concluded the session.

During the next three weeks, participants used journals and bulletin board postings to detail their progress. This allowed all the participants to gauge their own progress and provide insightful comments to each other. Chat sessions were held bi-weekly to discuss progress issues, roadblocks, and difficulties with subject-matter research. Kayla facilitated the first chat session; in subsequent sessions, participants were allowed to select a session to facilitate in any way they chose. Kayla provided some timely topics to guide discussion at various stages of the project. The participants found that taking part in leading a discussion in a chat session was enjoyable and beneficial. This not only generated new ideas, but allowed them to reflect on the appropriateness of those ideas for use in their own web-based instruction projects.

At the end of four weeks, the participants provided Internet links to their projects, and the participants were invited to critique those that were completed. With the feedback obtained, the learners further modified their projects. Chat sessions and bulletin board postings continued to be vehicles for sharing ideas and generating discussions. Finally, at the end of six weeks, participants piloted their projects both to the class and to a sample of their respective target audiences. Kayla assessed the participants based on their participation, progress in their work from the beginning to the end of the project, reflective discussions, and self-reflection postings. Later, Kayla received many e-mails from her participants reporting that their projects were going well after implementation, and that they were remaining flexible in meeting the needs of their learners.

Questions to consider from the scenario

- How would you describe Kayla Johnson's class to an outsider?
- What kind of instructional strategies did you observe?
- Do you agree with the strategies used? Please explain.
- Did you feel that learning took place, if so, to what extent?
- How much of yourself do you see in Kayla and why?
- What would you add or do differently in the scenario?

It is clear that Kayla used some powerful instructional strategies. Her session was learner-oriented; it focused on the learners, and on activities that allowed them to interact with the content and each other by sharing their ideas. Kayla took a keen interest in understanding the participants' contexts, and provided feedback accordingly. Through interactive strategies such as brainstorming and discussion sessions, Kayla engaged the learners both as a class and in groups. Moreover, Kayla allowed the learners the opportunity to interact with the content by designing web-based instructional projects used with their own clients. This personalized instruction engaged the participants. At the end of the exercise, each left the workshop with a unit of web-based instruction as an artifact created through the exploratory process. Moreover, Kayla used multiple methods of presenting content and engaging the learners so that they were motivated and maintained attention throughout both face-to-face and online sessions. Kayla's session incorporated elements of two constructionist models of education—specifically, Learning by Design and Project-Based Learning.

Constructionism: What is it?

For a description of the differences between Project-based Learning and Problem-based Learning, click here .

Constructionism (Papert, 1993) is both a theory of learning and a strategy for education. It builds on the "Constructivist" theories of Jean Piaget, asserting that knowledge is not simply transmitted from teacher to student, but actively constructed in the mind of the learner. Learners don't get ideas; they create ideas. Moreover, constructionism suggests that new ideas are most likely to be created ideas when learners are actively engaged in building some type of external artifact that they can reflect upon and share with others. Papert (1991) differentiated between constructivism and constructionism:

> *"The word with the v expresses the theory that knowledge is built by the learner, not supplied by the teacher. The word with the n expresses the further idea that happens especially felicitously when the learner is engaged in the construction of something external or at least sharable"*
>
> *(Papert, 1991, p.3).*

Constructionism supports the constructivist viewpoint--that the learner is an active builder of knowledge. However, it emphasizes the particular constructions of external artifacts that are shared by learners. Although learners can construct and present knowledge or meanings without producing external products, the processes of construction are more evident when learners produce through social interaction with others and share representations of their understanding and thoughts.

Constructionism in the classroom: What does it involve?

A classroom based on constructionism has many elements that promote a learner-oriented learning environment. In this learning environment, the instructor acts as a facilitator and guides the learners along their paths of learning. Learners are assigned tasks in which they must implement particular instructional goals. They investigate, create, and solve problems. Some of the elements in a learning environment guided by constructionism are:

- presentation of rubrics which define expectations
- dialogue on interpretation of the assignment
- exploration of multiple strategies for tackling the assignment
- inquiry/learning discussion
- presentation of work
- projects which include revision and development of an idea
- learner collaboration
- learners working with professionals in the outside world
- learners engaging in "genuine", authentic real-world tasks

In a learning environment guided by constructionism, it is important to set lesson/unit goals and expectations at the outset, so that learners understand what they are trying to achieve and the level of that achievement. Explaining multiple strategies allows the learners various ways of solving the problems that they encounter. Obtaining feedback through presentation and discussion allows the learners to revise their projects/artifacts. Lastly, an

This book is licensed under a Creative Commons Attribution 3.0 License

involvement with application in the real world allows the learning process to take place in a more meaningful context.

Constructionism in Kayla's training session

Many of the above mentioned elements were present in the learning environment created by Kayla. She started the session with an agenda, clarifying expectations in a handout she created. She offered learners multiple strategies to handle their projects. Participants were allowed to brainstorm with colleagues, work on their own, solicit Kayla's help, and have access to the Internet as well as other planning and design software for quick research. The discussion and the presentation allowed the participants to obtain rich and varied feedback. The tasks chosen by the participants were those that were real to them. This environment, like most learning environments guided by constructionism, required the learners to construct artifacts reflecting their acquisition of knowledge. As a result, learners became researchers, investigators, and to some extent artists in designing the learning environment for their target audience. The rationale is that the ways learners analyze the external world reveal their thought processes.

Constructionism can be implemented in two forms-- Learning by Design (LBD) and Project-Based Learning (PBL). Because constructionist theories and strategies guide LBD and PBL, they have many features in common; however, they also differ in the kind of tasks that are expected of participants. Both LBD and PBL share a student-centered environment, as stipulated in constructionism. Learners in both environments are expected to take more responsibility for their learning; in both environments, learners have choices and are provided with opportunities to participate in real-world tasks that are meaningful for them.

In LBD, the participants are expected to design an artifact for their pre-selected target audiences; this can be an individual undertaking or a group work. However, PBL can involve long-term project work or working with other people and does not necessarily involve designing a learning environment for a targeted audience.

So what does this imply for implementing constructionism in practice? What issues should be considered in creating an environment grounded in constructionism? A significant part of a constructionist learning environment involves planning and preparation by the instructor. However, these planning and preparation strategies seem to differ from classroom to classroom and from instructor to instructor. Another issue that emerges is the accommodation of learner preferences. The instructor's role is complex one; teachers must balance the functions of disseminating information and facilitating while confronting their own biases towards learning and instruction. Communication of instructional procedures and strategies is another problem to be addressed in a constructionist environment. Learners must, at least to some degree, understand the design process which enables them to create their sharable artifact. What kind of procedures and processes should an instructor implement to ensure this understanding?

Moreover, assessing learners is a challenge in an open-ended and ill-defined learning environment which offers multiple choices. Thus, setting clear criteria for measuring progress or learning can be difficult and can vary from learner to learner. What kinds of feedback strategies should be implemented and how much should instructors change their approach based on learner feedback? Clearly, constructionism in practice raises several questions, that need answers. A discussion of the two types of constructionism in practice- Learning by Design and Project-Based Learning may provide answers. In the following sections, many of the questions are answered through explanations, strategies, and examples.

Learning by Design: What is it?

Learning by Design emerges from the constructionist theory that emphasizes the value of learning through creating, programming, or participating in other forms of designing. The design process creates a rich context for learning. Learning by Design values both the process of learning and its outcomes or products. The essence of Learning by Design is in the construction of meaning. Designers (learners) create objects or artifacts representing a learning outcome that is meaningful to them.

Goals of a Learning by Design environment

Many goals can be identified for an environment driven by Learning by Design. These goals may vary with the learner, content, task, and the instructor. However, there are some common trends permeating most environments that follow the principles of Learning by Design. The following reflects the common goals of Learning by Design, that are not, however, exclusive to this type of constructivist learning.

- extracting essential concepts and skills from examples and experiences
- engaging learners in learning
- encouraging question posing
- confronting conceptions and misconceptions

Components of Learning by Design

There are many perspectives on what constitutes Learning by Design. As this field evolves, the list will become more fluid. The following components allow for a rich learning environment that provides the learner with opportunities to interact with the content in a meaningful way. These elements also add to the value of effectively designing and reflecting on process and product to make the learning experience worthwhile. The following are the components most readily identified in a LBD environment.

- authenticity: tasks based on real-world applications
- multiple contexts for design activities
- a balance of constrained, scaffolded challenges with open-ended design tasks
- rich, varied feedback for designers
- discussion and collaboration
- experimentation and exploration
- reflection

Learning by Design strongly suggests that tasks should be based on hands-on experience in real-world contexts. The designers/participants should be given the option of multiple contexts so that they can devise multiple strategies when they use the problem-solving process. Because the learning process is open and varied according to the student learning preferences, skills, and knowledge, it is important that there be a balance among guided tasks, challenges, discussions and reflections that follow. Collaborative work allows the learners to obtain feedback from both peers and the instructor, who primarily plays the role of facilitator.

The visual model of the Design Process represents the essence of Learning by Design. The learner begins walking down the "path of knowledge," and stops to choose a topic or task (Stop 1). This task would be based on a real-world application that is meaningful for the learner. The next stop (Stop 2) is to describe the audience. The choice of audience will guide the learner as he designs the specific artifact. The following stop (Stop 3) along the path is the actual creation of the artifact. Once the artifact is created, the learner will then pilot the artifact (Stop 4).

This book is licensed under a Creative Commons Attribution 3.0 License

At this point, the learner should receive feedback from the facilitator and peers (Stop 5). The learner then reflects on the artifact and the feedback in order to evaluate his work (Stop 6) .The learner can then modify the artifact based on this evaluation (Stop 7). The entire design process is overseen by the facilitator who is represented by the "eye in the sky".

Learning by Design in Kayla's session

Kayla incorporated many strategies suggested by the Learning By Design (LBD) framework. First , Kayla created a learner-centered environment in which she assumed the role of the facilitator by minimizing lecture time and increasing learner participation through thought-provoking questions, feedback, and guiding or scaffolding the learners as they began planning and designing their projects. The task Kayla prescribed was to construct an artifact, web-based instruction for their target audiences. The learners were provided with examples of many different contexts if they had none of their own. However, because each of the trainers had their specific clients, they were provided with multiple contexts as options. Additionally, the group discussions allowed the participants to obtain feedback from their peers, which they used to modify their projects; further input came from the facilitator and their projected target audience when the projects were piloted at the end of the training session. Participants were allowed to reflect on their learning and what they were taking away from the instruction. This reflection process is helpful for both the facilitator and the participants, as constructionism is geared to prepare learners with skills that will make them life-long learners.

Learning by Design: instructional strategies

As with any learning environment, many strategies can be employed to make the learning process more meaningful. Because the learner is an active builder of knowledge, according to constructionism, it is essential that the learning environment be learner-centered. Some strategies can be implemented in the learning environment to promote a LBD framework. (Table 1). There is no prescribed set of linear procedures in creating a LBD classroom environment ; however, the table offers strategies and examples that can ensure an enriched LBD environment.

Table 11: Learning by Design (LBD) - strategies and examples

Strategies	**Implementation Examples**
Clear expectations from day one	• Handouts • Explanation • Discussion session • Web page • Clarification of questions embedded in the course
Inform participants of implicit and explicit objectives and how they will be evaluated	• Discussion following pre-test • Handouts • Web page • Question/answer sessions • Collaboratively determine evaluation criteria
Learner should be the active builder of knowledge	• Brainstorming • Group discussions

Instructor should take on the role of a facilitator, motivator	• Games • Decision making • Learner has a choice of topic • Learner has a choice of context • Investigative tasks • Scaffold learners' activities • Challenge learners • Assign open-ended design tasks • Balance scaffolding, challenge learners, and assign tasks • Reinforce concepts, confront misconceptions
Tasks given should allow learners to design and construct an artifact that can be shared.	Design tasks can include but are not limited to: • Educational software • Educational games • Web sites, PowerPoint presentations
Provide rich and varied feedback for the designers/learners	• Agreeing on a rubric initially • Self evaluation through reflection • Journals • Progress reports • Class discussion • Short paper • Peer evaluation • Portfolio: progress report • Piloting to target audience • Piloting to subject matter experts • Feedback by observing student interaction and participation

These strategies can effectively prevent problems common in LBD environments such as:

- Unclear expectations
- Minimal or incomplete information
- Lack of clear instructional objectives
- Accommodation of learner preferences
- Complex instructor role: moving from traditional to innovative
- Assessment of the learning process

For example, to address the issue of unclear expectations, instructors should clarify the expectations from the outset. Various modes of clarification have been suggested, but it is crucial that the communication of expectations and questions be clear.

This book is licensed under a Creative Commons Attribution 3.0 License

The essence of Learning by Design: constructionism in practice

In summary, the essence of Learning by Design lies in the experience of the learner as a designer and creator of an external, shareable artifact. Learners become more accountable for their learning through designing, sharing, piloting, evaluating, modifying their work, and reflecting on the process. The instructor acts as a facilitator and motivator by creating an open-ended learning environment and by challenging and scaffolding the learners in a balanced manner while providing options with rich and varied feedback. Through this experience, learners construct meaning and internalize the learning process.

Project-Based Learning—What is it?

Project-Based Learning is a comprehensive instructional approach to engage learners in sustained, cooperative investigation (Bransford & Stein, 1993). Project-Based Learning is a teaching and learning strategy that engages learners in complex activities. It usually requires multiple stages and an extended duration--more than a few class periods and up to a full semester. Projects focus on the creation of a product or performance, and generally call upon learners to choose and organize their activities, conduct research, and synthesize information. According to current research (Thomas, Mergendoller, & Michaelson, 1999; Brown & Campione, 1994), projects are complex tasks, based on challenging questions, that serve to organize and drive activities, which taken as a whole amount to a meaningful project. They give learners the opportunity to work relatively autonomously over extended periods of time and culminate in realistic products or presentations as a series of artifacts, personal communication, or consequential tasks that meaningfully address the driving question. PBL environments include authentic content, authentic assessment, teacher facilitation but not direction, explicit educational goals, collaborative learning, and reflection.

Constructionism is reflected in PBL by

- creation of a student-centered learning environment
- emphasis on artifact creation as part of the learning outcome based on authentic and real life experiences with multiple perspectives

Thus, learners are allowed to become active builders of knowledge while confronting misconceptions and internalizing content and associated conceptions.

Components of Project-Based Learning

Seven features can be identified as key components of Project-Based Learning. These features can be used in describing, assessing, and planning for projects. They are:

- Learner-centered environment
- Collaboration
- Curricular content
- Authentic tasks
- Multiple expression modes
- Emphasis on time management
- Innovative assessment

Learner-centered environment: This component is designed to maximize student decision-making and initiative throughout the course of the project including topic selection to design, production, and presentation decisions. Projects should include adequate structure and feedback to help learners make thoughtful decisions and revisions. By documenting learners' decisions, revisions, and initiative, teachers (and learners) will capture valuable material for assessing student work and growth.

Collaboration: This component is intended to give learners opportunities to learn collaborative skills, such as group decision-making, interdependence, integration of peer and mentor feedback, providing thoughtful feedback to peers, and working with others as student researchers.

Curricular content: Successful integration of content requires projects to be based on standards, to have clearly articulated goals, and to support and demonstrate content learning both in process and product.

Authentic tasks: This element can take on many forms, depending on the goal of the project. PBL may connect to the real world because it addresses real world issues that are relevant to learners' lives or communities. A project may be connected to real professions through the use of authentic methods, practices, and audiences. Communicating with the world outside the classroom, via the Internet or collaboration might also make real world connections with community members and mentors.

Multiple presentation modes: This component gives learners opportunities to effectively use various technologies as tools in the planning, development, or presentation of their projects. Though the technology can easily become the main focus of a given project, the real strength of the multimedia component lies in its integration with the subject curriculum and its authentic use in the production process.

Time management: It builds on opportunities for learners to plan, revise, and reflect on their learning. Though the time frame and scope of projects may vary widely, they should all include adequate time and materials to support meaningful doing and learning.

Innovative assessment: Just as learning is an ongoing process, assessment can be an ongoing process of documenting that learning. PBL requires varied and frequent assessment, including teacher assessment, peer assessment, self-assessment, and reflection. Assessment practices should also be inclusive and well understood by learners, allowing them opportunities to participate in the assessment process in ways not typically supported by more traditional teacher-centered lessons.

Generally, three phases can be suggested in conducting Project-Based Learning: planning, creating and implementing, and the processing.

This book is licensed under a Creative Commons Attribution 3.0 License

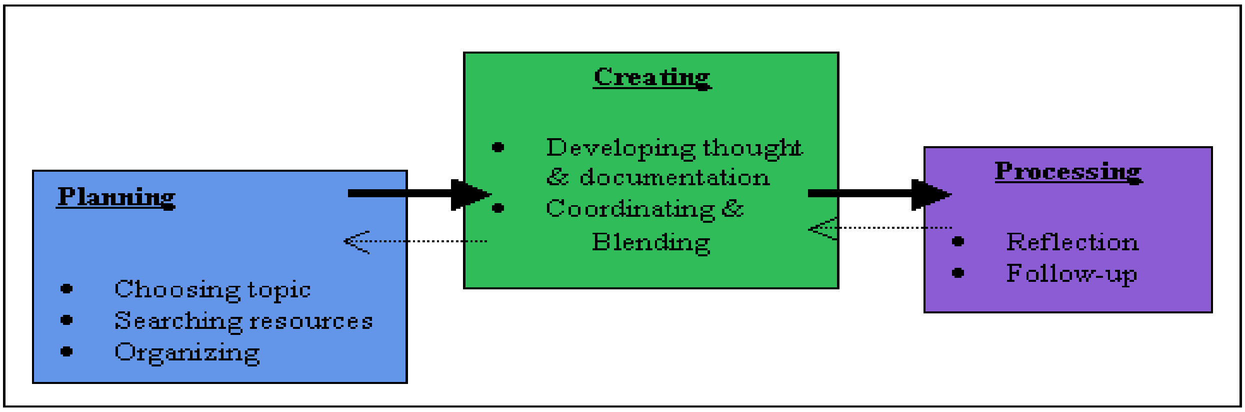

Exhibit 6: General framework of Project-Based Learning represents the general framework of project-based learning. PBL can be divided into three main processes. In the planning phase, the learner chooses the topic, searches for resources for needed information, and organizes the resources into an usable form. In the implementation or creation phase, the learner develops the project idea, combines the contributions of the group, and builds the project. In the processing phase, the project is shared with other groups, feedback is obtained, and then the group reflects on the project.

In the "planning" phase, the learner chooses the project, locates the required resources, and organizes the collaborative work. Through these activities, the learner identifies and represents a topic, gathers relevant information and generates a potential solution.

The second phase is "creating", or implementing the project. This phase includes activities such as development and documentation, coordination and blend of member contributions, and presentation to class members. In this stage learners are expected to build a product that can be shared with others.

The activities for the third phase, "processing" the project, include reflection and follow-up on the projects. In this stage, the learners share their artifacts in a small group or with the entire class, obtain feedback, and reflect on the learning process and the project. Learners share each group's or individual's project and exchange feedback.

See also:

- Houghton Mifflin's Project Based Learning Space

The four phases model of Project-Based Learning: searching, solving, creating, and sharing

- Mission to Mars

This project provides four stages model of Project-Based Learning: problem generation, creation of cooperative team, jigsaw group, and culminating a consequential task

Project-Based Learning in Kayla's situation

Kayla's workshop fits well in the general framework for Project-Based Learning. Kayla created a learner-centered environment by empowering the learners with options to choose their topics and contexts, to work collaboratively and to provide rich feedback in evaluating authentic tasks that reflect real-world issues.

In the planning stage, learners chose their topics for designing and delivering effective web-based instruction. The participants formed groups by interest areas and were asked to narrow their focus by changing their ideas to question format, thus identifying and representing a problem. A web communication technologies group, for example, may decide to list the features of effective communication tools and discover potential situations to implement them. They are aware of the resources available to them; they collaborate to fine-tune their ideas. Such activities increase learner decision-making and initiative throughout the course of the project.

In the creation stage, learners built their own web-based instructions. They had options in both multimedia/multiple presentation modes and delivery strategies and incorporated feedback into their presentations.

In the processing stage, the learners' reflective discussion allowed them to analyze and share their learning experience as they constructed their web-based instruction.

Project-Based Learning: instructional strategies

The full benefits of projects cannot be achieved without considering the nature of the student's knowledge, the extent of teacher knowledge, and the complexity of the classroom setting. The following strategies can be implemented in the learning environment to promote a Project-Based Learning framework. Table 2 shows the general procedure and strategies for using PBL, and includes both learner and instructor perspectives.

Table 12: Project-Based Learning: procedure and strategies

Context	**Procedure and strategies**	**Learner perspective**	**Instructor perspective**
Planning			
1. Designing overall climate	• Create environments that will promote inquiry and challenge • Make real-world connections	• Allow sufficient time for project work • Provide input for creation of questions, approaches, and artifacts	• Understand project content to help learners • Provide open-ended situation • Facilitate learning
2. Inquiry	• Choose topic • Locate resources • Organize collaboration	• Ask and refine questions • Formulate goals • Plan procedures • Debate ideas • Incorporate "Jigsaw" method	• Discover prior knowledge before the project begins • Provide structured set of inquiry steps for learners to follow
Creating			
1. Analyzing Data	• Make predictions • Design plans and/or experiments • Collect and analyze data	• Guide to analyze data • Incorporate a technical assistance model	

This book is licensed under a Creative Commons Attribution 3.0 License

2. Collaborating with others	• Communicate ideas and findings to others	• Possess skills needed to work with others and knowledge necessary to explore questions that arise	• Emphasize individual and group learning process • Provide norms for individual accountability
3. Developing thoughts and documentation	• Create artifacts • Visualize and construct ideas	• Ask new questions • Draw conclusions	• Design activities • Provide resources • Give advice to learners as they progress in their projects
Processing			
1. Presenting knowledge and artifacts	• Monitor what is known	• Demonstrate the full range of one's competence	• Incorporate presentation opportunities involving external audiences • Require multiple criterion performances (e.g. collaboration, explanation, demonstration, self-report)
2. Reflection & Follow-up	• Assessment • Peer evaluation • Self-evaluation • Portfolio evaluation	• Understand the teacher's method of evaluation • Create and agree on the norm of assessment initially • Reflect their own learning • Share and acquire multiple perspectives	• Create a classroom culture that supports frequent feedback and assessment • Find ways for learners to compare their work with others

Project-Based Learning in the classroom: What does it involve?

Project-Based Learning offers many advantages and challenges when implemented in the classroom. However, there are strategies to successfully meet these challenges. Some of the advantages in PBL learning include but are not limited to:

- increased motivation
- increased problem-solving ability
- improved media research skills
- increased collaboration
- increase resource management skills

Increased motivation: Learners can choose their topics, the extent of content, and the presentation mode. Learners build their projects to suit their own interests and abilities. These kinds of activities are highly motivating for learners.

Increased problem-solving ability: Project-Based Learning encourages learners to engage in complex and ill-defined contexts. From the beginning, learners identify their topics and problems, then seek possible solutions. By participating in both independent work and collaboration, learners improve their problem solving skills thereby developing their critical thinking skills.

Improved media research skills: Project-Based Learning provides a real world connection to context. Learners conduct research using multiple information resources. By locating the resources themselves, their research skills develop and improve.

Increased collaboration: In the processing stages, learners create and organize their groups. They share knowledge and collaboratively construct artifacts. Through collaboration, they develop social communication skills and obtain multiple perspectives.

Increased resource-management skills: Successful Project-Based Learning provides learners with experience in project organization and time management with necessary scheduling resources.

Potential challenges and solutions

As with any instructional strategy, Project-Based Learning presents some challenges. The following highlights some challenges of a PBL environment:

Support of student learning: Teachers may be unprepared to implement activities for Project-Based Learning due to a lack of familiarity with this pedagogy. They must stimulate discussion through open-ended questions that facilitate creative thinking. Instructors should also encourage learners to find answers independently from resources rather than simply "feeding" them information.

Assessment: Evaluating academic performance in a Project-Based Learning environment is problematic for instructors. Evaluation of learners' knowledge acquisition is difficult because individual contributions can seldom be identified with certainty. Several strategies are available for evaluating learner achievement, such as individual or group self-evaluation, or comparison between student performance and class objectives. The process of assessment should also address how the learners share the responsibility of peer-work.

The essence of Project-Based Learning: constructionism in practice

In conclusion, the essence of Project-Based Learning lies in the engaging experiences that involve learners in complex and real world projects through which they develop and apply skills and knowledge. In this environment, learners choose, plan, design, and construct artifacts as part of their learning outcomes. The instructor facilitates by designing learner-centered activities, providing resources, and advising learners as they reflect on their learning process.

Notes

Some examples of Learning by Design:

http://www.cs.colorado.edu/~l3d/research/projects.html

http://www.positivepractices.com/LearningbyDesign/LBDLinks2001.html

Books: Gagnon, George W. & Collay, Michelle (2001). Designing for Learning: Six Elements in Constructivist Classrooms Corwin Press, Incorporated

References

Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: sustaining the doing, supporting the learning. Educational Psychologist, 26 (3 & 4), 369-398.

Bransford, J. D., & Stein, B. S. (1993). The IDEAL problem solver (2nd ed.). New York: Freeman.

Brown, A. L., & Campione, J. C. (1994). Guided discovery in a community of learners. In K. McGilly (Ed.), classroom lessons: integrating cognitive theory and classroom practice (pp. 229-272). Cambridge, MA: MIT Press.

Harel, I. & Papert, S. (1991). Constructionism. Norwood, NY: Ablex Publishing Corporation.

Kafai, Y & Resnick, M. (Eds.) (1996). Constructionism in practice. Mahwah, NJ: Lawrence Erlbaum Associates.

Papert, S. (1993). The Children's machine: rethinking school in the age of the computer. New York: Basic Books.

Perkins, D. N. (1986). Knowledge as design. Hillsdale, NJ: Lawrence Erlbaum Associates.

Thomas, H. W., Mergendoller, J. R. and Michaleson, A. (1999). Project-based learning: a handbook for middle and high school teachers. Novato, CA: The Buck Institute for Education.

This book is licensed under a Creative Commons Attribution 3.0 License

14. Problem-based instruction

Author: Evan Glazer (The University of Georgia, USA)

Editor's Note: Dr. Glazer chose to use the term Problem-based Instruction, but my reading and other references to this chapter also use the term Problem-based Learning. The reader can assume the terms are equivalent.

Scenario

If you would like to read this story in a ComicLife format, you can click here on Samstonian in ComicLife

Samstonian is a small suburban town about thirty minutes south of a large metropolitan area. Most of the residents work for Nikron, a packaging factory on the outskirts of town. Local social, cultural, and fund-raising events are often partially sponsored by Nikron making the company an ingrained and influential component of the community. In essence, Nikron and the townspeople have a symbiotic relationship; without the factory, Samstonian would suffer unemployment, and without the people, the factory would have a manpower shortage.

The town's daily newspaper, the Samstonian Chronicle, recently published a disturbing front-page photograph of the Samstonian River located about 1.3 kilometers from the Nikron factory. Beneath the headline, "What's Wrong with the Water?" at least twenty dead fish were shown floating near the riverbank. The article stated that the reasons for this incident were unknown, but that there was cause for great concern because the river was the main source of the town's water supply.

Some suspicion arose among the residents of Samstonian about the possibility that the factory was dumping pollutants in the Samstonian River. In response to this media attention and public scrutiny, Nikron issued a public statement declaring its deep concern about the matter but rejecting any blame for the recent fish kills. Because of the company's desire to maintain strong relations with the community, Nikron welcomed the town's help in further investigating the incident. In an effort to build credibility in its statement, Nikron opened its facility to all concerned citizens for public inspection.

Mr Fred Samples, a chemistry teacher at Samstonian High School, took advantage of this opportunity by inviting his class to address the problem: Is the town's water supply being contaminated by pollutants from the factory? Mr Samples knew this question was significant and expected his class to spend several weeks addressing the problem. He first asked his class to formulate research questions to analyze this problem. The students determined that they should investigate the following questions:

- Why are fish dying in the Samstonian River?
- What is the history of the level of toxins discharged by the factory?
- What types and quantities of toxins are present in the Samstonian River?
- What types and quantities of toxins are present in the local water filtration system?

The class was divided into four teams with each addressing a single question. The school media specialist, Mr Harrington, was brought into the class to discuss the resources available to the students for their research. Mr

Samples asked each group to devise a proposal for a final product that would represent its research efforts. The groups could compose a news story, write a research report for Nikron or to the Environmental Protection Agency, create a documentary, develop a legal brief for a court case, or other projects that the groups could develop. In their proposals, the groups were to provide a detailed description of the project and an itemized breakdown of the manner in which their projects would be assessed. Following submission, the proposals were reviewed and negotiated with the teacher. The media specialist also reviewed each of the proposals and provided recommendations for sources and strategies to gain access to relevant information.

The groups used the feedback from their teacher and the media specialist to devise a set of methods and strategies to answer their questions. As the students developed their ideas, they realized that they would need to obtain water samples from the water filtration plant, various locations in the river, and from the town's tap water; air samples from the factory; autopsy results from samples of dead fish from the river; and toxin analysis records from the county's environmental health office. In response, Mr Samples arranged field trips to the Nikron factory, the Samstonian River, and the county environmental health office. Mr Harrington helped to locate potentially useful databases from these sources. He also spoke to each of the groups about strategies for finding information while in the field collecting data.

The students collected data and worked in their teams to address the focus question. The group investigating the death of the fish decided to make further contacts, such as meeting with the newspaper reporter who broke the story, and interviewing townspeople who regularly fished in the river. Before dissecting some of the fish, the groups consulted the library, the Internet, and their biology teacher to learn more about the typical life cycle and common diseases in this species of fish. Using this information, along with information about toxins obtained from the other groups, the group determined the cause of death in the fish they dissected. They looked for more dead fish and a relationship between the cause of death in the previous fish samples. In addition, they caught live fish of the same species and tested them for traces of toxins.

The quality of students' findings depended on synthesizing their information with the results of the other groups. They compared their lab results with those of the other groups for relationships between the toxins in the fish or water, with the pollutants emitted from the factory. This analysis helped the group to make some initial conjectures about the cause of fish deaths in the Samstonian River. They then returned to their data to test their hypothesis and developed a project to represent these findings.

Simultaneously, the other three groups were conducting similar searches for information, contacts with experts, lab tests, conjectures, and analyses to support their findings. Throughout the process, Mr Samples helped to extend students' thinking by asking questions about their strategies and arguments. Although he had a background in chemistry and toxicology, Mr Samples was not an expert in all areas of the students' inquiry. Instead, he helped the students find sources and reflect in ways that would expand their thinking and address the overall question of study.

After the groups presented their findings about their subquestions, Mr Samples revisited the original question with the entire class: Is the town's water supply being contaminated by pollutants from the factory?

The students' responsibility was then to synthesize all of the findings and produce an argument affirming or refuting this question. Mr Samples chose to engage the students in a mock trial, The People of Samstonian vs Nikron Corporation, in which the class would present both sides of the case; in addition, a jury would determine the

This book is licensed under a Creative Commons Attribution 3.0 License

outcome. The jury was not only to analyze the evidence and arguments presented in the trial; it was to examine the moral, ethical, social, and economic implications of the case.

Description

For a description of the differences between Project-based Learning and Problem-based Learning, click here .

Problem-based inquiry is an effort to challenge students to address real-world problems and resolve realistic dilemmas. Such problems create opportunities for meaningful activities that engage students in problem solving and higher-ordered thinking in authentic settings. Many textbooks attempt to promote these skills through contrived settings without relevance to students' lives or interests. A notorious algebra problem concerns the time at which two railway trains will pass each other:

Two trains leave different stations headed toward each other. Station A is 500 miles west of Station B. Train A leaves station A at 12:00 pm traveling toward Station B at a rate of 60 miles per hour. Train B leaves Station B at 2:30 pm for Station A at a rate of 45 miles per hour. At what time will the trains meet?

Reading this question, one might respond, "Who cares?", or, "Why do we need to know this?" Such questions have created substantial anxiety among students and have, perhaps, even been the cause of nightmares. Critics would argue that classic "story problems" leave a lasting impression of meaningless efforts to confuse and torment students, as if they have come from hell's library. Problem-based inquiry, on the other hand, intends to engage students in relevant, realistic problems. Several changes would need to be made in the above problem to promote problem-based inquiry. It would first have to be acknowledged that the trains are not, in fact, traveling at constant rates when they are in motion; negotiating curves or changing tracks at high speeds can result in accidents. Further, all of the information about the problem cannot be presented to the learner at the outset; that is, some ambiguity must exist in the context so that students have an opportunity to engage in a problem solving activity. In addition, the situation should involve a meaningful scenario. Suppose that a person intends to catch a connecting train at the second station and requires a time-efficient itinerary? What if we are not given data about the trains, but instead, the outcome of a particular event, such as an accident?

Why should we use problem-based inquiry to help students learn? The American educational system has been criticized for having an underachieving curriculum that leads students to memorize and regurgitate facts that do not apply to their lives (Martin, 1987; Paul, 1993). Many claim that the traditional classroom environment, with its orderly conduct and didactic teaching methods in which the teacher dispenses information, has greatly inhibited students' opportunities to think critically (Dossey et al., 1988; Goodlad, 1984; Wood, 1987). Problem-based inquiry is an attempt to overcome these obstacles and confront the concerns presented by the National Assessment of Educational Progress:

If an unfriendly foreign power had attempted to impose on America the mediocre educational performance that exists today, we might well have viewed it as an act of war. We have, in effect, been committing an act of unthinking, unilateral educational disarmament. (A Nation at Risk, 1983)

Problem-based inquiry emphasizes learning as a process that involves problem solving and critical thinking in situated contexts. It provides opportunities to address broader learning goals that focus on preparing students for active and responsible citizenship. Students gain experience in tackling realistic problems, and emphasis is placed on using communication, cooperation, and resources to formulate ideas and develop reasoning skills.

14. Problem-based instruction

What is a framework for a problem-based inquiry? Situated cognition, constructivism, social learning, and communities of practice are assumed theories of learning and cognition in problem-based inquiry environments. These theories have common themes about the context and process of learning and are often associated. To provide a structure and rationale behind problem-based inquiry, some of its prominent characteristics will be discussed in reference to the scenario presented at the beginning of the chapter.

First, learning events are situated and assume meaning within particular contexts. In other words, learning is most meaningful and is enhanced when students face a situation in which the concept is immediately applied. For example, the students in the scenario want to learn about the anatomy and life cycle of a fish because they perceive that this information might be useful in determining the cause of the fish kill in the Samstonian River. This belief contradicts many traditional curriculum models, including those using Bloom's Taxonomy, as a basis for creating instruction. In a traditional biology class, students learn about the anatomy and life cycle of a fish before they understand how the information might be useful. In problem-based inquiry situations, students are presented with an application and perform analysis, perhaps even before they know or understand the concepts involved in the situation. Further, in problem-based inquiry all knowledge and skills in situated environments are directly relevant to the context; whereas some traditional curricula incorporate basic knowledge and skills that may never be applied. Varying perspectives about learning are present in this fish example. A proponent of Bloom's Taxonomy would hold that students will more successfully learn about fish if they first understand facts about its anatomy and later apply this knowledge in an application such as determining the cause of death through dissection. On the other hand, an educator with the situated learning perspective believes that students are less likely to make a connection between book knowledge and application unless they learn about fish anatomy by practical application; thus, the situated learning perspective suggests that participation is a crucial element in learning.

Another important principle rooted in problem-based inquiry is that definitive answers do not exist independently of the learner's knowledge and experience. In the fish kill scenario, the teacher has no solution to the problem and does not guide students to reach that conclusion. Instead, knowledge is constructed within each individual or community based on the learner's or community's prior knowledge, values, beliefs, and perspectives. Consequently, a single event or item of information can be perceived differently resulting in multiple interpretations and understandings. Mr Samples expects students to reach different conclusions, perhaps even from the same information. However, because the course each group of students chooses to pursue is based on their values and perceptions, they will likely follow different paths to arrive at their conclusions. This method of learning differs substantially from instructional models that emphasize the attainment of behavioral objectives as the goal of learning. Classical behaviorist approaches to instruction emphasize learning as a process by which students acquire predetermined knowledge and skills, most often structured and guided, step-by-step, by information processing methods. Constructivist approaches to learning, on the other hand, stress the general strategies and processes to attain broader goals without relying on specific information or methods that lead to sequential steps in logic and reasoning. In the fish kill scenario, Mr Samples' primary goal is to help students develop thinking and problem-solving skills that will empower them to create an argument that reflects their individual research questions and the overarching problem. In sum, a problem-based inquiry approach is often too complex to resolve by directly guiding learners to specific pieces of knowledge or an existing solution. Instead, the ideas are generated within the individual and the community based on their different experiences, the types of information they find, and ways of understanding that information.

This book is licensed under a Creative Commons Attribution 3.0 License

Problem-based inquiry is also based on a view that learning occurs through social interactions whereby an outside source can help individuals extend their learning. This frame of reasoning suggests that understanding of an idea or concept becomes limited at some point and approaches a barrier called the Zone of Proximal Development. This zone can occur along varying levels of understanding among individuals, depending on the extent of their expertise. In order to extend understanding past this barrier, the individual must interact with a person or medium that holds new information, thus allowing new perspectives to arise. In the fish kill scenario, Mr Harrington and Mr Samples serve as expert sources who promote problem-solving strategies, information-gathering tactics, and research methodologies that were previously unknown to students. In addition, the teacher continually identifies potential flaws in student reasoning and uses questioning as a means of extending their awareness to think about the task in a different way. If Mr Samples does not interact with a group that has erroneous judgments, the students may not understand that they are making an error until they face a subsequent interaction that contradicts their logic. For example, the students may eventually find diseased fish in a river with low toxic levels or listen to another source providing a counter example to the group's argument. In addition to the teacher's influence on student learning, resources external to the local learning environment—such as information from a book, an expert opinion on the Internet, or input from the media specialist and biology teacher—contribute to the development of an evolving framework of ideas. These types of external interactions can help students leave the Zone of Proximal Development, expand their understanding to develop emerging thoughts, and then repeat the cycle when learning again ceases to progress. In the complex situations associated with problem-based inquiry, multiple learning cycles co-exist and develop simultaneously, each emphasizing different concepts or strategies. Systemically, learning an idea probably does not cease altogether, but instead, fades while understandings of other concepts are enhanced according to the needs and goals of the individual and learning community.

Lastly, problem-based inquiry values the presence of a learning community. The community takes on a view that advancement in thinking and addressing the problem occurs through social interactions that emphasize joint enterprise, shared repertoire, and mutual engagement. Through joint enterprise, the class shares a common goal (such as solving a problem) whereby each person in that class invests time and energy and is committed to help accomplish that goal. In order to sustain this interest, students are treated as legitimate participants in the research process, analysis, and presentation of the findings. That is, even though they are novices at some tasks, Mr Samples legitimizes their contribution by creating an environment in which students share a common repertoire involving activities that contribute to the overall findings such as continual inquiry, data collection, problem solving, and higher-ordered analyses. Furthermore, Mr Samples promotes joint enterprise to address the problem among class members by fostering mutual engagement. In essence, students are viewed as equal contributors who work together to solve the problem. Each person's contributions are valued and considered in the overall decision making process. This type of interaction is often different from traditional classrooms where the teacher's actions and decisions determine the direction of learning and products that students create. In this setting, the students and the teacher contribute equally to the content and method of learning in an effort to resolve the overall problem.

Characteristics

The fictitious scenario and activity with Mr Samples' class involving the fish kill near the Nikron plant highlights some common characteristics in problem-based inquiry instructional models:

- The activity is grounded in a general question about a problem that has multiple possible answers and methods of addressing the question.
- Learning is student-centered; the teacher acts as facilitator.
- Students work collaboratively toward addressing the general question.
- Learning is driven by the context of the problem and is not bounded by an established curriculum.

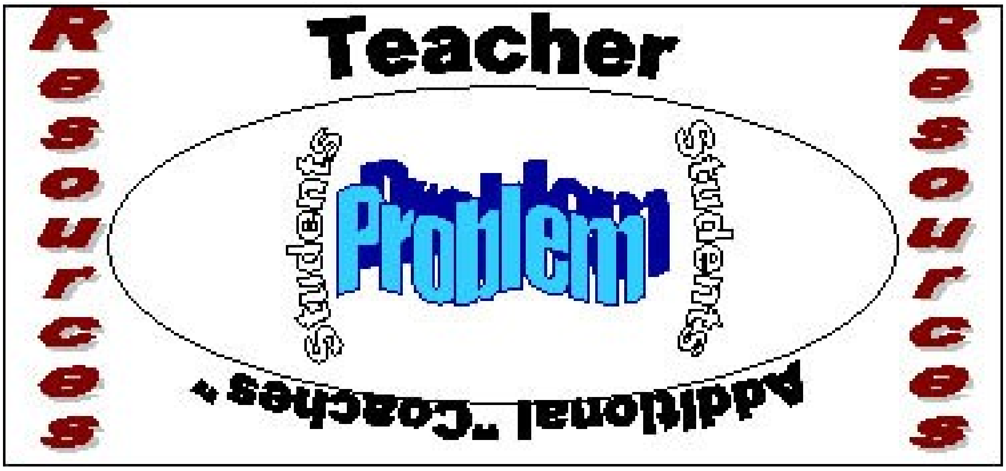

Exhibit 7: The problem-based inquiry learning space: The center of PBL is students working on a problem. Teachers, additional coaches, and other resources provide guidance and support for the students.

These characteristics will be described in detail, highlighting and reflecting on various actions and events from the scenario presented at the beginning of the chapter. Exhibit 7 illustrates the relationship between these factors.

Activity is grounded in a general question about a problem that has multiple possible answers and methods for addressing the question. Each problem has a general question that guides the overall task followed by ill-structured problems or questions that are generated throughout the problem solving process. That is, in order to address the larger question, students must derive and investigate smaller problems or questions that relate to the findings and implications of the broader goal. The problems or questions thus created are most likely new to the students and lack known definitive methods or answers that have been predetermined by the teacher. In the killed fish scenario, students derive four questions to address the main problem of determining whether the factory is polluting the water supply. There are multiple means of addressing these questions depending on the available resources and strategies that the students employ. Further, their list of questions is not necessarily comprehensive. As they collect information and data in their research, they may realize that there are other questions or issues that should be included in their list. The quality of their conclusions to the overall problem in the mock trial depends on how well the students synthesize information and develop an argument based on their findings from the smaller questions.

Learning is student-centered; the teacher acts as facilitator. In essence, the teacher creates an environment where students take ownership in the direction and content of their learning. In the scenario, Mr Samples gives the students the overall problem and asks them to define the means by which they should address it. The students develop subquestions to investigate, suggest methods to collect data, and propose a format for presenting their findings. For example, the group investigating the types and quantities of toxins present in the

This book is licensed under a Creative Commons Attribution 3.0 License

Samstonian River determined that they should collect samples from various locations in the river. The teacher's role, in this case, is to help provide access to this resource by arranging a field trip to the river. He and the media specialist also encourage students to use other resources such as historical data, books, the Internet, and experts, to help support their arguments. In addition to creating learning opportunities for the students, the teacher manages the overall structure and progress of the activity ensuring that students submit proposals, methods, and results. As a manager, Mr Samples is aware of the different strategies and content each group is investigating, he also assumes the responsibility of recommending peer consultations with members of other groups. Mr Samples and Mr Harrington's consultation with groups is also important because they focus on teaching the processes and strategies associated with information gathering, research, and problem solving. In effect, this cognitive mentorship helps students organize the direction of their learning as well as understand how their strategies connect to the broader goal of solving the overall problem.

Students work collaboratively towards addressing the general question. Mr Samples facilitates this type of environment by emphasizing the existence and development of a learning community. All of the students work together to attain the shared goal of producing a solution to the problem. Mr Samples creates an environment in which mutual reliance gives students an active voice and a contribution toward reaching the goal. For example, students take on individual responsibilities such as finding information and resources, making calculations, and performing analyses in coordination and collaboration with the direction and ideas of the group. As a consequence, group progress depends on each individual's contribution. On a larger scale, groups take on similar responsibilities by addressing their research questions but not exclusive of the learning community, because groups rely on each other for consultation about their strategies and findings. For example, the group addressing the cause of death of the fish in the Samstonian River needed information from the group that studied the different toxins present in the river. Consequently, the groups co-depend on each other's performance and contributions in order to make their own advances in reasoning toward answering the research questions and the overall problem.

Learning is driven by the context of the problem and is not bound by an established curriculum. In this environment, students determine what and how much they need to learn in order to accomplish a specific task. Consequently, acquired information and learned concepts and strategies are tied directly to the context of the learning situation. For example, in the chapter scenario, the students who are trying to explain the dead fish decide that they need to learn more about the fish species' life cycle and diseases before they begin the dissection process. The teacher's responsibility in this case is not to act as an expert and dispense knowledge to the students but to serve as a facilitator, manager, and strategist providing consultation and access to resources. Because the students have generated the research questions, Mr Samples does not expect to be able to answer all of their content questions; thus, the locus of learning responsibility is placed in the hands of the students. He believes that an external resource, such as information from a library, another teacher, a media specialist, or an expert source on the Internet can help advance the students' thinking and understanding. Consequently, learning is not confined to a preset curriculum. The teacher does not define the topics of learning based on his knowledge of chemistry and expects that learning will incorporate multidisciplinary components, such as principles of biology, mathematics, and rhetoric.

The Samstonian River killed fish scenario does include some elements that are not necessarily present in all problem-based inquiry models, such as a problem that has direct implications on the local community, and student access to resources outside the classroom. These additional factors may create more relevance and influence student motivation for learning; however, they may not be included in other problem-based scenarios, because subject areas such as history and geography are not always immediately relevant. For example, the question, "How should ballots in Florida have been counted during the 2000 presidential election?" could be the foundation for a problem-based inquiry activity that has no immediate bearing on the local population as the students may not live in Florida or have access to Florida research sources. Regardless, this question is based on evaluating a historical outcome that cannot influence the actual results unlike the problem posed at the beginning of the chapter; however, students' analysis in both questions has relevance because a presentation of their findings can influence society's future thoughts and actions.

Creation of a final product is not a necessary requirement of all problem-based inquiry models. In the killed fish example, the teacher assigns the students the creation of a proposal for a product that will later serve as evidence in a mock trial. Project-based learning models most often include this type of product as an integral part of the learning process, because learning is expected to occur primarily in the act of creating something. Unlike problem-based inquiry models, project-based learning does not necessarily address a real-world problem, nor does it focus on providing argumentation for resolution of an issue. In a problem-based inquiry setting, there is greater emphasis on problem-solving, analysis, resolution, and explanation of an authentic dilemma. Sometimes this analysis and explanation is represented in the form of a project, but it can also take the form of verbal debate and written summary.

Instructional models and applications

There is no single method for designing problem-based inquiry learning environments. Various techniques have been used to generate the problem and stimulate learning. Promoting student-ownership, using a particular medium to focus attention, telling stories, simulating and recreating events, and utilizing resources and data on the Internet are among them. Three instructional models that implement problem-based inquiry will be discussed next with particular attention to instructional strategies and practical examples.

Problem-Based Learning

Problem-based learning (PBL) is an instructional strategy in which students actively resolve complex problems in realistic situations. It can be used to teach individual lessons, units, or even entire curricula. PBL is often approached in a team environment with emphasis on building skills related to consensual decision making, dialogue and discussion, team maintenance, conflict management, and team leadership. While the fundamental approach of problem solving in situated environments has been used throughout the history of schooling, the term PBL did not appear until the 1970s and was devised as an alternative approach to medical education. In most medical programs, students initially take a series of fact intensive courses in biology and anatomy and then participate in a field experience as a medical resident in a hospital or clinic. However, Barrows (http://www.pbli.org/faculty/hsb.htm) reported that, unfortunately, medical residents frequently had difficulty applying knowledge from their classroom experiences in work-related, problem-solving situations. He argued that the classical framework of learning medical knowledge first in classrooms through studying and testing was too passive and removed from context to take on meaning. Consequently, PBL was first seen as a medical field immersion experience whereby students learned about their medical specialty through direct engagement in realistic problems and gradual apprenticeship in natural or simulated settings. Problem solving is emphasized as an

This book is licensed under a Creative Commons Attribution 3.0 License

initial area of learning and development in PBL medical programs more so than memorizing a series of facts outside their natural context.

In addition to the field of medicine, PBL is used in many areas of education and training. In academic courses, PBL is used as a tool to help students understand the utility of a particular concept or study. For example, students may learn about recycling and materials as they determine methods that will reduce the county landfill problem. In addition, alternative education programs have been created with a PBL emphasis to help at-risk students learn in a different way through partnerships with local businesses and government. In vocational education, PBL experiences often emphasize participation in natural settings. For example, students in architecture address the problem of designing homes for impoverished areas. Many of the residents need safe housing and cannot afford to purchase typical homes. Consequently, students learn about architectural design and resolving the problem as they construct homes made from recycled materials. In business and the military, simulations are used as a means of instruction in PBL. The affective and physiological stress associated with warfare can influence strategic planning, so PBL in military settings promotes the use of "war games" as a tactic for facing authentic crises. In business settings, simulations of "what if" scenarios are used to train managers in various strategies and problem-solving approaches to conflict resolution. In both military and business settings, the simulation is a tool that provides an opportunity to not only address realistic problems but to learn from mistakes in a more forgiving way than in an authentic context.

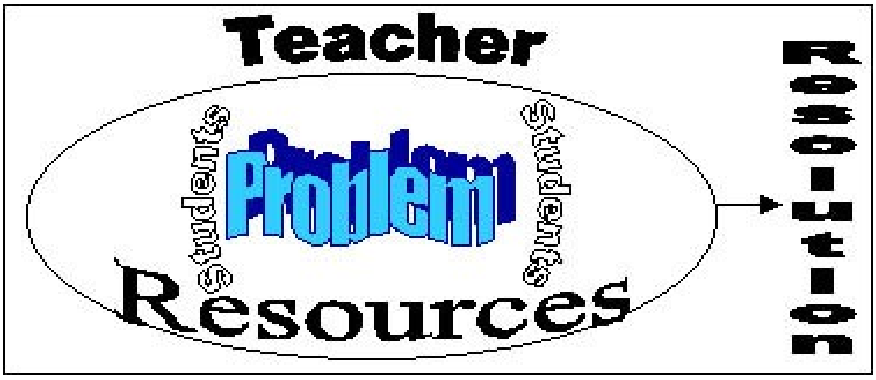

Exhibit 8: The PBL learning space: Problem-based learning (PBL) is an instructional strategy where students actively resolve complex problems in realistic situations. Click here for exhibit location

Designing the learning environment

The following elements are commonly associated with PBL activities.

Problem generation: The problems must address concepts and principles relevant to the content domain. Problems are not investigated by students solely for problem solving experiences but as a means of understanding the subject area. Some PBL activities incorporate multidisciplinary approaches, assuming the teacher can provide and coordinate needed resources such as additional content, instructional support, and other teachers. In addition, the problems must relate to real issues that are present in society or students' lives. Contrived scenarios detract from the perceived usefulness of a concept.

Problem presentation: Students must "own" the problem, either by creating or selecting it. Ownership also implies that their contributions affect the outcome of solving the problem. Thus, more than one solution and more than one method of achieving a solution to the problem are often possible. Furthermore, ownership means that students take responsibility for representing and communicating their work in a unique way. Predetermined formats of problem structure and analysis towards resolution are not recommended; however, the problem should be presented such that the information in the problem does not call attention to critical factors in the case that will lead to immediate resolution. Ownership also suggests that students will ask further questions, reveal further information, and synthesize critical factors throughout the problem-solving process.

Teacher role: Teachers act primarily as cognitive coaches by facilitating learning and modeling higher order thinking and meta cognitive skills. As facilitators, teachers give students control over how they learn and provide support and structure in the direction of their learning. They help the class create a common framework of expectations using tools such as general guidelines and time lines. As cognitive modelers, teachers think aloud about strategies and questions that influence how students manage the progress of their learning and accomplish group tasks. In addition, teachers continually question students about the concepts they are learning in the context of the problem in order to probe their understanding, challenge their thinking, and help them deepen or extend their ideas.

Student role: Students first define or select an ill-structured problem that has no obvious solution. They develop alternative hypotheses to resolve the problem and discuss and negotiate their conjectures in a group. Next, they access, evaluate, and utilize data from a variety of available sources to support or refute their hypotheses. They may alter, develop, or synthesize hypotheses in light of new information. Finally, they develop clearly stated solutions that fit the problem and its inherent conditions, based upon information and reasoning to support their arguments. Solutions can be in the form of essays, presentations, or projects.

An online example

Crime and Punishment: Case Negotiation in the Criminal Justice System

http://www.udel.edu/inst/problems/negotiations/

In this activity, students are asked to resolve a court case related to a drunk driving accident. The defendant, Sam Sad, ran a red light into oncoming traffic and killed a passenger who was not wearing his seatbelt. Students are asked to play the roles of the prosecutor, defense attorney, victim, and defendant, and to determine a course of action for this case. They weigh the evidence and issue a negotiated plea, a decision to drop some or all charges, or a decision to go to trial on the original or reduced charges. To assist them in their role playing, the students are given a paragraph of information about the different roles that they are to assume.

Groups are asked to discuss the following questions before role playing:

- What legal issues will be involved in this case?
- What evidence will be important?
- What more do you need to know to negotiate a resolution to this case?

After students assume their roles, they meet in smaller teams to address different options and strategies. They are provided with the following set of focusing questions to help formulate their ideas:

- What are your interests and priorities in the upcoming negotiation?
- What do you need to learn to be an effective negotiator for this case?
- What sources might you consult to develop this knowledge?
- How will you allocate the responsibilities within your team to develop the required knowledge?

This book is licensed under a Creative Commons Attribution 3.0 License

A list of online resources related to legal advice and drunk driving is available for students to use in gathering information to create and support their arguments.

The teams reconvene and identify their interests based on their findings, and then negotiate a resolution to the case.

Anchored instruction

Anchored instruction is a framework for learning that emphasizes complex problem solving in integrated learning contexts. Integrated learning contexts take on the form of drawing realistic connections, making learning meaningful for students, and forming connections within and between content domains. Learning and teaching activities are designed around an "anchor" which is often a story, adventure, or situation that includes a problem or issue to be resolved and that is of interest to the students. Instructional materials include resources students can easily explore, such as video discs or interactive computer simulations, as they decide how to solve a problem. An anchored instruction activity supports learning opportunities that relate to and extend thinking to other content areas.

The term anchored instruction was coined by the Cognition and Technology Group at Vanderbilt (CTGV) from their work in the Jasper Woodbury Adventure Series (http://peabody.vanderbilt.edu/projects/funded/jasper/default.html). In these activities, students view a story that ultimately leads to a dilemma the students need to resolve. The story serves as an anchor to ground their initial ideas, formulate strategies to solve the problem, and later as a source of information. Students primarily use middle grades mathematics to solve problems in the context of settings from other domains, such as science and history. Solving the larger problem often requires that students generate subquestions that help guide or support their thinking. They review parts of the story to find information that will support these smaller questions and then use additional resources to acquire information or skills to help them answer their questions. For example, if the goal of the main problem is to find a way to rescue an injured eagle using a lightweight glider, then students might need to calculate the mass of both the eagle and the plane's pilot, and determine a relationship between the mass in the plane and its capacity for air travel.

Anchored instruction activities have been used in a variety of contexts outside of mathematical problem solving and the CTGV. The Voyage of the Mimi is a series of adventure stories in which a scientist and teenaged assistants explore humpback whales and then later a Mayan civilization. Anchored instruction has been useful in teacher education programs where technology training has been investigated in problem-solving situations by use of various multimedia tools. Other educators have used movie trailers and sports videos, along with their transcripts, as a mechanism to learn about language and creative writing.

Exhibit 9: The Anchored Instruction learning space: Anchored instruction focuses on an 'anchor' that includes an interesting problem. Through teacher guidance and the use of additional resources that require student exploration, student learning experiences can be extended to other areas of the curriculum.

Designing the learning environment

The following stages are commonly associated with anchored instruction activities:

Introduce the anchor. Create a situation, story, or experience with information that will engage students in a complex problem. Students should feel that their problem-solving will serve a purpose, such as contributing to the story line by helping someone else or themselves. The presentation medium should be flexible enough to allow students to easily search for information; thus, video discs are more efficient than videotape, and hypertext is preferable to regular text.

Develop a shared experience around the anchor. Students revisit the story or engage in activities and become more familiar with and knowledgeable about a particular concept. The teacher might initially provide more guidance in acquiring the concept, but ultimately, students assume control over the application of the concept to resolve a smaller problem within the actual story line.

Expand the anchor. Students are given more autonomy to do independent or group research to clarify and locate hidden or missing information relevant to the problem. The information may be in the storyline itself or in related external resources.

Use knowledge as tools for problem solving. Students use the information or clues in the anchor and develop a plan to resolve the larger problem. They may need to ask subquestions in order to discern additional information or patterns that will help complete the overall task. Throughout this phase, the teacher probes students' understanding and challenges students' strategies to examine their reasoning and scaffold the problem-solving process.

Work on projects related to anchor. Students explore related content presented in the anchor to deepen their understanding of the concepts and to connect their knowledge to other disciplines. They might read more about the subject area, explore a related story, engage in a related simulation, create a project, or design a web site.

Share what was learned. Students present their findings on the problem as well as connections to their extended learning. This phase allows students to make contributions to the learning community by sharing the

This book is licensed under a Creative Commons Attribution 3.0 License

strategies used to resolve the overall problem. The teacher should emphasize alternative problem solving methods, as well as common themes, among the different groups to help synthesize and broaden understanding.

WebQuests

A WebQuest is a web-based, inquiry-oriented activity through which students examine evidence about a particular topic and then respond to an issue or make a decision from a particular point of view. The activity is grounded in an open-ended question based on a realistic event or applied context that can facilitate multiple reactions or viewpoints. WebQuests often address problems, but often simply attempt to promote awareness and representation by activities such as producing a variety show that captures the life behind people in the Harlem Renaissance. Students use a series of links compiled by the teacher to learn about the overarching question while gathering evidence that will support their arguments or defend their point of view. The WebQuest site designed by Bernie Dodge includes examples of model classroom projects and training materials to aid in the design of instructional materials.

An electronic support community (http://webquest.org/) is available to reinforce understanding, promote collaboration, and provide individualized assistance in the design and implementation process of WebQuest activities. There is also a resource for a fee to help you build webquests and house them on a server. It is a very nice resource for a nominal fee. It is called QuestGarden and is available at http://webquest.org/questgarden/author/ Teachers can participate in a synchronous chat environment in a shared meeting place to consult with experts or share and debate views about learning and design. In addition, they can also pose questions about WebQuest development or collaborate in activities by subscribing to an electronic listserv. Teachers seeking guidance or feedback on their WebQuest design may also submit their activities for review.

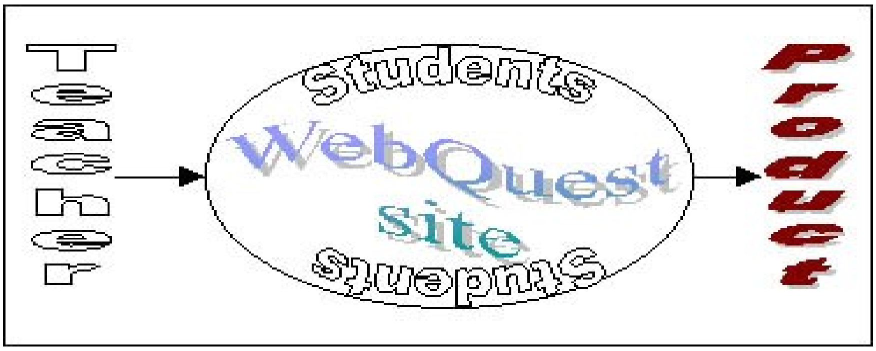

Exhibit 10: The WebQuest learning space: Teachers provide students with a series of Internet links for solving a given problem. The problem is solved as the students create a final product. Click Here For Exhibit Location

WebQuests follow a recommended design structure which includes an introduction, a task, a process for accomplishing the task, web resources, an evaluation rubric, and a conclusion. This design is intended to support the development of a WebQuest without restricting creativity in the appearance and content of the activity. That is, within the structure, teachers can create a wide range of tasks including developing an argument based on a perspective, interacting with an expert, analyzing data, or designing a plan. Teachers are provided a variety of tools throughout the creation process, including aids for search techniques, creation of evaluation rubrics, web page design strategies, task characteristics, and checklists for monitoring progress.

Designing the learning environment

The following elements are commonly associated with WebQuest activities.

Introduction: Background information is provided and context for the activity is set. The problem or controversy and its origin are discussed.

Task: An interesting question or dilemma with multiple interpretations is created. Students can take on their own perspective or role-play to find strategies to defend a particular position. In this section, the goal and purpose of the activity are outlined so that students understand what they are expected to accomplish by completing the activity.

Process: The steps learners should consider to accomplish the goals of the activity are described. General strategies are reviewed about finding useful resources, organizing information, interacting and forming conclusions with team members, and using guidelines for a final presentation or product. The teacher provides guidance through questions that will help students think about the situation and reflect on their roles, but excessive structure that could limit student creativity and extensions should be avoided.

Resources: Links are provided to external web resources that will help students think about different factors and perspectives that influence the overall problem. These links should be organized or annotated so that students understand the type of information each link provides. Additional sources can be suggested, if available, such as access to expert sources or periodicals that may not be available online.

Evaluation: A grading rubric is created so that students understand what is expected of them and how they will be assessed. Both the students' products and processes in the activity might be included as part of the grading scheme. Products may include the content of a project, argument in a presentation, and quality of supporting work. Process can include research strategies, organization, and collaborative effort.

Conclusion: The learning experience is summarized and student accomplishments are reviewed; students are reminded of what they have learned through the activity. The boundaries of the activity may be extended by asking reflection and extension questions for students to consider for further potential learning pursuits. Connections are drawn to students' lives, current events, or related topics in the curriculum.

An online example

Searching for China http://www.kn.pacbell.com/wired/China/ChinaQuest.html

In this activity, students examine the foreign policy tensions between the US and China and then propose a plan that benefits people from both countries. Students are placed into groups that must investigate and present the issues from the viewpoints of various interested parties such as business investors, human rights activists, and United States senators. Each group develops an action plan that will address foreign policy based on a negotiation of their assigned perspectives. Developing such a report requires that they acquire an understanding of foreign relations with China from these different roles and then gather evidence to create a compromise plan that will reflect all of the principals' perspectives. Their group reports are to present their values while addressing issues such as spiritual understanding, world peace, economic growth, and preservation of cultural treasures.

The web site provides a list of links for exploring diverse Chinese issues. Students are asked to spend about 30 minutes assembling background information on China from one of the sites and then to meet in groups to share and address the most important issues they have found from each of the sites. After the discussions, their individual roles are explored in detail by examining their dossiers and answering a series of reflection questions. For example,

This book is licensed under a Creative Commons Attribution 3.0 License

a museum curator will investigate the question, "What is happening to Tibetan culture?" by exploring three related web sources and inferring a theme common to all of the resources referred to as "one truth". After answering a set of questions in this format, the students summarize their findings by formulating an action plan statement that represents their point of view such as "What should be done to preserve cultural treasures?" When students have explored their individual roles, they generate a group report supporting a negotiation of their values in the form of a unified plan. The group is asked to address the major issues in the foreign policy agreement and how they might impact other goals. Students develop a set of resolutions based on these arguments and then make a prediction for potential outcomes and future prosperity.

Students then submit their reports for feedback from a variety of sources such as electronic bulletin boards or even public officials (the author recommends that teachers check with their school's policy before pursuing this action). The WebQuest concludes with a summary of the learning activity and issues to further think about such as the differences in the countries' populations, history, and political systems. The conclusion focuses on the students' success in addressing and reasoning through a complex task as well as being empowered with strategies to research and resolve difficult issues.

Conclusions and implications

Problem-based inquiry approaches to learning provide students with strategies and experiences that empower them to become critical consumers of information and tackle authentic problems through group problem-solving. While these attributes help students prepare for active citizenship in a rapidly changing world, the structure of most schools often hinders the implementation of problem-based inquiry models. Pragmatic factors such as class period length, access to resources, standardized testing issues, and the activities in a typical school day affect what is learned. Cultural factors, such as the student-teacher relationship, the teacher and text as expert sources, and student responsibility affect how learning occurs. Thus, several implications arise concerning the need to restructure education in order to fully adopt and obtain the learning benefits associated with problem-based inquiry.

The school day should provide students with opportunities to explore ideas in greater depth. Students in many middle and high schools take five to eight courses that last from forty to sixty minutes each. This class structure encourages learning content in segmented blocks through information processing approaches. As a consequence, the curriculum is faced with emphasizing breadth of content whereby new ideas are taught each day in a linear fashion based on the concept introduced the previous day. On the other hand, real-world problems such as those addressed in a problem-based inquiry model, incorporate concepts that do not necessarily lie along a predetermined pathway of knowledge and skills. Greater attention is given to fewer concepts that have direct relevance to students' lives. More time is needed to allow opportunities to explore complex situations in depth. Even though real-world problems are not resolved in a single day, a school day with larger blocks of time better supports approaches to problem-based inquiry. Implementing problem-based inquiry in a system with short class periods ultimately derails the momentum of learning because students must continually start, stop, and recall information and procedures more frequently.

Standardized tests should also incorporate complex real-world problems in order to be more comprehensive as assessment instruments. If one of the goals of education is to prepare students for a productive workforce, and modern business engages employees in complex projects that require higher-ordered thinking, then the educational system is obligated to make provisions that embody these skills in ubiquitous assessment instruments. Because the scores of standardized tests are sometimes, unfortunately, used to measure learning and the success of a school, test content and question types send a message to teachers and students about what type of learning is valued. The majority of questions on most standardized tests target lower-ordered thinking skills and can be answered in less than one minute. While these questions assess what students understand and what they can recall, the tests often do not allow students to express their problem-solving and critical thinking abilities in novel situations. Test creators are discouraged from creating questions that require higher-ordered thinking questions for many reasons. Such problems take longer to answer and grade; they potentially reduce reliability due to partially subjective grading in essay responses; and they affect the validity of test scores when fewer questions are asked. In light of these challenges, unfortunately, few instructional practices will change toward addressing societal goals until they are reinforced on nation wide standardized tests.

Finally, teachers must rethink their roles from instructor to facilitator and collaborator. Generally, teachers determine what and how students learn from their subject-area knowledge and from primary sources such as textbooks. An advantage to this situation is that students receive similar learning experiences that can be accurately and consistently measured according to a series of objectives; however, learning in these situations is based on the teachers', and textbook authors', values regarding which topics are important. Furthermore, the learning environment in this situation is bounded by these sources, neglecting opportunities for continued exploration or deeper analysis using other sources, such as technological tools, Internet references, students, and teachers. When solving real-world problems, additional resources expand opportunities for students to present varying perspectives that are not necessarily tied to the views of the instructor. Hence, in inquiry-based environments, teachers should relinquish some control over content. Teachers need to recognize that students may not naturally develop, believe, or accept their particular arguments or points of view. Also, in a problem-based inquiry approach, students must be given greater control over the direction and content of their learning. If teachers accept students as equal contributors to the learning community, then less emphasis will be placed on teacher-presented information. Instead, teachers can then take responsibility for facilitating learning so that analysis, synthesis, evaluation, and extension of information by students assume its proper role.

Questions

The following questions are an effort to reflect upon, explore, and extend the concepts presented in this chapter.

- Consider the scenario presented at the beginning of the chapter. If this type of event occurred in your local neighborhood or school, do you think the chemistry teacher should engage in this type of activity? Would your opinion change if your child was in the chemistry class? If not, why not? If so, what would you change about his instructional methods?
- Should all teachers use problem-based inquiry as a method of instruction?
- Which of the three instructional models presented in this chapter most closely aligns with your teaching philosophy? Explain why.
- Find an interesting web-based activity that you think employs problem-based inquiry. Note the URL and explain why it is a problem-based inquiry activity. Also, discuss why this particular activity appeals to you.

This book is licensed under a Creative Commons Attribution 3.0 License

- Can every real-world problem be addressed through a problem-based inquiry instructional model? Explain why or why not, citing examples.
- A large number of frogs are becoming deformed around the country. The Deformed Frogs Mystery project examines whether the deformation is a result of parasites or environmental chemicals. Is this activity an example of problem-based inquiry? If so, which instructional model, if any, is used in this learning environment?
- Choose one of the instructional models and describe how the learning environment would change if a different instructional model were used. For example, suppose the problem-based learning activity about the litigation in the drunk driving case used a different instructional model, such as anchored instruction or a WebQuest. How would the resources, instruction, and student activities change with this new model while still addressing the same problem(s) of determining an appropriate resolution to the case?
- Problem-based inquiry instructional models support learning as a social process that involves student construction of ideas. How would the instructional strategies and the learning environment change if learning did not take place in a social setting, such as in a home schooling setting? How would the instructional strategies and the learning environment change if learning did not involve the student's construction of ideas?
- The implications of this chapter suggest that schools need to be restructured in order to experience all of the benefits of problem-based inquiry. Suppose a school day or particular curriculum cannot change immediately. For example, class periods are fifty minutes in length, classroom resources are restricted to the library, the curriculum among a group of teachers is driven by the context of a textbook, etc. In this situation, is it possible to engage students in a problem-based inquiry activity? If not, explain why not. If so, what restrictions or limitations are placed in this type of situation that affect learning and learning outcomes?
- What are some of the weaknesses and limitations of using problem-based inquiry as a means of instruction?

References

Dossey, J., Mullis, I., Lindquist, M., & Champbers, D. (1988). The mathematics report card: Are we measuring up? Trends and achievement based on the 1986 national assessment. Princeton, NJ: Educational Testing Service.

Goodlad, J. L. (1984). A place called school. New York: McGraw Hill.

Lave, J., & Wenger, E. (1991). Situated learning: Legitimate peripheral participation. Cambridge: Cambridge University Press.

Martin, L. M. (1987). Teachers adoption of multimedia technologies for science and mathematics instruction. In R. D. Pea & K. Sheingold (Eds.) Mirrors of minds: Patterns of experience in educational computing. Norwood, NJ: Ablex Publishing Corporation.

National Commission on Excellence in Education. (1983). A Nation at Risk. Washington, D. C.: U.S. Department of Education.

Paul, R. W. (1993). Critical thinking: How to prepare students for a rapidly changing world. Santa Rosa, CA: Foundation for Critical Thinking.

Vygotsky, L. (1978). Mind in society: The development of higher psychological processes. In M. Cole, V. John-Steiner, S. Scribner, & E. Souberman (Eds.), Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

Wenger, E. (1998). Communities of Practice: Learning, Meaning, and Identity. Cambridge: MA: Cambridge University Press.

Wood, K. D. (1987). Fostering cooperative learning in middle and secondary level classrooms. Journal of Reading, (30), 8, 10-19.

Online resources

Problem-Based Learning

Founders of PBL: http://www.pbli.org/pbl/pbl.htm

Skills to Enhance PBL: http://www.med-ed-online.org/f0000009.htm

Text sources on PBL: http://www.pbli.org/bibliography/articles.htm

Anchored instruction

Cognitive Constructivism & Social Constructivism: Anchored Instruction:
http://viking.coe.uh.edu/~ichen/ebook/et-it/ai.htm

Anchored Instruction and Its Relationship to Situated Cognition:
http://inkido.indiana.edu/w310/response.html

Design and Development Tips: http://www.edtech.vt.edu/edtech/id/models/anchored.html

Adventures of Jasper Woodbury: http://peabody.vanderbilt.edu/projects/funded/jasper/Jasperhome.html

Anchored Instruction Examples from Penn State: http://www.ed.psu.edu/nasa/achrtxt.html

WebQuests

The WebQuest page: http://edweb.sdsu.edu/webquest/webquest.html

This book is licensed under a Creative Commons Attribution 3.0 License

15. I-Search

Editors: Ahram Choi, Stuti Garg, and Margaret Kilroy (The University of Georgia)

Scenario

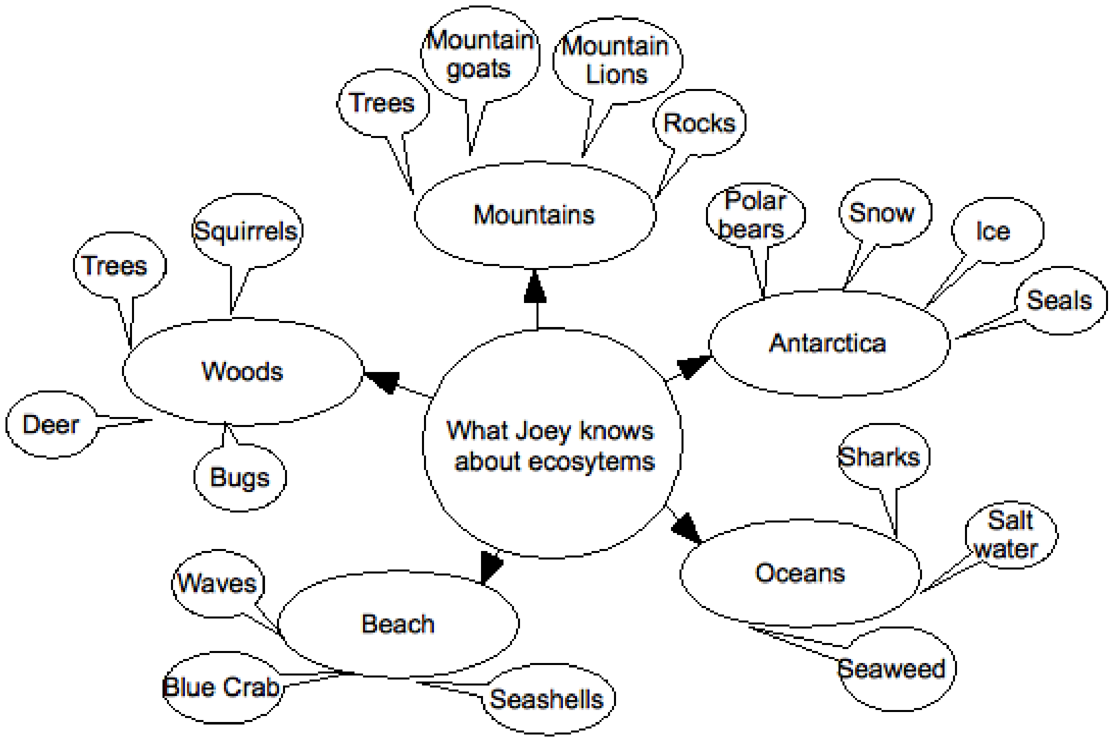

Exhibit 11: Joey's interest web

Ms Johnson has decided to include I-Search papers in a unit on ecosystems. She has worked with the school media specialist to determine what materials are available for this study within the school setting, the local community, and on the Internet. She introduces the concept of the I-Search to her students and has them select a topic they would like to explore. They may choose any topic related to ecosystems. Joey is a student in Ms Johnson's class. To help Joey and his classmates get started, Ms Johnson has the students begin their learning logs with an interest web showing what they know about ecosystems. Joey's web is shown below. While the students work on their webs, the teacher proposes that they consider their last trip to the mountains or the beach. After making their webs using Inspiration, the students share their ideas and choose a topic from their web. After getting feedback from his teacher and peers and reflecting on his choices, Joey decides to do his I-Search on blue crabs because he has so much fun catching them and he thinks they taste good.

Ms Johnson helps Joey and his classmates develop possible research questions using the accordion exercise in which each student writes a question about the chosen topic on a separate fold of the paper. When the students get this sheet, they write a question that they would like to answer about the given topic, which is written at the top of the page. Joey is considering doing his search about blue crabs. From this exercise, he can get ideas from his peers for questions he could ask about blue crabs.

Table 13: Joey's accordion exercise (folded paper)

Blue crabs
How do you catch blue crabs?
What do blue crabs look like?
How do you tell if a blue crab is a male or a female?
Are blue crabs easy to catch?
How do you cook blue crabs?
Are blue crabs dangerous?

In the next class, Ms Johnson instructs the class to complete a pre-notetaking sheet based on the KWL format. The KWL chart format (see Exhibit 13) which was created by Ogle (1986), has three columns: K (know), W (want to know), and L (learned). Students put their prior knowledge in the left column. Some of the peer questions received in the accordion activity (see Exhibit 12) can be placed either in the middle column or in the left column. The right column is the place for research questions. Based on the questions from the accordion exercise and his reflections, Joey fills in the three columns. He chooses 'Why aren't there as many blue crabs now as there were when my mother was my age?" as his I-Search question.

Table 14: Joey's pre-notetaking sheet

What I know	What I don't know	What I want to know
• Blue crabs taste good. • Blue crabs are blue. • You can catch blue crabs with chicken necks and a net. • My mom says you used to be able to catch crabs easier when she was young.	• How do you tell if a blue crab is a male or a female • How do you cook blue crabs?	• How do you cook blue crabs? • Why aren't there as many blue crabs now as there used to be?

Now the students have their own search questions and can begin to find the answers to the questions. Students are familiar with searching for information on the Web, and they frequently go to the school media center to obtain information. The teacher invites Ms Becker, who is a media specialist, to brief the students about how to find information and the types of media that are available for them to use. Although Joey likes to catch blue crabs, he doesn't have much knowledge about the blue crab's place in the ecosystem. Ms Johnson advises Joey to scan books and magazines about blue crabs to broaden his knowledge. She also gives him questions to think about, such as "What does the reduced number of blue crabs indicate?" and "How is the crab population related to the ecosystem?" Ms Becker helps him to find the books and magazines. After reading the available references, he

This book is licensed under a Creative Commons Attribution 3.0 License

generates several more detailed sub-questions about the blue crab. During the class, one of his friends mentions gaining valuable information from an interview and Joey decides to interview a local crabber. Joey uses the double entry draft template (see Exhibit 14) to record information during an interview with a local crabber. Double entry draft is a tool which students can use while they are gathering information. In the left column, the students keep a record of the information they find then write reflective thoughts related to the information in the right column.

Table 15: Joey's double entry draft

SAMPLE RESOURCE: LOCAL CRABBER	
CONTENT	RESPONSE
Crab populations are decreasing. People are keeping females with eggs and not letting them go. population (not applicable) What do blue crab eggs look like? Females with eggs have an orange "sponge" attached to the shell. Fewer people should be allowed to catch crabs. Many things affect the crab population. Female crabs with eggs should be let go when they are caught. I need to know more about how water temperatures affect blue crabs.	If the population gets too small, there won't be any crabs left. People are killing the baby crabs before they are born. all of the blue crabs that live in a place (not applicable) Maybe people don't know the crabs have eggs. I've caught crabs like that. I thought they were sick. Maybe there should be fewer crabbers but people should be able to catch crabs for dinner. Crabs are being hurt by higher temperatures. If crabs with eggs aren't let go, there won't be any blue crabs in the future. I will check with the fisheries experts to find out more.

After compiling all of the information obtained from library resources, the Internet, and interviews with experts, Joey writes his I-Search paper describing his journey in search of an answer to his questions (see Exhibit 12).

BLUE CRAB I-SEARCH

I chose to study blue crabs because I always like catching them at the beach and they taste good. My mom told me that she used to be able to catch a lot more blue crabs when she was my age. I wondered what happened to make us have fewer blue crabs today. My teacher had a scientist from the DNR come to class to talk to us about ecosystems. I asked him about the crabs and he said that there were several things causing the crab population to get smaller. He talked about the pollution in the water and that the temperature of the coastal waters where the crabs live had gone up in the last twenty years. He also talked about over-fishing and told me that a lot of people aren't following the rule about releasing the female crabs that have eggs attached to their shells.

I started wondering why people would keep the crabs that had eggs, so my mom took me down to the docks to talk to the crabbers. They said that they didn't keep them but that many people who just go crabbing for the day with their families or friends keep them because they haven't caught many crabs and want to have enough to cook. The crabbers said they don't think people understand that they are killing the baby crabs that will grow up for them to catch. I asked how to know if a crab is female and if it has eggs and one of the crab fishermen showed me the difference between the males and females. If you look at the bottom of the shell, the part that folds over from the back is pointed on the males and rounded on the females. I never knew that and plan to start looking at the crabs I catch. He also told me I could go to the Marine Institute at Skidaway Island and they would be able to show me crabs that have eggs…….

Exhibit 12: Joey's blue crab I-Search

As part of the assessment process, students are required to present the information they have discovered through the I-Search process in a format of their choice. Joey chooses to produce an informational flyer that can be placed in locations where people who are going crabbing will see them (see Exhibit 13).

Exhibit 13: Joey's blue crab flyer

From traditional research to standards-based I-Search

I-Search is the process of searching for answers to questions which have personal meaning to the writer combined with a metacognitive review of the search process. Instead of restating old information as done in the traditional research paper, I-Search is inquiry-based and the path of discovery is driven by the need to find answers. I-Search embraces the emotional involvement of the writer and imparts the inner conflicts discovered as it

This book is licensed under a Creative Commons Attribution 3.0 License

becomes necessary to choose between alternative answers to questions along the way. I-Search is the story of the search rather than the summary of answers found in traditional research papers.

Table 16: Traditional research vs forms of I-Search

I-Search	Traditional research	Standards-based I-Search
"tell stories of quests that count for the questers written in a way that catches and holds readers" (Macrorie, 1988, Preface, paragraph 26)	"an exercise in badly done bibliography, often an introduction to the art of plagiarism, and a triumph of meaninglessness for both writer and reader" (Macrorie, 1988, Preface, paragraph 26)	Tells the story of the student's search for answers to questions within the constraints of the content standards imposed by the curriculum
Driven by the writer's need to know the answer	Driven by the writer's need to cover a topic	Driven by the students desire to learn about the topic
Written in the first person	Written in the third person	Written in the first person
Portrays the writer's emotional conflict	Objectively dissociates the writer's personal feelings	Portrays the writer's attempts to analyze differing points of view
Imparts the writer's "truths"	Imparts an objective interpretation of facts	Imparts the writer's learning process
A story of the journey to find an answer	A report of the results of the search	A story of a journey to metacognition
Inquiry-based	Summary of "old" information	Inquiry-based

The I-Search was introduced by Macrorie (1988) as an alternative approach to the traditional research paper in his undergraduate English classes. He proposed the idea to resolve the problems encountered while teaching students who are not engaged in the writing process. He defines I-Search as the writer's "search to find out something he needs to know for his own life and write the story of his adventure" (1988, Preface, paragraph 9).

Tallman and Joyce expanded the original idea of I-Search by offering teachers and media-specialists applications and strategies for using the I-Search to teach writing and researching skills. They define the I-Search as an approach that uses students' interests to build a personal understanding of the research process and to encourage stronger student writing (Tallman & Joyce, 2006). They suggest that the I-Search method involves scaffolding (see scaffolding) strategies and activities adaptable to the class.

Duncan and Lockhart (2005) brought the I-Search into the classroom as a tool for use in standards-based instruction in all classes. Through the I-Search unit, teachers can provide an opportunity for students to "develop questions, research the answers, record their findings, and illustrate their learning through products while reflecting on and evaluating their learning" (Duncan & Lockhart, 2005, p. 3) In the I-Search unit, students still choose a topic of interest to them. The research is still driven by a desire to answer a question that is of importance to the student; however, the choice is made within the context of the content standards.

I-Search and standards-based instruction: features

Student as a collaborative partner, teacher as a facilitator

In the I-Search process, the relationship between students and teachers is different from their relationship in a traditional research process. In the I-Search process, students have ownership of their research as they investigate what they find meaningful. For example, Joey found blue crabs interesting so he chose them to research. In the traditional research process, topics are often assigned to the students, causing them to feel less empowered. Students encounter successes and frustrations while they are developing and adapting strategies in the I-Search, and they take on the role of collaborative partner as they share their own experiences with their peers and teachers.

Teachers and media specialists play a crucial role as facilitators in the I-Search process.

Tallman and Joyce (2006) characterize facilitation as a means of helping students discover how different research strategies can work for them. Because most students are not familiar with creating higher-order questions, teachers provide scaffolding through conferencing with students to help them develop reflective thinking skills.

Also, teachers and media specialists work collaboratively throughout the process. Determining "how to interact with the information" is vital for a successful I-Search experience. Teachers and media specialists provide information about where to gather meaningful resources and how to relate that information to students' own lives through scaffolding.

In the scenario, the class works collaboratively to find the right topic within the content area. Through the accordion exercise (see Exhibit 12), the students obtain diverse perspectives on their topics from their peers. This broadens their list of choices within the search topic and makes the students aware of questions they had not considered. Ms Johnson and Ms Becker support Joey and his classmates by letting them know how to find and use information. Moreover, the teacher acts as a facilitator in helping Joey find out about how his crabbing activities influence the ecosystem by providing cue questions.

Writing as a tool to build up critical thinking skills

Through the I-Search process, students eventually develop their critical thinking skills. In each phase of the I-Search process, students reflect on their I-Search experience. They articulate and reflect on what they have learned, what they want to learn, and how they will learn. During the pre-search and search phases, students also learn how to create a plan, evaluate the information they gather, and integrate the information into their own experience. These activities correspond to the three higher-level thinking skills of analyzing, evaluating and creating described in the revised Bloom's Taxonomy.

As stated in the scenario, Joey wants to find out more about blue crabs because he enjoys catching them. As he gains more information from references and gets advice from Ms Johnson, he learns how to relate his topic to his life. Finally, he discovers how his catching blue crabs can affect the ecosystem.

Learning logs function as tools promoting students' critical and reflective thinking skills

(see Articulation and Reflection) Students begin to write a learning log as the I-Search process starts (see Table 15). They keep a record in their learning logs of their reflective thoughts on both the I-Search process and the product they develop through the process. I-Search is an outcome of the students' findings throughout the process and it requires articulation; the students make their knowledge explicit through articulation. The accumulated narratives recorded in the learning log become a critical part of the final product.

This book is licensed under a Creative Commons Attribution 3.0 License

The first entry added to the learning log is the personal universe web (see Exhibit 11). After generating their personal universe web, students pick two or three topics that they find most interesting. Students decide on their I-Search topic by reflecting on the chosen topics from the web. The writing prompt is an effective tool to help in the process of choosing a topic. Teachers provide writing prompts with which students start their reflective sentences. Sample writing prompts include:

- This topic is attractive because:
- The web helped me select the topic in that:

Table 17: Learning log entries

Process	Product	Reflection
Choose a topic	Personal universe web	Reflection on the web
	Topic web around the chosen topic	
Find information	Bibliographic citation	What was learned in general about the topic
	Pre-note taking sheet (KWL chart)	
Use information	The plan of action Double-entry draft	Reflection on the prioritized information
	Evaluation of the information	
Develop a final product	Final product	Lessons learned

Increasing students' motivation

I-Search closely follows the 6 C's of Motivation which are strategies for increasing motivation and allowing students to have a choice in their search.

- **Choice**: A basic principle for increasing motivation is to let people do what they want to do. Within the I-Search process, everything is determined by personal choice. Beginning with the choice of the search topic, the students select what they want to explore and what they find meaningful. In the scenario, Joey chooses blue crabs for the topic of his I-Search. He wants to learn more about blue crabs because he enjoys catching and eating them. He chooses the methods for his research (interviews, Internet, etc.) as well as the format of the final product.
- **Challenge**: After choosing a search topic, students describe "what they know" and "what they need to know." They become aware of any gaps in their knowledge in the chosen topic as they complete the pre-notetaking sheet (see Table 14). Students then express "what they want to know", which becomes their search question. Thus, they discover new information that challenges their current level of understanding. Ms Johnson's questions provide a challenge to Joey in that he had not considered the effects catching blue crabs might have on the ecosystem.
- **Control**: In the I-Search process, students have control over their own search process. Joey is fully empowered in his I-Search. He picks the topic, builds his own search plan, and arranges the interview to gather information that he finds more relevant. If students have difficulty exercising so much control over the I-Search process, teachers can help them manage the search process.
- **Collaboration**: Although the I-Search originated as an assignment for a writing class, it has elements of collaboration when implemented in the classroom. Students share their knowledge and useful resources

and provide comments on the search process as Joey does in the accordion exercise (see Exhibit 12). Joey arranged to interview a local crabber after his classmate introduced this strategy for obtaining information.

- **Constructing meaning**: The students continuously reflect on the learning process. Joey deliberates about how the topic is related to his life and how his choices affect the topic of his search. During the search process, students write about what they have learned and why the information is meaningful to them; therefore, the search result has meaning beyond that of a compilation of superficial knowledge. Since the students choose what has relevance to their lives, they stay motivated. Joey even creates a blue crab flier to raise people's awareness of the blue crab population crisis because he discovers a personal value, to maintain the ecosystem, in his I-Search.
- **Consequences**: The result of I-Search can take any format the learner chooses. Learners are motivated when they feel they are recognized. In the scenario, all of the students have opportunities to present their I-Search products.

I-Search process

Although sub-steps for the I-Search may vary depending on the topic, there are four major steps (see Exhibit 14):

- Choose a topic/Generate the I-Search question.
- Develop a search plan/Gather information.
- Use information.
- Develop a final product.

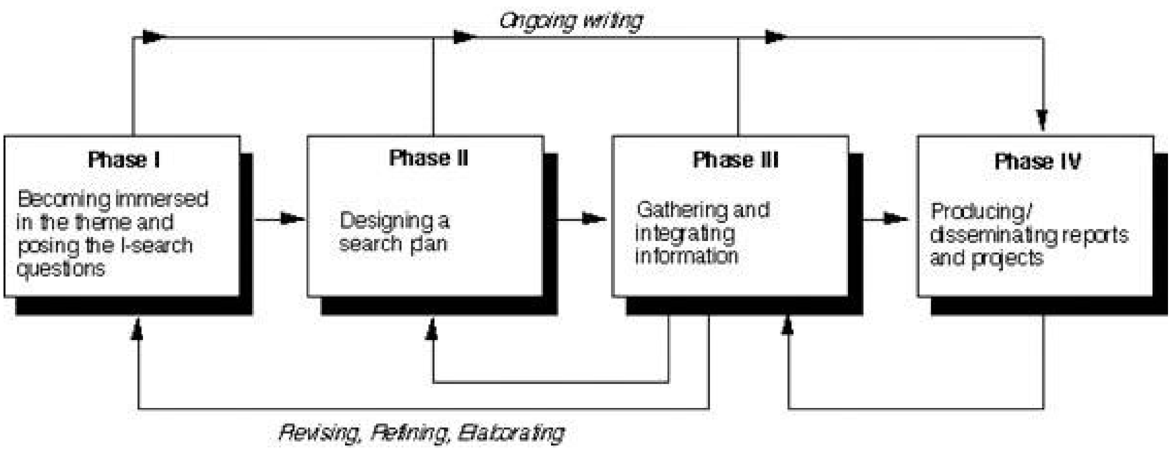

Exhibit 14: I-Search process: the educational development center's four instructional phases (Adapted from http://www2.edc.org/FSC/MIH/4-phases.html)

I-Search does not merely supply an alternative to the research paper. It provides a process for learning throughout the phases of the I-Search. It is an iterative process. Once students have created their research questions, they revise and elaborate on the questions or create different questions as they go through the process. Once they have identified helpful resources for their I-Search, they read them using a scanning technique, connect the reading to their experience, and do a detailed reading based on the questions so they keep interacting with the information throughout the process. There is ongoing assessment through reflection and conferencing so that the students stay focused.

This book is licensed under a Creative Commons Attribution 3.0 License

In this chapter, the process is introduced based on the four phases shown above, with the adaptable in-class strategies suggested by Tallman and Joyce (2006) (see Table 6).

Table 18: Outline of the I-Search process (Tallman & Joyce, 2006)

I. Create personal universe web

A. Choose interest area to explore

B. Create interest topic web

II. Solicit questions and suggestions about interest areas from family and peers

A. Participate in accordion strategy

B. Share results

III. Create pre-notetaking sheet with three columns

A. What I know

B. What I don't know

C. What I want to know through my research

IV. Read without notetaking from general sources to build background knowledge

A. Do not take notes while reading in general sources

B. Learn to skim and scan

C. Wait until done with a session, then close source, reflect on how information informs topic in learning log

D. Use teacher-created prompts to promote reflection

E. Create bibliographic citations in proper form and keep them with notes in learning log

F. Identify keywords and search terms

V. Create 2nd draft of pre-notetaking sheet

A. Revise questions based on increased knowledge from general source reading

B. Identify specific resources, including Internet websites, people to interview, media center holdings, etc.

VI. Use double-entry drafts for reflective notetaking from resources

A. For each resource, write bibliographic citation on double-entry draft page

B. Take notes from sources in left column on double-entry draft page

C. Reflect on notes in right column on double-entry draft page

D. Use teacher prompts for reflections, if desired

VII. Apply the findings to the research question

VIII. Reflect on value of search strategies in learning log

IX. Organize learning log reflections, double-entry draft entries, and reflections into final product (format can be student's choice) that includes:

A. Why the topic was chosen

B. Story of the student's search

C. What the student found

D. How the student answered the question or solved the problem

Step 1. Choose a topic

The starting point of the I-Search process is to choose a topic that interests the students. The result of I-Search might vary depending upon the topic choice. Choosing topics that attract the students' attention and have relevance to their lives enables the students to stay motivated and engaged in the I-Search process. In standards-based I-Search, the topics should be in curriculum content areas. Background information in the content area should be provided before beginning the I-Search so that students are prepared to engage in brainstorming. Also, teachers should inform the students of the available resources, such as magazines, websites, and knowledgeable others that are relevant to the content so that students can obtain knowledge from diverse perspectives.

Drawing an interest web is a good strategy to help students find personally interesting topics. Teachers model creating an interest web, then have the students draw a personal universe web (see Exhibit 11). The web can involve anything related to the students and their lives, such as hobbies, families, friends, and school. After generating the webs, each student picks two or three of the topics on his or her web and develops further ideas on the selected topics.

Teachers help the students develop a more detailed web by asking questions. They may start by asking for factual information and gradually move to questions about the students' standpoint on the factual information. After completing the personal universe web, the class has a debriefing session to share the strategies they used for topic decisions and their topic choices. Teachers, media specialists, and students work collaboratively as they discuss the successes and frustrations encountered in this first step.

Step 2. Find information

In this phase, students narrow the topic and form researchable questions from the topics they selected in Step 1. The key role of teachers in this step is to encourage students to generate higher-order questions. Students need to find a point to investigate within their chosen topic, but they may be unaware of how to start. The accordion exercise and pre-notetaking are strategies that are beneficial for converting vague ideas into higher-order research questions.

The accordion exercise provides a way to promote divergent thinking and solicit more diverse responses about the topic from peers. Fold a sheet of paper horizontally to make several rows, and write the student's topic at the top of the paper. Hand the sheet over to the class and have other students write possible questions about the topic. The papers should remain folded so that students write down original ideas without being influenced by others' opinions. The collected queries offer students a greater variety of ideas and points to consider about their research topics.

Based on the reflections, students begin to fill in the pre-notetaking sheet which adopts the KWL chart format. Then, students start by forming knowledge level questions that begin with "what" or "when" and develop them into higher-order questions beginning with "how" or "why". The teacher supports students as they convert lower-level questions into higher-level by scaffolding and through conferencing. Action verbs suggested by Bloom (1974) are utilized to make a gradual conversion to higher-order questions. The pre-notetaking sheet guides students as they gather their information.

After completing the sheet, students do some background reading using skimming and scanning without taking notes. The background reading expands the students' general knowledge in the content area and encourages revision of the questions in the last column. Students should not take notes while they are reading since the focus of

This book is licensed under a Creative Commons Attribution 3.0 License

this activity is on general rather than detailed information. After completing the background readings, students should close the resources, write bibliographic citations in the learning log, and deliberate over the information gathered from the readings. By taking notes after reading, students are forced to interpret the information in their own words and relate the information to the topic while reflecting on their general reading. Other resources such as websites or magazines may be offered to provide the students with more information about the content and more chances to practice scanning and skimming. Once the students become familiar with the topic, they are able to express the main concept using key words.

At this point, students return to their I-Search question and determine whether it is still applicable. With broadened knowledge in their chosen fields, students may add more questions to the "what I want to know" column by finding key words from the reading and combining them with "how", "what", or "why". Students select several questions relevant to their I-search focus from the right column on the pre-notetaking sheet. The most enticing question becomes the final question for I-Search.

Step 3. Use the right information

In the traditional research process, the final paper becomes the place where copies and pastes are compiled and the stance of a writer on the research question is often lost. This step is a guideline to help avoid this tradition.

The purpose of this step is to provide perspective on the topic by properly using the information found. To get started, students first prioritize the information listed in their learning logs. They then take a photocopy of the highlighted information while noting reasons for its importance. Students then restate the core ideas in their own words, reorganize the information to respond to their research questions, and find connections between the information and the students' prior experiences or knowledge by evaluating and synthesizing the information. The aforementioned tasks are recorded in the learning log throughout this phase, and the narratives in the learning log are used in the final product.

During this phase, it is critical that teachers and media specialists instruct students about how to evaluate the available resources. The double-entry draft (see Table 13) is an effective tool that may be used to assist the students in determining the validity and reliability of the information they discover. The suggested criteria for accomplishing this (Tallman & Joyce, 2006) are:

- currency
- accuracy
- point of view
- bias
- fact versus opinion

The teacher and the media specialist provide the class with a variety of resources containing information on their topics. Students evaluate each of the resources using the double-entry draft (see Table 13). Students select several sources of information on each topic and participate in group discussions about the topics based on the above criteria. This activity provides each student with the opportunity to create a personal perspective. Reflection on the information compiled in the double-entry format comprises a vital part of the final product.

Table 19: Double-entry draft template with probing comments

Resource (Author, Title, etc.):	
Content	**Response**
• A main idea or key concept	• Why it is a key point
• A sentence/passage that produces an emotional reaction	• An explanation of the reaction and the reason for that reaction
• An unknown word	• A possible definition
• A confusing passage	• Paraphrase
• Questions that comes to mind	• Reasons for wanting to know the answer or a possible answer
• Information that relates to a personal experience	• Personal experience
• A statement of the author's opinion	• Reasons for agreeing or disagreeing with the author
• A key point	• Another author's view on the same topic
• Important information	• How the information helps to answer a research question
• Other	• Other

Before producing the final product, students organize the narratives recorded in the learning log in a manner that responds to their research question. Students return to the pre-notetaking sheet and review some of the questions they generated. These questions provide clues to the content of the narratives and may be used as subtitles for the final product.

Step 4. Develop a final product

Although I-Search was originally used in an English composition class, the final result does not have to be a writing piece. The formats of the products are chosen to fit the questions. While developing the final product, it is important to maintain a first person point of view. As students address their experiences or opinions with "I", they gain ownership in the I-Search process and gain confidence in their product. This final step provides another opportunity for students to develop critical thinking skills through peer editing. Students, as peer editors, build critical thinking skills such as analyzing and evaluating and gain knowledge in the content area during the process of editing. Presentation of the final product may diverge from the original goal of the I-Search. Through participation in debriefing sessions, conferencing, and class discussions, students and teachers become familiar with all of the topics. One example of a product is the flyer (Exhibit 13) found in the blue crab example, which shows how to identify a female crab carrying eggs. This flier could be made available to people who want to go crabbing by posting it in areas such as local marinas and bait shops.

This book is licensed under a Creative Commons Attribution 3.0 License

Assessment

One of the features of I-Search is the ongoing assessment built into the process. It utilizes authentic assessment by having students receive feedback through conferencing, reflections, and peer reviews. Teachers may generate checklists or rubrics to enable students to self-assess while they are engaged in the I-Search process. Also, Bloom's Taxonomy can be used to evaluate students' higher-order thinking skills as demonstrated in their learning logs and final presentations.

Benefits of I-Search

Increased motivation

Students' own choices lead the research within the context of the curriculum content, which helps increase motivation as indicated by the Six C's of Motivation. Students choose a topic and a question to answer that have personal meaning to them, thereby enhancing their desire to complete a thorough search for answers to their questions. This open-ended, student-centered approach provides maximum student control.

Promotion of articulation and reflection and development of metacognition

I-Search reveals the thought processes involved in the search for answers. This allows other members of the learning community to follow the writers' thought processes as their search leads them along the path of discovery. Throughout the I-Search process, students reflect on the information they encounter and make decisions about how to proceed based upon their reflections. This combination encourages the development of metacognitive skills because the students are required to reflect deeply as they analyze the information they uncover and make decisions about its validity. The reader is then able to share the learning process because of the emphasis on the search in writing the I-Search paper.

Challenges of I-Search

Limited choices in curricular areas

Traditional I-Search allows complete choice on the part of the writer. This very openness, which motivates the writer to delve deeper into the topic of choice, is limited in the standards-based classroom. The challenge is to maintain the openness while staying within the confines of the curriculum content. This can be accomplished by using the I-Search as one tool in the search for knowledge as shown in the blue crab scenario.

Time and resource intensive

Incorporating I-Search into the classroom requires a wide variety of resources if students are to be given maximum freedom in choosing topics. Much more planning time is required of both the teacher and the school media specialist with this student-centered approach in order to compile a comprehensive assortment of resource materials. In rural areas with limited resources, both human and technological, this can be difficult to accomplish.

If you would like some assistance in going through the iSearch process, there is a well designed tutorial to assist you. You can access that tutorial by clicking here.

References

Duncan, D. & Lockhart, L. (2005). I-Search for Success. New York: Neal-Schuman.

Educational Development Center. (2006). The I-Search Unit. Retrieved November 11, 2006, from http://www2.edc.org/FSC/MIH/i-search.html.

15. I-Search

Forehand, M. (2005). Bloom's Taxonomy: Original and Revised. Retrieved November 11, 2006. from http://projects.coe.uga.edu/epltt/index.php?title=Bloom%27s_Taxonomy.

Tallman, J., & Joyce, M. (2006). Making the Writing and Research Connection with the I-Search Process. New York: Neal Schuman.

Macrorie, K. (1988). The I-Search Paper. Portsmouth, NH: Heinemann.

Ogle, D. (1986). K-W-L: A Teaching Model that Develops Active Reading of Expository Text. The Reading Teacher, 39, 564-570.

Tallman, J. (1997). Connecting Writing and Research Through the I-Search Paper: a Teaching Partnership Between the Library Program and Classroom, Emergency Librarian, 23(1), 20-25.

Wang, S. & Han, S. (2001). Six C's of Motivation. Retrieved November 11, 2006. from http://projects.coe.uga.edu/epltt/index.php?title=Motivation.

This book is licensed under a Creative Commons Attribution 3.0 License

16. Case-Based Learning

Editor: Myra Blackmon, Yi-Chun Hong, and Ikseon Choi (The University of Georgia, USA)

Dr David's accounting class scenario

Dr David is a retired accounting professor who has been hired by a large nonprofit organization to teach basic organizational accounting as part of a week-long training conference for its local units' new CEOs. Most of the branches are located in small communities and have only two or three staff members to handle all administrative and program delivery functions. For many in the group, this is their first experience as a CEO. At the first meeting, Dr David runs through some fundamental principles and tells the students how important it is for them to be able to understand basic accounting; he explains that many critical decisions are based on information found in income statements and balance sheets. Then he uses a PowerPoint lecture with definitions and explanations of various income, expense, asset, and liability categories. At the end of the session, when he asks if there are questions, the students all look confused. One finally says, "I don't know enough to know what I need to ask. I need to understand all this in the context of my little organization. This doesn't mean anything to me."

During the afternoon and evening, Dr David reflects on the class and is puzzled that the students had such a hard time understanding such simple concepts. He thinks about the student's comment, "This doesn't mean anything to me." Then he realizes that the students will understand better if the information is presented in the context of their own organizations. He consults with the training director and they determine a different course of action. Dr David works late into the night, searching the Internet for materials and revising his plans for the following day.

At the second meeting, Dr David gives the students a news story about a small nonprofit which has recently discovered that its bookkeeper was embezzling funds. The discovery was made when the CEO noticed that items in the income statement and balance sheet had discrepancies. Dr David then walks the students through the case, pointing out the examples of income, expense, asset, and liability categories and offers an explanation of how these items relate to one another and their meaning in financial statements.

He invites student questions and there are many. Most of the questions are about what the organization should do about the situation, not about accounting. He explains that the focus of the case should be about accounting issues, not the organization. However, Dr David offers his analysis of the situation, suggests a course of action and presents steps the organization could have taken to avoid the problem.

At the end of this session, students' comments include things like: "I think I'm starting to get this." Dr David takes this as an indicator of success and uses a similar process on the remaining three days. For each session he finds a news story about a particular situation and uses it to illustrate other concepts in his lectures, such as accounting for pledged and uncollected donations and differentiating between capital and operating expenses.

On the last day, the students politely thank him for the class. He responds, "Thank you for the feedback. I was hoping the case method would work better for you."

Dr Miller's pharmacy class scenario

Dr Miller is in her second year teaching pharmacotherapy in the pharmacy school. She observes that many senior pharmacy students have difficulty applying their acquired knowledge in real-life situations. Even though students perform well on tests, they have problems applying their preclinical learning in their rotations in the hospital. Over time, students become inured to their classroom learning and thus see little connection between the classroom and clinical settings. In addition, she notices that students tend to experience high anxiety when they first enter the hospital setting for their rotations, because they are not confident that their knowledge is sufficient to complete their assigned tasks. Many previous students had shared with her the difficulty of their learning journey. Even though they finally learned to use patients' situations to suggest the appropriate dosages to their teams and work professionally with doctors and nurses during the rotation program, they struggled to get through.

All these observations bring to mind Dr Miller's experience as a pharmacy student. She had joined a study group with her cohort. They prepared for tests using the patients' cases in a handout provided by the instructors. The cases were the centers of their discussion. She found the processes of analysis and synthesis particularly helpful in developing a deeper understanding of the topic. By doing so, she not only earned good test grades, but also honed her ability to apply facts in the assigned tasks during her later rotation experiences.

Now, Dr Miller thinks her previous learning experiences may help close the gap between what students learn and the skills they need in the hospital setting. She decides to introduce an alternative way of learning that she believes can really help students and eliminate much of the frustration in their rotation experiences.

She decides to have students use authentic patients' problems during their preclinical education. She uses Case-Based Learning with real-life situations in the clinical setting by providing profiles of three patients who are currently receiving kidney dialysis and have different complications. She assigns students to groups of five and has them discuss the appropriate medication and the appropriate doses of the suggested medications based on each patient's situation. Through working in groups, students learn to work collaboratively with others, which simulates the out-of-school environment. In the beginning phase of solving the complex problems in the case, students need to assess each patient's kidney situation, complications, current medication, previous medication, and other physical factors, such as weight and age.

Meanwhile, Dr Miller poses some questions to lead and challenge students' understanding of each patient's situation. After students clearly identify the patients' state, they begin to identify resources online and from professional journals for the appropriate therapy. The students have to play an active role in their learning process. During students' involvement in the cases, Dr Miller functions as a facilitator. In the next class, students suggest not only the appropriate medication and the reasonable dosage for each patient, but also describe their rationales for the medication they suggested. Dr Miller thinks that with Case-Based Learning, her students are more engaged in the process of examining patients' cases and suggesting appropriate medications to the doctors. She also believes that students are more comfortable working on the authentic problems.

What is Case-Based Learning?

Case-Based Learning is not a new idea. Storytelling to share history, teach morals, and illuminate concepts is ancient. What is modern is the use of narratives developed to provide authentic learning for students.

Defining Case-Based Learning is not an easy task. Cases are used for different purposes, fields, and forms. Despite their very different approaches, Dr Miller and Dr David both believed they were using Case-Based

This book is licensed under a Creative Commons Attribution 3.0 License

Learning. No consensus exists across fields on how cases can be used in learning, increasing the difficulty in defining case methods. Even though divergent views in Case-Based Learning illustrate the difficulty of a universal definition, we can still capture two shared emphases of Case-Based Learning across fields. These two are the cases themselves and the discussion of them (Merseth, 1991).

According to Shulman (1992), “a case has a narrative, a story, a set of events that unfolds over time in a particular place” (p. 21).

The content of cases has to be written with the narrative form and to demonstrate the contextualization and specificity of cases. To provide well-written content for cases is not sufficient for successful Case-Based Learning. Christensen (1987) and Wetley (1989) both argued that the key to the case method is discussion. Discussion has to be integrated into students’ learning process. Engaging learners in discussion provides students opportunities to analyze, propose solutions, evaluate potential solutions, solve problems, or make decisions. These activities give students an active role in the learning process. Case-Based Learning is a pedagogy which helps learners improve higher-order thinking ability and achieve deeper understanding of the to-be-learned content. The content of cases and the process of discussion are inseparable in Case-Based Learning.

The examples of Dr David and Dr Miller illustrate the diverse spectrum of applications in Case-Based Learning. Some might call Dr David’s approach “Case-Based Learning Lite” because he used the stories only as examples. Teachers and learners have used cases in myriad ways that range from the case as an example to support lecture and traditional instruction to immersing students in a case and using it as the primary tool for instruction and learning. Along that spectrum are other uses. Some teachers use a case as the basis for a follow-up assignment after presentation of the lesson content. Cases are frequently used as a supplement to textbooks or lectures in class as tools for small group discussions.

As Hoag, Brickley, and Cawley (2001) wrote: "While the claims in the discourse conclude that case-based instruction is superior for skill development in managers and teachers, these conclusions are based largely on instructor perceptions" (p. 52). Although the earliest users of Case-Based Learning began without any research, subsequent research has confirmed that Case-Based Learning can overcome many of the limitations of the traditional lecture-based class (Bolt, 1998; Stoiber, 1991).

There are a variety of research efforts that document quantitative and qualitative evaluations of the effectiveness of Case-Based Learning in higher-order learning, as compared to didactic methods. In what they termed a “quasi-experiment” with 81 students, a control group and a study group, in a media management class, Hoag et al (2001) concluded that the case method improves problem-solving skills. Using a leadership course for 182 cadets at the United States Military Academy, Zbylut (2007) found that the quality of answers and diagnosis of leadership problems were better using a case and discussion. The findings were consistent with self-reports from the instructors. Using three groups of students in a business statistics course, a control group, a group that used one case study, and a group that used three case studies, Pariseau and Kezim (2007) found that the students who had used the case studies scored significantly higher on their comprehensive final examinations. Though measuring different outcomes, all three studies support the contention that Case-Based Learning is more effective in high-order learning than other methods.

Case-Based Learning can cover a wide variety of instructional strategies, including but not limited to, role plays, simulations, debates, analysis and reflection, group projects, and problem-solving. It provides a great deal of flexibility at the practical level. Regardless of the varied beliefs about Case-Based Learning, there are some basic commonalities among beliefs, most of which arise from the situated cognition theory of learning.

Among those beliefs about Case-Based Learning are the following advantages:

- It provides students with authentic situations in which to explore and apply a range of behaviors and information that can strengthen the transfer of learning. (Lombardi, 2007).
- When students participate in analysis and discussion of alternative solutions they better understand difficult or complicated issues and analyze them more effectively (Lombardi, 2007).
- The emphasis on the process of decision making requires students to synthesize information from a variety of social disciplines (David, 1954).
- Narratives or story-telling can be effective instructional supports in a variety of settings (Herreid, 1997).

Table 20: Essential characteristics of an effective case

When examining the concept of Case-Based Learning, it is important to first capture the essential components of the method. Anyone can tell a story, but according to Wasserman (1994) and Herried (1997) effective cases for learning share a number of characteristics:

- The case content is closely aligned with the overall instructional goals and objectives.
- The case tells a story and focuses on an issue that arouses interest.
  - The case itself is well-written and its readability is appropriate for the age or level of the student.
  - The case should be written in the present tense and deal with an authentic situation not more than five years old.
  - The case includes direct quotes, using the characters' dialog to tell the story.
- The story is compelling and creates empathy with the main characters.
- The case clearly states and illuminates the dilemma without resolving it.
- The case is relevant to the reader.
- The case provokes conflict and forces decision making.
- The case is general enough to be used in several applications.
- The case is short.

Using Case-Based Learning

As stated earlier, Case-Based Learning has long been used by many professions including law, medicine, and business education. The strong belief in effective learning through case methods is supported by several theories, including situated cognition, which Collins (1988) described as "the notion of learning knowledge and skills in contexts that reflect the way they will be used in real life" (p.2); cognitive flexibility or the "ability to spontaneously restructure one's knowledge in many ways, in adaptive response to radically changing situational demands" (Spiro, 1995, cited in Graddy, 2001); and social constructivism, the importance of culture and circumstances in constructing knowledge.

Case methods of teaching require careful preparation by the teacher, but can be used in many different situations, across many domains, as we saw when Dr David and Dr Miller used cases in their classes. And it may take time for a teacher, particularly one who has used more traditional methods, to become comfortable with the process of Case-Based Learning. Even though there are different instructional methods of learning with cases, there

This book is licensed under a Creative Commons Attribution 3.0 License

are a set of guidelines for both teachers' and students' role in case methods based on the description from Shulman (1992) and Sudzina (1999).

Teacher's role

- Establish a friendly environment for open discussion.
- Collect as many different issues, perceptions, and solutions as possible.
- Do not make judgments and interject personal and professional opinions during learners' discussion.
- Ask the "who, what, why, when, and where" questions to engage learners in the activity.
- Use the same cases from more than one perspective to help students understand the multi-dimensionality of real-life situations.
- Summarize key issues.
- Bring in relevant knowledge.

Student's role

- Read cases and describe the issues, perceptions, and possible courses of action.
- Actively participate in the discussion.
- Review literature relevant to the case.
- Continually evaluate the proposed solutions and reflect on what is learned and what needs to be learned.
- Work collaboratively with peers.

Case development

Writing a good case for teaching is neither simple nor quick, but sometimes is preferable to using one of the thousands that are now available. Wasserman (1994) offers some helpful guidance about writing a good case. After first being clear in your own mind about the "big idea" of the story, use the following guidelines:

- Draw the reader into the story during the opening.
- Build the case around an event of consequence.
- Elevate the tension between conflicting points of view.
- Write the story so that readers grow to care.
- Be sure the case is believable.
- End the case on the "horns of the dilemma" .

Designing learning activities

Just writing the story is not finishing the job. Developing discussion and study questions are also important. They help to keep the discussion on track and the focus on the pertinent issues.

Again, Wasserman (1994) offers some helpful guidance:

Sequence questions to provoke developmental analysis

One: Begin with an examination of the events, issues and characters

Two: Move to an analysis of what lies behind the surface of events

Three: Pull the students deeper into the case with generative questions that call for evaluations and judgments, applications, and proposed solutions.

Facilitating student discussion may appear to be simple, but in reality requires the teacher to use great skill in helping students explore and discuss the case in ways that maximize their learning. According to Kenneth Andrews (1954) these abilities include the following:

- Keep the proceedings orderly.
- Ask questions that encourage better thinking and at the same time reveal the relevance of the discussion that has gone on before.
- Weave together the threads of individual contributions into a pattern the class can perceive.
- Use a good sense of timing so that a discussion is not moving fast enough, or is moving too fast for all students to comprehend.
- Exercise control over an essentially "undirected" activity while staying out of the way.

Student assessment in Case-Based Learning

Initially, assessment and performance evaluation in Case-Based Learning may seem daunting. It can be more subjective than some other methods and some teachers may be uncomfortable with that. However, with careful lesson planning and preparation, assessment in Case-Based Learning can be done efficiently, effectively and fairly.

Wasserman (1994) asserts that the learning goals and objectives established at the beginning are key. Once those are clear, the next step is to establish standards and let students know exactly what is expected of them (Wasserman,1994).

Wasserman (1994) devotes several chapters to a detailed approach that includes evaluations of student behavior, generative activities and analysis activities, as summarized in Table 20. Teachers and students alike can find scoring rubrics particularly helpful. These help to paint a picture of successful behavior or work quality, which can remove subjectivity and some of the ambiguity inherent in using this method. When the teacher has thoroughly described the behavior or other criteria, and students have access to that detailed information, assessment becomes not only smoother, but the learning process can be enriched as well.

Table 21: Standards and criteria for student assessment. *Based on Wasserman (1994)*

Impact	Standard	Criteria
Student Behavior	Intellectual Development	Quality of thinking
	Skills	Communication, research, and interpersonal skills
	Attitudes	Personal perspectives, beliefs and values, self-evaluation
Generative Activities	Projects	Evidence of research; analysis of information; organization & layout; creativity and originality
	Written & Oral Presentations	Organization; fresh perspective; use of examples; development of ideas; use of facts to substantiate arguments; quality of thoughts and analysis
	Field Study	Hypothesis; systematic data collection; relevance of conclusions; identification of relationships
	Making	Ability to zero in on significant factors; extensive comparison

	Comparisons	
	Applying Principals	Recognize principles or rules that apply; logical connection of principles and situations
Analytical Activities	Evaluating and Judging	Specific, reasonable, sound and appropriate criteria; clear relationship
	Interpreting	Comprehension of big ideas; analysis focused on important meaning; articulation of importance; discernment of implicit content and making inferences; speculation presented with caution
	Summarizing	Reflection of key ideas; succinct, accurate representation of key issues; articulate and intelligible summaries
	Classifying	Connected attributes; larger purpose; enables new meaning; beyond the obvious
	Decision-Making	Articulated values behind choices; humanly sound values; informed choice using best available data; carefully thought out
	Creating and Inventing	Cognitive risks; truly new, fresh, and imaginative; appropriate to demands of the task
	Designing Investigations	Frame problem for thoughtful investigation; logical, thoughtful investigation plans; data will yield information about the problem; viability; built-in evaluation; clear relationship between plan and problem

Conclusion

Case-Based Learning provides opportunities for richer, deeper exploration of concepts and ideas. Students gain experience with analyzing ideas and applying concepts to solve problems or achieve goals as opposed to acquiring abstract knowledge. Case-Based Learning requires careful preparation and skilled facilitation on the part of teachers. It also requires students to become engaged with one another and their environment and improve a wide range of social and cognitive skills. Assessing student learning and evaluating performance requires much more than the traditional multiple-choice or short-answer tests, but clear learning objectives, performance standards and relevant criteria can enable teachers to use a more holistic approach and to better tailor activities to students' needs.

References

Andrews, K.R. (1954). The role of the instructor in the case method. In McNair, M.P. (Ed.), The case method at the Harvard business school. New York: McGraw-Hill. (p.98, 109)

16. Case-Based Learning

Bolt, B. (1998). Encouraging cognitive growth through case discussions. Journal of Teaching in Physical Education. 18(1), 90-102. In Jones, K.A. (2003). Making the case for the case method in graduate social work education. Journal of Teaching Social Work, 23(1/2) 183-200.

Christensen, C. R. (1987). Teaching and the case method. Boston: Harvard Business School Press. Collins, A. (1988). Cognitive apprenticeship and instructional technology. Technical Report No. 6899. BBN Labs Inc., Cambridge, MA.

David, D.K. (1954). Forward In McNair, M.P. (Ed.), The case method at the Harvard business school. New York: McGraw-Hill (p.viii)

Flynn, A and Klein J, (2001). The influence of discussion groups in a Case-Based Learning environment. Educational Technology Research & Development v49 (3) p. 71-86

Herreid, C.F. (1997) What is a case? Bringing to science education the established teaching tool of law and medicine. Retrieved 12/04/2007 from http://ublib.buffalo.edu/libraries/projects/cases/teaching/whatis.html

Herreid, C.F. (1997). What makes a good case? Some basic rules of good storytelling help teachers generate excitement in class. Retrieved on 11/10/07 from http://ublib.buffalo.edu/libraries/projects/cases/teaching/good-case.html.

Hoag, A., Brickley, D., & Cawley,J. (2001). Media management education and the case method. Journalism and Mass Communication Educator v. 55 (4): p. 49-59.

Lombardi, M.M. (2007). Authentic learning for the 21st century: An overview, Educause learning initiative, Diana G. Oblinger (Ed.). Retrieved on December 4, 2007 from http://www.educause.edu/ir/library/pdf/ELI3009.pdf.

McNair, M.P. (1954). (Ed.)The case method at the Harvard business school. New York: McGraw-Hill.

Merseth, K.K (1991). The case for cases in teacher education. Washington, D. C: American Association Colleges for Higher Education.

Pariseau,S and Kezim,B/ (2007). The effect of using case studies in business statistics. Journal of Education for Business 83(1): 27-31.

Shulman, J. (1992). Case methods in teacher education. New York: Teachers College Press.

Spiro, R., P. Feltovich, M. Jacobson, and R. Coulson (1995). Cognitive flexibility, constructivism, and hypertext: Random assess instruction for advanced knowledge acquisition in ill-structured domains. In Graddy, Duane B.(2001) Cognitive flexibility theory as a pedagogy for web-based course design, Teaching Online in Higher Education Online Conference, Indiana University-Purdue University Fort Wayne.

Stoiber, K.C. (1991) The effects of technical and reflective preservice instruction on pedagogical reasoning and problem solving. Journal of Teacher Education, 42(2), 131-139. In Jones, K.A. (2003). Making the case for the case method in graduate social work education. Journal of Teaching Social Work, 23(1/2) 183-200.

Sudzina, M. R. (1999). Organizing instruction for case-based teaching. In R. F. Mcnergney, E. R. Ducharme, & M. K. Ducharme (Eds.), Educating for democracy: Case-method teaching and learning (pp. 15-28). Mahwah, NJ: Lawrence Erlbaum Associates.

Wasserman, S. (1994). Introduction to case method teaching: A guide to the galaxy. New York: Teachers College Press.

This book is licensed under a Creative Commons Attribution 3.0 License

Yadav, A. Lundeberg, M; DeSchryver, M,; Dirkin, K,; Schiller, N..; Maier, K & Herreid, C. (2007). Teaching science with case studies: a national survey of faculty perceptions of the benefits and challenges of using cases. Journal of College Science Teaching 37(1): 34-38.

Wetley, W. (1989). Discussion method teaching. Change, July/August, 40-49.

Zbylut, M. L. (2007). Case method instruction : 25 minutes of discussion can make a difference Alexandria, Va., U.S. Army Research Institute for the Behavioral and Social Sciences.

This book is licensed under a Creative Commons Attribution 3.0 License

17. Conceptual change

Author: Joan Davis (The University of Georgia, USA)

Introduction to conceptual change, a scenario

Heather, a very bright ninth grader, is asked to explain the mechanisms causing the seasons and the phases of the moon. She has received no formal instruction on these topics in her ninth grade earth science class although these topics were covered in science lessons from earlier grades. In her explanations, Heather demonstrated some misconceptions. For example, she believed that the earth orbits the sun in a bizarre curlicue pattern and that the seasons are caused by the proximity of the earth to the sun at different points along the orbit.

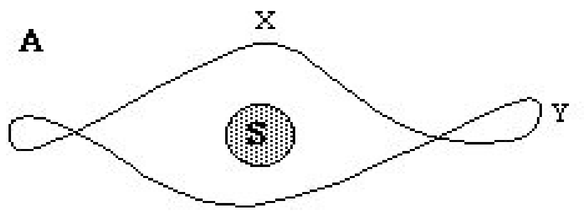

Exhibit 15: Graphic representation of Heather's misconception regarding the 4 seasons. It shows a "curlicue" path around the sun. Read more about her misconception below.

She explains that when the earth is closest to the sun at point X, it is winter in the northern hemisphere because the light rays from the sun hitting the earth are "indirect". Heather says that when the earth is at point Y, it is summer because the light rays hitting the northern hemisphere are "direct". She goes on to explain that direct rays are those that originate from the sun and travel in a straight line to the earth, and that indirect rays are rays that "bounce off" somewhere in space before reaching earth. To explain the phases of the moon, Heather explains that the shadow of the earth on the moon is the cause (Mestre, 1994).

The preceding scenario summarizes events documented in the educational video *A Private Universe* (Pyramid Film & Video, 1988). Heather's explanation of the seasons includes a mixture of correct and incorrect ideas. Her notion of direct and indirect light does explain, in part, why there are seasons, but her belief that the earth travels in a curlicue orbit is incorrect. Like Heather, all students enter classrooms with a wealth of knowledge about their physical, biological, and social worlds. They construct their own ideas about how the world works and explain scientific phenomena in terms of these ideas. These kinds of notions are referred to as naive beliefs, misconceptions, alternative conceptions; such preconceptions seldom match the scientific explanations that are taught in science courses.

To continue with Heather's story...

In her earth science class, Heather receives formal instruction explaining the causes of both the seasons and the phases of the moon. Two weeks after instruction begins, Heather is asked the same questions in another interview.

Instruction has helped Heather overcome several of her misconceptions. For example, Heather has revised her theory about the curlicue path of the earth around the sun. She now explains that the earth follows a nearly circular path around the sun. Furthermore, instruction has also changed Heather's belief that the seasons are caused by the proximity of the earth to the sun; she now knows that the earth is approximately the same distance from the sun throughout the year. She illustrates by drawing a diagram that the seasons are caused by the tilt in the earth's axis, which causes direct and indirect light to fall on the northern and southern hemispheres of the earth.

However, when asked to explain what she means by "direct" and "indirect" light, Heather resorts to her previous beliefs. She says that indirect light is light that bounces off points in space—similar to light reflecting off a mirror—before hitting the earth. Even a strong hint from the interviewer and a display of diagrams illustrating the differences between direct and indirect sunlight does not change Heather's mind; she incorporates the hints into her erroneous conception by saying that the indirect light from the sun, which also causes winter in the northern hemisphere, is light that bounces off some other point on the earth before reaching the northern hemisphere (Mestre, 1994).

After formal instruction, Heather has overcome some of her misconceptions. She no longer believes that the earth travels in a curlicue path around the sun. However, even with direct instruction, Heather still holds onto some of her misconceptions. She still believes that light bounces off points somewhere in space before hitting the earth. Heather seems to be relying on her earth-based observation of light bouncing off a mirror to explain the astronomically-based phenomenon of seasons. In the past, Heather's prior knowledge of the reflection of light may have facilitated learning certain concepts in physical science. In this case, however, the same prior knowledge interferes with learning.

Misconceptions are not prevalent only among school-age children. Even after several years of science instruction, adults maintain incorrect ideas about scientific phenomena. In *A Private Universe*, recent Harvard graduates (including some physics majors) and their professors were also asked to explain the seasons and the phases of the moon. Surprisingly, most displayed the same naive theories as Heather.

Conceptual change: definition

Heather's story illustrates a learning process called conceptual change. Conceptual change is generally defined as learning that changes an existing conception (i.e. belief, idea, or way of thinking). In the preceding scenario, Heather experiences conceptual change in her understanding of the cause of seasons. Although her conception does not come completely into line with the scientific explanation, there is a major shift in her understanding of seasons. This shift or restructuring of existing knowledge and beliefs is what distinguishes conceptual change from other types of learning. Learning for conceptual change is not merely accumulating new facts or learning a new skill. In conceptual change, an existing conception is fundamentally changed or even replaced, and becomes the conceptual framework that students use to solve problems, explain phenomena, and function in their world.

This book is licensed under a Creative Commons Attribution 3.0 License

Conceptual change in education

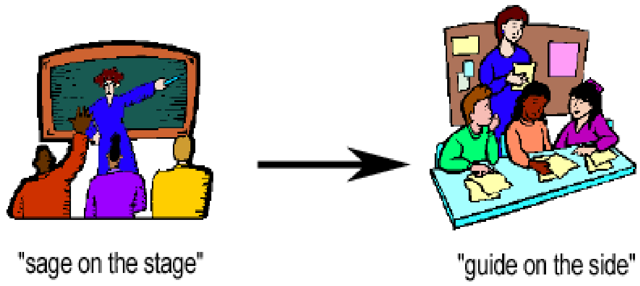

Exhibit 16: Changing conceptions related to teaching. Instead of the "Sage on the Stage," teachers become the "Guide on the Side" in the Constructivist approach.

Teaching for conceptual change primarily involves (1) uncovering students' preconceptions about a particular topic or phenomenon and (2) using various techniques to help students change their conceptual framework. The vast majority of research on conceptual change instruction has been confined to science education, while research in other subject areas has been scarce. However, outside of school, students develop strong (mis)conceptions about a wide range of concepts related to non-scientific domains, such as how the government works, principles of economics, the utility of mathematics, the reasons for the Civil Rights movement, the nature of the writing process, and the purpose of the electoral college. Conceptual change instruction can help students overcome misconceptions and learn difficult concepts in all subject areas.

Conceptual change is not only relevant to teaching in the content areas, but it is also applicable to the professional development of teachers and administrators. For example, as constructivist approaches to teaching gain popularity, the role of the teacher changes. Teachers must learn different instructional strategies, but they must also re-conceptualize or change their conception about the meaning of teaching. This change implies conceiving of teaching as facilitating, rather than managing learning and changing roles from the "sage on the stage" to a "guide on the side".

Likewise, a shift has occurred for school media specialists (formerly known as librarians). Their role in the school has changed from being "keeper of the books" to "collaborative planner", working in partnership with teachers, school administrators, and the community (Tallman & Tastad, 1998).

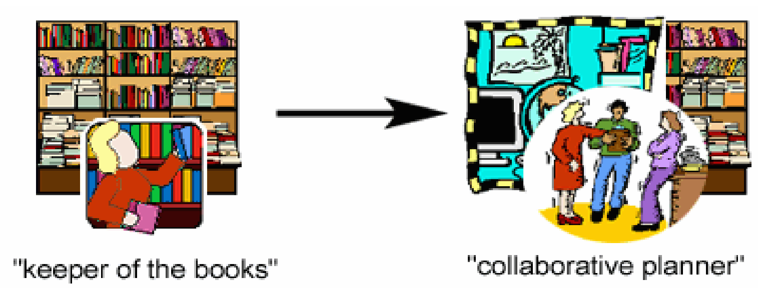

Exhibit 17: Changing conceptions related to teaching. Instead of the "Sage on the Stage," teachers become the "Guide on the Side" in the Constructivist approach.

Conceptual change in business & industry

Conceptual change is of particular relevance in business and professional communities. Companies often restructure, changing their business strategies and processes to remain competitive and responsive to the needs of their customers. The advancement of technology has also initiated a trend in the restructuring of industrialization. Lansky states that technological innovation, globalization, and industrial relocation are leaving only two general types of paid work in advanced industrialized countries: technical jobs, which center on problem-solving, and interpersonal jobs, which require a "human touch" (p. 213).

Lansky (2000) observes that the contemporary work force can be divided into three categories. The first is "highly skilled and highly paid technicians [and] providers of interpersonal services". The second group consists of "lower paid technicians and lower paid providers of interpersonal services". The third group comprises workers "without the education, skills or connections needed to become technicians or interpersonal workers" (Lansky, 2000). Due to this trend toward "upskilling", the first and second groups benefit from the changes in industry; the third group faces the possibility of unemployment.

Conceptual change is not limited to the company level; it can also occur at the level of an entire industry. Hospitals are now known as "medical centers". Those who receive care in such facilities are now termed "clients" rather than "patients". Banks have been replaced by "financial centers". Employees of organizations are now considered "associates". Companies are beginning to view themselves as "learning organizations" instead of "corporations". These are not simply changes in terminology; the changes signify conceptual change.

Restructuring in companies or entire industries often require employees to re-conceptualize their roles and responsibilities and change the way they perform their jobs. Teaching new job skills and new procedures to employees is relatively easy to accomplish; bringing about a conceptual change in how these workers view their organizational roles is a far more difficult undertaking. One such example is the shift in scope of practice for health psychologists. The role of these practitioners has shifted away from that of "peripheral case consultants" who simply provide psychological interventions to "primary care case managers", who actively manage the care of their clients (James & Folen, 1999). In reflecting on training health psychologists as primary care case managers, James and Folen emphasize "that the most arduous task in bringing about this shift was neither the training nor the demanding workload. Rather, it was bringing about a conceptual shift in traditionally trained psychology interns, whose training resists going beyond traditional psychological interventions" (p. 352).

Theoretical origins: initial theory of conceptual change

In the early 1980s, a group of science education researchers and science philosophers at Cornell University developed a theory of conceptual change (Posner, Strike, Hewson, & Gertzog, 1982). This theory is based on Piaget's notions of disequilibration and accommodation as well as Thomas Kuhn's description of scientific revolution (Kuhn, 1970). According to Kuhn, scientific revolutions have followed a consistent pattern. First, a dominant scientific paradigm, a basic way of perceiving, thinking, valuing, and doing (Harmon, 1970), fell into a "state of crisis" by failing to provide solutions or explanations to deal with significant problems identified by the scientific community. Second, an alternative paradigm with the potential to solve these problems had to be available. The existence of these two conditions increased the probability of a "paradigm shift", or universal adoption of a new framework for thinking.

This book is licensed under a Creative Commons Attribution 3.0 License

A revisionist theory of conceptual change: a holistic view

Researchers have found that learners' preconceptions can be extremely resilient and resistant to change, as demonstrated in Heather's story from *A Private Universe*. A major criticism of the original conceptual change theory is that it presents an overly rational approach to student learning—an approach that emphasizes and assumes logical and rational thinking (Pintrich, Marx, & Boyle, 1993). Pintrich et al. refer to this approach as "cold conceptual change", because it ignores the affective (e.g. motivation, values, interests) and social components of learning. In particular, the notion of conceptual ecology was criticized because it focuses solely on the learner's cognition and not on the learner as a whole. Furthermore, it does not consider other participants (i.e. the teacher and other students) in the learning environment and how these participants influence the learner's conceptual ecology, thus influencing conceptual change. Strike and Posner (1992) also recognized similar deficiencies in their original conceptual change theory and suggested that affective and social issues affect conceptual change.

Social constructivist and cognitive apprenticeship perspectives have also influenced conceptual change theory (Hewson, Beeth, & Thorley, 1998). These views on learning encourage discussion among students and instructor as a means of promoting conceptual change. Thus, conceptual change is no longer viewed as being influenced solely by cognitive factors. Affective, social, and contextual factors also contribute to conceptual change. All of these factors must be considered in teaching or designing learning environments that foster conceptual change (Duit, 1999).

Teaching for conceptual change

As mentioned above, learner preconceptions are resistant to change. Because learners have relied on these existing notions to understand and function in their world, they may not easily discard their ideas and adopt a new way of thinking. Thus, simply presenting a new concept or telling the learners that their views are inaccurate will not result in conceptual change. Teaching for conceptual change requires a constructivist approach in which learners take an active role in reorganizing their knowledge. Cognitive conflict strategies, derived from a Piagetian constructivist view of learning, are effective tools in teaching for conceptual change (Duit, 1999). These strategies involve creating situations where learners' existing conceptions about particular phenomena or topics are made explicit and then directly challenged in order to create a state of cognitive conflict or disequilibrium. Cognitive conflict strategies are aligned with Posner et al.'s theory of conceptual change in that their common goal is to create the four conditions necessary for conceptual change. That is, learners must become dissatisfied with their current conceptions and accept an alternative notion as intelligible, plausible, and fruitful.

Conceptual change instructional model

Cognitive conflict has been used as the basis for developing a number of models and strategies for teaching for conceptual change. Among these are the Generative Learning Model (Cosgrove & Osborne, 1985), the Ideational Confrontation Model (Champagne, Gunstone, & Klopfer, 1985), and an instructional strategy using anomalous data (Chinn & Brewer, 1993). Although these models suggest different methods and techniques, they share a structure similar to the conceptual change teaching strategy proposed by Nussbaum and Novick (1982):

- Reveal student preconceptions.
- Discuss and evaluate preconceptions.
- Create conceptual conflict with those preconceptions.
- Encourage and guide conceptual restructuring.

Reveal student preconceptions

A basic assumption in teaching for conceptual change is "the key constructivist idea that construction of new conceptions (learning) is possible only on the basis of already existing conceptions" (Duit, 1999, p. 275). Even though existing knowledge (be it correct or incorrect) allows us to make our way through the world, we are not necessarily conscious of it. Thus, the first and most significant step in teaching for conceptual change is to make students aware of their own ideas about the topic or phenomenon under study.

Present the exposing event

To elicit students conceptions, instruction begins with an exposing event. The exposing event is any situation that requires students to use their existing conceptions to interpret that event. Exposing events may be of two types: a situation for which outcome is not known or one in which the outcome is known (Chinn & Brewer, 1993). In the "unknown" case, the teacher asks students to predict the outcome and explain the basis for their prediction. In the "known" case, students make no predictions; however, they must provide an explanation of the event. Heather's teacher used a "known" exposing event to reveal student preconceptions. She simply asked the students, "What causes the seasons of the Earth?" However, the teacher could have employed an "unknown" exposing event by presenting a physical model of the solar system with the earth positioned at some specific point relative to the sun. She then would ask the student to predict which season(s) the northern and southern hemispheres would be experiencing at the time.

Ask students to describe or represent their conceptions

Students can represent their ideas in many ways. They can write descriptions, draw illustrations, create physical models, draw concept maps, design web pages, or create any combination of these to present evidence of their understanding of a particular concept. If computers and the appropriate software are available, students can develop presentations (using PowerPoint or other software), create models or simulations, or construct concept maps. Regardless of the method, the goal of this step is to help students recognize and begin to clarify their own ideas and understandings. Once students' conceptions are made explicit, teachers can use them as the basis for further instruction.

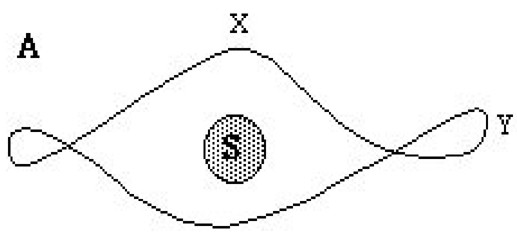

Exhibit 18: Heather chose to draw a picture that explains the seasons.

Discuss and evaluate preconceptions

The goal of this step is to have students clarify and revise their original conceptions through group and whole-class discussions. If this is the teacher's first conceptual change learning activity, it is wise to begin with the latter; such discussions allow the teacher to model the evaluation process before students evaluate each other's ideas in smaller groups. To begin, the teacher asks various students to describe their representations (conceptions). After all conceptions are presented, the teacher leads the class in evaluating each for its intelligibility, plausibility, and fruitfulness in explaining the exposing event. Nussbaum and Novick (1982) suggest that the teacher accept all representations and refrain from value judgments. The teacher should also refer to the representations by student name, e.g. "Who thinks Heather's drawing is right?"

After the whole-class discussion, students with differing conceptions work in pairs or groups to evaluate each other's ideas. Each group selects one conception (or a different conception modified through evaluation), provides a rationale for the selection, and presents that rationale to the whole class. Student motivation can be increased by allowing the students to vote for the conception that they think best explains the exposing event.

In the whole-class discussion in *A Private Universe*, Heather learns that her curlicue orbit theory was incorrect. Most students represent the earth's path around the sun as circular because that is how it appears on the solar system model the teacher was holding.

Heather works with Roger and Susan in the group discussion in the video. Unlike the other representations, Roger's depicts the earth's path around the sun as oval in shape. He says that the oval path explains the seasons: "When the earth is really close to the sun, it's hot. When it's far away, it's cold. If it's a circle, then the temperature is always the same, 'cause the earth is the same distance from the sun." Susan adds, "If it's oval, it'll be hot twice a year and cold twice a year!"

Create conceptual conflict

As students become aware of their own conceptions through presentation to others and by evaluation of those of their peers, students become dissatisfied with their own ideas; conceptual conflict begins to build. By recognizing the inadequacy of their conceptions, students become more open to changing them.

To create greater conflict, the teacher creates a discrepant event. The discrepant event is a phenomenon or situation that cannot be explained by the students' current conceptions but can be explained by the concept that is the topic of instruction. At this point, if no student has offered the "correct" conception, then the teacher may suggest it as one given by a student in a previous class. If the teacher does not know the range of student (mis)conceptions about a topic or phenomenon before the conceptual change activities begin, it may not be possible to plan a discrepant event in advance. In such cases, the teacher should ask the students to suggest a test or method to determine which of the students' (and possibly "planted") conceptions best explains the "exposing event". If the subject is science, the students may suggest some type of experiment. The teacher could also create a discrepant event by presenting anomalous data evidence that contradicts the students' current conceptions (Chinn & Brewer, 1993).

Encourage cognitive accommodation

Students should be given time to reflect on and reconcile differences between their conceptions and the target theory. The teacher should incorporate reflective activities into lessons to promote cognitive accommodation or restructuring of the student preconceptions.

Learning environment

A cooperative learning environment is necessary for successful conceptual change instruction. There must be opportunities for discussion; students must feel safe in sharing their viewpoints as they consider and evaluate other perspectives (Bruning, Schraw, & Ronning, 1999; Scott, Asoko, & Driver, 1991). The "safety factor" is especially important when the teaching employs the cognitive conflict strategy presented above. One research study (Dreyfus, A., Jungwirth, E., & Eliovitch, R., 1990) found that low achieving students experienced a loss of self-confidence, viewing the conflict as another failure.

For successful implementation of the conceptual change instructional strategy, the teacher and students should have some experience with constructivist learning and cooperative learning groups. Students who are accustomed to a transmission style of teaching (i.e. direct instruction) may be less motivated to participate in discussion-based activities (Scott, Asoko, & Driver, 1991). The teacher must be adept in managing class groups and able to assume a facilitative role.

Implications for teaching and learning

Challenges and benefits

Teaching for conceptual change is not an easy process; it is more time-consuming than traditional, rote teaching methods. It requires a supportive classroom environment in which students feel confident in expressing and discussing their ideas. Conceptual change instruction also requires that the teacher possess well-developed facilitation skills and a thorough understanding of the topic or phenomenon in question.

Conceptual change learning results in better conceptual understanding by the students. Consistent evaluation and clarification of conceptions helps students develop metaconceptual awareness; that is, they come to understand how they develop their beliefs (Vosniadou, 1994).

Although a specific instructional approach has been presented here, other constructivist teaching approaches may also promote conceptual change learning. The unique features of conceptual change instruction are:

- students make their conceptions explicit so that they become aware of their own ideas and thinking, and
- that students are constantly engaged in evaluating and revising their conceptions.

The goal of teaching for conceptual change is for students to adopt more fruitful conceptions while discarding the misconceptions they bring to the learning environment. Students are more likely to rid themselves of conceptions that they have evaluated than those that they have not examined at all.

References

Bruning, R. H., Schraw, G. J., & Ronning, R. R. (1999). Cognitive Psychology and Instruction. Upper Saddle River, NJ: Prentice-Hall.

Champagne, A. B., Gunstone, R. F., & Klopfer, L. E. (1985). Effecting changes in cognitive structures among physics students. In L. West & A. Pines (Eds.), Cognitive Structure and Conceptual Change (pp. 163-188). Orlando, FL: Academic Press.

Chinn, C. A., & Brewer, W. F. (1993). The role of anomalous data in knowledge acquisition: A theoretical framework and implications for science instruction. Review of Educational Research, 63(1), 1-49.

Cosgrove, M., & Osborne, R. (1985). Lesson frameworks for changing children's ideas. In R. Osborne & F. P. Freyberg (Eds.), Learning in Science: The Implications of Children's Science (pp. 101-111). Portsmouth, NH: Heinemann.

Duit, R. (1999). Conceptual change approaches in science education. In W. Schnotz, S. Vosniadou, & M. Carretero (Eds.), New Perspectives on Conceptual Change (pp. 263-282). Oxford: Pergamon.

Harmon, W. (1970). An Incomplete Guide to the Future. New York: W. W. Norton.

This book is licensed under a Creative Commons Attribution 3.0 License

Hewson, P. W., Beeth, M. E., & Thorley, N. R. (1998). Teaching for conceptual change. In K. G. Tobin & B. J. Fraser (Eds.), International Handbook of Science Education (pp. 199-218). Dordrecht, Netherlands: Kluwer Academic Publishers.

James, L. C., & Folen, R. A. (1999). A paradigm shift in the scope of practice for health psychologists: Training health psychologists to be primary care case managers. Professional Psychology: Research and Practice, 30(4), 352-356.

Kuhn, T. (1970). The Structure of Scientific Revolutions. Chicago: University of Chicago Press.

Lansky, M. (2000). The changing nature of work/Restructuring the employment relationship/A theory of employment systems: Micro-foundations of societal diversity/Employee representation. International Labor Review, 139(2), 213-227.

Mestre, J. P. (1994). Cognitive aspects of learning and teaching science. In S. J. Fitzsimmons & L. C. Kerpelman (Eds.), Teacher Enhancement for Elementary and Secondary Science and Mathematics: Status, Issues, and Problems (pp. 3-1 - 3-53). Washington, DC: National Science Foundation (NSF 94-80).

Nussbaum, J., & Novick, N. (1982). Alternative frameworks, conceptual conflict, and accommodation: Toward a principled teaching strategy. Instructional Science, 11, 183-200.

Pintrich, P. R., Marx, R. W., & Boyle, R. A. (1993). Beyond cold conceptual change: The role of motivational beliefs and classroom contextual factors in the process of conceptual change. Review of Educationa Research, 6, 167-199.

Posner, G. J., Strike, K. A., Hewson, P. W., & Gertzog, W. A. (1982). Accommodation of a scientific conception: Toward a theory of conceptual change. Science Education, 66, 211-227.

Pyramid Film & Video. (1988). A private universe. An insightful lesson on how we learn [Film]. Santa Monica, CA.

Scott, P., Asoko, H., & Driver, R. (1992). Teaching for conceptual change: A review of strategies. In R. Duit, F. Goldberg & H. Niedderer (Eds.), Research in Physics Learning: Theoretical Issues and Empirical Studies (pp. 310-329). Kiel, Germany: Institute for Science Education at the University of Kiel.

Strike, K. A., & Posner, G. J. (1992). A revisionist theory of conceptual change. In R. Duschl & R. Hamilton (Eds.), Philosophy of Science, Cognitive Psychology, and Educational Theory and Practice (pp. 147-176). Albany, NY:SUNY.

Tallman, J., & Tastad, S. (1998). Library power: Vehicle for change. Knowledge Quest, 26(2), 17-23.

Additional resources

This section lists several types of computer tools and web based instructional materials that can be used in teaching for conceptual change.

Teaching for conceptual change in history

The website Constructing History: How Historians See the Light illustrates the application of conceptual change to the domain of history (most of the other examples are limited to science topics). This site has two views. One is for the students to learn about history following a conceptual change model. The other is for the teacher to learn how to implement the conceptual change lesson. Click the lesson title to view it.

Concept mapping tools

These tools are used to create concept maps. A concept map is a diagram consisting of boxes or graphics that represent concepts and labeled lines that represent relationships between the concepts. Students can create concept maps to present their conceptions about a particular topic at the beginning and throughout the instructional sequence. Concept maps allow students (and the instructor) to see how their conceptions change over time.

Two recommended concept mapping tools are Inspiration and IHMC Concept Mapping Software or C-Map. Concept maps created in C-Map can be shared across a network. C-Map is a free download, and Inspiration can be downloaded for a free 30-day trial. Sample concept maps and background information about concept mapping are available at the C-Map web site.

Simulations

Simulations can be used to present exposing or discrepant events to individual learners or in a group setting.

Multimedia Educational Resource for Learning and Online Teaching (MERLOT) (http://www.merlot.org) contains simulations for the domains of business, physics, genetics, and medical education among others. Most of the simulations are designed for adult learners, but a few are targeted for K-12 education.

Interactive Physics and Geometer's Sketchpad are two popular simulation-construction tools.

WISE (Web-based Integrated Science Environment, (http://wise.berkeley.edu) is a free Web-based learning environment where students examine real-world evidence and analyze current scientific controversies. The curriculum projects are designed to meet standards for grades 5-12. Students can take notes, discuss theories, and organize their arguments using the Web browser. Teachers may explore new projects and grade students' work on the Web.

This book is licensed under a [Creative Commons Attribution 3.0 License]

18. Transformative learning

Contributors: Michael Tsao, Kazuya Takahashi, Jamal Olusesi, and Shikha Jain (The University of Georgia, USA)

Scenario

Romanesque Architectural Design is an architecture company that specializes in 12th century architecture. The company was started 20 years ago by three professional architects in their late 50s. The company is a middle-tier firm staffed mostly by retired consultants who are familiar with the architectural time period that the company caters to and younger full-time workers who strictly adhere to traditional architectural design methods. In order to establish more profitable contracts, the company's employees need to be able to use a new age architectural design software so that they have a better chance of having their designs accepted for more lucrative contracts.

Most of the staff use traditional methods for drafting their designs directly onto the drawing board. Most of them retired from major architectural firms because they felt the firms were becoming too technically oriented. The company hired a consultant to give a training seminar on AutoCAD, one of the most popular architectural design software tools on the market. During the first session, as the consultant introduced himself, he could see expressions of frustration every time he mentioned AutoCAD. The first task the consultant had the trainees do was fill out a questionnaire. The reasoning for this task was to gather information on the trainees' frame of mind when it came to learning this tool. The questionnaires came back and revealed that every one of the older staff members felt incapable of learning software as difficult as AutoCAD; the younger staff members felt that this software would take away from the historical nature of the architectural time frame in which they dealt. AutoCAD is robust enough to handle their specific architectural designs. However, the young staff members simply did not like the idea of using architectural software in their design methods.

During the next session, the instructor explained to the employees how he has had many trainees in the past who have felt just as they do now. He described how his past trainees' comfort level rose dramatically after a minimal time of exposure to AutoCAD. To help reiterate this, the instructor displayed examples of his past trainees' architectural designs created using AutoCAD. Then the instructor showed that the tools in AutoCAD mimicked the normal tools that they use and tried to establish that the learning curve for AutoCAD is not as great as they thought. He also tried to establish how using AutoCAD would eliminate certain limitations that they encountered when using traditional methods, explaining how AutoCAD would help them create a more precise and robust design. Then he discussed how the click-and-drag components made AutoCAD as easy as using a word processor in some aspects. He then had the trainees work on simple examples using AutoCAD as a practice assignment. He suggested that they should ask one another for constructive feedback or to report to him regarding difficulties and obstacles they faced while using the software.

In the next session, some trainees stated that they had an easier time using the software than expected and that they saw the potential benefits that AutoCAD could have for future projects. The instructor started an open debate among trainees who felt they were becoming more comfortable using AutoCAD and the rest of the class, about how and why they have this assumption. As the trainees worked on more simple examples, the consultant could see their faces light up as they realized how easy it is to use AutoCAD. To increase their comfort level, the instructor told them to create an original design using traditional methods as an outline and transfer their design onto AutoCAD. This was an attempt to help the trainees blur the lines between their old habits and new technical capabilities. After the post-questionnaire was turned in, the results showed what the instructor expected—trainees stated that they saw AutoCAD as a valuable tool they could use while maintaining the historical nature of their architectural design.

Definition

Transformative learning is learning to purposely question one's own assumptions, beliefs, feelings, and perspectives in order to grow or mature personally and intellectually (Herod, 2002). Taylor (1998) suggests that the process of transformation occurs according to the following phases, as suggested by Mezirow:

- a disorienting dilemma
- self-examination with feelings of guilt or shame
- a critical assessment of assumption
- recognition that one's discontent and process of transformation are shared and that others have negotiated a similar change
- exploration of options for new roles, relationships, and actions;
- planning a course of action
- acquisition of knowledge and skills for implementing one's plans;
- provisionally trying out new roles
- building of competence and self-confidence in new roles and relationships
- a reintegration of new assumption into one's life on the basis of conditions dictated by one's new perspective

Scenario breakdown of the Mezirow phases of transformation

The learner must first face a disorienting dilemma. A disorienting dilemma is triggered by a life crisis or major life transition, although it may also result from an accumulation of transformations in meaning schemes over a period of time (Mezirow, 1995, p. 50). Mezirow (1997) points out that transformative learning theory always begins with a disorienting dilemma. This kind of method can be used to identify the sources of their assumptions. Identifying the assumptions is one of the primary steps of transformative learning. In the scenario, the instructor gave the questionnaire to the trainees so that they could go through the process of self-examination. The instructor could sense the frustration of the veteran architects and young full-time workers in having to learn how to use design software (AutoCAD). A learner must become aware of their assumptions and make them explicit. The questionnaire the instructor gave allowed the trainees to assess and clarify their assumptions. Some trainees may have written their personal story of why they fear new technologies. The instructor stated to the learners how he had had many trainees in the past who had felt just as they did. This strategy helped learners recognize the process of transformation is shared amongst themselves and that others have negotiated similar change.

After the instructor shared learning experiences with the trainees they moved onto hands-on activities. The instructor showed examples that the trainees could follow and then gave them a simple practice assignment. This task allowed the trainees to explore options for new roles. Then the instructor showed that the tools in AutoCAD mimicked the tools that they were used to. This is the instructor's chosen course of action to aid the trainees'

This book is licensed under a Creative Commons Attribution 3.0 License

acquisition of knowledge and skills. The instructor asked the learners to create an original design using traditional methods as an outline and transfer their design onto AutoCAD to increase their comfort level. This was an attempt to help the trainees provisionally try out new roles and build competence and self-confidence in these roles. At the end of the course, the instructor used the post-questionnaire to help the learners reintegrate their new assumptions.

Meaning schemes

Meaning schemes are frames of reference that are based on the totality of an individual's experiences over a lifetime of cultural assimilation. Meaning schemes consist of specific beliefs, value judgments, attitudes, and feelings. When their meaning schemes interpret and assimilate a new experience, it may either just reinforce the perspective or gradually stretch its boundaries. As a result, a novel experience is either flatly rejected or the experience itself is transformed in order to fit into existing meaning schemes. People may change their meaning schemes as they add to or assimilate new information to their prior scheme and, in fact, this kind of transformation may commonly occur through learning. In the scenario, the instructor told the trainees to create an original design using traditional methods as an outline and to transfer their design into AutoCAD. This process is very important to bridge their prior meaning schemes and new meaning schemes.

Meaning perspectives

Transformation of meaning perspectives is more rare than the transformation of meaning schemes. Transformative learning does not happen by itself; it takes place when learners face a radically different and incongruent situation or information that cannot be assimilated into their meaning perspective. Learners' experiences significantly affect their perspectives, an interpretation of experience, which is a part of transformative learning. Meaning perspective is "a collection of meaning schemes made up of higher-order schemata, theories, propositions, beliefs, prototypes, goal orientations, and evaluations" (Mezirow, 1990, p. 2) and "a way of seeing the world, that is, the perspective or view through which meaning emerges from experience" (Cranton, 1994, p. 42). For instance, in the scenario, the learners had a limited understanding of AutoCAD (meaning schemes), and they felt that the only valuable way to work in architectural design was through manual labor and hard work (meaning perspective).

Interestingly, words like assimilation and ideas like "incongruent situation" align quite well with Piaget's Constructivism ideas of assimilation and disequilibration. Further, Mezirow's transformation of a meaning perspective aligns quite well with Piaget's accommodation.

The transformative learning theory has held three common themes from the beginning of its proposal in 1978 by Jack Mezirow, which are centrality of experience, critical reflection, and rational discourse (Taylor, 1998).

Centrality of experience

Centrality of experience is the starting point. People's assumptions are generally constructed by their interpretation of experience. The instructor in the scenario used the questionnaires to check the learners' frame of mind (centrality of experience) that is constructed from their experiences.

Critical reflection

Critical reflection attempts to deconstruct the learner's prior assumptions such as beliefs, value systems, attitudes, and social emotion in a rational way. According to Burbules and Berk (1999), critical thinking is best suited for recognizing faulty arguments, assumptions lacking evidence, and obscure concepts.

In the scenario, the learners are retired consultants who are familiar with the architectural time period which the company specializes in and younger full-time workers who strictly follow traditional architectural design methods. Most of them retired because they feared the firms were becoming too technically oriented. The younger workers simply did not like the idea of using architectural software in their design methods. This anti-technology feeling, therefore, forms their assumption and prevents them from accepting the use of AutoCAD. The questionnaires that the instructor used served not only to examine the learners' meaning perspectives, but also to help the learners critically reflect on their experiences.

Mezirow points out that learners must engage in critical reflection on their experiences, which could subsequently lead to transformation of meaning perspective. Thus a perspective transformation is the goal. It is "the process of becoming critically aware of how and why our assumptions have come to constrain the way we perceive, understand, and feel about our world". This critical reflection of assumptions then changes "these structures of habitual expectation and makes possible a more inclusive, discriminating, and integrating perspective" and makes learners choose or otherwise act upon these new understandings (Mezirow, 1991, p. 167).

Transformative learning theory changes learner's epistemic, sociolinguistic, and psychological perspectives and transforms the learners themselves. Adult learners are usually tenacious in holding on to their assumptions, and even if they overcome the initial personal and social resistance to questioning their assumptions, their critical reflection does not become any less troubling (Cranton, 1994, p. 18). In the scenario described, the results of the questionnaire show how the learners feel frustrated and incapable of learning the AutoCAD software. This disquieting emotion is felt when learners engage in the process of freeing themselves from assumptions that limit their opinions or choice of perspectives.

Transformative learning is based on Habermas's theory of communicative action: the concepts of instrumental, communicative, and emancipatory knowledge. The instrumental domain is where learners form a hypothesis about their perceptions. The communicative domain mainly focuses on learners' interaction to make meaning through understanding others. The emancipatory domain is the place where learners can free themselves from any restrictions and actively question their assumptions. Cranton concisely listed three types of reflection that involves movement toward the emancipatory domain: content, process, and premise reflection (Cranton, 1994, p. 48). Content reflection is an examination of the content or description of a problem; process reflection involves checking on the problem; premise reflection happens when the problem itself is questioned. The importance of the premise reflection is repeatedly stressed throughout Mezirow's theory, and he concludes that "premise reflection is the dynamic by which our belief systems - meaning perspective - become transformed" (Mezirow, 1991, p. 111).

Table 22: Types of reflection and meaning perspectives (Cranton, 1994, p. 51).

Reflection	**Perspective**		
	Psychological	Sociolinguistic	Epistemic
Content	What do I believe about myself?	What are the social norms?	What knowledge do I have?

This book is licensed under a Creative Commons Attribution 3.0 License

Process	How have I come to have this perspective of myself?	How have these social norms been influential?	How did I obtain this knowledge?
Premise	Why should I question this perception?	Why are these norms important?	Why do I need/not need this knowledge?

Table 23: Scenario chart, types of feflection and meaning perspectives (Cranton, 1994, p. 51).

Reflection	**Perspective**		
	Psychological	Sociolinguistic	Epistemic
Content	I am against new forms of technology-oriented methods in my work place, for example AutoCAD.	My colleagues don't believe the new technologies such as AutoCAD is vital or necessary to our work environment.	Knowledge of traditional architectural design methods and strategies (prior knowledge).
Process	I am accustomed to using traditional method such as drafting my designs on drawing boards. Therefore, I'm not comfortable using other technology-oriented methods.	Because it helps to maintain the traditional methods of architectural design in our firm.	I have obtained a degree in architecture from an accredited university and I have several years of work experience.
Premise	My experience and new knowledge gained from the training seminar has helped changed my meaning perspective.	Because traditional design methods are shared by all current staff members.	New technology-oriented design methods are available and intended to make my faster, cheaper, and easier.

Table 24: Types of reflection and learning (Cranton, 1994, p. 51).

Reflection	**Learning**		
	Instrumental	Communicative	Emancipatory
Content	What is the causal relationship event?	What do others say about this issue?	What are my assumptions?
Process	How did I empirically validate the causal relationship?	How did I obtain consensual validation on this issue?	How do I know my assumptions are valid?
Premise	Why is this knowledge important to me?	Why should I believe in this conclusion?	Why should I revise/not revise my perspective?

Meaning making

Meaning making refers to the transformation of learners' assumptions and offers a new interpretation of their prior assumptions. This process emphasizes that transformative learning is not a goal of learning, but rather a process of helping learners become more autonomous in their learning. Thus, transformative learning is, in a sense, the deconstruction of learners' prior assumptions through critical reflection as well as the reconstruction of their assumptions through meaning making.

Rational discourse

"Rational discourse is a catalyst for transformation, as it induced the various participants to explore the depth and meaning of their various world-views, and articulate those ideas to their instructor and classmates" (Mezirow, 1991). For example, the instructor started an open debate between trainees who felt they were becoming more comfortable using AutoCAD and the rest of the class about how and why they have their assumptions. This debate was a good example of rational discourse and an essential factor for changing meaning perspective because they are engaged in sharing their own feelings on their current view of AutoCAD.

Conclusion

The most important aspect of transformative learning theory is that one has to establish and clarify the learners' prior assumptions. Once this is done, strategies can be developed to help transform these assumptions. When learners go into critical reflection they have sufficient evidence to accept the validity of the new concept and to change their meaning perspectives or schemes. Through this developmental process, they become able to free themselves from their previous assumptions and become critical thinkers as well as autonomous learners.

References

Burbules, N. C., & Berk, R. (1999) Critical Thinking and Critical Pedagogy: Relations, Differences, and Limits. In Thomas S. Popkewitz and Lynn Fendler, eds.: Critical Theories in Education. New York: Routledge. Retrieved October 2, 2006 from http://faculty.ed.uiuc.edu/burbules/papers/critical.html

Cranton, P. (1994). Understanding and Promoting Transformative Learning: A Guide for Educators of Adults. San Francisco: Jossey-Bass.

Habermas, J. (1984). The Theory of Communicative Action: Reason and the Rationalization of Society. Trans. Thomas McCarthy (Vol. 1). Boston: Beacon.

Herod, L. (2002). Adult learning from theory to practice. Retrieved November 6, 2006, from http://www.nald.ca/adultlearningcourse/glossary.htm#t

Mezirow, J. (1991). Transformative Dimensions of Adult Learning. San Francisco: Jossey-Bass.

Mezirow. J. (1995). Transformation Theory of Adult Learning. In Welton M. R. (Eds.), In Defense of the Lifeworld (pp. 39-70). New York: SUNY Press.

Mezirow, J. (1997). Transformative Learning: Theory to Practice: New Directions for Adult and Continuing Education (Vol. 74, p. 5-12).

Taylor, E. (1998). The theory and practice of transformative learning: A critical review. Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education. (ERIC Document Reproduction Service No. 423 422).

This book is licensed under a Creative Commons Attribution 3.0 License

19. Cognitive apprenticeship

Authors: Jennifer Brill, Beaumie Kim, and Chad Galloway (The University of Georgia, USA)

Editor: Damon Anderson

A tale of two classrooms

The fourth grade at Cedars Elementary, Cedarville and the US Great Depression

Exhibit 19: Traditional school house sitting on a hill.

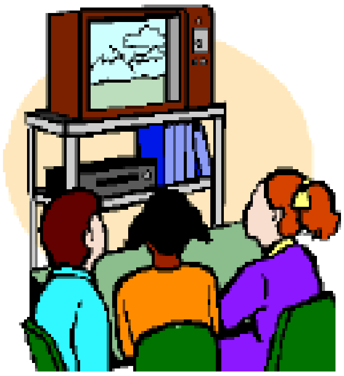

Exhibit 20: Three children watching a video.

The fourth grade at Cedars Elementary is ready to learn about the Great Depression in the US, US President Franklin D. Roosevelt, and the New Deal. Ms Beauchamp and Ms Reed, both fourth-grade teachers, have reviewed the curriculum benchmarks and prepared their lessons for the coming weeks. They have already led their classes through three days of the unit work. What follows is a "virtual visit" to each teacher's classroom.

Ms Beauchamp's fourth grade class

Ms Beauchamp assigned Chapter 4 of the fourth grade history textbook as homework over the previous weekend. Most of the students read the chapter and wrote answers to the end-of-chapter review questions. A few students copied the answers out of the back of the book. A handful simply failed to complete the assignment.

On Monday, the class reviewed the answers to the textbook questions as a group. Ms Beauchamp led the review by asking for a volunteer for each question. Each volunteer read the question and answer aloud. Ms Beauchamp provided feedback on the correctness of the answer so that the entire class could check their work. Next, Ms Beauchamp showed the children a 20-minute documentary about life during the Depression, how it began, and the role that FDR and the New Deal played in bringing the country out of economic misfortune.

On Tuesday, Ms Beauchamp felt it was important to reinforce the key concepts presented thus far in the textbook reading and the movie. So, she conducted a review. She selected a few blank transparencies and markers, set up the overhead projector at the front of the room, and dimmed the lights.

With the children seated at their desks, Ms Beauchamp asked the group some questions: "What was the Great Depression?" "When did it occur and how long did it last?" "Who promised to bring America out of the depression?" "What was his 'New Deal' for the American people?" Ms Beauchamp called on certain students to answer her questions. As they answered, she ignored incorrect replies and wrote the correct responses on a blank transparency. As she wrote, she emphasized key words in a clear and authoritative voice: "Franklin Delano Roosevelt." "1929." "New jobs."

As Ms Beauchamp conducted the 20-minute review, some students flipped through their textbooks, and a few took notes; most did not raise their hands and were not asked to participate; some talked among themselves, while others looked out the window; several doodled in their books or fidgeted in their seats. Ms Beauchamp had to interrupt her lesson several times to discipline one student whose desk had already been moved away from the rest of the class. Joe sat in the far right hand corner of the room by the windows. His desk had been there for three weeks as a result of his disruptive behavior during class.

On Wednesday, Ms Beauchamp distributed a play about life during the Great Depression, assigning roles to various students. Over the next week or so, Ms Beauchamp would have the students rehearse and perform the play in an attempt to help the class become involved with the material. Finally, the class would be ready to take the ten-question (five multiple choice and five short answer questions), end-of-unit quiz.

Questions to consider

- How would you describe the activity in Ms Beauchamp's classroom? What teaching strategies did you witness? What learning strategies did you observe? What is your reaction to this classroom? To the quality of learning taking place? What do you feel was effective? Ineffective?

Ms Reed's fourth grade class

On Monday, Ms Reed introduced three visitors to the class: Mr Clancy, Ms Moore, and Ms Abrams. Ms Reed explained that the visitors would be helping the class over the next several weeks to look at a period in American history known as the Great Depression. The class' goal would be to understand with help from the visitors what it was like to live during this very difficult time in the nation's history and to explore what messages the Great Depression might have for us today.

Exhibit 21: Teacher showing a book to students.

Ms Reed explained further. Mr Clancy, Ms Moore, and Ms Abrams all had unique perspectives to share, as they had, with their families and friends, lived through the Depression in this same state when they were about the same age as the students. The three guests would be sharing their pictures, mementos, and stories as the group would journey back through time together.

This book is licensed under a Creative Commons Attribution 3.0 License

Then Ms Reed introduced yet another guest, Ms Blackenship, an employee of the public library. Together they made an exciting announcement. To ensure that the stories of Mr Clancy, Ms Moore, and Ms Abrams were preserved for the benefit of the community, everyone would collaborate in creating a multimedia presentation documenting the Great Depression from a local perspective. The final project would be donated to the local public library in a Memorial Day ceremony and added to the current collection of web based local history lessons available from the library's Internet site. Ms Blackenship then led the group on a brief tour of the library's site, demonstrating samples of other multimedia presentations that had been created for the library.

After painting a picture of the weeks to come, Ms Reed started the group on their journey by allowing the students and guests to get better acquainted in a short "icebreaker" activity. Then they all watched the video I*n Our Own Voices: Stories of the Great Depression*, an assembly of recollections by individuals from across the country who had experienced its toll.

After the video, Ms Reed led the group in an informal discussion about the movie and the personal recollections of Mr Clancy, Ms Moore, and Ms Abrams. She asked questions such as: "What was it like to live during the Great Depression?" "For parents?" "For children?" "What do you think were some of its causes?" "Why do you think FDR was elected?" "What did he have to offer that the American people needed?" "What would Cedarville be like today if we experienced another depression?" Ms Reed closed the discussion by giving a homework assignment. Students were to read Chapter 4 of the textbook and brainstorm a list of questions about the Great Depression. What did they want to know? What did they feel was important for others to know about this time period? The students were encouraged to ask their parents these questions before returning to class.

On Tuesday, Mr Clancy, Ms Moore, and Ms Abrams returned with a collection of artifacts for the class to examine: scrapbooks, photographs, food stamps, and other items from the era in question. Ms Reed also had a collection of artifacts, including vintage clothing, music, and old advertisements. Ms Clark, the school's technology coordinator, arrived with additional resources. Together, Ms Reed and Ms Clark laid out the tools that students had previously used including a digital camera and a camcorder.

Ms Reed asked the class to write each of their questions on a post-it note and place them on the whiteboard. Together, the class sorted the questions into three different categories: "who/what/when/where", "how/why", and "so what". Then, Ms Reed asked class members to break into three small groups and randomly assigned a category to each group. Each group took a turn interviewing each guest, seeking answers to their set of questions. Each group was responsible for collecting the data shared using the tools provided. The adults helped the children share the workload by encouraging them to take turns at different roles: interviewer, photographer, videographer, and so on. Ms Reed encouraged each group to consult additional resources, textbooks, the Internet, etc.,to fill in the answers to their questions. Afterward, the students held a debriefing session in which each group reviewed their major findings with the entire class.

On Wednesday, each group began planning its part in the multimedia presentation. They drew sketches of their work, loaded photos and movie clips into the computer workstations, and began to type the text of their stories. The next eight days or so would be spent working in small groups to design and develop the multimedia program into a final product. As the students worked, Ms Reed would guide them toward considering certain questions, organizing their thoughts and their work, and consulting a variety of resources, including books, videos, the Internet, and, of course, other people. Ms Clarke would check in to provide technical support. Mr Clancy, Ms Moore, and Ms Abrams would come by several more times to provide additional information and reactions to the project as it developed.

Periodically, the students engaged in "quick crits" in which they offered suggestions and asked questions about each other's work to date.

When the projects were completed, the entire group, along with parents and other friends, would have the opportunity to participate in the Memorial Day presentation and viewing of "Life in Cedarville During the Great Depression". After the ceremony, everyone would be invited to enjoy snacks on the lawn where Ms Reed would lead the group in discussing their experiences working on the project, including what they had learned about the Great Depression and why it was important for people in the town to know about it. When the students returned to school, Ms Reed would ask them to record a personal reflection in their electronic journals about the entire learning experience.

Questions to consider

- How would you describe Ms Reed's classroom? What teaching strategies did you witness? What learning strategies did you observe? What is your reaction to this classroom? To the quality of learning taking place? What do you feel was effective? Ineffective?

The bottom line

Both Ms Beauchamp and Ms Reed use some effective strategies for learning. Both incorporate a variety of media, including books and video, as well as a variety of activities including reading, writing, and presentation. Yet, the nature of the experience is quite different in each classroom. In Ms Beauchamp's classroom, the teacher is more active and directive, while the students are more passive. In educational terms, Ms Beachamp's classroom might be described variously as didactic, traditional, instructivist, or instrumental. In Ms Reed's classroom, both the teacher and the students are involved in and share responsibility for directing project activities. Ms Reed's classroom might be described by a professional educator as facilitative, collaborative, holistic, or social. Ms Beauchamp's approach is a familiar one. Her classroom is illustrative of a classic model of teaching and learning. Ms Reed's classroom is representative of a more novel, less familiar approach, one demonstrating many of the characteristics of cognitive apprenticeship.

An introduction to cognitive apprenticeship

Cognitive apprenticeship practices, along with anchored instruction, learning communities, and in-situation assessment, are educational approaches derived from Situated Learning Theory. These practices strive, first and foremost, to place teaching and learning practices within a rich and varied context that is meaningful and authentic to students. An apprenticeship is distinguished from tutoring, mentoring, coaching, and volunteerism by its focus on interaction that is a specific socially and culturally valued activity at which the adult is more skilled (Tisdale 2001).

As Brown, Collins, & Duguid describe it, "Cognitive apprenticeship methods try to enculturate students into authentic practices through activity and social interaction in a way similar to that evident in craft apprenticeship". Interestingly, apprenticeship is a old and well-established model for learning. As Brown and his colleagues point out: "Only in the last century and only in industrialized nations, has formal schooling emerged as a widespread method of educating the young. Before schools appeared, apprenticeship was the most common means of learning and was used to transmit the knowledge required for expert practice in fields from painting and sculpting to medicine and law" (p. 453).

This book is licensed under a Creative Commons Attribution 3.0 License

Like the apprentice electrician or the interning future physician, cognitive apprenticeship seeks to engage learners in real-world scenarios in which they act and interact to achieve useful outcomes. The workplace has a number of strengths as a learning environment: authentic, goal-oriented activities; access to guidance; everyday engagement in problem solving; and intrinsic reinforcement (Kerka 1997). Although children cannot experience all aspects of the typical craft apprenticeship (nor should they), they can benefit from some of its common practices, such as modeling of certain skills by more advanced individuals and coaching by mentors toward higher levels of knowledge and practice. Cognitive apprenticeship is one example of situated learning in which learners participate in a community of practice that is developed through activity and social interaction in ways similar to that in craft apprenticeships (McLellan 1994).

What is the context in which Ms Reed's class is learning about the Great Depression? In what ways does it provide variety, depth, meaning, and authenticity for learners?

- The Great Depression is explored within the context of the students' local community life, past and present.
- This historical period is explored through the personal stories of people from all walks of life and all parts of the country, including Cedarville, as well as through questions originating from the students.
- The multimedia project extends the learning experience beyond the classroom, providing an authentic, goal-oriented service to the local library and community.
- Variety is introduced in learning through tools and artifacts (books, movies, camcorders, computer workstations, journals, photographs, vintage items), activities (reading, writing, discussion, interviewing, designing, producing, presenting), and people (the teacher, the students, the local librarian, the media specialist, the technology specialist, assorted family, and community members).
- Students explore ideas in greater depth by revisiting their content questions throughout the project in eclectic ways, collaboratively through peer and group discussion and project construction, and individually through reading, journaling, and other activities.

Breaking it down

Beyond striving to engage learners in activities in real-world, meaningful contexts, cognitive apprenticeship is known to embody certain characteristics known as modeling, coaching, scaffolding, reflection, articulation, and exploration. The following sections explore how each of these concepts are applied in the fourth-grade classrooms of Ms Beauchamp and Ms Reed.

Modeling

Modeling takes place constantly in everyday life. Learning simple tasks, such as how to wash dishes, involves more physical skills and processes than cognitive processes. A task can be imitated simply by observing another person demonstrating how to wash dishes. Complex tasks that require complicated cognitive processes are more difficult to model because it is impossible to observe what takes place in the human mind. For example, if students are observing a "good" math student solving a complex problem quietly, they can see what the good student writes on the paper but cannot see the process by which the problem was interpreted or why certain rules were chosen over others to solve the problem.

A cognitive modeling strategy, with teachers and competent students serving as cognitive role models, is a key characteristic of cognitive apprenticeships. The models should put their thoughts and reasons into words while explaining and demonstrating certain actions, because students cannot otherwise monitor the thinking process

(Meichenbaum, 1977; Shunk, 2000). These think-aloud which allow students to build a conceptual model and acquire an integrated set of cognitive and metacognitive skills through processes of observation (Collins, Brown, & Newman, 1989; Collins, 1991).

Modeling in cognitive apprenticeship means showing how a process unfolds and giving reasons why it happens that way (Collins, 1991). There are two kinds of modeling that can be used in education:

- **Modeling of expert performance**. This includes making the problem-solving process of experts explicit to students.
- **Modeling of processes in the world**. This includes making invisible parts of a process visible (e.g. photosynthesis processes).

These two kinds of modeling can be interwoven, especially when the problem includes the invisible parts of the process. In applying these two types of modeling in educational settings, two strategies are available to teachers:

- **Modeling on the outset**. Apprenticeships normally start with modeling and explaining the process that students are to use.
- **Modeling after students' attempt at a task**. Another strategy is to present the problem to the students first, let them think through the process, and then provide modeling of experts' processes.

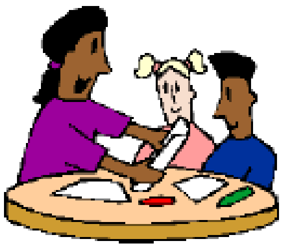

Exhibit 22: Teacher admiring two children's artwork

The major responsibilities of the teacher during the modeling stage of cognitive apprenticeship are structuring situations of expert practice and demonstrating the expert's thinking process in a manner that does not overwhelm students (Rogoff, 1990). The goal of this stage is to build mental models of experts' cognitive processes so that students can eventually work on their own.

Because it involves a process that cannot be directly observed and experienced, cognitive modeling requires more sophisticated planning to apply in classrooms than does modeling of physical performance. The modeling of cognitive processes requires the following:

- modeling an expert's performance
- externalizing internal/cognitive processes (verbalizing thought processes)
- encouraging students to think like experts and treating them as experts
- modeling the performance in different contexts
- demonstrating how to cope with difficulties (if needed)

Teachers or other models who demonstrate performance should identify and represent cognitive processes that the experts engage in as they solve problems (Collins, Brown, & Newman, 1989). This culture of expert practice

This book is licensed under a Creative Commons Attribution 3.0 License

reflects the work of Vygotsky (1978) wherein he stresses the benefits of students' interaction with competent others. It is important for learners to be exposed to a higher level of reasoning than the current level for their cognitive growth (Hogan & Tudge, 1999). Demonstrating the process of reading comprehension, teachers might verbalize the internal process as follows: "What is it I have to do? I have to find the topic sentence of the paragraph. The topic sentence is what the paragraph is about. I start by looking for a sentence that sums up the details or tells what the paragraph is about" (McNeil, 1987, p.96; Shunk, 2000).

It is a good strategy to include a demonstration of performance that displays typical fears and deficiencies of learners at the outset, and gradually reveals the improvements in the modeling (Shunk, 2000). During the demonstration, teachers might state how they are coping with difficulties as follows: "This paragraph is less structured than the other ones. I can't find the topic sentence. What should I look for then? Oh, this sentence seems to be connecting the idea of the previous paragraph to the idea of this paragraph." Students might gain confidence in performing the task and not be discouraged when faced with difficulties because they have observed the struggles of experts.

A key component of cognitive apprenticeship is that students learn the cognitive processes in realistic contexts so that they may process their thoughts accordingly in actual situations. In the teaching of reading comprehension, teachers might use an authentic newspaper and go through the process of reading and comprehending an article. Thus, students understand and build a conceptual model of the comprehension process and its conditions for application in conditions similar to real life situations (Collins, Brown, & Newman, 1989).

Returning to the story of the fourth grade at Cedars Elementary reveals how Ms Beauchamp and Ms Reed provide or could have provided cognitive apprenticeships starting with modeling.

Modeling in Ms Beauchamp's class

As mentioned earlier, Ms Beauchamp leads the class in a very traditional way. She presents knowledge, gives instructions, and corrects students if they are wrong. Students listen to Ms Beauchamp's lectures, do as she instructs, and bring their assignments to class for correction. The nature of students' tasks is clearly different from that of the teacher's tasks. There is no continuum of activities from the teacher to the students because Ms Beauchamp provides no demonstration of student activities. No aspect of modeling is found in her class.

Problem-solving activities play an insignificant role in Ms Beauchamp's classroom. She often begins the class by reviewing and correcting the answers to the textbook questions that students have individually prepared as assignments. This activity of reading the answers aloud and giving correct answers fails to provide the teacher with important and useful information, such as the students' thoughts about the questions while answering them and the ways they reflected on what they learned through the assignment. It seems clear that writing correct answers on transparency film accompanied by a loud and authoritative voice does not promote students' thinking processes. Thus, this approach provides no cognitive modeling for solving problems.

Modeling in Ms Reed's class

Unlike Ms Beauchamp's class, the scenes from Ms Reed's class are dynamic and engaging. Ms Reed conducts the class as a facilitator and collaborator in its activities. In her class, there is little distinction between the activities of the teacher and those of the students. The students creatively replicate the activities of the teacher and others.

Coaching and scaffolding

Coaching and scaffolding are two critical components of the cognitive apprenticeship model. These elements are addressed together because they share many characteristics. Although coaching does not enjoy the familiarity of its cousin scaffolding in the research literature, some researchers call it "the thread running through the entire apprenticeship experience" (Collins, Brown, & Holum, 1991). Scaffolding, while distinct from coaching, can actually be categorized as a type of coaching. In this section we will discuss why this is the case.

Although it is considered a separate component of cognitive apprenticeship, coaching has as much in common with the process of scaffolding. Both involve a teacher (or a more knowledgeable other) providing some type of assistance to a learner to facilitate attainment of a goal. Coaching may be seen as a broader term than scaffolding, however. In fact, scaffolding can be considered only one form of coaching (see Exhibit 19). At this point a closer examination of coaching is in order.

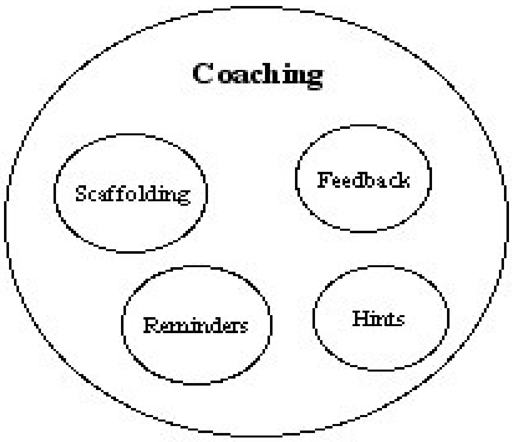

Exhibit 23: Four Components of Coaching - Scaffolding, Feedback, Reminders, and Hints in a Venn Diagram. The diagram shows each of the four components as a separate circle without overlap, but contained within the one larger circle called Coaching.

Collins, Brown, and Holum (1991) provide many examples of coaching, which they call "the process of overseeing the student's learning". The goal of coaching can be simply summarized as the learner accomplishes the learning goal. The process of ensuring this goal may begin with helping learners choose their tasks (admittedly, not always an option), and may end with providing feedback to learners on their completed products. In between these steps, many other coaching strategies may be employed, including providing hints and scaffolding, evaluating how learners actually go about the process of learning, diagnosing problems, offering verbal and nonverbal encouragement, structuring lessons in ways that facilitate learning, and working with learners to overcome weaknesses. So, it can be said that coaching is the process of doing whatever it takes to assist learners in their learning, from start until finish. It is now instructive to turn to one of the components of coaching—scaffolding.

Of the six characteristics of the cognitive apprenticeship model, scaffolding is perhaps the best known and most discussed in literature. Although there are numerous definitions of this term, any one of them is likely to provide the basic idea of what scaffolding is all about.

First, two definitions offered by the *Merriam-Webster Online Dictionary*:

This book is licensed under a Creative Commons Attribution 3.0 License

- A temporary or movable platform for workers (as bricklayers, painters, or miners) to stand or sit on when working at a height above the floor or ground
- A supporting framework

At first glance, the more detailed first definition may not appear to have as much application to an educational environment as the more general second definition. However, upon substituting the word "students" for "workers" in this definition, the applicability to education becomes evident. A scaffold is a structure that supports students while they work at a level higher than their ability allows without assistance.

Of course, when educational researchers, practitioners, or theorists talk or write about the process of scaffolding, each has a specific conception of what this process is. For instance, Collins, Brown, and Newman (1989) describe scaffolding as: "a kind of cooperative problem-solving effort by teachers and students in which the express intention is for the students to assume as much of the task on his own as possible, as soon as possible".

Although scaffolding has some very specific components that will be discussed later, in almost all cases, it refers to any situation in which two processes occur. The first process involves providing support to the student by a More Knowledgeable Other (MKO), whether a teacher, a better informed peer, a community member, a domain expert, a parent, or in some cases, even a computer. The second process inherent in the scaffolding experience involves the gradual removal of the support system in a way which leaves the student able to perform unassisted the task which was previously possible only with the scaffolding.

Scaffolding is based on Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD), which he defined as the distance between the "actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86). Vygotsky believed that when a student is at the ZPD for a particular task, providing the appropriate scaffolding would give the student enough of a "boost" to complete it. Further, once the student, with the benefit of scaffolding, masters the task, the scaffolding can be removed. Just as a building remains erect after its scaffolding is removed, a student should be able to achieve the task again without the aid of scaffolding.

Zhao and Orey (1999) identify six elements of ideal scaffolding. The first element is the sharing of a specific goal, which typically refers to achieving a task. Sharing the goal increases intersubjectivity between the learner and the MKO and also helps decrease learner frustration because the learner knows that he is not alone in trying to achieve the task. The second element of ideal scaffolding is a whole-task approach. This simply means that the focus is on learning the task as a whole, not concentrating on individual sub-skills of the task.

The third element is the immediate availability of help. This is in alignment with the primary basis of scaffolding: help the learner when he is at a point where he needs help in order to continue the task. When learners are left for too long at a point where they cannot make progress, they may lose interest and motivation and become frustrated. The fourth element is that the scaffolding should assist the learner in his intentions. The MKO should help the learner on whatever he is currently struggling with, so as not to interrupt another train of thought. This meshes well with the previous element of immediacy—helping the learner when he needs it, not after he moves to another task or problem.

The fifth element of ideal scaffolding is providing an optimal level of help. The MKO should provide assistance that is tailored to the needs of the learner. It should be just enough to get the learner past his current difficulties. The MKO should assist only in those steps that are beyond the learner's ability. The sixth and final element of scaffolding is the conveying of an expert model. An expert model is a model of a task that will lead the learner to accomplish the task efficiently. This model provides a framework around which learners can organize their skills.

Now that some of the background and components of coaching and scaffolding have been described, the ways in which the two teachers employed them in their classrooms may be examined. It is also productive to speculate on how they could have further helped their students to learn.

Coaching and scaffolding in Ms Beauchamp's classroom

Ms Beauchamp's class seems typically traditional; very little coaching can be seen in her classroom. She structures class events to provide multiple opportunities to learn about the New Deal and the Depression. She asks her students to read ahead and answer textbook questions, goes over the answers in class, provides a short film for her students, conducts a review, has her students act out a play, and then assesses student learning with a test. Can any of this be accomplished in a way that will engage her students with the material and help them gain a better understanding of the events that occurred during this period in history?

To begin, it is worthwhile to examine Ms Beauchamp's method of questioning and providing feedback. It appears to be in the form of stating "Correct" or "Incorrect" after a student responds to a question. To increase learning beyond the simple recitation of names and dates, Ms Beauchamp could lead the class in a discussion of why each answer is correct or incorrect, which would be an excellent use of coaching. She could also ask more open-ended questions about important points, rather than the basic questions in the textbook that can be answered with one or two words. For example, instead of asking, "When did the Great Depression occur?" she might inquire of the class, "What do you think was occurring domestically and internationally in the late 1920s that may have contributed to the beginning of the Great Depression?" This type of questioning requires students to think more deeply and to synthesize information, with less rote memorization. It also provides Ms Beauchamp more opportunities to provide hints to students, allowing them to piece together answers from what they are reading or discussing in class.

Ms Beauchamp's use of a play as an instrument to help students learn about the Great Depression, on the other hand, is an excellent strategy; however, its implementation could be modified to allow the learners to become more intimately engaged with the material . For example, students might be asked to work in small groups to create their own mini-plays. Ms Beauchamp could then work with individual groups, providing ideas to improve their productions and correcting any mistaken ideas they have. Also, it would give her a chance to encourage her students to use research materials and artifacts from outside the class, as well as to express their own interpretations of history in a dramatic form.

In considering the notion of scaffolding in the context of the story, Ms Beauchamp's goal for this unit must be determined. While Ms Beauchamp does not explicitly state a learning goal in this example, it can be inferred from analysis of the information provided and by asking such questions as, "What does she ask her students?","How does she assess her students' knowledge?", and "What are the anticipated learning outcomes of the unit?" From the answers to these questions, it appears that Ms Beauchamp tends to primarily ask questions that can be answered with a word or a short phrase, such as "Franklin Delano Roosevelt", "1929", or "new jobs". Also, based on her method of assessment (short answer and multiple choice questions), it would appear that discrete facts are the primary desired learning outcome for her students.

This book is licensed under a Creative Commons Attribution 3.0 License

It is important to remember that the scaffolding process facilitates attainment of goals that are slightly beyond students' reach (when they are in the ZPD). Considering the inferred goals of Ms Beauchamp's class (the learning of discrete facts), is scaffolding needed? Do students require support to remember that the Great Depression began in 1929? The obvious answer is "no". Scaffolding is not an appropriate instructional tool here because it does not facilitate the instructional goals that it can be assumed were set by the teacher. However, the appropriateness of these goals are a legitimate object of question.

How has student knowledge and understanding been affected at the completion of this unit? Is it likely that Ms Beauchamp's students will retain much significant knowledge about the New Deal or FDR once they enter the fifth grade? The most likely answer: probably not. If anything, they may recall that FDR wanted to provide more jobs to Americans and that the Great Depression started around 1930.

Coaching and scaffolding in Ms Reed's classroom

Ms Reed, on the other hand, offers an explicit goal for her students: "to understand what it was like to live during this very difficult time in the nation's history and to explore what messages the Great Depression might have for us today". The questions that she asks and the opportunities for class discussion that she provides (rather than just lecture or video presentation) seem to support this broad goal.

In addition, Ms Reed uses coaching and scaffolding strategies in her classroom. She chooses a variety of learning tasks from which her students may choose: reading their textbook, interacting with contemporaries of the historical era under study, synthesizing information into a multimedia presentation, watching videos, and other activities. Not only does Ms Reed choose these activities wisely, she implements them effectively. She sees that support is available to her students during each activity, through both human and non-human resources. This very deliberate decision-making is an excellent way of overseeing the student learning process, and, within each activity, coaching occurs.

In the scenario, Ms Reed's students receive ample encouragement to perform well in their learning tasks. For instance, while student groups are interviewing the classroom guests, Ms Reed challenges them to take on different roles in the interviewing process, even if the students are not completely comfortable doing this. She encourages them, and likely expresses her confidence in their abilities, while also reminding them that she is available to assist them with any questions or problems they encounter.

Coaching also occurs during the development of the multimedia presentation. Ms Reed keeps her eye on the groups and helps them organize their thoughts and work. She also "coaches" them toward considering certain questions and consulting particular reference sources for information. In addition to Ms Reed's coaching, the students also have the benefit of Ms Clarke's coaching on technology issues and the coaching of the visitors, who provided additional information and support as the students needed it. All in all, the students in Ms Reed's class seem to have access to much more coaching than their peers in Ms Beauchamp's class. As a result, Ms Reed's students are more likely to leave the fourth grade with a stronger understanding of issues related to the Great Depression.

Thus, Ms Reed's instructional goal is very different from that of her colleague. Instead of requiring her students to learn bits of segmented data, she wants them to learn what it was like to live during this period of the nation's history. Admittedly, this goal requires more work from her and her students. Simply stated, this goal is more difficult. However, while Ms Beauchamp's class will likely remain in the Knowledge level of Bloom's Taxonomy of

Educational Objectives, Ms Reed's class attained higher levels of learning—comprehension, application, analysis, synthesis, and possibly even evaluation. (Further explanation of Bloom's Taxonomy can be found at http://faculty.washington.edu/krumme/guides/bloom.html.)

To promote this goal of understanding, Ms Reed provides numerous types of scaffolding. It must be noted that the cognitive apprenticeship model does fall under the umbrella of situated cognition theory and, as such, "shifts the focus from the individual to the sociocultural setting and the activities of the people within that setting. Knowledge accrues through the lived practices of the people in a society" (Driscoll, 1994, p. 156). Therefore, when implemented as an element of the cognitive apprenticeship framework, scaffolding is likely to include aspects of the "social and physical context" (Brown, Collins, & Duguid, 1989) of the topic under study. Ms Reed brings three visitors into her class with whom her students are encouraged to discuss the Depression, the New Deal, and various other components of their lesson unit. Taken together, the goal is for the interaction of the students and these More Knowledgeable Others to produce new and more informed understandings of what it was like to live during that time in America's history. Not only is this social context made available to the students, so too, are various physical artifacts, such as clothing, food stamps, and scrapbooks. These items can also be considered part of the scaffolding process, as they help students understand how people in their community or state lived in the late 1920s and early 1930s. Other scaffolds are present in Ms Reed's class, of course; the multimedia presentation, the interviews with Depression survivors, and teacher-led (but not teacher-dominated) discussions about the subject.

But what about Ms Reed's students? What happens to them once their scaffolds are removed (a process referred to as "fading")? What happens after Mr Clancy, Ms Moore, and Ms Abrams make their last visit to the classroom, and after the classroom discussion turns to the next series of historical events? Will the students retain much of what they have learned about FDR, the New Deal, and the Great Depression? It appears so. By allowing her students to "enter that community and its culture" (Brown, Collins, & Duguid, 1989) and to take ownership over their presentation of what they learned, Ms Reed scaffolds her students' learning. In the process, she also increases the likelihood that her students will internalize and retain much of their learning experience once they complete the unit and leave her classroom.

Questions to consider

- Which of the two teachers do you identify with and why? What recommendations would you give to either or both of the teachers in terms of coaching and scaffolding? What kinds of coaching and scaffolding activities can be used in the classes of different knowledge domains?

Articulation and reflection

Articulation and reflection are two more hallmarks of cognitive apprenticeship practices. These components are discussed together as they often go hand-in-hand in practice.

Articulation is defined as "the act of giving utterance or expression" (Merriam Webster's, 2001). In terms of cognitive apprenticeship, articulation is described by McLellan as consisting of two aspects: separating component knowledge and skills to learn them more effectively and, more commonly verbalizing or demonstrating knowledge and thinking processes in order to expose and clarify them. Through articulation, the learners make their learning explicit through language so that community members have a basis of interaction to refine and expand understanding. Articulation can be interwoven in a learning experience through a variety of strategies including discussion, demonstration, presentation, and the exchange of written or other learner-produced artifacts.

This book is licensed under a Creative Commons Attribution 3.0 License

Merriam Webster's (2001) defines reflection as "consideration of some subject matter, idea, or purpose". Reflection has been identified as one of the most important, yet neglected, aspects of learning and instruction. The founders of the Foxfire Project (1992), an innovative educational program for high school students, assert

"...some conscious thoughtful time to stand apart from the work itself - is an essential activity that must take place at key points throughout the work. It is the activity that evokes insights and nurtures revisions in our plans. It is also the activity we are least accustomed to doing, and, therefore, the activity we will have to be the most rigorous in including, and for which we will have to help students develop skills."

Exhibit 24: Three students standing around desks talking.

In the cognitive apprenticeship model of teaching and learning, reflection is yet another cornerstone activity. The goal of reflection is that students have guided opportunities to look back and analyze their individual and group performance and artifacts with an eye toward understanding and improvement. Like other components of cognitive apprenticeship, reflection can be encouraged in students in a variety of ways. For example, a mentor can pose experientially-based questions, or ask students to construct their own questions, throughout the learning experience—questions that consider content (e.g. who or what?) while emphasizing process (e.g. how and why?).

Articulation and reflection in Ms Beauchamp's classroom

In Ms Beauchamp's classroom, articulation is employed as part of the instructional strategy. For example, Ms Beauchamp and her students share the answers to the end-of-chapter textbook reading. Most certainly, they will articulate certain knowledge of the Great Depression as they perform the play, and even as they record their answers to the written test. However, much of the knowledge shared is discrete and superficial (FDR, 1929, the New Deal) and generated directly from sources external to the students (the textbook authors, the playwright, and even Ms Beauchamp). Furthermore, most of the sharing of knowledge occurs directly between Ms Beauchamp and individual students rather than between and among diverse groups. In such an approach, opportunities for leveraging the knowledge and experiences of class members and potential outside contributors are missed.

Similarly, Ms Beauchamp's students experience few significant opportunities to reflect on the Great Depression. Students "reflect" on the chapter reading by answering the end-of-chapter questions and then later, questions on the written test. Ms Beauchamp's review and student participation in the play may have encouraged some students to reflect on the content; however, these opportunities for reflection are superficial, at best, and encourage little in-depth thought or discussion. They are also discrete activities in that they lack a shared focus. There is nothing to connect the reading, the review, the play, and the test in a manner that has personal meaning for the students.

Articulation and reflection in Ms. Reed's classroom

In Ms Reed's classroom, articulation is more evident as a strategy to support individual and group learning. First, student/apprentices and adult/experts exchange knowledge and experiences about themselves and the Great Depression early on, through the teacher-facilitated discussion. This exchange continues before and after the movie, and through the group categorization of student-generated questions prior to beginning the multimedia project. From the outset, Ms Reed facilitates the sharing of knowledge among a diverse set of novices and experts that includes students, school staff, community members, and parents. All students benefit by having knowledge of the Great Depression made more accessible through a variety of media (books, movies, the Internet, etc.) as well as through opportunities for guided, social interaction.

The practice of articulation continues in Ms Reed's classroom as students prepare to design their multimedia presentation through the group debrief session in which students share the data that they have gathered so far. Once engaged in design and production, students participate in ongoing feedback sessions through the student "quick crits", the periodic visits by community members, and the coaching of Ms Reed and Ms Clarke. As the students develop their knowledge artifacts (the multimedia productions) they have opportunities to test them and make revisions in a formative manner. Before the "taking and scoring of a test", which is often the first time many teachers find out what their students have learned, the teacher and other experts have numerous opportunities to help students confront and problem-solve through misconceptions and ineffective strategies.

Articulation is extended through the final phases of the unit work in the Memorial Day presentation and demonstration of the multimedia project to the community, in the group discussion that follows, and in individual student electronic journals. Here again, students have the opportunity to share their knowledge of the Great Depression within the useful context of its meaning for their community today. Yet another opportunity is provided for students to revisit and extend their understandings to more sophisticated levels.

As demonstrated through the experiences of Ms Reed's fourth grade students, articulation can take many forms and be revisited throughout a learning episode. As one aspect of cognitive apprenticeship, articulation supports a fundamental premise of situated cognition theory—that learning is a social and contextualized phenomenon. As such, masters and apprentices from multiple perspectives benefit from coming together, articulating, and ultimately negotiating shared understandings.

In contrast to Ms Beauchamp, Ms Reed interweaves opportunities for reflection throughout her students' experience learning about the Great Depression. Early on, students are asked to generate personally meaningful questions about the Great Depression—questions they feel are important and want answered. These questions then guide the students' data collection as they prepare to design the multimedia project. During the development of the project, students reflect frequently and in a variety of ways through guided discussions with their teacher, through student "desk crits", and through discussions with Mr Clancy and the other visitors. Here, formative reflection advances the thinking and effort of the group as it is expressed in a more complete and sophisticated artifact, the multimedia project. Toward the end of the project, students are afforded even more opportunities for reflection as they discuss the project with community members at the Memorial Day presentation and record their personal reflections in their electronic journals upon returning to the classroom.

Ms Reed's students do not only engage in reflection more frequently; the quality of their reflection is more diverse and thoughtful. From start to finish, reflective activities provide a vehicle for connecting individual activities in a thematic and meaningful way. First, the reflective activities focus on the stated objectives of the unit - "to

This book is licensed under a Creative Commons Attribution 3.0 License

understand what it was like to live during this very difficult time in the nation's history and to explore what messages the Great Depression might have for us today". Second, the reflective activities revisit this goal with increasing depth and diversity, gently moving students toward greater levels of understanding and ability.

Interestingly, reflective activities provide Ms Reed with numerous opportunities to "check in" with her students. This enables her to assess the degree of content mastery and the extent to which the unit goal has been achieved. Thus, she need not rely primarily on an end-of-unit test to evaluate students. Instead, she can assess her students formatively and guide them toward greater levels of achievement "as the learning is occurring" in addition to employing some form of summary assessment at the close of the lesson. In this way, reflective activities help to take the mystery out of what is going on with the learning of individual students.

Questions to consider:

- Which of the two teachers do you identify with and why? What recommendations would you give to either or both of the teachers in terms of articulation and reflection? What kinds of articulation and reflection activities can be used in the classes of different knowledge domains?

Exploration

Independent exploration of student learning occurs naturally in cognitive apprenticeship when coaching and scaffolding are relaxed and fading occurs (Collins, Brown, & Newman, 1989). Exploration is not one of the characteristics of traditional apprenticeships of physical skills and processes because fading of supports could mean that students are already reaching mastery of the skills.

Features of exploration are similar to those found in discovery learning and inquiry-based approaches. Exploration is not merely reading or listening to a teacher presentation but obtaining knowledge for oneself. Nor is it simply students doing what they want to do; they perform directed and guided activities suggested by the teacher. The teacher poses general problems and allows students to move into specific problems of their own, instead of teaching how to solve a problem and providing materials to help students explore. Through exploration and other similar approaches, students discover new knowledge and learn general problem-solving skills (Bruner, 1961; Shunk, 2000).

Exploration in cognitive apprenticeship is pushing students to try out their hypotheses, methods, and strategies with processes similar to those that experts use to solve problems (Collins, 1991). Students are usually engaged in two kinds of exploration:

- **Exploration of the world.** Students explore and even play with facts, problems, phenomena, and properties of our world in a less structured learning environment (Rose, 1995).
- **Exploration of problem solving processes.** When novel problems that require adjustment of pre-existing cognitive processes are presented to the students, the learners try different problem-solving processes.

The responsibilities of the teacher to foster students' explorations include gradual fading of support, encouraging students' autonomy, and transferring responsibility to students (Rogoff, 1990). The goal of the students is to actually use their mental models of experts' cognitive processes on their own or as a group to find and solve problems, set achievable goals, test hypotheses, and make their own discoveries (Collins, 1991).

Exploration should not be included only after all the supports are removed during cognitive apprenticeships. When students are lost in the course of exploration, guiding and scaffolding should be provided. Also, students need to continue to articulate and reflect on what they have found, as experts do in real situations. To provide experience in exploration, teachers should:

- gradually fade support systems
- encourage learner autonomy
- provide general goals
- encourage students to set their own achievable goals
- encourage problem formation and problem solving

Fading of supports includes both fading in problem solving as well as fading in problem setting (Collins, Brown, & Newman, 1989). In other words, students are to find their own problems for their own goals and also find their own solutions to these problems. Teachers must teach general exploration strategies through modeling and guidance so that students will not be lost when they are on their own.

Through exploration, learners are encouraged to carry out expert problem-solving processes on their own. Exploration also promotes learner autonomy in defining or formulating the problems to be solved (Collins, Brown, & Newman, 1989). Learners become independent of the teacher and begin to apply what experts do regarding forming and testing hypotheses, formulating rules, and gathering information. Once they are in the problem-solving mode, students are forced to make discoveries on their own. By doing so, they experience what it is like to be a scientist, historian, or mathematician because they are thinking and performing like these professionals.

To have authentic experiences of expert practice, students should be able to explore in an environment similar to that in which they will actually use the process and knowledge. This environment should reflect conditions for realistic application of knowledge. Learning through exploration can occur in the classroom through strategies such as role-playing, independent or group projects, and computer simulations (Collins, 1991; Shunk, 2000).

It is the teacher's responsibility to find general tasks that students will find interesting. The goals should be broad enough so that students or student groups can find their own achievable goals. Goals for exploration should take into account thinking and the learning process. Goals that only require rote memorization or simple physical practice should not be considered. Solving problems that require inductive reasoning and resolving situations that are puzzling encourage student involvement (Shunk, 2000).

Thus far, it is evident that the two classrooms differ drastically in the extent to which elements of the cognitive apprenticeship model are present in class activities; it is to be expected that a similar disparity would exist in the use of exploration.

Exploration in Ms Beauchamp's class

It is obvious that in Ms Beauchamp's class student autonomy and problem-solving are not encouraged. The teacher lectures and leads activities throughout the class, whether or not students are paying attention. It is to be hoped that some students might be interested in the topics presented in class and will explore them by themselves outside of class. However, without completely altering her instructivist approach, Ms Beauchamp can encourage students to explore their interests related to the topic by changing the nature of the questions she asks in class and those she assigns for homework. At present, the questions seem to address only the basic facts about the Great Depression. Adding some problem-solving aspects to the questions and giving students guidelines to answer those questions will promote further exploration of the topic.

This book is licensed under a Creative Commons Attribution 3.0 License

At the end of the unit, students will be involved in a play about life during the Great Depression. Ms Beauchamp will assign each student the role of a character from the play, which will be performed from a pre-existing script. The drama should be interesting to the students, but the assignment is not significantly different from reading a book or watching a video. Instead of having students play predefined roles from a script, Ms Beauchamp could provide only the opening of the play. Students could then explore the lives of people in their community who lived during the Depression era and generate the rest of the play from this research.

Exploration in Ms Reed's class

Ms Reed, on the other hand, provides ample opportunity for students to explore their own interests in the Depression era. When Ms Reed begins the Great Depression chapter, she invites people from the community who lived during that period to share their experiences. By arranging this stage at the beginning, students are given an opportunity to explore the topic within the context of the local community, both past and present. Students begin their exploration of the topic by interviewing these people and listening to their personal recollections; the student investigators also learn how those who lived through this difficult time were affected by it.

Ms Reed's assignments encourage students to find their own questions, problems, and ways to answer them. She asks students to brainstorm a list of questions about the Great Depression, exploring what they want to know instead of what the textbook prescribes or what she wants them to know. She divides the class into small groups so that students can share the roles of experts—interviewers, photographers, videographers and the like. Each group is responsible for organizing its ideas, setting group goals, and formulating a set of questions. Group members are treated as experts responsible for their respective roles in collecting data.

The groups concurrently develop their own multimedia projects, with each focusing on its specific goals. Through this class-wide exploration, students become the owners of their knowledge. Real-life experts, such as historians, set their own goals and explore them to produce knowledge through problem solving; students in Ms Reed's class perform similar tasks. The authentic experiences of students in Ms Reed's class are vastly different from the experiences of students who passively take in information provided by Ms Beauchamp and then write answers to questions corresponding to information given in the text.

Questions to consider

- What are the exploration experiences that you have experienced or provided in class? What recommendations would you give to either or both of the teachers in terms of exploration? What kinds of exploration activities can be used in the classes of different knowledge domains?

Examples of cognitive apprenticeship in the real world

Below are some examples of ways that cognitive apprenticeship practices are applied in real-world settings. One example is from a K-12 setting; another is from an adult learning venue. For each example, there is a brief description along with an internet resource. The web sites contain more information, demonstrations, and even different learning environments.

Exhibit 25: CoVis logo

19. Cognitive apprenticeship

CoVis is an integrated learning environment of visualization and communication tools. The visualization tools model the processes of non-visible weather phenomena. Students learning in the CoVis environment engage in open-ended scientific investigations and explorations that resemble the authentic practices of scientists. The communication tools provide channels for both synchronous and asynchronous collaboration with other students and mentors. The mentors provide coaching/scaffolding of the science practice. The software systems of the CoVis environment include an asynchronous networking system, the Collaboratory Notebook. It provides the mechanism for recording activities, sorting artifacts, and sharing the working process with others. Through this mechanism, students reflect and articulate their scientific inquiry processes and the knowledge they gain through the processes.

Exhibit 26: Screen capture of online teaching and learning classroom

Students completing a certificate in online learning at Edith Cowan University must be able to employ contemporary learning theories in the design of flexible and open on-line courses. They must choose appropriate learning media, plan engaging learning activities, assess the learning potential of on-line activities and exercises, and so on. In the online learning course, students work through a variety of real-world scenarios to develop knowledge and skills. For example, operating in a virtual office space, students must complete the evaluation of a web based learning course that is being considered for additional funding. Cognitive apprenticeship practices include the use of coaching/scaffolding available in online journals and bulletin board discussion with mentors, modeling through access to prototypes, and articulation/reflection through online journaling.

Concluding thoughts: implications of the cognitive apprenticeship model for teaching and learning

Cognitive apprenticeship is not a linear process occurring once during the teaching and learning process of particular subject-area content; rather, it is a recursive process (see Exhibit 20). Cognitive apprenticeship usually commences with modeling guided by a teacher, experts, or peers. The teacher gradually decreases the support provided to students through scaffolding and coaching methods and increases students' autonomy through exploration. In the process of learning, students must revisit what they have done and discuss their ideas with teachers and other students. Students finally discuss, demonstrate, present, and exchange their individual or group products and look back to analyze their own or others' performance and artifacts through articulation and reflection methods.

This book is licensed under a Creative Commons Attribution 3.0 License

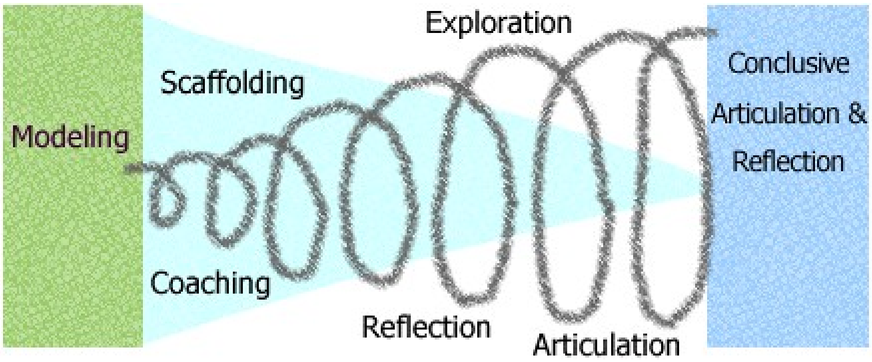

Exhibit 27: Model of Cognitive Apprenticeship visualized through a spiral that begins with Modeling builds with Coaching, Scaffolding, Reflection, Exploration, and Articulation and ends with Conclusive Articulation and Reflection.

In implementing cognitive apprenticeships in classrooms, it is important to examine the aspects of different disciplines, educational settings, and students; these will be important parts of the learning experiences. Even though a model and scenario of an effective classroom approach to cognitive apprenticeship have been presented here, there remain questions to consider before teachers look into their own classrooms. Can educators create effective learning experiences for students by employing a cognitive apprenticeship approach? In what ways might cognitive apprenticeship practices be most useful? In what ways might the cognitive apprenticeship model break down for classroom use?

Benefits of cognitive apprenticeship

Cognitive apprenticeship practices can benefit learning in many ways:

Cognitive apprenticeship encourages authentic activity and assessment. The most important emphases of the learning environment in cognitive apprenticeship are situated learning and the culture of expert practice (Collins, Brown, & Newman, 1989). Learners are engaged in learning activities that are similar to the practices of real-world experts.

Practices of cognitive apprenticeship are motivating and engaging for learners. Cognitive apprenticeship provides students with authentic tasks; it encourages them to think like and to be treated as experts (Collins, 1991). When students are actively engaged in authentic tasks and make discoveries on their own, they are motivated and experience a sense of ownership of their knowledge and tasks.

Cognitive apprenticeship may encourage greater levels of retention and transfer. Learning within the cognitive apprenticeship framework is situated in a context similar to that in which experts actually practice (Resnick, 1989). Situated, contextualized learning enables students to retain their knowledge until they encounter similar situations in the future.

Cognitive apprenticeship may facilitate higher order reasoning. In cognitive apprenticeship practices, students work with teachers and experts who use higher-level thinking processes; they are exposed to these processes through cognitive modeling (Hogan & Tudge, 1999). After receiving initial stages of support from teacher and experts, students actually explore new ideas and make discoveries using advanced reasoning processes.

Challenges of the cognitive apprenticeship model

Using a cognitive apprenticeship approach in the classroom is not without its challenges. Some pitfalls in employing the cognitive apprenticeship model include:

Cognitive apprenticeship may require highly facilitative teaching skills. Cognitive apprenticeship requires teachers (or coaches) to constantly attend to students' difficulties and problems. Students' autonomy levels depend on the success of the coaching and scaffolding provided largely by the teacher. This requires patience and advanced facilitative teaching skills.

The cognitive apprenticeship approach may result in higher levels of student anxiety and frustration. If expert modeling overwhelms the students, there may be difficulty in understanding the process and construction of a mental model of the process. Students may become anxious, frustrated, and afraid to explore tasks on their own.

Cognitive apprenticeship may require more time on task. The time required of students to explore different areas and to make discoveries and create their own products can be enormous. When students are working in a group, they must constantly discuss and reflect on their accomplishments and plans for the future.

Cognitive apprenticeship may require additional or more sophisticated resources. Successful implementation of cognitive apprenticeship requires realistic assessment of available resources. The nature of cognitive apprenticeship includes situated learning and the culture of expert practice. This may automatically require resources that are not readily available in schools and educational institutions (e.g. subject matter experts, time, money for expert modeling).

Cognitive apprenticeship affords both opportunities and challenges, as do most educational models. What challenges have you considered? How might you overcome them? What benefits might such a model bring you and your students? What aspects of cognitive apprenticeship are you already using? What aspects might you bring back to your classroom for a trial run?

References

Bloom, B.S. (Ed.). (1956). Taxonomy of educational objectives: The classification of educational goals: Handbook I, cognitive domain. New York; Toronto: Longmans, Green.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. Educational Researcher, 18(1), 32-42.

Bruner, J. S. (1961). The act of discovery. Harvard Educational Review, 31, 21-32.

Collins, A. (1991). Cognitive apprenticeship and instructional technology. In L. Idol & B.F. Jones (Eds.), Educational values and cognitive instruction: Implication for reform (pp. 121-138). Hillsdale, NJ: Lawrence Erlbaum Associates.

Collins, A. Brown, J.S. and Holum, A. (1991). Cognitive apprenticeship: Making thinking visible. American Educator, 15(3), 6-11, 38-46.

Collins, A., Brown, J. S., & Newman, S. E. (1989). Cognitive apprenticeship: Teaching the craft of reading, writing, and mathematics. In L. B. Resnick (Ed.), Knowing, learning, and instruction: Essays in honor of Robert Glaser (pp. 453-494). Hillsdale, NJ: Lawrence Erlbaum Associates.

Driscoll, M. P. (2000). Psychology of learning for instruction (2nd ed.). Boston: Allyn and Bacon.

The foxfire approach: Perspectives and core practices. (1992). Hands On: A Journal for Teachers, 42/43, 4-5.

This book is licensed under a Creative Commons Attribution 3.0 License

Hogan, D. M., & Tudge, J. R. H. (1999). Implications of Vygotsky's theory for peer learning. In A. M. O'Donnell & A. King (Eds.), Cognitive perspectives on peer learning (pp. 39-65). Mahwah, New Jersey: Lawrence Erlbaum.

Kerka, Sandra. (1997). Constructivism, workplace learning, and vocational education. ERIC Digest 181; 1-4.

McLellan, H. (1994). Situated learning: Continuing the conversation. Educational Technology 34, 7- 8.

McNeil, J. D. (1987). Reading comprehensions: New directions for classroom practice (2nd ed.). Glenview, IL: Scott, Foresman & Company.

Meichenbaum, D. (1986). Cognitive behavior modification. In F. H. Kanfer & A. P. Goldstein (Eds.), Helping people change: A textbook of methods (3rd ed., pp. 346-380). New York: Academic Press.

Merriam Webster's Collegiate Dictionary. (2001). Merriam-Webster, Incorporated. Available: http://www.m-w.com/home.htm [2001, April 12].

Norman, D. A. (1993). Things that make us smart: Defending human attributes in the age of the machine. New York: Addison-Wesley Publishing Company.

Resnick, L. B. (Ed.). (1989). Knowing, learning, and instruction: Essays in honor of Robert Glaser. Hillsdale, NJ: Lawrence Erlbaum Associates.

Rogoff, B. (1990). Apprenticeship in thinking: cognitive development in social context. New York, NY: Oxford University Press.

Rose, D. (1995). Apprenticeship and exploration: A new approach to literacy instruction. Scholastic Literacy Research Paper, 6, 1-8.

Shunk, D. H. (2000). Learning theories: An educational perspective (3rd ed). Upper Saddle River, NJ: Prentice-Hall.

Tisdale, Kit. (2001). Dissertation and distress in a cognitive apprenticeship in reading. Reading Research and Instruction; 41, 51-82.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

Zhao, R. & Orey, M. (1999). Implementing the scaffolding strategy with the computer. Presented at the annual meeting of the Association for Educational Communications and Technology, Houston, TX.

This book is licensed under a Creative Commons Attribution 3.0 License

20. Examples of modeling

Authors: Saif Altalib and Myoungjin Yang Tollett (The University of Georgia, USA)

Cognitive modeling scenario

The University of Mosul Art History class attempts to explain the high level task of how expert art critics recognize the difference between the works of various famous painters. The first challenge for the art professor, Dr Khan, is to demonstrate effectively to the students the cognitive process in discriminating between a van Gogh painting from a Rembrandt painting. Clearly, simple steps cannot teach this level of cognitive task, and it is not possible to visually imitate the physical actions of the professor or the SME (subject matter expert) since the many skills to accomplish this task and its nuances are within the brain of the SME. Learning cognitive tasks requires the study of key cognitive steps, procedures, and experiences that have been stored and sequenced in the minds of expert art critics from many years of reading, learning, and researching. Rather than having the students learn everything their professor knows, they are expected to learn the key cognitive steps Dr Khan uses in making the distinctions between a selection of very famous historical works of art.

To teach his students how to tell the difference between various historical paintings, Dr Khan uses the first step of the cognitive apprenticeship teaching method, modeling, by first listing and discussing the subtasks or criteria experts use to make discriminations between works of art. His criteria is:

- Study the brush strokes for certain characteristic features, e.g.:
  - broad, flat, smooth, and bold (van Gogh)
  - direction
  - length
  - texture
- Note the use of color:
  - earth tones (Rembrandt)
  - bright, pastel tones (van Gogh)
  - attempt to capture the effects of sunlight (van Gogh)
- Observe the subject matter:
  - different historical period and costumes
  - south France (van Gogh)
  - Holland (Rembrandt, van Gogh painted in Holland in his early period also)
- Study the composition:
  - bold, striking
  - detailed

Note how the model above is nothing more than an outline of subtasks. The professor explains the importance of learning, understanding and articulating each of the above criteria/subtasks before moving on to the next step of the cognitive modeling process. After the students have learned the above criteria, the professor displays various van Gogh and Rembrandt paintings, side by side, in front of the class and articulates to the class the processes that he goes through mentally in telling which painting was created by which artist and how he came to that conclusion. Dr Khan notes the difference of brush strokes, use of color, the subject matter, the historical context of the painting, and the details and composition used in the displayed pieces. This thinking out-loud and commenting activity is intended to build confidence in the students on how to effectively use their mental processes and knowledge of painting standards and criteria in a real world context.

Vincent van Gogh, *Patience Escalier with Walking Stick* (1888) If the strokes are broad, flat and smooth, it is probably a painting by van Gogh (Davis, Alexander, Yelon 1974).

Rembrandt, *Self-Portrait* (detail, 1659), from the National Gallery in Washington, D.C., is one of his finest. Here the artist presents himself with dignity but also reveals, with great candor, the evidence of harsh life experience.

In the next class, Dr Khan visually demonstrates the actual types of brush strokes, paint consistency, and colors being used by van Gogh and Rembrandt. He then splits the students into van Gogh and Rembrandt groups. The assignment is to create a simple painting using the same tools, colors and painting styles modeled by Dr Khan and used by van Gogh and Rembrandt. This type of experiential learning, which is tactile in nature, could scaffold the students' understanding and bring about higher-level thinking regarding how and why the look and feel of the image appears from the start, middle, to the end of the painting.

Over the next class periods, the professor displays more paintings and thinks aloud as he compares the different standards and styles of paintings. The students grow more familiar with his mental processes and realize the professor/expert does not actually go through the various criteria or subtasks in a step-by-step fashion. Because expert art critics have learned to make the judgment so well, they compress these steps and often appear to go directly to the answer.

After the teacher decides some of his students are ready to articulate and make the distinctions themselves, he gives them the opportunity to compare different paintings themselves in front of the class. Presenters are given positive reinforcement, tips, and suggestions in their thinking process from their peers, if needed (scaffolding).

As the course progresses, Dr Khan reduces his participation (fading) and displays paintings with more difficult discriminations (for example the difference between a van Gogh and a Bonnard shown below), thus making the cognitive tasks of the students even more challenging to advance the level of their mental painting discrimination skills.

Vincent van Gogh, *Patience Escalier with Walking Stick* (1888) If the strokes are broad, flat and smooth, it is probably a painting by van Gogh (Davis, Alexander, Yelon 1974).

Pierre Bonnard, *Portrait of Pierre Monteux* (1915). Bonnard's portrait of Pierre Monteux, one of the leading musical conductors of the twentieth century, emphasizes the figure's massiveness.

Cognitive modeling strategies

A cognitive modeling strategy, with teachers and competent students serving as cognitive role models, is a key characteristic of cognitive apprenticeships. The models should put their thoughts and reasons into words because students cannot otherwise monitor the thinking process. If we do not have a few cognitive model strategies mentally stored, engaging in authentic and complex tasks can be extremely difficult.

When designing a modeling strategy, it is important to keep three things in mind:

- First, the model must be complete. Every step in each task and subtask must be included.

This book is licensed under a Creative Commons Attribution 3.0 License

- Second, avoid using words or phrases that can be interpreted in different ways. Try to use action verbs that describe observable behavior. Say exactly what you mean in the simplest and most direct terms.
- Third, be certarson to do two incompatible things at the same time. For example, a person cannot perform two operations at opposite ends of a room at the same exact time.

What is a task?

A task is some activity (often assigned) in which people engage. Not all tasks have an open or observable action component. There are two major classes of tasks: actions task and cognitive task. Normally an action task implies that someone is doing something to another person or object. Cognitive tasks are performed overtly, exposing mental activities. A number of verbs are used to describe such cognitive tasks. Some of these are: decide, judge, discriminate, evaluate, or solve. When managers decide to hire a particular applicant for a job, to invest more money in advertising, or to stop manufacturing a certain item, they are engaging in a cognitive task. When teachers evaluate pupils, decide to seek a new job, or select a spouse, they are engaging in cognitive tasks.

Although we do not often know enough about how people actually complete cognitive tasks, it is still helpful to try to identify the component parts or subtasks and list them. In the case of a decision-making task, we sometimes list the criteria for making the decision. These criteria can then be converted into a form of task description.

It is possible to actually describe cognitive tasks if:

- There are experts who can show and tell us how to perform the cognitive task.

  or

- There is a generally agreed upon procedure for performing the cognitive task.

Sometimes cognitive tasks are a fixed sequence and can be modeled with a flow diagram. A large number of these fixed sequence tasks are in the area of mathematics, or involve the use of mathematical formulae. Although we may do a mathematical task in our heads, it is often done using a fixed sequence of steps with decision points, cues for the next step, and feedback for previous steps.

Another class of tasks is creative tasks, which present a special set of problems. Creative tasks are those which include the production of an original output as the primary goal. When creative tasks are carefully studied, they can generally be broken down into subtasks. Some of the subtasks are describable and some are not. Whenever a task involves an element of personal taste, value, or preference, it is very difficult, if not impossible, to describe or model it. Judges of beauty contests and figure skating may use some objective criteria to evaluate the contestants, but their personal tastes and preferences also play a significant role in their choices (Davis, Alexander, & Yelon, 1974).

Cognitive modeling and behavioral modeling

A cognitive or behavior model (whether it be an outline, visual, flow chart, virtual, etc.) must catch the learner's attention by being distinct, unique, and leaving no room for confusion. Visuals trigger feelings the quickest, go the deepest, and stay with us the longest. Words cannot do that. Davis, Alexander, and Yelon (1974) described unique characteristics of the SME, the SME's behavior, the modeling media, and the learner, which have been demonstrated to significantly affect the degree of learning by modeling.

Modeling is facilitated when the model, or the subject matter expert, in relation to the observer:

- is of the same age, sex, and race, etc
- is of apparent high competence or expertise
- is of high status

- controls resources desired by the observer
- is apparently friendly and helpful
- when the model is rewarded for engaging in the behaviors

Greater modeling will occur when the SME behavior is distinctive. This strategy enhances recall and discrimination of modeled behaviors. Distinctiveness may occur naturally (e.g. a red shape against a black background).

Decker and Nathan (1985) suggest one can induce distinctiveness by:

- displaying key behaviors out of context
- exaggerating the behaviors
- repeating the behaviors, and/or including written labels or descriptions of the vital behavior in the modeling display
- being meaningful to the observer. Bandura, Jeffery, and Bachicha (1974) have shown that letters assigned to modeled behaviors significantly enhance the reproduction of those behaviors when the letters form a meaningful word
- being simple and clearly observable. The key behavior must be readily observable for imitation or generalization to occur

Modeling is facilitated when the modeling media (e.g. film, book, website) depicts the behaviors to be modeled:

- in a vivid and detailed manner
- in order from least to most difficult behaviors
- with sufficient frequency and repetitiveness to make learning probable
- with a minimum of irrelevant details
- when several different models rather than a single model are utilized
- when a live, interactive, or videotape acted model is used
- when a positive modeling display is shown (with or without a negative modeling display) rather than a model only depicting what not to do

Davis, Alexander, and Yelon (1974) found that greater modeling will occur when the observer:

- is instructed to or expected to model or perform the behavior
- is similar to the model in relevant attitudes or background
- is favorably disposed toward or attracted to the model
- is rewarded for engaging in the model's behaviors

Davis, Alexander, Yelon (1974) described the following five functions of learning from behavioral models:

- Attend to the pertinent clues of the expert. The students may misdirect their attention at the time the model is observed, and therefore fail to perform the behavior properly later. A teacher can help by directing the student's attention to those parts of the model's performance that are most important.
- Code for memory. A visual image must be stored in the memory for the particular behavior that the student has witnessed. Older students learn more readily from looking at other's performances than do younger students because of the cumulative effect of the storage in the memory. The development of language and coding schemes for observations, improves the student's ability to profit from watching models.

This book is licensed under a Creative Commons Attribution 3.0 License

- Be able to retain memory of what they have observed, so that it will be available when needed. Memories do fade or disappear with time. However, memory-aiding techniques, such as rehearsal, review, practice, or making an image very vivid for the student, help to maintain the image in the student's memory
- Reproduce the observed motor activities accurately. The student must not only get the idea of the behaviors to perform but she/he must also get the muscular feel of behavior. According to Bandura, usually the student cannot do this perfectly on the first trial, and thus the student needs a number of trials to approximate the behavior.
- Be motivated to carry through all the steps in the process of learning from models. The crucial role of the consequences of the behavior enters the picture at this point. The student must understand that in the future this would be a good way to behave under particular sets of circumstances.

Conclusion

Methods of modeling instruction under cognitive apprenticeship differ greatly from those used in traditional instructional settings, and yet teachers have used forms of them for ages. What differs most is the manner in which the methods are applied and for what purposes. "Rather than emphasizing message delivery and isolated practice, cognitive modeling emphasizes support for learner mental processes as they structure the problem, derive or find information, form action sequences, create new patterns for recall and use, solve problems, and self-evaluate" (Gibbons, 1997, p. 4).

Modeling can be successful when the learners engage in ongoing dialogue with knowledgeable others, as they form, refine, and expand their comprehension. To explain modeling, you must discuss the other methods of cognitive apprenticeships (coaching, scaffolding and fading, articulation, reflection, and exploration) since all of the steps complement each other and are enhanced by the number of principles brought into play together. Cognitive apprenticeship encourages the designer to combine all methods for full enrichment of this proven and efficient teaching style.

References

Bandura, A., Jeffery, R. W., & Bachicha, D. L. (1974). Analysis of memory codes and cumulative rehearsal in observational learning. Journal of Research in Personality, 7, 295-305.

Barlow, D. L. Educational Psychology (1985). The Teaching-Learning Process. The Moody Bible Institute of Chicago.

Bellinger, G. (2004). Modeling. Available Website: http://www.systems-thinking.org/simulation/model.htm.

Berryman, S. E. (1990). Designing Effective Learning Environments: Cognitive Apprenticeship Models. Institute on Education and The Economy, Columbia University, New York.

Bloomfield, B. P. (1986). Modeling the World. Basil Blackwell Ltd.

Boeree, Dr. C. G. (1998). ALBERT BANDURA. Available Website: http://www.ship.edu/~cgboeree/bandura.html.

Brill, J., Kim, B., & Galloway, C. (2001). Cognitive apprenticeships as an instructional model. In M. Orey (Ed.), Emerging perspectives on learning, teaching, and technology. Available Website: http://www.coe.uga.edu/epltt/CognitiveApprenticeship.htm.

20. Examples of modeling

Conway, J. (1997). Educational Technology's Effect on Models of Instruction. Available Website: http://copland.udel.edu/~jconway/EDST666.htm.

Davis, R. H. and Alexander, L. T., and Yelon S. L. (1974). Learning System Design: An approach to the improvement of instruction. McGraw-Hill, Inc.

Decker, P. J. and Nathan, B. R. (1985). Behavior Modeling Training. Praeger Publishers.

Dennen, V. P. (2001). Cognitive Apprenticeship in Educational Practice: Research on Scaffolding, Modeling, Mentoring, and Coaching as Instructional strategies. Florida State University, Tallahassee, FL.

Dick, W., Carey, L., & Carey, J. O. (2005). The systematic design of instruction (6th ed.). Boston: Allyn and Bacon.

Epsilon Learning Systems (2003). Epsilon Learning. Available Website: http://www.epsilonlearning.com/focus.htm.

Harris, J. B. and Jones, G. A Descriptive Study of Telementoring Among Students, Subject Matter Experts, and Teachers. University of Texas at Austin.

Hmelo, C. E., Ramakrishnan, S., Day, R. S., Shirey, W. E, Huang, Qingshou (1999). Scaffolded use of a modeling tool to support scientific inquiry. International Conference on Computers in Education.

Huitt, W. (2004). Observational (social) learning: An overview. Educational Psychology Interactive. Valdosta, GA: Valdosta State University. Retrieved [date], from http://chiron.valdosta.edu/whuitt/col/soccog/soclrn.html.

Lajoie, S. P., Wiseman, J., and Faremo, S. (1999). Tutoring Strategies for Effective Instruction in Internal Medicine. McGill University, Department of Educational and Counseling Psychology.

McGee, S., Howard, B. C., & Hong, N. (1998). Cognitive Apprenticeship, Activity Structures, and Scientific Inquiry. NASA Classroom of the Future. Annual Conference of the American Educational Research Association, Sand Diego, CA.

Solmon, L. C. (1996) Technology, Corporate Training, and Education. Milken Institute Monograph Series.

William and Mary Electronic Emissary Project. http://emissary.wm.edu/

Yates, B. L. (1999) Modeling Strategies for Prosocial Television: A Review. Paper presented to the Open Paper Competition. AEJMC Southeast Colloquium. Lexington, Kentucky March 4-6.

This book is licensed under a Creative Commons Attribution 3.0 License

21. Scaffolding

Authors: Lindsay Lipscomb, Janet Swanson, and Anne West (The University of Georgia, USA)

Scenario

Third grade students in Mrs Maddox's class have been studying about different types of communities for the past two weeks. Throughout this study, students have focused on distinguishing between rural, urban, and suburban communities. Living in a rural community, students are familiar with large expanses of land, farms, considerable distances between houses, and lack of malls, skyscrapers, and entertainment venues. In contrast with that, the students took a field trip to downtown Atlanta, a US capital city in the state of Georgia, to experience tall buildings, public transportation, commuters, super highways, extensive shopping, sports arenas, and fine arts venues. Through this trip, they came to have a better understanding of an urban community. Between the school and downtown Atlanta, students were exposed to suburban communities as the bus took them through a neighborhood and a community outside the perimeter. Students experienced rows of houses, commuters, strip malls, eating establishments, churches, and parks. The students were able to apply the knowledge of their classroom activities to the field trip and could easily determine the differences between each type of community.

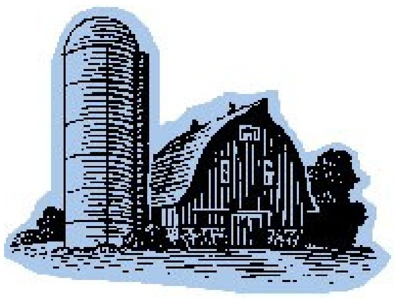

Exhibit 28: Barns and silos

Exhibit 29: City and tall buildings

As a culminating activity for this study on types of communities, the students are going to prepare some type of individually selected project demonstrating their knowledge of urban, suburban, and rural communities. Mrs Maddox makes suggestions as to the types of projects students might consider. Some choose to write and illustrate a book, others write and perform a play, and still others film a video using footage taken from their trip. One student focuses on interviewing residents of each community.

Patrick, the computer whiz of the class, decides to prepare a PowerPoint presentation which will incorporate digital pictures taken on the field trip and of the rural areas surrounding the school community. He has successfully written the text for his slides but has been unable to insert the digital pictures from his disk. Mrs Maddox notices that Patrick is experiencing frustration with his inability to insert the pictures. She approaches to offer help, not to complete the task for Patrick, but rather to provide support and to help him achieve his objective on his own.

Mrs Maddox thinks aloud as she offers help: “Let’s see. I want to insert a picture into the slide from the disk. I need to go to the toolbar at the top and select 'insert' since that’s what I want to do. And since it’s a picture that I want to insert, I’ll select 'picture'. Now I have to tell the computer where to find the picture I want. Since the picture is on a disk, I’ll select ‘from file’. Then I’ll click 'insert' and viola! My picture is there. Now all I have to do is save it.” As Mrs Maddox talks through the steps, Patrick carefully follows her prompts and completes each step. He beams as he sees the selected picture on his slide. Mrs Maddox then teaches Patrick a chant she has composed that will assist him with the steps: “In-sert a picture from a file; locate the file and se-lect the pic; click to in-sert and save it, quick!” She watches as Patrick goes through the steps, questioning him with leading questions; he hesitates and listens, while he quietly says the chant to himself to perform the task. Again, he beams with excitement as the slide displays the selected picture. Mrs Maddox moves away from the computer and allows Patrick to insert the next picture on his own. Seeing that he is successful, she moves on to assist another student.

Later, when another student, Melissa, needs assistance with inserting a picture to a PowerPoint slide, Mrs Maddox asks Patrick to be a peer tutor to her. He further expands his learning by explaining the steps to Melissa and by teaching her the same chant he used to complete the steps to insert a picture in the PowerPoint slide.

Through her support and facilitation, Mrs Maddox helped Patrick master a skill and achieve independence through carefully designed instruction called scaffolding. This process of scaffolding is much like the traditional definition of scaffolding as a temporary support system used until the task is complete and the building stands without support. Such is the concept of scaffolding. Immediate support is given to students in order to help them achieve skill or task independence. This assistance is a temporary framework provided by the teacher or a more knowledgeable person to assist students in performing a task they otherwise cannot accomplish without assistance. Support is provided to the learner and then gradually removed so that the student can become a self-regulated, independent learner. “Although the teacher assumes much of the control during scaffolded instruction, the ultimate goal of instruction is covert, independent self-regulatory learning” (Ellis et al. 1994).

What is scaffolding?

The term “scaffolding” comes from the works of Wood, Bruner, and Ross (1976). The term “scaffolding was developed as a metaphor to describe the type of assistance offered by a teacher or peer to support learning. In the process of scaffolding, the teacher helps the student master a task or concept that the student is initially unable to grasp independently. The teacher offers assistance with only those skills that are beyond the student’s capability. Of great importance is allowing the student to complete as much of the task as possible, unassisted. The teacher only attempts to help the student with tasks that are just beyond his current capability. Student errors are expected, but, with teacher feedback and prompting, the student is able to achieve the task or goal. When the student takes responsibility for or masters the task, the teacher begins the process of “fading”, or the gradual removal of the scaffolding, which allows the student to work independently. “Scaffolding is actually a bridge used to build upon what students already know to arrive at something they do not know. If scaffolding is properly administered, it will act as an enabler, not as a disabler” (Benson, 1997).

Many different facilitative tools can be utilized in scaffolding student learning. Among them are: breaking the task into smaller more, manageable parts; using “think alouds”, or verbalizing thinking processes when completing a task; cooperative learning, which promotes teamwork and dialogue among peers; concrete prompts, questioning; coaching; cue cards or modeling. Others might include the activation of background knowledge, giving tips,

This book is licensed under a Creative Commons Attribution 3.0 License

strategies, cues and procedures. Teachers have to be mindful of keeping the learner in pursuit of the task while minimizing the learner's stress level. Skills or tasks too far out of reach can lead a student to his frustration level, and tasks that are too simple can cause much the same effect.

Each facilitative method used is chosen as an individually tailored instructional tool. Teachers have to have open dialogue with the students to determine what and how they are thinking in order to clear up misconceptions and to individualize instruction. Crucial to successful scaffolding is an understanding of the student's prior knowledge and abilities. The teacher must ascertain what the student already knows so that it can be "hooked", or connected to the new knowledge and made relevant to the learner's life, thus increasing the motivation to learn.

In the scenario example, Mrs Maddox used several different strategies to help Patrick learn the steps to inserting a picture in his PowerPoint project. By thinking aloud, Mrs Maddox verbalized her thinking processes for Patrick. Hearing the process, Patrick was able to follow her thinking and take control of the computer. Using a mnemonic device, the chant, she enabled Patrick to verbalize the process himself. Internalizing the chant, he was able to complete the task. Questioning and prompting enabled Patrick to think through the process until he was able to insert a picture with very limited help. Mrs Maddox gradually reduces the amount of help she gives Patrick, eventually allowing him to complete the task independently. She further expands his knowledge by asking him to assist another student. While tutoring another student, he is able to think through the process and verbalize the steps in a manner in which others can understand.

Vygotsky's Zone of Proximal Development

Inherent in scaffolded instruction is Lev Vygotsky's (1978) idea of the Zone of Proximal Development (ZPD). Vygotsky suggests that there are two parts of a learner's developmental level: the "actual developmental level" and the "potential developmental level". The Zone of Proximal Development is: "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (Vygotsky, 1978, p. 86). The ZPD can also be described as the area between what a learner can do by himself and that which can be attained with the help of a More Knowledgeable Other (MKO) adult or peer. The MKO shares knowledge with the student to bridge the gap between what is known and what is not known. Once the student has expanded his knowledge, the actual developmental level has been expanded and the ZPD has shifted. The ZPD is always changing as the student expands and gains knowledge, so scaffolded instruction must constantly be individualized to address the changing ZPD of each student.

It was Vygotsky's belief that "good learning" occurs in the child's Zone of Proximal Development. Important to teaching in the ZPD is the determination of what the student can manage on his own and to allow the student to do as much as possible without any assistance. "Fading" is the process of gradually removing the scaffolding that was put into place for the child until it is completely gone. Eventually, the child internalizes the information and becomes a self-regulated, independent learner. (For a more thorough look at Vygotsky's theories and his works relating to ZPD and MKO see the chapter in this e-book entitled Vygotsky's Constructionism.)

Until students can demonstrate task mastery of new or difficult tasks, they are given more assistance or support from a teacher or a More Knowledgeable Other (MKO). As the learner moves toward mastery, the assistance or support is gradually decreased in order to shift the responsibility for learning from the MKO to the learner (Larkin, 2002). Zhao and Orey (1999) summarize, "scaffolding is a metaphor to characterize a special type of instructional process which works in a task-sharing situation between the teacher and the learner". The authors further delineate this basic idea into two key aspects (or rules): "(a) help the learner with those aspects of the task that the learner can not manage yet; and (b) allow the learner to do as much as he or she can without help" (p. 6).

Characteristics and critical features of scaffolded instruction

Lange (2002) states that there are two major steps involved in instructional scaffolding: (1) "development of instructional plans to lead the students from what they already know to a deep understanding of new material", and (2) "execution of the plans, wherein the instructor provides support to the students at every step of the learning process". In an appropriate scaffolding process, there will be specific identifiable features that are in place to allow facilitation of assisting the learner in internalizing the knowledge until mastery occurs. Applebee and Langer (1983), as cited by Zhao and Orey (1999), identify these five features as:

- **Intentionality**: The task has a clear overall purpose driving any separate activity that may contribute to the whole.
- **Appropriateness**: Instructional tasks pose problems that can be solved with help but which students could not successfully complete on their own.
- **Structure**: Modeling and questioning activities are structured around a model of appropriate approaches to the task and lead to a natural sequence of thought and language.
- **Collaboration:** The teacher's response to student work recasts and expands upon the students' efforts without rejecting what they have accomplished on their own. The teacher's primary role is collaborative rather than evaluative.
- **Internalization**: External scaffolding for the activity is gradually withdrawn as the patterns are internalized by the students (p. 6).

Larkin (2002) states, "Scaffolding is one of the principles of effective instruction that enables teachers to accommodate individual student needs". In keeping with this theory, it can be seen that instruction must also be tailored around "contingent instruction", which is a term identified by Reichgerlt, Shadbolt, Paskiewica, Wood, & Wood (1993) as cited by Zhao and Orey (1999). The teacher or MKO realizes that the amount of instructional support given is dependent upon the outcome of the previous assistance. If a learner is unable to complete a task after an intervention by the MKO, then he or she is immediately given a more specific directive. Equally, if the learner is successful with an intervention, then he or she is given a less explicit directive the next time he or she needs assistance. Next, the instructor or MKO must recognize that the instructional intervention must be specific to the task the learner is currently attempting to complete. Finally, the teacher must keep in the forefront of the process that the student must be given ample time to apply the directive or to try a new move him/herself before additional intervention is supplied. We can explore this type of instruction through the introductory scenario about Mrs Maddox's class' study of communities.

In our scenario Mrs Maddox showed **intentionality** by providing activities for her students to enhance the study of rural, urban, and suburban communities. She drew on prior knowledge of the rural area by reminding students of the characteristics of the area in which they live. Next, she introduced urban and suburban communities by providing a field trip to Atlanta, an urban environment. The students also experienced suburban communities by driving through several of these areas on the way to Atlanta.

This book is licensed under a Creative Commons Attribution 3.0 License

Appropriateness was displayed by her choice of projects for her students. Even though she offered the students a choice, they were limited by her menu of projects. Her selections were made by including only those which the students could not successfully complete on their own. In other words, the projects are just beyond their zone of proximal development.

The **structure** of modeling and questioning activities provides appropriate approaches to the tasks for the students. Mrs Maddox uses verbalizing for Patrick as well as modeling. He is then allowed to become a peer tutor in order to expand his knowledge.

Collaboration is also seen in her work with Patrick. She did not tell him that he was wrong but, instead, analyzed his approach, verbalized the steps necessary to complete the task while modeling the skills needed. She then invited him to join her in a chant to help him remember the steps of the process.

Finally, **internalization** is evidenced by Mrs Maddox's fading of her scaffolding and allowing Patrick to become a peer tutor for Melissa.

Six general elements of scaffolded instruction

Scaffolded instruction can be analyzed for application through its six general elements. Zhao and Orey (1999) identify these six general features of the scaffolding process as: sharing a specific goal, whole task approach, immediate availability of help, intention assisting, optimal level of help, and conveying an expert model.

Sharing a specific goal

It is the teacher's responsibility to establish the shared goal. However, the learner's interests must be recruited or enlisted through the teacher's ability to communicate with the learner and achieve intersubjectivity (sharing intentions, perceptions, feelings, and conceptions) (Zhao & Orey, 1999). The teacher must do some pre-assessment of the student and the curriculum. Achievement of curriculum objectives is planned as the teacher considers the needs of each student. The teacher must be considerate of some of the unique, unusual, and often ineffective problem-solving techniques that children use. As discussed in the chapter on the Six C's of Motivation, allowing input from the student on the shared goal will enhance intrinsic motivation. It will also help control the frustration level of the learner as he or she will feel that their interests have been validated. It will assist the learner in establishing a desire to master the goal where success is contingent upon one's own ability in developing new skills. In this manner, the process of learning itself is esteemed, and the attainment of mastery is seen as being directly correlated with the effort put forth.

Whole task approach

In the whole task approach, the focus is on the overall goal to be attained throughout the entire process. Consequently, the task is learned as a whole instead of a set of individual sub-skills. Each feature of the lesson is learned as it relates to the whole task. This approach lessens the amount of passive knowledge on the part of the learner and the need for transfer is not as great. It must be noted that this approach is only effective if the learner does not experience extreme difficulty with any of the component skills needed to complete the whole task. Imagine how difficult it would be to scaffold a child in telling time if they could not identify the numbers 1 through 12.

Immediate availability of help

Frequent success is important in scaffolding, especially in helping control frustration levels of the learner. Student successes may be experienced more often if the MKO provides assistance in a timely and effective manner so as to enable the learner to proceed with the task. These successes, in turn, help to increase motivation through a positive self-efficacy and make the learner's time and effort more productive. This procedure directly corresponds to the first rule of scaffolding as defined by Zhao & Orey (1999), which is to assist the learner with those tasks he/she is not yet able to carry out on his/her own.

Intention-assisting

It is central to the scaffolding process to supply assistance to the learner's present focus, thereby helping the learner with his/her current difficulties. In providing this immediate help with the current task at hand, a more productive learning environment is fostered because information has been related and conferred according to the learner's focus keeping the learner in pursuit of the task. However, it is often necessary to redirect the intentions of the learner if they do not represent an effective strategy for completing the task. The teacher or MKO must be cognizant that there are numerous ways of accomplishing a certain task. If the learner's current path is effective, it should be accepted as it is the essence of scaffolding to help the learner proceed with the least amount of assistance as possible. If the MKO finds him/herself consistently helping a learner with low level intentions, it may be a good idea to turn to coaching as a strategy to help the learner progress. This is beneficial in that it helps the learner examine the task from a different perspective so as to encourage higher level thinking skills.

Optimal level of help

What the learner is able to do should be matched with the level of assistance provided. The learner should be given just enough help to overcome the current obstacle, but the level of assistance should not hinder the learner from contributing and participating in the learning process of that particular task. In other words, the assistance should only attend to the areas of the task that he/she cannot accomplish on his/her own. No intervention should be made if the current task is within the learner's capabilities. However, if the learner lacks the necessary skills, a demonstration is needed.

Conveying an expert model

An expert model can provide an explicit example of the task as the expert way of accomplishing the task. The techniques for accomplishing the task are clearly expressed. In an implicit demonstration, the information is outlined around the expert model.

Methods of instructional scaffolding

Lange (2002) states that based on the work of Hogan and Pressley (1997) there are five different methods in instructional scaffolding: modeling of desired behaviors, offering explanations, inviting students to participate, verifying and clarifying student understandings, and inviting students to contribute clues. These techniques are used to direct students toward self-regulation and independence.

The first step in instructional scaffolding is usually modeling. Lange (2002) cites Hogan and Pressley (1997) as defining modeling as, "teaching behavior that shows how one should feel, think or act within a given situation". There are three types of modeling. Think-aloud modeling gives auditory substance to the thought processes associated with a task. For example, a teacher might verbalize her thought processes for breaking an unfamiliar word down into its parts so that it can be read. Talk-aloud modeling involves verbalizing the thought process or problem solving strategy while demonstrating the task. An example would be a teacher verbally describing her thought processes as she demonstrates the correct way to subtract two digit numbers on the board. Lastly, there is performance modeling. Performance modeling requires no verbal instruction. For example, a baseball coach might show one of his players how to get under a ball to catch it (Lange, 2002).

As well as modeling, the instructor needs to offer explanations. These explanations should openly address the learner's comprehension about what is being learned, why, and when it is used, and how it is used (Lange, 2002). At the beginning, explanations are detailed and comprehensive and repeated often. As the learner progresses in his knowledge, explanations may consist of only key words and prompts to help the learner remember important information. For example, when teaching children how to identify adjectives in a sentence, the teacher will need to lead the children through learning the detailed definition of an adjective in the beginning. The instructor may have to repeat or rephrase this thorough explanation many times during guided practice. As the students gain experience, the teacher might just prompt the students with words like “what kind”, “which one”, and “how many”.

Lange (2002) next addresses inviting student participation, especially in the early stages of scaffolding. This technique will heighten student engagement and ownership in the learning process. It will also provide the instructor with an opportunity to emphasize or correct understandings of the task. This leads us to verifying and clarifying student understandings. As students become familiar with new material, it is key for the teacher to evaluate student understanding and provide positive and corrective feedback.

Points to consider when implementing instructional scaffolding:

Larkin (2002) suggests that teachers can follow a few effective techniques of scaffolding:

> *Begin by boosting confidence. Introduce students first to tasks they can perform with little or no assistance. This will improve self-efficacy. Provide enough assistance to allow students to achieve success quickly. This will help lower frustration levels and ensure that students remain motivated to advance to the next step. This will also help guard against students giving up due to repeated failures. Help students “fit in”. Students may actually work harder if they feel as if they resemble their peers. Avoid boredom. Once a skill is learned, don’t overwork it. Look for clues that the learner is mastering the task. Scaffolding should be removed gradually and then removed completely when mastery of the task is demonstrated.*

Applications of scaffolding

Scaffolding is used in a very wide range of situations. Mothers naturally employ this approach as they teach their children how to live in and enjoy their world. Teachers, from Pre-K to Adult Education appreciate the necessity and increased learning afforded by the use of these techniques. Non-traditional educational settings, such as business training scenarios and athletic teams, also use these methods to assure the success of their employees and/or members. Teachers and trainers can even use the techniques and strategies of scaffolding without even knowing the name of this useful method. It is a very natural approach to ensure the learning of the student.

Preschool (toddlers)

Morelock, Brown and Morrissey (2003) noted in their study that mothers adapt their scaffolding to the perceived abilities of their children. The mothers scaffold interactions at play by modeling or prompting behaviors which they see demonstrated by their child or just beyond the level demonstrated. For instance, the very young child is playing with blocks by stacking them on top of each other. The mother attracts the child’s attention and models how to “build” a wall or bridge by stacking them in a different way and using a toy person or truck to climb the wall or ride over the bridge. She then watches and assists as needed until the child appropriates the skill or loses interest and moves on to something else. She will try again the next time the child is playing with the blocks or try another construction which she feels will be more attractive to the child.

The study further suggested that the mother will adapt her scaffolding behavior to the needs of her child. If she sees that the child is imaginative and creative, she will then scaffold beyond the apparent skill level exhibited. Conversely, if she perceives that the child is less attentive or exhibits behaviors which are not easy to decipher, she will then demonstrate new skills instead of extensions to the skills already present. The authors suggest that this could be a possible early indicator for giftedness.

Pre-K through grade 5 (elementary school)

An elementary math teacher is introducing the addition of two digit numbers. She first solicits the students' interest by using a "hook" such as an interesting story or situation. Then she reduces the number of steps for initial success by modeling, verbally talking through the steps as she works and allowing the students to work with her on the sample problems. An overhead projector is a great tool for this activity because the teacher is able to face the class while she works the problems. She can then pick up non-verbal cues from the class as she works. The students' interest is held by asking them to supply two digit numbers for addition, playing "Stump the Teacher". She takes this opportunity for further modeling of the skills and verbally presenting the process as she works through these problems.

The students are then allowed to work several problems independently as the teacher watches and provides assistance where needed. The success rate is increased by providing these incremental opportunities for success. Some students may require manipulatives to solve the problems and some may require further "talking through" the procedures. These strategies may be applied individually or in small groups.

More challenging problems can then be added to the lesson. Further explicit modeling and verbalization will be required. Some students will be able to work independently while some will require more assistance and scaffolding. She will begin to fade the scaffolding as soon as she is sure that the students can effectively function alone.

Upper grades (6-12)

Banaszynski (2000) provides another example of instructional scaffolding in his article about a project in which a group of eighth-grade history students in Wisconsin examined the US Revolutionary War from two points of view, American and British. He began by guiding his students as they undertook a sequential series of activities in order to thoroughly investigate the opposing reactions to causes of the war. Then students contributed to a class time line which detailed causes, actions, and reactions. Banaszynski describes how work continued:

> *" After the time line was completed, the students were arranged in groups, and each group did a critical analysis of primary-source material, focusing on the efforts each side made to avoid the war. This started students thinking about what the issues were and how each side handled them. The next step was to ask a question: Did the colonists have legitimate reasons for going to war against Great Britain? [I] asked each group to choose either the Patriot or Loyalist position and spend a day searching the Internet for primary sources and other materials to support their positions."*

The instructor continued scaffolding by interviewing the groups to probe for misconceptions, need for redirection, or re-teaching. Students later compared research and wrote essays that were analyzed and evaluated by fellow students using rubrics; groups then composed essays that included the strongest arguments from the

This book is licensed under a Creative Commons Attribution 3.0 License

individual works. The project, Banaszynski says, was an enormous success; students began the unit working as individuals reliant upon him for instruction. As work proceeded, the feedback framework was altered so that students were guiding each other and, in turn, themselves. Banaszynski's role in guiding the research and leading the reporting activities faded as the project continued and requirements became more complicated. As a result, students were able to appreciate their mastery of both materials and skills.

Adult and higher education

Kao, Lehman, & Cennamo (1996) postulated that scaffolds could be embedded in hypermedia or multimedia software to provide students with support while using the software. They realized that soft scaffolds are dynamic, situation-specific aids provided by a teacher or peer while hard scaffolds are static and specific. Thus, hard scaffolds can be anticipated and planned based on a typical student difficulties with a task. With these two aspects in mind, they developed a piece of software called "Decision Point" and tested it with a group of students.

They embedded three types of hard scaffolds: conceptual scaffolds, specific strategic scaffolds, and procedural scaffolds. The conceptual scaffolds assisted the students in organizing their ideas and connecting them to related information. The specific strategic scaffolds were included to help the students ask more specific questions and the procedural scaffolds were useful to clarify specific tasks such as presentations. Examples of these types of embedded scaffolds include: interactive essays, recommended documents, student guides, student journal, and storyboard templates.

This type of software would be very useful in higher education and adult learning because it is portable, could be used asynchronously, and allows the learners more independence. One or two initial face-to-face sessions would be required to teach the basics, establish learning communities and relate the class expectations and time line. The students could then proceed at their pace while working within the framework of their group and the class expectations. The instructor would provide feedback to groups and individuals, be available for assistance and scaffold specific students at their point of need.

If software with built in scaffolds is not available, then the instructor could provide a similar environment by having an open classroom in which the students are provided with the expectations and a time line at the onset. They may then choose to attend face-to-face classes, work independently, or work in groups. The more knowledgeable students, as well as the instructor, could then provide scaffolding in and out of the classroom. The hard scaffolds could be provided with textbooks and references and links on the class website. The instructor would still provide feedback on assignments and class work, be available for assistance, and scaffold specific individuals or groups at their point of need.

Appropriately, more responsibility is placed on the adult learner. Motivation comes from within and is based on the learner's goals and objectives such as advanced degrees, career opportunities, and increased pay. Ultimately, the learner assumes a dual role in that they are students and peer instructors as they scaffold their classmates.

Dance in the landscape

Diane Wilder (2003) wrote about an open-ended form of dance creation experience that was presented at the founding community dance conference "Moving On 2000" in Sydney, Australia. The first workshop participants created a piece based on their collaborative efforts in "inviting and layering ideas, making and linking connections, interplay of relationships, and harnessing the collective wisdom". The dancers then re-grouped for successive workshops within the conference structure.

In each re-grouping, the attendees taught, scaffolded, and collaborated with one another to further the dance piece. If someone did not understand the layer that was created at a previous workshop, the participants familiar with that sequence would then scaffold by first checking for prior knowledge. Then, they would model the dance sequence and have their fellow learners follow along. This step would be repeated several times, then the "instructors" would step back to watch. Interventions would take place when appropriate until the novices had mastered the sequence.

Scaffolding would then fade as the participants began to extend the creation of the dance with sequences of their own. The beauty of this type of scaffolding at a conference is that everyone would have the opportunity to either provide scaffolding or to be the recipient of the scaffolding. As the participants went on to successive workshops, new groups were formed with different sets of prior knowledge. The task was then to build upon that knowledge base by collaborating to learn new sequences and then expand upon that base by adding another set of dance elements.

Business

Mr Longstreet is the trainer for High Point National Bank. His responsibilities include training new cashiers as well as updating all employees on technology upgrades and new programs. As new employees enter the business, he contacts them to set up a training schedule. Each new employee is provided with a manual, a CD-ROM of the introductory presentation, and a mentor.

Mr Longstreet begins the training program with a tour of the bank's facilities. He is careful to mention and point out the placement and uses of the equipment for which the new employees will be responsible. Next, they meet for a face-to-face orientation presentation. He provides an overview of the manual by using PowerPoint and a projector. The employees are encouraged to mark any portions of the manual with which they feel uncomfortable and note questions in the margin.

The mentors then take over and the new employees spend several hours shadowing them to gain insight into operations and have a chance to ask questions. The mentors assess their protégés during this process in order to provide feedback to the trainer about gaps in their knowledge or specific problem areas.

The third session is held in the computer lab at the main office. The cashiers-in-training are instructed in a hands-on work session using the actual programs and real life scenarios included in the manual's appendix. The trainer is able to scaffold each individual at their point of need based on his own observations as well as the information provided to him by the mentors. The learners continue to work through the scenarios at their own pace while the trainer circulates through the lab modeling, questioning or providing feedback as needed.

Now the new cashiers are ready to work in tandem with their mentor. They first watch the mentor and answer questions, and then they are given the responsibility of handling transactions while the mentor takes the backseat. They are in charge, but the mentor is right there to intervene in case of a lapse in memory or a new situation. Fading begins and new scaffolding opportunities are encountered as the zone of proximal development expands with the new cashiers' acquired knowledge and skills.

Finally, the cashiers are ready to function on their own. The mentor will continue to periodically contact and question the cashier as well as be available for comments and questions that may arise during the workday. The trainer will hold his final follow-up session in about two weeks to update the new cashiers on any recent changes, allow time for questions, and assess the learners with a final scenario.

This book is licensed under a Creative Commons Attribution 3.0 License

Challenges and benefits of scaffolding

As with any other learning theory or strategy, there are challenges and benefits to scaffolding. Understanding and comparing both will assist the educational professional or trainer in their assessment of the usefulness of the strategies and techniques as well as allow for comprehensive planning before implementation. The challenges are real but can be overcome with careful planning and preparation.

Challenges

- very time consuming
- lack of sufficient personnel
- potential for misjudging the zone of proximal development; success hinges on identifying the area that is just beyond but not too far beyond students' abilities
- inadequately modeling the desired behaviors, strategies, or activities because the teacher has not fully considered the individual student's needs, predilections, interests, and abilities (such as not showing a student how to "double click" on an icon when using a computer)
- full benefits not seen unless the instructors are properly trained
- requires the teacher to give up control as fading occurs
- lack of specific examples and tips in teacher's editions of textbooks

When assessing the benefits of scaffolding, it is necessary to consider the context in which you wish to implement the strategies and techniques. Additionally, you must know the learners and evaluate their particular needs first.

Benefits

- possible early identifier of giftedness
- provides individualized instruction
- greater assurance of the learner acquiring the desired skill, knowledge, or ability
- provides differentiated instruction
- delivers efficiency—Since the work is structured, focused, and glitches have been reduced or eliminated prior to initiation, time on task is increased and efficiency in completing the activity is increased.
- creates momentum—Through the structure provided by scaffolding, students spend less time searching and more time on learning and discovering resulting in quicker learning
- engages the learner
- motivates the learner to learn
- minimizes the level of frustration for the learner

Effective teaching principles

Another major benefit of scaffolding is that it supports the ten principles of effective teaching highlighted in Ellis, Worthington, and Larkin's (n.d.) Executive Summary of the Research Synthesis on Effective Teaching Principles and the Design of Quality Tools for Educators. These ten principles are:

Principle 1: Students learn more when they are engaged actively during an instructional task.

Principle 2: High and moderate success rates are correlated positively with student learning outcomes, and low success rates are correlated negatively with student learning outcomes.

Principle 3: Increased opportunity to learn content is correlated positively with increased student achievement. Therefore, the more content covered, the greater the potential for student learning.

Principle 4: Students achieve more in classes in which they spend much of their time being directly taught or supervised by their teacher.

Principle 5: Students can become independent, self-regulated learners through instruction that is deliberately and carefully scaffolded.

Principle 6: The critical forms of knowledge associated with strategic learning are (a) declarative knowledge, (b) procedural knowledge, and (c) conditional knowledge. Each of these must be addressed if students are to become independent, self-regulated learners.

Principle 7: Learning is increased when teaching is presented in a manner that assists students in organizing, storing, and retrieving knowledge.

Principle 8: Students can become more independent, self-regulated learners through strategic instruction.

Principle 9: Students can become independent, self-regulated learners through instruction that is explicit.

Principle 10: By teaching sameness both within and across subjects, teachers promote the ability of students to access potentially relevant knowledge in novel problem-solving situations.

Each one of these principles can be supported with the use of scaffolding. In our efforts to provide the best educational opportunities for all of our students, we must continue to research and test cutting-edge strategies and techniques while employing the tried and true methods of effective practice.

References

Applebee, A.N., & Langer, J. (1983). Instructional scaffolding: Reading and writing as natural language activities. *Language Arts*, *60(2)*, 168-175.

Banaszynski, J. (2000). Teaching the American Revolution: Scaffolding to success. retrieved February 10, 2004, from Education World: The Educator's Best Friend Web site: http://www.educationworld.com/a_curr/curr218.shtml.

Benson, B. (1997). Scaffolding (Coming to Terms). *English Journal*, *86(7)*, 126-127.

Borthick, A. (1999). Designing learning experiences within learner's zones of proximal development (ZPDs): Enabling collaborative learning on-site and online. Retrieved on September 25, 2007 from http://goliath.ecnext.com/coms2/gi_0199-2983439/Designing-learning-experiences-within-learners.html.

Brill, J. (2001). Cognitive apprenticeship as an instructional model. Retrieved March 1, 2004 from http://www.coe.uga.edu/epltt/CognitveApprenticeship.htm.

Brush, T. A, & Saye, J. W. (2002). A summary of research exploring hard and soft scaffolding for teachers and students using a multimedia supported learning environment.*The Journal of Interactive Online Learning*, *1(2)*. Retrieved on September 25, 2007 from http://www.ncolr.org/jiol/issues/PDF/1.2.3.pdf.

Ellis, E. (1994). Effective teaching principles and the design of quality tools for educators. Retrieved March 15, 2004, from http://uoregon.edu/~ncite/documents/techrep/tech06.html.

Ellis, E. S., Worthington, L., & Larkin, M. J. (n.d.). Executive summary of the research synthesis on effective teaching principles and the design of quality tools for educators. Retrieved March 25, 2004 from http://idea.uoregon.edu/~ncite/documents/techrep/tech06.html.

This book is licensed under a Creative Commons Attribution 3.0 License

Galloway, C. (2001). Vygotsky's constructionism. Retrieved January 20, 2004 from http://projects.coe.uga.edu/epltt/index.php?title=Vygotsky%27s_constructivism.

Gillen, J. (2000). Versions of Vygotsky. *British Journal of Educational Studies*, *48(2)*, 183-198.

Hausfather, S. (1996). Vygotsky and schooling: Creating a social context for learning. *Action in Teacher Education*, *18(2)*, 1-10.

Hogan, K., & Pressley, M. (Eds.). (1997). Scaffolding student learning: Instructional approaches and issues. Cambridge, MA: Brookline.

Kao, M., Lehman, J., & Cennamo, K. (1996). Scaffolding in hypermedia assisted instruction: An example of integration. Paper presented at the convention of the Association for Educational Communications and Technology. (ERIC document reproduction service no. ED397 803).

Lange, V. L. (2002). Instructional scaffolding. Retrieved on September 25, 2007 from http://condor.admin.ccny.cuny.edu/~group4/Cano/Cano%20Paper.doc.

Larkin, M. (2002). Using scaffolded instruction to optimize learning. Arlington, VA: ERIC Clearinghouse on Disabilities and Gifted Education. (Retrieved September 25, 2007 from ERIC at EBSCOhost, ERIC No. ED. 474 301).

Morelock, M. J., Brown, P. M., & Morrissey, A. (2003). Pretend play and maternal scaffolding: Comparison of toddlers with advanced development, typical development and hearing impairment. Retrieved February 16, 2004 from http://search.epnet.com/direct.asp?an=11246829&db=aph.

Reichgelt, H., Shadbolt, N., Paskiewicz, T., Wood, D., & Wood, H. (1993). Implementing more effective tutoring systems. In A. Sloman, Hogg, D., Humphreys, G., Ramsay, A., & Partridge, D. (Eds.). Prospects for Artificial Intelligence. (pp. 239-249). Amsterdam: IOS Press.

Verenikina, I. (1998). Understanding scaffolding and the ZPD in educational research. Retrieved March 12, 2004 from http://www.aare.edu.au/03pap/ver03682.pdf.

Vygotsky, L.S. (1978). Mind in Society. Cambridge, MA: Harvard University Press.

Wilder, D. L. (2003). Community dance: Navigating the possible. Australian Dance Council. Retrieved March 31, 2004 from http://www.ausdance.org.au/outside/interest/comarticle.html.

Wood, D., Bruner, J.S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Psychology and Psychiatry*. 17.

Zhao, R., & Orey, M. (1999). The scaffolding process: Concepts, features, and empirical studies. Unpublished manuscript. University of Georgia.

This book is licensed under a Creative Commons Attribution 3.0 License

22. Articulation and reflection

Authors: Tina Harkness, Chandra Porter, and Dana Hettich (The University of Georgia, USA)

Scenario

Mrs Smart is teaching a 12th grade AP US History unit on politics and the election process in the United States in conjunction with the mid-term elections that are set for November 7th. She wants the students to be engaged in the classroom unit so they will have a desire to be engaged in the actual election process. There are quite a few students in her class who have just turned 18 and will be able to vote in the upcoming election. The rest of her students will soon be 18, and she wants them to understand and be engaged in the election process so they will be more likely to vote in the next election.

The students in Mrs Smart's class are very opinionated and have a basic knowledge of the electoral process. However, they do not understand the importance of debate and how to effectively communicate their opinions to others while being respectful of other's opinions.

Mrs Smart has been searching for an instructional strategy that will help her accomplish three goals:

- enable her students to clearly and concisely present their opinions
- teach students to incorporate others' opinions into their own thinking
- enable students to articulate this new thinking to others

Mrs Smart was browsing the Web one day during her planning period and stumbled upon the instructional model Cognitive Apprenticeship and two of its classic teaching methods: articulation and reflection.

Mrs Smart thought articulation and reflection could help with her AP US History class. She remembers the adage that "all politics are local" and that discussing political issues requires social interaction. While becoming an "expert" in politics is truly subjective, the students can become More Knowledgeable Others about the various political issues that are impacting the upcoming elections. They could then share their knowledge with other students outside the class and encourage others to vote and become politically active. Mrs Smart decides to explore articulation and reflection further.

After finding out more about articulation and reflection, Mrs Smart realizes that politics are articulation and reflection. Speeches and debates are an example of candidates articulating their point of view on an issue. Taking into account other people's point of view and shaping that with your own point of view is reflection. She decides that she can incorporate this teaching strategy into her politics and election unit.

Her students will frequently be provided the opportunity to articulate and reflect on their ideas through writing speeches and verbally delivering them. Mrs Smart also plans to include time for her students to watch current political figures give speeches and debate issues. She will also bring in local political figures to give the students an opportunity to learn from "experts" about their articulation and reflection process. They will have great opportunities to improve their verbal and writing skills, as well as their decision-making skills. By developing an opinion on political issues, students have to be aware of how that opinion would affect others if the opinion were to turn into a vote on legislation. This reflection of the political process enables students to think about how their decisions would affect others. This will enhance their ability to analyze situations and increase their level of decision-making ability.

Mrs Smart sees this teaching strategy as a way to get her students involved not only in the classroom, but also in the political process outside the classroom. Articulation and reflection lead to a dynamic learning environment that engages and enhances student learning.

The origins of articulation and reflection

Articulation and reflection are methods of instruction connected to cognitive apprenticeship and fall under the umbrella of the situated cognition theory. In other words, these methods are associated with a move away from viewing the learning process as mechanistic and towards the conceptualization of learning as something "emergent and social" (Brill, 2001). The situated cognition theory posits that cooperative efforts result in the best acquisition of knowledge. Indeed, it follows that only through interactions with one's peers and environment can a learner negotiate comprehension (Stein, 1998).

More directly, articulation and reflection are two parts of cognitive apprenticeship that strive to "place teaching and learning & within a rich and varied context that is meaningful and authentic to students" (Brill, Kim, and Galloway, 2001, p.20).

As we have learned, cognitive apprenticeship relies on social interaction, similar to the environment in which masters and apprentices of skilled trades and crafts have historically engaged in learning. The idea presumes that the newcomers should be acculturated into an established community of practice by way of observation and participation on the periphery. As learners become more confident in ability and more skilled in practice, the teachers and communities gradually cede control, resulting in the movement of novices from the fringes into the body of the community where they can participate and produce as equals (Bonk, 1998).

As such, articulation and reflection work together as a pedagogical strategy. Reflection skills promote critical thinking and students' construction of knowledge. Articulation skills give students the ability to communicate that knowledge with others. These methods of instruction give students the opportunity to express what they are learning as it relates to their own learning experience and to self-evaluate their process.

The ideal, as presented in the “Cognitive apprenticeship” chapter, is that through using the five teaching methods of modeling, coaching, scaffolding, reflection, and articulation, the teacher can guide the learner down the path of becoming an expert by providing opportunities to succeed based on the individual need or previous experiences of the learner. Ultimately the learner can take on the role as expert or More Knowledgeable Other. Because this learning process is somewhat cyclical in nature, the order of the methods utilized is in flux. Articulation and reflection of the process or problem could take place many times before the learner becomes an expert.

The reality, or so it seems, is that of the five instructional methods, Articulation and Reflection are the least exhaustively discussed in literature. Indeed, Articulation and Reflection are rather the red-headed-step-children of Cognitive Apprenticeship. We could hazard a guess that the reason for this is that researchers have a difficult time measuring the learning outcomes of Articulation and Reflection. After all, in the educational setting, we are neither tested on our abilities to ask questions in an articulate manner nor are we frequently asked to reflect on the process

This book is licensed under a Creative Commons Attribution 3.0 License

by which we came by our answer. Or perhaps, because the asking and answering of questions is so closely tied to the teaching and learning process, we, as teachers, are not as capable of separating the method from its use. Nonetheless, there still is little information regarding articulation and reflection that exists separately from cognitive apprenticeship. As demonstrated in our e-book chapter, these methods rarely receive more than a cursory nod.

For Mrs Smart, teaching a unit on politics never seems to engage the students to the extent that it did for Mrs Smart when she was younger. One of the basic fundamentals of cognitive apprenticeship is teaching within a varied and authentic context. Mrs Smart focuses the debate and discussion in her class on issues that are relevant to the students. For example, her state is considering an initiative that would require students to maintain a 2.0 GPA in order to obtain a driver's license. Because this issue directly affects her students in a real-world context, she believes her students will be more likely to be fully engaged in the unit.

What does it mean?

Articulation and reflection focuses on the importance of learners' abilities to express their ideas either out-loud or in writing. For many who majored in writing and reading intensive subjects in college, Reflection is a familiar, if somewhat dreaded, process. Recall how many reflection papers you were asked to write or how many "discussions" you participated in during college. This process is an old one, as even Socrates demanded that his students be able to formulate answers to questions and ask questions of themselves (Daudelin, 1996).

Yet, the question and answering need not take place only between teacher and learner. As defined by cognitive apprenticeship, the collaboration between peers provides varied opportunities for students to cultivate explanatory analysis as the formation of an argument or explanation immediately lends itself to the opportunity to examine one's own thought processes (Goodman, 1998). Meanwhile, as we will discuss later, who or what can act as a peer is changing as technology introduces new opportunities for learners.

What is reflection?

And so, what is reflection? At its most basic, reflection enables students to compare the route by which they find answers to the route taken by others. Those "others" can include experts, peers, or even themselves in a different context.

The idea of reflection in education first emerged in the writings of John Dewey, who defined reflection in 1933 as "active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusion to which it tends" (Dewey, 1933, p. 9). Dewey distinguished between primary and secondary experiences and believed that Reflection was the secondary experience, beginning when the primary experience fails to meet the needs of the learner (Miettinen, 2000). It is this failure of expectation, this moment when one's habitual problem solving does not work any longer, that gives rise to Reflection and learning.

Dewey divided the reflection process into five stages, the first of which is "the indeterminate situation", during which routine ways of doing things fail to meet the needs of the problem solver (Miettinen, 2000, p.66). This starting point is a disturbance in the normal flow of activity. During the second stage, the learners define the problem. As the learners attempt to adequately define an issue, they can inadvertently gain insight into the conditions by which she can remedy the situation. This leads immediately to stage three, which involves consciously studying the circumstances of the predicament and analyzing the means and resources available for resolution. At this time the learner can construct a possible working hypotheses, searching her memory for similar situations or imagine how someone else might handle the same situation. Stage four is the time for reasoning, when the learner thinks through the hypotheses, testing and evaluating the likelihood of their success. Finally, in stage five, the learner acts, testing a hypothesis to see if it will work to resolve the problem.

Based on the reflective process, good reflective activities encourage students to do more than simply "analyze their performance, contrast their actions to those others and ... compare their actions to those of novices and experts" (Goodman, 1998, p. 242). According to Mezirow, making use of the existing knowledge of peers and experts without attempting to appraise that knowledge based on one's thoughts and feelings does not fall into the realm of reflective action. Instead, reflective actions have the learners taking the time to pick apart the "content" of what they think, feel, or do. Alternatively, the learners can look at the "process" of how they actually execute the acting, thinking, or feeling. The third and most transformative of Mezirow's active reflections involve learners who analyze the "premise" on which they base all these thoughts and feelings. Perhaps the easiest way to think about these modes of Reflection is to try to answer the questions "what?", "how?", and "why?" in relation to a problem. By providing opportunities for learners to examine these questions, the teacher gives them a chance to examine their context in relation to society (Kember, Jones, & Loke et.al., 1999).

Mrs Smart first has her students form an opinion on the new law being considered by the state requiring students to maintain a 2.0 GPA to obtain their driver's license. She provides the actual US Congressional bill for the students to read and also any newspaper clippings and videotape of opinions already formed about the bill. Her students must keep a journal and reflect and react to the actual piece of legislation as well the opinions they see and hear from the newspaper and television reports. Based on this reflection, students should develop their own opinion about the new law.

What is articulation?

At its core, articulation is the actual process that a learner goes through to explain to other learners what problem solving activities have occurred. This explanation can also include future recommendations and perceived consequences (Goodman, Soller, Linton, & Gaimari, 1998). Like Batman needs his trusty sidekick Robin, reflection cannot exist without articulation, for together they provide learners with opportunities to be active participants in a "risk free environment" (Derrick, 2005, p.5). Once learners become comfortable with the skills necessary for reflection and articulation, they can find that articulation can lead to a different level of reflection.

This cycle can occur repeatedly during a discussion or problem-solving event among peers and teachers. For example, a student could develop a theory about why the sky is blue and then explain the theory to another student. In turn that second student might reflect on this theory and then articulate one of their own. The focus of this activity would not necessarily lead to the correct scientific theory, but it would provide an opportunity for the student to use abstract critical thinking skills and practice communicating the process of arriving at their theory through discourse with another student. Thus, articulation not only helps learners retain information, but it also "illuminates the coherence of current understanding" (Koschmann, 1995, p. 93). By forcing the student to actually commit to her knowledge of a subject, Articulation sets the stage for future opportunities of assessing and evaluating that knowledge (Koschmann, 1995).

Some of the best activities for articulation simply provide opportunities for learners to participate in dialogue or discourse. Good articulation requires time and practice.

This book is licensed under a Creative Commons Attribution 3.0 License

Although this seems rather natural, articulation is a skill that must be developed. Opportunities for articulation in a safe educational environment with ample time to explain ideas can help develop learners' articulation skills.

When done well, the dialogue can play an "important role as part of an interactive learning mechanism" (Cook, Oliver, & Conole, 2001, p. 2). Learning occurs through Articulation within groups of learners when they have the time to share interpretations of what they are learning. In these "communities of practice" learners have the opportunity to challenge each other through discussions or presentations as "learning becomes a process of reflecting, interpreting, and negotiating meaning" through narratives (Stein, 1998, p.3-4).

After her students formed their opinions about the new law, the students will give speeches articulating their position on the new driver's license law. Students will have the opportunity to discuss the impact of the new law with each other in small groups, creating a "community of practice" within the classroom. Mrs Smart will focus on creating a conducive environment for her students to continue the reflection and articulation process.

Benefits of articulation and reflection

Enhancing learning

In any type of learning situation, articulation and reflection can enhance the learning of every student. Articulation and reflection force learners to examine the learning experience and to verbalize what they have learned. Using this teaching method in conjunction with modeling, coaching, scaffolding, and exploration can enhance learning of the engaged student. The learning process can be enhanced by encouraging students to reflect on what they have learned and be able to communicate what they are thinking. (Goodman, Soller, Linton, & Gaimari, 1998).

Yet, teachers must provide learners with the opportunity to utilize these skills on a regular basis. In order to support students during the learning process, reflective activities can be used to evaluate their performance. These activities can also be used to compare and contrast their actions to those of other novices and experts. (Collins, 1990, Goodman, Soller, Linton, & Gaimari, 1998).

Improving critical thinking skills

Articulation and reflection can be used to improve learner's critical thinking skills. Students should be able to ask questions, solve problems, investigate, analyze, and develop new knowledge. Reflection and articulation are methods which are designed to help learners focus. By allowing them to focus, the teacher encourages the learner to more closely observe expert problem solving and to understand their own problem-solving strategies. This process encourages students to "develop a 'reflective practitioner' stance and to think critically about what they do" (Kraus, 1996, p.20).

Improving writing and verbal skills

Articulation and reflection can be used to improve a learners' writing in many different areas. There are several strategies in articulation and reflection that encourage learners to express their knowledge and understanding of a topic. Students may gain additional insight while participating in cooperative learning activities. Strategies such as journaling, written problem-solving analysis, and critiquing others allow students to compare knowledge in any context. (Collins, 1991, Kraus, 1996, p.20). Teachers can incorporate these strategies into their lessons to enhance the learners writing skills. Verbal skills can also improve as students become used to articulating their understanding of the lesson with their peers and teacher. These methods encourage students to explain and reflect on their knowledge, ideas, goals, and problem-solving efforts. For example, group discussion and reflection seminars allow thinking to be observed and shared with group members (Kraus, 1996, p.20).

Improving decision-making skills

In a cooperative learning environment, decision-making skills are crucial. Articulation and reflection provides a context for students to use decision-making skills when analyzing their own performance as well as the performances of their peers, questioning what was learned, and deciding what other alternatives to the problem are possible. According to Goodman, Soller, Linton, & Gaimari, reflection enhances the learning of an exercise because it gives students an opportunity to review their previous actions and decisions before proceeding, enabling them to make more educated decisions later (p.242).

Challenges of articulation and reflection

Insufficient research

There is negligible current research published about Articulation and Reflection as a pertinent teaching method in education. Most existing research pertains to cognitive apprenticeship. More research is needed to show the effect of articulation and reflection in subjects such as math, social studies, and even in career-based programs. It would be interesting to see the use of articulation and reflection in these programs and the insight given by the teachers and the students. "The minimal amount of research on Articulation and Reflection in mathematics opens the door for further research in this area. In general, writing and Reflection are considered to worthwhile endeavors, but formal research is difficult to find" (Derrick, 2005, p.5).

Applications of articulation and reflection

K-12 gifted education

Diezmann and Watters (1997) propose that articulation and reflection are key to meeting the needs of the gifted child because they provide opportunities for the learner to go beyond the normal classroom experience and become an actual generator of knowledge. In their proposal they recommend the use of cognitive apprenticeship because it "implies responsibilities for both the learner and the teacher". For Diezmann and Watters, a dialectic is created within cognitive apprenticeship, balancing the ability of the teacher to model, coach, and scaffold against the motivation of the learner to participate in articulation, reflection, and exploration. The result is the acquisition of knowledge as synthesis. (Diezmann & Watters, p.9 and p.11)

Mathematics education

Derrick (2005) used journal writing and sharing to explore whether Articulation and Reflection affected the amount of information learners retained from mathematics lessons. Again, by incorporating Cognitive Apprenticeship methods, the hope was that students would retain more of what they learned. The study was constructed using a pretest and post test and concluded that the students who submitted journal responses did see an increase in their scores. The sole complication of this study emerges from the construction of the study itself, which cannot isolate articulation and reflection as the only reason for the increase in score.

The natural learning environment

Creating a natural learning environment also utilizes articulation and reflection. According to Stein, a natural learning environment engages learners in solving authentic, non-routine problems likely to be encountered back on the job. Problem solving is collaborative, with participants contributing to the dialogue and constructing novel

This book is licensed under a Creative Commons Attribution 3.0 License

solutions. Articulation and Reflection can occur in any type of learning situation. It is very important for learners to be able to articulate what they are learning and to be able to reflect on their learning process and their learning outcomes. Cognitive apprenticeship, situated cognition, and natural learning environments allow for articulation and reflection to exist as learning strategies or approaches that are necessary to the learning environment.

Sample application of articulation and reflection in Mrs Smart's AP class

Mrs Smart created a lesson that would incorporate articulation and reflection. Mrs Smart obtained a copy of the gubernatorial debates that were previously televised. The students were given a brief biography of each candidate before viewing the debate. Mrs Smart and the students held a discussion about the qualifications needed to become governor and the responsibilities of the position. After the discussion, the students viewed the debates.

During the debate, Mrs Smart had the students write down one of the questions posed to the candidates. At the end of the debate, the students reflected on what they learned about each candidate's platform. The students wrote whether they agreed or disagreed with the candidate's responses to the questions that were posed and how they felt about the candidate. After they completed their journal, students began to share their reflections with their peers.

Mrs Smart set up a mock election and debate within her classroom. Some students volunteered to run as candidates in the mock election. The students had to campaign, hold a primary election, and develop questions for the debate. Mrs Smart believed that this activity would enhance the students learning and provide them with an authentic learning experience. The students were able to articulate what they learned in the unit and reflect on their experience through the use of the mock election and debate.

References

Atwell, N. (1998). In the Middle: New Understanding About Writing, Reading and Learning. Portsmouth, NH: Boynton/Cook Publishers.

Bonk, C.J., & Cunningham, D.J. (1998) Searching for learner-centered, constructivist and sociocultural components of collaborative educational learning tools. In, K. King Electronic Collaborators: Learner-Centered Technologies for Literacy, Apprenticeship, and Discourse. Mahwah, NJ: Lawrence Erlbaum Associates. Retrieved October 2, 2006, from http://www.publicationshare.com/docs/Bon02.pdf.

Brill, J., Kim, B., & Galloway, C. (2001). Cognitive apprenticeships as an instructional model. In M. Orey (Ed.), Emerging perspectives on learning, teaching, and technology. Retrieved from: http://www.coe.uga.edu/epltt/CognitiveApprenticeship.htm.

Brown, J.S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. Educational Researcher, 18(1), 32-42.

Collins, A. (1990). Cognitive Apprenticeship and Instructional Technology. In Idol, L. and Jones, B. F. (Eds.), Educational Values and Cognitive Instruction. Hillsdale, NJ: Lawrence Erlbaum.

Cook, J., Oliver, M., & Conole, G. (2001). Using educational dialogues to design systems for learning. In ED-MEDIA 2001 World Conference on Educational Multimedia, Hypermedia & Telecommunications. Retrieved November 12, 2006 from ERIC.

Daudelin, M.W. (1996). Learning from experience through reflection. Organizational Dynamics 24(3): 36-48. Retrieved October 16, 2006 from Emerald.

22. Articulation and reflection

Derrick, C.L. (2005). Improving student retention through articulation and reflection. Instructional Technology Monographs 2(1). Retrieved November 8, 2006 from http://projects.coe.uga.edu/itm/archives/spring2005/derrick.htm.

Dewey, J. (1933). How We Think: a Restatement of the Relation of Reflection Thinking to the Educative Process. Boston: D.C. Heath and Company.

Diezmann, C., & Watters, J. (1997). Bright but bored: Optimizing the environment for gifted children. Australian Journal of Early Education, 22(2), 17-21. Retrieved October 16, 2006 from ERIC.

Goodman, B., Soller, A., Linton, F., and Gaimarie, R. (1998). Encouraging student reflection and articulation using a learning companion. International Journal of Artificial Intelligence in Education, 9, 237-255. Retrieved October 16, 2006 from ERIC.

Herringon, J., & Knibb, K. (1999). Multimedia and student activity: An interpretive study using VideoSearch. Australian Journal of Educational Technology 15(1), 47-57. Retrieved October 16, 2006 from ERIC.

Imel, S. (1995). Teaching adults: Is it different? Myths and Realities. Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education. Retrieved October 16, 2006 from ERIC.

Kim, B. (2001). Social constructivism. In M. Orey (Ed.), Emerging perspectives on learning, teaching and technology. Retrieved September 25, 2007 from http://projects.coe.uga.edu/epltt/index.php?title=Social_Constructivism.

Kember, D., Jones, A., Loke, A., McKay, J., Sinclair, K., & Tse, H, et al. (1999). Determining the level of reflective thinking from students' written journals using a coding scheme based on the work of Mezirow. International Journal of Lifelong Education 18, 18-30. Retrieved October 16, 2006 from ERIC.

Koschmann, T. (1995). CSCL: Theory and Practice of an Emerging Paradigm (Computers, Cognition, and Work). Hillsdale, NJ: Lawrence Erlabaum.

Kraus, C. (1996). Administrative training: What really prepares administrators for the job? Paper presented at the Annual Meeting of the American Educational Research Association (New York, NY, April 8-12, 1996) 28p.

Miettinen, R. The concept of experiential learning and John Dewey's theory of reflective thought and action. International Journal of Lifelong Education 19, 54-72. Retrieved October 16, 2006 from ERIC.

Oxendine, C., Robinson, J., & Willson, G. (2004) Experiential learning. In M. Orey (Ed.), Emerging perspectives on learning teaching, and technology. Retrieved September 25, 2007 from http://projects.coe.uga.edu/epltt/index.php?title=Experiential_Learning.

Stein, D. (1998). Situated Learning in Adult Education. ERIC Digest. Retrieved November 9, 2006 from: http://www.ericdigests.org/1998-3/adult-education.html.

This book is licensed under a Creative Commons Attribution 3.0 License

23. Resource-based learning

Editor: Damon Anderson

Authors: Lisa Campbell, Paula Flageolle, Shann Griffith, and Catherine Wojcik (The University of Georgia, USA)

Introduction

Scenario

Mr Hartman, the media specialist, was asked to collaborate on a US Civil War unit for fourth grade students. Ms Russell, the classroom teacher, informed him that the fourth graders had been introduced to PowerPoint and Kidspiration software. Together they planned the unit to include essential research skills and further exposure to these technologies. Ultimately, the unit would conclude with student-produced PowerPoint presentations displaying their understanding of the Civil War.

Mr Hartman began by placing Civil War books on a cart. Some of these texts were primary documents and some were broad overviews of the war while others dealt with the underlying causes such as the doctrine of states' rights, slavery, and the abolitionist movement. Other books dealt with specific aspects of the war such as the battles, weapons, uniforms. There was even a book of recipes from the Civil War era. These books varied in reading level from quite low with many pictures, to a reading level of high proficiency. Mr Hartman also selected biographies of US figureheads such as Abraham Lincoln, Clara Barton, Robert E Lee, Ulysses S Grant, Jefferson Davis, and Harriet Tubman.

Mr Hartman's next task was to research Internet sites that were appropriate for fourth graders. This portion of the preparation was time consuming and exacting, but he located a handful of WebQuests and databases that were ideal for his purposes. He designed a WebQuest on the causes of the Civil War, because many of the the available sites were beyond the ability of fourth graders.

At this point, he turned his attention to audiovisual materials that could enhance the unit and pulled several videos from the media center shelves. In addition, he ordered a few others from the county instructional resource catalog. Mr Hartman also found a collection of Civil War ballads, which he added to the cart. Additionally, he arranged for Civil War re-enactors to visit the school.

When it was time to introduce the materials to the learners, Mr Hartman took the cart to the classroom and instructed the class that each student was to choose one Civil War topic of interest. He recommended that they browse the books to get ideas. Ms Russell would screen the videos over the first few days of the project, and play the CD as they conducted their preliminary research. By the end of the week, Ms Russell had helped the students use Kidspiration, a graphic organizer, to map their interests in the Civil War and focus on a topic.

The following week, Mr Hartman returned and handed out a simple worksheet to help the students identify clear research questions related to their chosen topics. A discussion followed about the various resources available. He used several students' topics as examples and the class helped choose the appropriate resources for those topics. Questions like the following were asked to prompt higher order thinking skills: "When would a map be the most appropriate resource for information? When would an encyclopedia be the best choice? When would they reach for

Civil War diaries? When would an almanac, a biography or the Internet be preferable?" The students enjoyed the challenge of his questions and were becoming adept at understanding the benefits of various resources.

Using these resources, the class spent the next few weeks conducting research on their topics. The computer lab was also reserved for student use. Students used that time to build both their technical skills and the content to create their PowerPoint presentations.

At the end of the unit, each student had developed a small PowerPoint slide show depicting an aspect of the Civil War that was of personal interest. On presentation day, two girls dressed in period costumes, each giving their presentation on field hospitals in the form of a first-person dialogue. Another student read portions of speeches by Abraham Lincoln, with a Civil War ballad as background music to accompany his PowerPoint.

In another fourth grade class, Ms White also taught the required unit on the Civil War. The students were assigned to read the same historical novel set during the Civil War. Class time was used for reading, and additional chapters were assigned as homework. Each day Ms White reviewed the chapter description of the Civil War with the class. On Friday of each week, the students took a short quiz on the completed chapters. Halfway through the unit, the class viewed a documentary about Lincoln, Lee, Grant, and Davis. Using the supplemental materials from the video, she led a question-and-answer session. She also played several Civil War ballads for her class and explained the lyrics. The students were provided a non-fiction text with a time line and overview of the Civil War. For homework, Ms White assigned readings from this text and handed out questions that she had written. The following day she explained the answers to the questions and collected the homework. Finally, after a teacher-led review, the unit culminated in a major paper and pencil test.

What is resource-based learning?

The Civil War unit planned by Mr Hartman and Ms Russell, with its multitude of available resources, is the epitome of a resource-based learning (RBL) unit. However, resource-based learning is not tied to a single learning theory or to any specific pedagogy (Hill & Hannafin, 2001; Ling, 1997). Nor is it new to teaching and learning.

Traditionally, resource-based learning has been used to supplement more instructivistic teaching methods. However, the volume of information available and the ability to transmit that information in multiple formats has refocused attention on the potential of resource-based learning (Hill & Hannafin, 2001) to support emerging inquiry-based models.

Renewed interest in RBL has been spurred by the emergence of pedagogical constructs such as Blended Learning and Flexible Delivery. Orey (2002) defines blended learning from the perspective of the learner as "...the ability to choose among ALL available facilities, technology, media and materials matching those that apply to my prior knowledge and style of learning as I deem appropriate to achieve an instructional goal". Caladine defined flexible delivery (2002) as including "various types of mediated instruction including print, audio-visual, computer assisted or on line delivery as well as traditional instructional formats such as lectures and tutorials". In both instances, the teacher or designer of the experience locates and makes available resources for achieving particular educational goals. It is therefore useful to view Blended Learning and Flexible Delivery from the RBL perspective.

What, then, is resource-based learning? Resource-based learning is an educational model designed to actively engage students with multiple resources in both print and non-print form. Ideally, the classroom teacher and media specialist collaborate to plan resource-based units (California Media and Library Educators Association [CMLEA]). Learners take responsibility for selecting resources, human or otherwise, that appeal to their own learning

This book is licensed under a Creative Commons Attribution 3.0 License

preferences, interests, and abilities. Thompson and Henley (2000) provide a comprehensive list of resources ranging from traditional reference books to the Internet, as well as innovative games. Resources incorporated into planned, authentic tasks afford students opportunities to develop the skills and techniques necessary to become autonomous, self-directed learners and effective users of information (Doiron & Davies, 1998; Atlantic Provinces Education Foundation, n.d.). Resource-based learning units often culminate in student products or artifacts, which are presented to an audience (Bleakley & Carrigan, 1994).

Teachers often teach lessons or units using a variety of media, including guest speakers, videos, or hypermedia presentations. Because teachers select content and mode of delivery, such instruction is more aptly deemed resource-based instruction (Doiron & Davies, 1998), a pedagogy that is more teacher-centered. Resource-based learning is predicated upon the principle that individual learners will be drawn to the media and content which best match their own processing skills and learning styles (Farmer, 1999). The learning focus shifts from teachers using resources to facilitate instruction to students directing the choice of resources. In a continuum between teacher-centered and student-centered learning, resource-based learning occurs somewhere in the middle. When the constructivist educator uses resource-based learning, instruction is teacher-planned, but student-directed. This was evident in Ms Russell's classroom.

Educators adhering to more didactic or expository pedagogy may also employ resource-based learning. For example, Ms White used several resources to teach the same unit. Her instructional design, however, relied heavily on teacher directed supports, such as quizzes and choreographed discussions. Her students read the same historical novel, which eliminated "stray" learning and gave her more control over the facts disseminated to the students. Clearly, both resource-based teaching and resource-based learning access and use materials in diverse formats. Although Ms White planned this unit around resources, her students had little opportunity to direct their own learning. Although the resources probably enriched the unit and raised the interest level of many students, Ms Russell's Civil War unit is a better example of resource-based teaching. The remainder of this chapter will address resource-based learning at the more student-centered end of the continuum.

The Association of College and Research Libraries [ACLR] and the American Library Association [ALA] (1989) strongly endorse resource-based learning schools. They envision a more interactive environment in which students pursue questions of high personal interest. To that end, students collaborate with their peers, teachers, and communities, to find answers with enormously varied information resources. In the Civil War example, Ms Russell's class had available databases such as the History Resource Center, where they can access primary source documents to answer open-ended questions about the war. They might also find historical images that will spark their curiosity and help them better understand the era. By accessing Civil War-era diaries, students are transported to the nineteenth century, where they gain insight into the feelings, fears, hopes and dreams of a war-torn nation.

In a resource-based learning school, students become more self-sufficient. They ask productive questions; they synthesize, analyze, interpret and evaluate information. Libraries and databases all over the world can be accessed almost instantly giving students access to an enormous amount of information from a variety of sources.

The nature of resources has changed as a result of technological developments and the ability to catalog and classify digital media. Considerable opportunities are now available to teachers and students. Metadata—data about data—provides information about documents that can be retrieved by searching for the author, creation date, or content (Hill & Hannafin, 2001). Technology allows teachers or students to use those parts of resources that will satisfy their curiosity or educational needs. The boundaries that once separated teachers and students from resources are virtually gone.

Implementing resource-based learning

Constructionism, Learning by Design, and Project Based Learning can easily be used as models for implementing resource-based learning in the classroom. Resource-based learning begins with clearly identified instructional goals. The teacher and media specialist decide on acceptable student-generated products. They divide the teaching responsibilities and gather varied resources. A timeline is created and the media center, computer lab, guest speakers, and other resources are booked. Rubrics are designed and the students begin their quests. The teacher, often with input from the media specialist, evaluates the student produced artifacts. Finally, both the teacher and media specialist assess the success of the instruction itself, making adjustments for future implementations of the unit.

These are the steps in implementing a resource-based learning unit:

- Identify the goal or goals.
- Determine acceptable student produced artifacts including, but not limited to timelines, electronic slide shows, dramatic readings, videos, debates, postcards, reports, diaries, hierarchical web-based documents, or poster-board presentations.
- Collaborate with the media specialist to plan the unit. Divide the responsibilities.
- Select resources in a variety of formats which can include diaries, WebQuests, original documents, newspaper articles, magazine articles, games, poems, reference books, nonfiction books, experts, videos, museums, maps, charts, the Internet, works of art, plays, CD-ROMs, musical compositions, costumes, exhibits, PowerPoint presentations and field trips. This list is neither exhaustive nor static. But, rather, it is a dynamic list that will grow and change as new technologies emerge. The idea is to enlist a multitude of quality resources that will help students gather information, create knowledge and increase understanding and skill (Thompson & Henley, 2000).
- Create a timeline for implementation of the unit.
- Schedule the media center, computer lab, guest speakers, and field trips, if applicable.
- Create rubrics used to evaluate student artifacts.
- Evaluate student products using rubrics.
- Collaboratively evaluate the effectiveness of the unit and revise appropriately.

This book is licensed under a Creative Commons Attribution 3.0 License

Exhibit 30: This is a table of resources that could be incorporated in to Resource-Based Learning. This table includes a report, globe, books, map, slide projector, computer, video, field trip, floppy disk, and CD-ROM.

Determine unit goals. Because resource-based learning takes a great deal of time, teachers and media specialists must be sure the goal reflects higher order thinking skills and problem solving abilities. In the scenario, Mr Hartman and Ms Russell met in the media center to clarify the learning goals and objectives for the Civil War resource-based learning unit. The goal, a deeper understanding of an aspect of the Civil War, was reflected in student produced PowerPoint presentations.

Determine acceptable student artifacts. The teacher should require a product that is challenging but realistic for the students. Ms Russell wanted her students to integrate their newly acquired technology skills into the Civil War unit.

Thoroughly plan the unit. The teacher and media specialist should outline the unit. To ensure complete planning, responsibilities and tasks for the teacher and media specialist should be determined. Generally, the media specialist is responsible for locating appropriate resources; the teacher provides guidance and feedback to students during the research process and is involved in student assessment. In our scenario, Mr Hartman and Ms Russell met to plan the unit and determine their individual tasks and responsibilities. Together, they brainstormed to select resources such as re-enactors, speakers, videos, databases, texts, and Internet sites.

Gather resources in a variety of formats. Mr Hartman was familiar with the many resources available in the media center. He gathered biographies of famous people of the Civil War. These biographies ranged from low to high reading levels. He included books containing primary documents and books about Civil War issues. He found

Internet sites and produced his own WebQuest on the causes of the war. He reserved videos from the county instructional resource department and contacted the librarian at the public library for additional resources.

Generate a time line for the unit. Mr Hartman and Ms Russell mapped out the time line for the four-week unit. They set realistic dates, making allowances for technical difficulties.

Schedule research time. The unit designers must be sure the media center, computer lab, and other resource sites are available. Guest speakers, field trips, and other events must be arranged. A calendar noting each lesson within the unit is prepared.

Develop a rubric assess student artifacts. The teacher designs a rubric that clearly states the requirements for the end product. In the Civil War scenario, Ms Russell determined that a rubric would be the best way to evaluate student performance. She designed it during the planning phase of the unit and distributed it on the first day. Students began their work knowing what was expected. With the rubric to guide them, they were able to choose a topic, research it, and finally create their products.

Evaluate student performance. Using the rubric, the teacher judges the student-generated product. In the Civil War scenario, Ms Russell observed the PowerPoint presentations. In evaluating them, she used the rubric to ensure that the presentations had all the required elements.

Evaluate the unit. At the completion of the unit, the teacher and media specialist meet to assess the success of the unit. They make recommendations and changes for future use. Mr Hartman and Ms Russell listed the strengths and weaknesses of the unit and reflected upon how they could modify and enhance the unit for future implementations.

Developing a resource-based learning unit requires close cooperation between designers in all phases of design. This collaboration eliminates duplication of effort and ensures that the unit is complete.

Role of the media specialist in resource-based learning

Exhibit 31: A illustration of a media specialist.

The media specialists play a crucial role in resource-based learning, beginning with the selection and acquisition of curriculum-supported materials. Aside from building the foundation of instructional materials, they must find the most appropriate information, map, music, or video from the plethora of resources that are available. Media specialists must teach students how to navigate websites. The History Resource Center website, for example, an enormous and comprehensive database, can be used to research the Civil War. It contains periodicals, reference

This book is licensed under a Creative Commons Attribution 3.0 License

materials, primary sources, maps, and images. However, Mr Hartman must teach students how to efficiently use the various components of the site in order to maximize its potential.

Media specialists must be technologically up-to-date in order to offer the latest resources to staff and students. For example, it might be useful to add free e-books to the library home page and then teach the students how to download them from home. The scope of information literacy changes rapidly and the media specialist is instrumental in keeping the students and staff current on rapid changes in technology.

Role of the teacher in resource-based learning

Exhibit 32: A illustration of a teacher.

Teachers act as coaches, facilitators, or guides as their learners are sampling and manipulating information in multiple formats. The teaching of facts is replaced by teaching students how to learn. The goal is to teach students to find, evaluate and use information to tackle the challenges they encounter along the way (Association of College and Research Libraries [ACRL] & American Library Association [ALA], 1989). Asking the right questions and finding the right resource to answer that question is a technique that teachers can model for their students.

In the Civil War resource-based learning example, Mr Hartman and Ms Russell provided a rich resource base from which students could choose. A student interested in visual arts might have chosen to design a timeline of the major Civil War battles; those interested in personal reaction might have selected primary resources such as the journals of soldiers, statesmen, or private citizens.

When teachers thoughtfully design resource-based units, as did Ms Russell and Mr Hartman, students are forced to analyze and evaluate the information they encounter. Teachers must ask the right questions and offer enough help so that students progress in their learning. Learners are further motivated when their final products, such as the Civil War PowerPoint presentations or reflections in the example, are displayed or published.

Insightful teachers have recast the role of the instructor from providers of information to facilitators who ensure that learning occurs (Beswick, 1977). Ultimately, the goal of education is to produce fully capable members of the wider, inter-related learning community (American Association of School Librarians [AASL] & Association for

Educational Communications and Technology [AECT], 1998). Media specialists and teachers now facilitate learning rather than dispense content through worksheets and textbooks.

Benefits of resource-based learning

Good lesson plans engage students. Resource-based learning is more engaging and therefore more motivating—thus, it helps make students better learners. According to Turner and Paris (1995), there are six strategies for motivation: choice, challenge, control, collaboration, constructing meaning, and consequences. (See the Six C's of motivation). The resource-based learning unit in the above scenario employs all six of these strategies.

Resource-based learning provides the training ground for development of the necessary information literacy skills for learners to navigate the changing, sometimes confusing, landscape of information sources. When information literacy skills lessons are seamlessly interwoven into content lessons, resource-based learning enables students to independently meet their information needs during an activity and, more importantly, in their future learning; it promotes the goal of lifelong learning.

By using a variety of resources, students learn to efficiently use almanacs, encyclopedias, atlases, databases, technology tools, and other resources. This awareness is at the very core of information literacy.

Student motivation is heightened during resource-based learning because final products are readily displayed or presented, providing consequences for a task successfully completed.

Students feel empowered by the freedom to explore various resources and often perceive that they have uncovered knowledge unknown even to their teachers. In the Civil War lesson, Ms Russell might create a class Civil War web page; the students will realize that millions of people can learn from the results of their efforts. This is highly motivating to the learners.

Resource-based learning can significantly change teacher practices, challenging them to reinvent old instructional practices and routines in ways that reflect the changing world in which our students learn.

Computer software allows students to investigate and experiment in ways that would have been impractical or impossible before the advent of this resource. In this virtual environment, students can mix volatile chemicals, melt pounds of gold, or split atoms without the obstacles of cost and efficiency (Girod, 2000). This has changed the thinking skills of today's students, as many lessons are open-ended and allow unlimited avenues for inquiry.

Exhibit 33: A illustration of students using a computer.

This book is licensed under a Creative Commons Attribution 3.0 License

According to McKenzie (2000), these are the three stages in problem-solving activities: **"Prospecting —> Interpreting —> Creating good new ideas".** Information-literate students are proficient locators, capable evaluators, and responsible, creative users of information (AASL & AECT, 1998). Clearly, resource-based learning necessitates development of information literacy skills. Students engaged in resource-based learning activities must analyze, synthesize, and evaluate information; these cognitive competencies are on the highest levels of Bloom's Taxonomy. Resource-based learning promotes problem-solving and higher-order thinking skills. Students no longer passively receive information; instead, they actively interact with it through engaging, relevant resources.

For instance in Civil War research, students might access school databases such as the History Resource Center, or use the World Wide Web to examine fashions of the day at http://www.costumes.org. Government documents, journals, and videotapes can be used to gather even more information that can be pieced together to construct meaning and answer divergent questions.

When students know how to locate and use valuable, valid and reliable information, this enables them to meet any challenge that arises. By becoming familiar with different types of resources, students are better able to make choices when faced with important decisions. Through resource-based learning, students become aware of the wealth of information that is available to them.

An integral aspect of resource-based learning is its flexibility. Students may work alone, or cooperatively. They select resources which fit best with their learning styles. Resource-based learning can be used effectively as a component of project—or problem-based learning, or as a complement to other inquiry learning models. The benefits of resource-based learning also include maximizing the use of instructional resources and teaching time, as well as effective incorporation of technology into the curriculum (Doiron & Davies, 1998). Click here for the interactive thermometer online.

The benefits listed on the thermometer are:

- When the instructor introduces additional resources, the students benefit by increased motivation and interest.
- When students are allowed to choose their own resources with the guidance of a teacher, they can match their learning style.
- When students are asked to find resources for their project or artifact , they learn problem-solving skills.
- When students are able to participate in deciding how to use resources to complete their project, they learn how to learn.
- When students are able to understand how resources can be used for learning, they gain information literacy.

Challenges of resource-based learning

Perhaps the greatest obstacle to implementing resource-based learning activities is cooperative planning, which the teacher and media specialist do together. In order to create this teaching team, the media specialist and the teacher must apportion responsibility, and ensure that each knows the teaching needs and methods of the other (Farmer, 1999). Cooperative planning requires good communication skills and requires both time and effort. Resource-based learning also necessitates planning a timetable for the unit, student grouping, structuring the learning environment, and the management of the unit as well as summative evaluation of the entire process.

The scenario offers an exemplary case of collaborative planning. Ms Russell facilitated and guided the students after Mr Hartman gathered the Civil War materials and gave a lesson on the use of each resource. She took over the webbing exercise as students searched for personally interesting topics and he helped them clarify their research questions. From this point, Ms Russell guided student learning through the end of the unit. Mr Hartman was invited to observe the student presentations.

Another challenge of resource-based learning is assessing student attainment of learning goals and objectives. Assessments veer away from the multiple-choice quiz to observations of students as they demonstrate mastery of the subject matter and information literacy. In resource-based learning, students will be involved with a wide variety of resources. Consequently, the information accessed will not be uniform from student to student. Rubrics offer clear expectations and provide specifications for the desired product(s) and process accompanying each learning outcome. When presented to the students at the onset of the learning activity, rubrics afford students the ability to self-assess their ongoing efforts as well as their final product.

Exhibit 34: A illustration of students using the globe.

The dynamic components of resource-based learning are also problematic. Many Web-based information sites are updated frequently (Hill & Hannafin, 2001). Information may become inaccessible literally overnight. Despite fast Internet connections, transmission speeds vary considerably from day to day. In addition, the reliability and validity of digital resources can be difficult to establish. Although not confined to digital resources, student plagiarism is another challenge of resource-based learning.

Planning resource-based learning experiences for all students—at-risk, minority, economically disadvantaged, and ESL student populations—is also challenging. Information literacy skills, developed through resource-based learning, will aid these learners in attaining financial independence. The educational system must offer these opportunities to all students; otherwise, that system will be responsible for developing a new elite—the information elite (Bell, 1986).

Of course, resource-based learning must be supported by school administration. With encouragement from the principal, teachers will begin to view media specialists as teaching partners and as information specialists. Media specialists must also be allowed sufficient flexibility to meet with teachers during their planning periods. A fixed media center schedule severely restricts teacher access to the expertise of the media specialist. Administration must also provide the media center with adequate funds to build the collection and to keep its resources and facilities current. Clearly, the support of administration is paramount for resource-based learning to work effectively.

This book is licensed under a Creative Commons Attribution 3.0 License

References

American Association of School Librarians, & Association for Educational Communications and Technology. (1998). Information power: Building partnerships for learning. Chicago: ALA.

Association of College and Research Libraries, & American Library Association. (1989, January 10). Presidential Committee on Information Literacy. Washington, D.C.

Atlantic Provinces Education Foundation. (n.d.). Foundation for the Atlantic Canada English Language Arts curriculum. Retrieved October 2, 2007 from http://www.ednet.ns.ca/pdfdocs/curriculum/camet/foundations-ela.pdf

Bell, T. H. (1986, September). Communication to CU President E. Gordon Gee.

Beswick, N. (1977). Resource-based learning. London: Heinemann Educational Books.

Bleakley, A., & Carrigan, J. L. (1994). Resource-based learning activities: Information literacy for high school students. Chicago: ALA.

Bloom, B. S., & Krathwohl, D. R. (1956). Taxonomy of educational objectives: The classification of educational goals: Handbook I, cognitive domain. New York: Longmans, Green.

Caladine, R. (2002). Definitions, Glossaries and Terms. [On-line]. Available: http://cedir.uow.edu.au/NCODE/info/definitions.html

California Media and Library Educators Association. (1994). From library skills to information literacy: A handbook for the 21st century. Castle Rock, CO: Hi Willow Research and Publishing.

Cohen, P. (1995, February). Developing information literacy. *Education Update*, *37(2)*, 1-8.

Cross, P. K. (2001, July/August). Leading-edge efforts to improve teaching and learning: The Hesburgh Awards. *Change*, *33(4)*, 30-27.

Doiron, R., & Davies, J. (1998). Partners in learning: Students, teachers, and the school library. Englewood, CO: Libraries Unlimited.

Farmer, L. S. J. (1999). Cooperative Learning Activities in the Library Media Center. Englewood, CO: Libraries Unlimited.

Fellman, B. (2002, February). Leading the libraries. Yale Alumni Magazine, 65(4). Retrieved September 27, 2002, from the World Wide Web: http://www.yalealumnimagazine.com/issues/02_02/libraries.html

Girod, M., & Cavanaugh S. (2001). Technology as an agent of change in teacher practice. T.H.E. Journal. Retrieved September 27, 2002, from the World Wide Web: http://www.thejournal.com/magazine/vault/A3429.cfm

Hambleton, A. E., & Wilkinson, J. P. (1994). The role of the school library in resource-based learning. SSTA Research Centre Report #94-11. Retrieved September 8, 2002, from the World Wide Web: http://www.ssta.sk.ca/research/instruction/94-11.htm

Hill, J. R., & Hannafin, M. J. (2001). The resurgence of resource-based learning. Educational Technology, Research and Development, 49(3), 37-52.

Ling, P. (1997). Evaluating teaching initiatives which employ resource based learning. UltiBASE. Retrieved September 2, 2002, from the World Wide Web: http://ultibase.rmit.edu.au/Articles/dec97/lingp2.htm

McKenzie, J. (2000). Winning with information literacy. From Now On: The Educational Technology Journal. Retrieved September 18, 2002, from the World Wide Web: http://www.fno.org/sum00/winning.html

23. Resource-based learning

Moore, P. (2000, February). Primary school children's interaction with library media. Teacher Librarian, 27(3), 7-11.

Muronaga, K., & Harada, V. (1999, October). Building teaching partnerships: The art of collaboration. Teacher Librarian,27(1), 9-14.

Orey, M. (2002). Definition of blended learning. [On-line]. Available: http://www.arches.uga.edu/~mikeorey/blendedLearning/

Thompson, H. M., & Henley, S. A. (2000). Fostering information literacy: Connecting national standards, goals 2000, and the SCANS report. Englewood, CO: Libraries Unlimited.

Turner, J., & Paris, S. G. (1995). How literacy tasks influence children's motivation for literacy. The Reading Teacher, 48(8), 662-673.

Wang, F., & Wedman, J. (2001). eThemes: An Internet instructional resource service. *Information Technology and Libraries*, *20(4)*, 179-184.

This book is licensed under a Creative Commons Attribution 3.0 License

24. Experiential learning

Contributors: Chris Oxendine, James Robinson, and Ginger Willson (The University of Georgia, USA)

Experiential learning is a cyclical process that capitalizes on the participants' experiences for acquisition of knowledge. This process involves setting goals, thinking, planning, experimentation, reflection, observation, and review. By engaging in these activities, learners construct meaning in a way unique to themselves, incorporating the cognitive, emotional, and physical aspects of learning.

"Tell me, and I will forget. Show me, and I may remember. Involve me, and I will understand."

(Confucius)

Theory

Experiential learning theory (ELT) "provides a holistic model of the learning process and a multilinear model of adult development" (Baker, Jensen, Kolb, 2002, p. 51). In other words, this is an inclusive model of adult learning that intends to explain the complexities of and differences between adult learners within a single framework. The focus of this theory is experience, which serves as the main driving force in learning, as knowledge is constructed through the transformative reflection on one's experience (Baker, Jensen, Kolb, 2002).

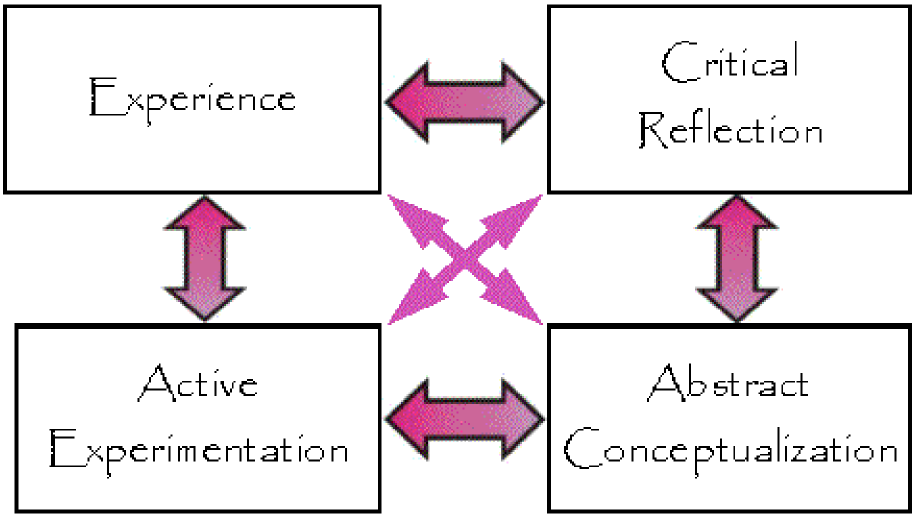

Exhibit 35: The graphic above is a representation of the Experiential Learning Cycle, which includes the components of experience, critical reflection, abstract conceptualization, active experimentation, and more critical reflection. Real experiences help the individual learn advanced abstract concepts. The experiences might result in paths, which allow the individual to actively collect information to learn and become a member of the community of practice. Perhaps critical thinking and reflection may refine ideas or lead the individual to consider alternate possibilities. Each phase potentially leads to another and builds upon the former. By Frank LaBanca (2008).

The learning model outlined by the experiential learning theory contains two distinct modes of gaining experience that are related to each other on a continuum: concrete experience (apprehension) and abstract conceptualization (comprehension). In addition, there are also two distinct modes of transforming the experience so that learning is achieved: reflective observation (intension) and active experimentation (extension) (Baker, Jensen, Kolb, 2002). When these four modes are viewed together, they constitute a four-stage learning cycle that learners go through during the experiential learning process. The learners begin with a concrete experience, which then leads them to observe and reflect on their experience. After this period of reflective observation, the learners then piece their thoughts together to create abstract concepts about what occurred, which will serve as guides for future actions. With these guides in place, the learners actively test what they have constructed leading to new experiences and the renewing of the learning cycle (Baker, Jensen, Kolb, 2002).

The ELT model for learning can be viewed as a cycle consisting of two distinct continuums, apprehension-comprehension and intension-extension. However, these dialectical entities must be integrated in order for learning to occur. Apprehension-comprehension involves the perception of experience, while intension-extension involves the transformation of the experience. One without the other is not an effective means for acquiring knowledge (Baker, Jensen, Kolb, 2002). Another way to view this idea is summarized as follows, "perception alone is not sufficient for learning; something must be done with it" and "transformation alone cannot represent learning, for there must be something to be transformed" (Baker, Jensen, Kolb, 2002, p. 56-67).

The ELT model attempts to explain why learners approach learning experiences in such different manners but are still able to flourish. Indeed, some individuals develop greater proficiencies in some areas of learning when compared to others (Laschinger, 1990). The ELT model shows that during the learning process, learners must continually choose which abilities to use in a given learning situation and resolve learning abilities that are on opposite ends of a continuum (Baker, Jensen, Kolb, 2002). Indeed, learners approach the tasks of grasping experience and transforming experience from different points within a continuum of approaches. However, it is important that they also resolve the discomfort with the opposite approach on the continuum in order for effective learning to occur. Thus, if a learner is more comfortable perceiving new information in a concrete manner and actively experimenting during the processing of the experience, the learner must also undergo some abstract conceptualization and reflective observation in order to complete the cycle and lead to effective learning. Thus, a learner who experiments with models and manipulates them in the process of learning must also be able to conceptualize and form observations based on what s/he experiences. This must occur, even if the learners do not consider themselves strong in these areas (Baker, Jensen, Kolb, 2002). This is at the heart of the ELT model and Kolb's view of the adult learner.

Applications

There are currently many applications of Experiential Learning Theory within educational systems, especially on college campuses. These examples include field courses, study abroad, and mentor-based internships (Millenbah, Campa, & Winterstein, 2004). Additional examples of well established experiential learning applications include cooperative education, internships, and service learning. There are also numerous examples of computer-based interventions based on experience.

Cooperative education, internships and service learning

by Tamara Pinkas

This book is licensed under a Creative Commons Attribution 3.0 License

"Cooperative education (co-op) is a structured educational strategy integrating classroom studies with work-based learning related to a student's academic or career goals. It provides field-based experiences that integrate theory and practice. Co-op is a partnership among students, educational institutions, and work sites which include business, government, and non-profit community organizations. Students typically earn credit and a grade for their co-op experience while working in a paid or unpaid capacity. College and university professional and career-technical programs such as engineering, media arts, and business often require cooperative education courses for their degrees. The National Commission for Cooperative Education (http://www.co-op.edu/) supports the development of quality work-integrated learning programs.

Closely related to cooperative education are internships. An internship is typically a temporary position, which may be paid or unpaid, with an emphasis on on-the-job training, making it similar to an apprenticeship. Interns are usually college or university students, but they can also be high school students or post graduate adults seeking skills for a new career. Student internships provide opportunities for students to gain experience in their field, determine if they have an interest in a particular career, create a network of contacts, and, in some circumstances, gain school credit (this definition of an internship is adapted from Wikipedia http://en.wikipedia.org/wiki/Intern).

Service learning is a teaching and learning strategy that integrates meaningful community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities with the emphasis on meeting community needs. Because of its connection to content acquisition and student development, service-learning is often linked to school and college courses. Service-learning can also be organized and offered by community organizations. Learn and Serve America (http://www.servicelearning.org/) supports the service-learning community in education, community-based initiatives and tribal programs, as well as all others interested in strengthening schools and communities using service-learning techniques and methodologies."

Field course scenario

A university offers a field-based campus course in wildlife and research management that requires students to actively participate in activities other than those normally encountered during a lecture or recitation section of class. These students are introduced to various vegetation sampling techniques in the one-hour lecture period, but application and use of the techniques occurs when students must describe the vegetation's structural differences between two wood lots on campus.

Students are provided with a general goal statement requiring them to differentiate between the two areas based on structure but are not told how to determine these differences or how detailed the description of structure must be (e.g. vertical cover or vertical cover broken out by height strata). Students must first determine the objectives of the project before proceeding. Once these have been agreed on with all members of the group, methods for collecting the data are determined. Students may work with others in the class or with the instructor to determine the most appropriate sampling design. After selecting an appropriate sampling design, students are required to collect the data, and thus learn about the technique(s) through experience with it (concrete experience). By doing so, students learn how to use the technique and are able to more readily decide if the technique is suitable under different sampling regimes (reflection and generalization).

During this process, students gain a broader understanding of the technique and its applicability; much of this may never be addressed or presented in a classroom setting. Based on the prerequisites for the course, the instructor worked from the assumption that students have an understanding of ecological concepts and basic statistics. Having these prerequisites facilitates students putting the techniques to use in the environment being studied. An additional benefit of allowing students to experiment with techniques is that unexpected events may occur e.g. it rains halfway through sampling. These unstructured events can further increase a student's confidence, excitement, and familiarity with a technique requiring the student to make decisions about how to proceed or when to stop (active experimentation). These types of events are difficult to model in a classroom, and even if possible, many students do not know how to deal with unexpected circumstances when their only training has been through discussion. Feeling adequately trained to handle these circumstances will require students to have firsthand knowledge and experience with real-world situations.

Another popular use of experiential learning which has been around for a long time is role play. It has been used for educational and training purposes, for military strategic and tactical analysis and simply as games. We role play in childhood—imitating our parents, playing with dolls and cars, building sand castles, and pretending we are princes and warriors—with the result that learning takes place, preparing us for life.

Role play scenario

The subject of this lesson is a controversy that has deep roots in American History, the US Constitution and the US Bill of Rights. Using the documentary video "In The Light Of Reverence", the teacher has the students closely examine the struggles of the Lakota Sioux to maintain their sacred site at Mato Tipila (Lakota for Bear's Lodge) at Devils Rock in Wyoming. Although the site at Devil's Rock was never ceded by treaty to the US government, it is now under the administration of the US National Park Service. Rock climbers claim any US citizen should have complete access to the site because it is on federal land. In deference to the religious practices of the Lakota, the National Park Service asks that people do not climb there during the entire month of June. The case has been litigated up to the US Supreme Court.

After watching the video and discussing various aspects of the controversy, students role-play members of four teams: the Lakota, rock climbers, US National Park Service, and the courts. Using extensive online resources linked to the lesson, students research the issues and evaluate the sources. The first three teams present their demands in a hearing. The court tries to help them reach a compromise and then adjudicates any unresolved issues. The lesson continues as students compare the plight of the Lakota to that of the Hopi and Wintu, (as presented in the video) who also struggle to maintain their sacred lands. The students will understand the concept of "rights in conflict" arising under the US First Amendment (freedom of religion), interpret a current conflict from multiple perspectives, learn to advocate for a point of view, and learn to resolve a conflict through a conflict resolution scenario.

Steps to integrating experiential learning in the classroom

One: Set up the experience by introducing learners to the topic and covering basic material that the learner must know beforehand.

Two: Engage the learner in a realistic experience that provides intrigue as well as depth of involvement (mock trial).

Three: Allow for discussion of the experience including the happenings that occurred and how the individuals involved felt (discussion afterwards).

Four: The learner will then begin to formulate concepts and hypotheses concerning the experience through discussion as well as individual reflection (discussion afterwards, but also could be done with journaling).

This book is licensed under a Creative Commons Attribution 3.0 License

Five: Allow the learners to experiment with their newly formed concepts and experiences (interpreting current conflict and conflict resolution scenario).

Six: Further reflection on experimentation (discussion, but could also be done through journaling).

Simulations and gaming within instruction also involve direct experience and thus are valid examples of experiential learning. Within game interactions, there are often several cycles presented to the participant. These cycles generally consist of participation by the user, decision making, and a period of analysis. This process coincides greatly with the Experiential Learning Cycle outlined above (Marcus, 1997). In addition, it has been found that simulations which shorten the debriefing period at the end of the game session can diminish their own effectiveness. This means that games that do not allow for appropriate reflection are not as effective as if proper reflection occurred. Thus, it is apparent that the reflective observation and abstract conceptualization portions of simulations and games are vital to learning, which has also been established by the experiential learning theory (Ulrich, 1997).

Yet another application of experiential learning is in the field of e-learning. Specifically, there has been an effort to utilize this model to increase the effectiveness of Continuing Professional Development (CPD) e-learning courses. It was found that many of these courses did not allow for concrete experience and active experimentation due to the fact that the learning processes were based on more traditional learning methods and not capitalizing on the self-directed nature of the learners (Friedman, Watts, Croston, & Durkin, 2002). However, with the use of different technologies such as multimedia resources, web-based discussions, online planners, and creative tasks, e-learning courses could be improved in a manner that would strengthen the entire experiential learning cycle for the learner (Frank, Reich, & Humphreys, 2003).

Weaknesses/criticisms

Since Kolb created the Experiential Learning Theory and the accompanying learning model, his work has been met with various criticisms about its worth and effectiveness. One of the criticisms of this model is that the concrete experience part of the learning cycle is not appropriately explained in the theory and remains largely unexplored. Herron (as cited in Yorks and Kasl, 2002 p. 180-81) believes that "the notion of feeling is nowhere defined or elaborated, thus concrete experience is not properly explored—the model is really about reflective observation, abstract conceptualization, and active experimentation". Another common criticism of the theory that exposes a weakness is that the idea of immediate and concrete experience is problematic and unrealistic (Miettinen, 2000).

Other criticisms of the ELT are that the concepts outlined by Kolb are too ill-defined and open to various interpretations and that the ideas he presents are an eclectic blend of ideas from various theorists that do not fit logically together. Another, perhaps more biting criticism of Kolb's work is that his ELT model is only an attempt to explain the societal benefit of his Learning Styles Inventory and thus may actually be a well derived marketing ploy (Miettinen, 2000). Also, it is believed that the phases in the ELT learning model remain separate and do not connect to each other in any manner (Miettinen, 2000).

However, the most tangible weaknesses of the ELT and the ELT learning model are the vast differences between it and the ideas established by John Dewey, whose beliefs are largely attributed to the establishment of the ELT. Dewey believed that non-reflective experience borne out of habit was the dominant form of experience and that reflective experience only occurred when there were contradictions of the habitual experience. But, in a glaring weakness of the ELT, Kolb does not adequately discuss the role of non-reflective experience in the process of learning (Miettinen, 2000). In addition, Dewey believed that observations of reality and nature were the starting point of knowledge acquisition. Kolb, however, believes that the experience is the starting point of knowledge acquisition and disregards the observations concerning the subjective reality of the learner, another blatant weakness (Miettinen, 2000). A final weakness in the ELT that was noticed is its lack of discussion concerning the social aspect of experience. The ELT learning model focused on the learning process for a single learner and failed to mention how the individual fit into a social group during this process and what role this group may play. Also, there was no discussion on how a social group may gain knowledge through a common experience.

Strengths

With all of the criticisms of the experiential learning theory, it may be too easy to overlook its merits in the field of adult education. Each adult has his/her own unique set of experiences and set of learning abilities that he/she feels comfortable utilizing. Kolb's theory accounts for this fact and shows how the learner can utilize his/her experiences and learning strengths in the process of constructing knowledge. Kolb also did a good job of integrating the two dialectical entities into the model to create a complete learning cycle in which the entire learning process can be traced. In addition, Kolb did a great job of showing how the learner can be effective utilizing his/her learning strengths, while at the same time using skills that are underdeveloped to complete the learning cycle.

However, due to the weaknesses of the ELT model as created by Kolb, it is necessary to construct another model, which includes Kolb's beliefs and at the same time confronts the weaknesses that have been found. Below is a representation of a model that could be used for this purpose. The idea behind this model was to include the observations of the learners' own subjective reality as a starting point for experience. Then, a disruptive experience occurs, which challenges the habitual patterns of the learner. Once the experience has been encountered learners enter a stage of emotion inventory in which they become cognizant of their emotions in reaction to the experience. These emotions then play a role in the next step, which is a stage of reflective observation similar to that outlined by Kolb in his model. After this stage, learners enter a stage of conceptualization and hypothesis formation in which they attempt to piece the information gathered thus far concerning the experience into logical chunks. Once this occurs, learners address the experience in some manner. This may include active experimentation to test a hypothesis. Or, it may also include higher order planning which requires even more in-depth examination of the experience. This stage can lead to two different types of experiences, expected and disruptive, both of which lead to repetition of the learning cycle. The expected experiences include those which can be predicted by the concepts and hypothesis that were established in the learning cycle. Disruptive experiences, on the other hand, include those that conflict with the concepts that were formulated in the experiential process. It is also readily evident in the model that the experiential learning cycle can occur individually or within a social group.

This book is licensed under a Creative Commons Attribution 3.0 License

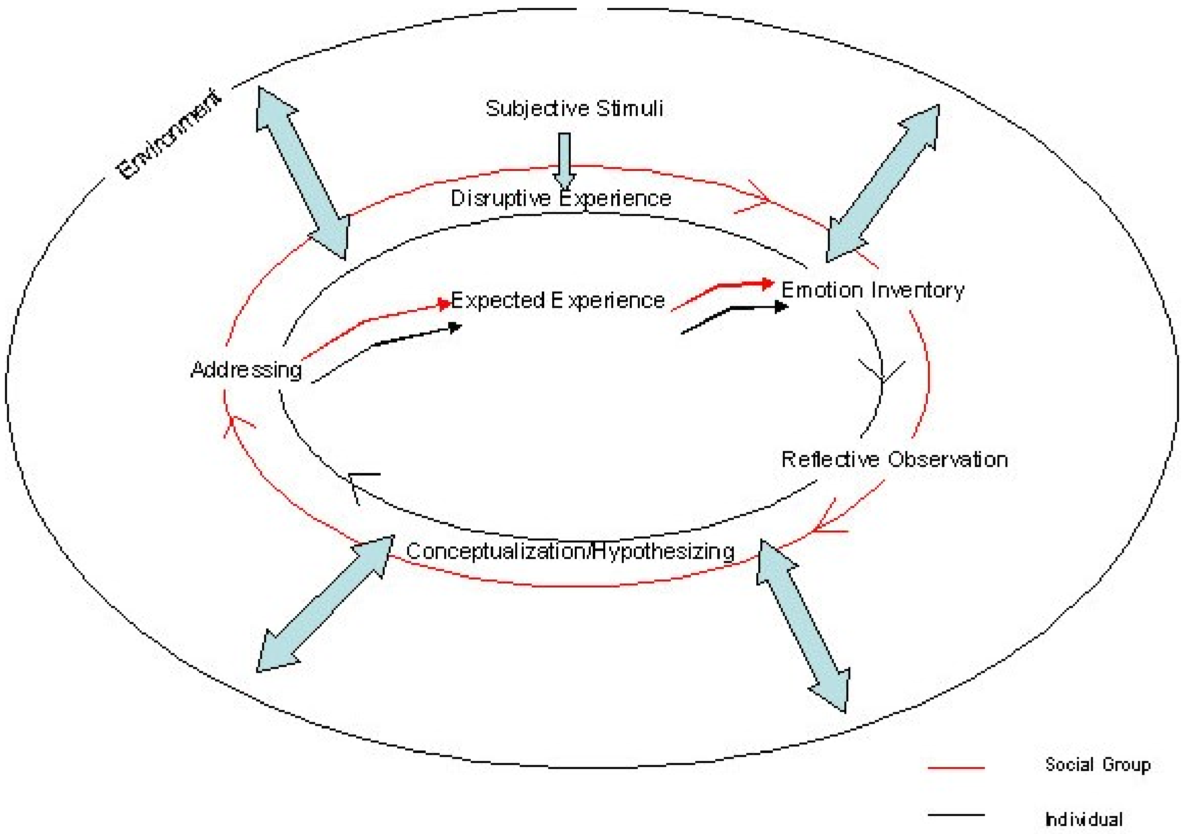

Exhibit 36: The graphic above depicts the revised experiential learning cycle. It includes the encompassing circle of the environment as well as cycle of events in the learning process that can occur individually or in a group. The different elements are explained below in the order that they appear on the cycle.

Performed individually

- Subjective stimuli: Observations about an individual's surrounding environment and nature made by the individual, as well as more affective and temporal judgments about things not really seen but that are definitely felt. It is possible that individuals can learn from this activity and not enter the cycle depicted below.

Can occur individually or in a social group

- Disruptive experience: experience that is a disruption of the habitual manner in which an individual experiences things. This is in contrast to a non-reflective experience borne out of habit.
- Emotion inventory: inventory of emotions that are created by the disruptive experience.
- Reflective observation: observations concerning the experience and reflection upon the event including causes, possible effects, etc.
- Conceptualization/hypothesizing: further processing of the experience; creating concepts to explain the experience and construction of explanatory hypotheses.

- Addressing: the concepts and hypotheses that have been constructed are formulated and the experience is addressed in some manner. There is an attempt to predict future experience. This may involve planning, active experimentation, or cautious testing.

The encompassing circle of the environment depicts how all of the activities take place in the context of a certain environment and are affected somehow by the environment.

Summary

The experiential learning theory outlines the manner in which learners gain knowledge and understanding through experiences. Though some may debate which steps are present in experiential learning, there is no debate about the worth of experience in learning. Through experience, learners are able to construct firsthand a sense of understanding of the events going on around them. Educators have begun to harness the power of experience in study abroad courses, field studies, role plays, and numerous computer-based interventions. The future could bring even more applications of this theory, a possibility as exciting for the learner as much as it is the facilitator.

Websites on experiential learning:

http://reviewing.co.uk/research/experiential.learning.htm#22

http://www.experiencia.org/

http://utah4-h.org/files/uploads/General%20Forms/Volunteer%20Leader%20Handbook.pdf

http://www.simplay.net/info.html

References

Baker, A., Jensen, P., Kolb, D. (2002). Conversational Learning: An Approach to Knowledge Creation. Wesport: Quorum.

Frank, M., Reich, N., Humphreys, K. (2003). Respecting the human needs of students in Development of e-learning. Computers & Education, 40, 57-70.

Friedman, A., Watts, D., Croston, J., Durkin, C. (2002). Evaluating online CPD using Educational criteria derived from the experiential learning cycle. British Journal Of Educational Technology, 33, 367-378.

Laschinger, H. (1990). Review of experiential learning theory research in the nursing profession. Journal of Advanced Nursing, 15, 985-993.

Ulrich, M. (1997). Links between experiential learning and simulation & gaming. Retrieved Mar 30, 2004, from http://www.ucs.ch/service/download/docs/articleexplearning.pdf

Miettinen, R. (2000). The concept of experiential learning and John Dewey's theory of reflective thought and action. International Journal of Lifelong Education, 19(1), 54-72.

Millenbah K. F., Campa H. III, and Winterstein S. R. (2000). Models for the infusing experimental learning in the curriculum. In W. B. Kurtz, M. R. Ryan, and D. E. Larson (eds.), Proceedings of the Third Biennial Conference in Natural Resource Education (pp.44-49), Columbia, MO, USA.

Yorks, L., Kasl. E. (2002). Toward a theory and practice for whole-person learning: Reconceptualizing experience and the role of affect. Adult Education Quarterly,52(3), 176-192.

This book is licensed under a Creative Commons Attribution 3.0 License

25. Six C's of Motivation

Contributors: Shiang-Kwei Wang and Seungyoen Han (The University of Georgia, USA)

Six C's of Motivation: Ames (1992), Lepper and Hodell (1989) suggest some strategies to increase students' classroom motivation. Turner and Paris (1995) term these the Six C's of Motivation: choice, challenge, control, collaboration, constructing meaning, and consequences. As we apply the Six C’s of Motivation to instructional design it is important to remember that these strategies are extremely flexible and can be modified and adapted as needed.

Scenario

It is useful to examine these strategies in an educational context. In a tenth grade geography classroom, Ms Betty assigned a group project to her students. The goal of this assignment was for students to learn the geographic location and some key information about east Asian countries. After Ms Betty described the group assignment, students formed five teams of three students each. Each team chose one of the Asian nations and wrote a five-minute news release about it. The students were to act as anchors of a news show to introduce their country to the audience. The goal of the news report was to help students learn general information about the featured country.

In the initial phase of this assignment, Ms Betty gave the students the opportunity to choose their team partners, create their project timeline, design their content outline, and assign duties to each team member. She told the students to take responsibility for their own products and she would assist as facilitator and coach. However, Ms Betty still spent time reviewing the groups' plans for potential problems. She also provided some television news clips for students and provided guidelines for writing a good news report.

Ms Betty also discussed the project with each group before they started. She asked questions to determine their goals, such as:

- What do you expect to learn from this assignment?
- Why did you choose this country?
- Why did you select these perspectives to do the introduction?
- What personal skills do you want to contribute to the project?

Once Ms Betty understood her students’ goals and expectations of the project, she made sure that their progress matched their original plan as she met with them weekly throughout the process. During their weekly appointments students reported on their progress. Ms Betty provided feedback as needed and helped the students find ways of applying their skills and talents to the project.

Finally, Ms Betty asked each student to write a short paper to report his/her reflections about the project. She wanted the students to focus on any gaps between their original expectations and the final results as well as to find out what the students learned from the project. She used these notes to revise her instructional strategies for the next semester.

The following section provides some elaboration on each of the six strategies used in this example.

Choice

Malone and Lepper (1983) suggest that providing explicit choices among alternatives can enhance intrinsic motivation. Schiefele (1991) identified two components of interest: feeling-related and value-related valences. Feeling-related valences are feelings attached to a topic. Value-related valences relate to the importance of the topic to an individual. Value-related valences are associated with "constructing meaning" and are discussed later in this chapter. Feeling-related valences are the degree of enjoyment that an individual has toward a topic or object. If students are allowed to select a task that they personally enjoy doing, their motivation to learn increases.

When students are given choices to select assignments that are close to their personal interests, their motivation to do the work should increase. Ms Betty allowed students to select the country that their group project would focus on. She gave them this choice hoping that the students would take responsibility for the assignment because it corresponded with their interests. For instance, Group A chose to introduce Japan because they liked to watch Japanese cartoons. Group B selected Taiwan because they had recently viewed a movie produced in Taiwan and were curious about the background of the movie. These feeling-related valences can be factors that enhance the motivation of learning.

Challenge

Providing or operating tasks just beyond the skill level of the students is a good approach to challenge learners. In the motivation chapter, the Flow Theory is presented (Csikszentmihalyi, 1985). Students may experience flow if the challenge of assignments matches their skills. Work that is too difficult raises anxiety, whereas tasks that are too easy contribute to boredom; both situations decrease motivation toward learning. In order to ensure that goals remain challenging, teachers should continue giving students the opportunity to provide feedback. Helping students search for more information to improve and revise their tasks plays an integral part in the learning process.

In the geography classroom, students edited the news release and produced the final product. When Ms Betty saw Group A's first draft about Japan, she suggested they include more information about natural resources and less about travel attractions. Ms Betty suggested that the group consider their audience and imagine what information they would expect to get from the news clip if they were the audience. The second draft was an improvement, but Ms Betty still suggested including more information on natural resources to insure a balanced report. Continuously providing proximal goals can enhance students' self-efficacy and sustain motivation toward learning.

Control

If students are involved in the process of classroom control, they will be more responsible, independent, and self-regulated learners. To share the classroom control with students means involving them in the process of decision-making , organization of content , and choosing team members. However, too many choices may lead to increased anxiety, so providing assistance at appropriate times is essential when the teacher shares the classroom control with students.

In the geography class, Group C had a problem assigning roles to each student and asked for help from Ms Betty. She then explained the roles of editor, information retriever, and anchor to the students until each had selected an appropriate role through negotiation. Ms Betty placed no restrictions on content, allowing students to choose to

This book is licensed under a Creative Commons Attribution 3.0 License

introduce their countries from their own perspectives. Ms Betty simply provided objective suggestions when she found problems.

Collaboration

Vygotsky (1978) theorized that communication and collaborative group work can enhance individuals' thinking and learning. Students can share learning strategies and perspectives with each other through social interaction. Collaboration seems to work best when students depend on each other to reach a desired goal, when there are rewards for group performance, and when students know how to work together effectively (Driscoll, 1994).

Ms Betty assigned group work at the initial phase because her previous experience showed that students show deeper engagement and persistence when they work collaboratively. Teachers must be aware of the performance of each student in group activities. Some passive students may remain silent while more demonstrative students lead the group discussion and play the role of coach.

In the collaborative learning process, students often inspire each other. For instance, in Group A, Mary reminded group members that they could refer to some useful online information. John had excellent writing skills, and he enjoyed the role of editor. Joan also had great writing skills, but she decided to be the anchor after negotiation with John. After they chose their different roles, everyone insisted they finish their own responsibilities, and they improved their performance by heeding peer comments.

Constructing meaning

Value-related valences are associated with the construction of meaning. If students perceive the value of knowledge, their motivation to learn increases. Setting a meaningful goal for students is an important factor to promote motivation. Students should be given the opportunity to construct meaning in text as well as to build a rationale for the meaningfulness of literacy activities (Turner & Paris, 1995).

In the geography class, Group C spent five minutes introducing the natural resources of their country, leaving only five minutes to present the rest of the information. Ms Betty suggested they reduce the amount of time spent on natural resources even though they liked this topic. She helped the students understand the importance of a balanced report. Ms Betty knew that if she did not help students discover the value and importance of doing the assignment, they would doubt its usefulness, and their motivation would decrease.

Consequences

People enjoy having their work and learning achievement appreciated and recognized by others (Malone & Lepper, 1983). When students are provided channels to display their work, motivation increases. There are various strategies for displaying students' work, such as hanging their posters on the wall, presenting their work at a science fair, publishing their work on web sites, and providing links to other students. There is no "correct" way to complete a project, and students can compare their creativity, integrating articles and presentation ability with other teams. This strategy creates a positive feeling about effort, ownership, achievement, and responsibility (Turner & Paris, 1995).

To implement this strategy, Ms Betty borrowed a camera from the media center. She taught students how to film and asked each group to film their television news release. When each group finished filming, Ms Betty displayed the news clips in the classroom so that everyone could compare the performance and results with other teams. She duplicated these tapes for each student as a souvenir. It was a very popular gift during the semester.

Conclusion

The Six C’s of Motivation strategies have the potential to enhance students' motivation when applied to open-ended tasks (Turner & Paris, 1995). There is no single correct answer in the open-ended tasks, allowing students to make their own choices and goals. In the open-ended task context, teachers should guide students in selecting the most appropriate choices, setting up short- and long-term goals, planning and evaluating their projects, working collaboratively, constructing personal meaning through the task, and displaying their final projects.

When integrating the six C’s of Motivation into curriculum design, it is important to be aware of the progress of each group and provide feedback based on that progress. When students engage in meaningful open-ended tasks, their motivation increases and the effect of learning is more powerful.

References

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. Journal of Educational Psychology, 84, 261-271.

Csikszentmihalyi, M. (1985). Emergent motivation and the evolution of the self. In D. A. Kleiber & M. Maehr (Eds.), Advances in motivation and achievement, (Vol. 4, pp.93-119). Greenwich, CT: JAI Press.

Driscoll, M. P. (1994). Psychology of learning for instruction. MA: Division of Paramount Publishing.

Lepper, M. R., & Hodell, M. (1989). Intrinsic motivation in the classroom. In C. Ames & R. Ames (Eds.), Research on motivation in education (Vol. 3, p.73-105). San Diego: Academic Press.

Malone, M. R. & Lepper, M. R. (1983). Making learning fun. In R. E. Snow & J. F. Marshall (Eds.), Aptitude, learning, and instruction: Cognitive and affective process analyses (Vol. 3, pp. 223-253). Hillsdale, NJ: Lawrence Erlbaum Associates.

Schiefele, U. (1991). Interest, learning, and motivation. Educational Psychologist, 26(3/4), 299-323.

Turner, J., & Paris, S. G. (1995). How literacy tasks influence children's motivation for literacy. The Reading Teacher, 48(8), 662-673.

Vygotsky, L. S. (1978). Mind in society. Cambridge MA: Harvard University Press.

This book is licensed under a Creative Commons Attribution 3.0 License

26. Behaviorism

Editor: Damon Anderson

Author: Melissa Standridge (The University of Georgia, USA)

What is behaviorism?

Behaviorism is primarily concerned with observable and measurable aspects of human behavior. In defining behavior, behaviorist learning theories emphasize changes in behavior that result from stimulus-response associations made by the learner. Behavior is directed by stimuli. An individual selects one response instead of another because of prior conditioning and psychological drives existing at the moment of the action (Parkay & Hass, 2000).

Behaviorists assert that the only behaviors worthy of study are those that can be directly observed; thus, it is actions, rather than thoughts or emotions, that are the legitimate object of study. Behaviorist theory does not explain abnormal behavior in terms of the brain or its inner workings. Rather, it posits that all behavior is learned habits, and attempts to account for how these habits are formed.

In assuming that human behavior is learned, behaviorists also hold that all behaviors can also be unlearned, and replaced by new behaviors; that is, when a behavior becomes unacceptable, it can be replaced by an acceptable one. A key element to this theory of learning is the rewarded response. The desired response must be rewarded in order for learning to take place (Parkay & Hass, 2000).

In education, advocates of behaviorism have effectively adopted this system of rewards and punishments in their classrooms by rewarding desired behaviors and punishing inappropriate ones. Rewards vary, but must be important to the learner in some way. For example, if a teacher wishes to teach the behavior of remaining seated during the class period, the successful student's reward might be checking the teacher's mailbox, running an errand, or being allowed to go to the library to do homework at the end of the class period. As with all teaching methods, success depends on each student's stimulus and response, and on associations made by each learner.

This chapter introduces behaviorism's principal advocates and their distinct approaches to the theory. Some implications for classroom management are also presented, along with methods for maintaining and eliminating behaviors. This paper presents information useful to instructional designers, media developers, and, especially, classroom teachers.

Behaviorism advocates

John B Watson (1878-1958) and B F Skinner (1904-1990) are the two principal originators of behaviorist approaches to learning. Watson believed that human behavior resulted from specific stimuli that elicited certain responses. Watson's basic premise was that conclusions about human development should be based on observation of overt behavior rather than speculation about subconscious motives or latent cognitive processes. (Shaffer, 2000). Watson's view of learning was based in part on the studies of Ivan Pavlov (1849-1936). Pavlov was studying the digestive process and the interaction of salivation and stomach function when he realized that reflexes in the autonomic nervous system closely linked these phenomena. To determine whether external stimuli had an affect on this process, Pavlov rang a bell when he gave food to the experimental dogs. He noticed that the dogs salivated shortly before they were given food. He discovered that when the bell was rung at repeated feedings, the sound of the bell alone (a **conditioned stimulus**) would cause the dogs to salivate (a **conditioned response**). Pavlov also found that the conditioned reflex was repressed if the stimulus proved "wrong" too frequently; if the bell rang and no food appeared, the dog eventually ceased to salivate at the sound of the bell.

Classical conditioning

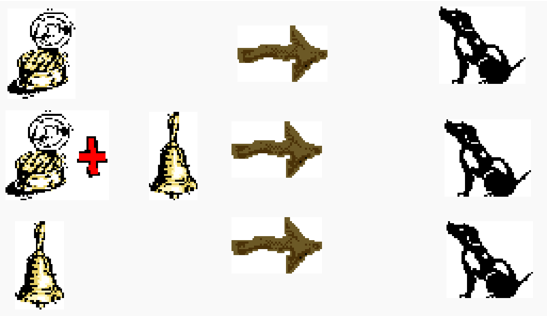

Exhibit 37: This illustration shows the steps of classical conditioning.

4. Food= salivation
5. Food + stimulus = salivation (conditioned stimulus)
6. Bell alone produces salivation (conditioned response)

Expanding on Watson's basic stimulus-response model, Skinner developed a more comprehensive view of conditioning, known as **operant conditioning.** His model was based on the premise that satisfying responses are conditioned, while unsatisfying ones are not. Operant conditioning is the rewarding of part of a desired behavior or a random act that approaches it. Skinner remarked that "the things we call pleasant have an energizing or strengthening effect on our behavior" (Skinner, 1972, p. 74). Through Skinner's research on animals, he concluded that both animals and humans would repeat acts that led to favorable outcomes, and suppress those that produced unfavorable results (Shaffer, 2000). If a rat presses a bar and receives a food pellet, he will be likely to press it again. Skinner defined the bar-pressing response as **operant**, and the food pellet as a **reinforcer**. **Punishers,** on the other hand, are consequences that suppress a response and decrease the likelihood that it will occur in the future. If the rat had been shocked every time it pressed the bar that behavior would cease. Skinner believed the habits that each of us develops result from our unique operant learning experiences (Shaffer, 2000).

This book is licensed under a Creative Commons Attribution 3.0 License

Operant conditioning

Exhibit 38: This illustration illustrates operant conditioning. The mouse pushes the lever and receives a food reward. Therefore, he will push the lever repeatedly in order to get the treat.

Educational implications

Behaviorist techniques have long been employed in education to promote behavior that is desirable and discourage that which is not. Among the methods derived from behaviorist theory for practical classroom application are contracts, consequences, reinforcement, extinction, and behavior modification.

Contracts, consequences, reinforcement, and extinction

Simple contracts can be effective in helping children focus on behavior change. The relevant behavior should be identified, and the child and counselor should decide the terms of the contract. Behavioral contracts can be used in school as well as at home. It is helpful if teachers and parents work together with the student to ensure that the contract is being fulfilled. Two examples of behavior contracts are listed below:

- A student is not completing homework assignments. The teacher and the student design a contract providing that the student will stay for extra help, ask parents for help, and complete assigned work on time. Teacher will be available after school, and during free periods for additional assistance.
- A student is misbehaving in class. The teacher and student devise a behavioral contract to minimize distractions. Provisions include that the student will be punctual, will sit in front of the teacher, will raise hand with questions/comments, and will not leave his seat without permission.

Consequences occur immediately after a behavior. Consequences may be positive or negative, expected or unexpected, immediate or long-term, extrinsic or intrinsic, material or symbolic (a failing grade), emotional/interpersonal or even unconscious. Consequences occur after the "target" behavior occurs, when either positive or negative reinforcement may be given. **Positive reinforcement** is presentation of a stimulus that increases the probability of a response. This type of reinforcement occurs frequently in the classroom. Teachers may provide positive reinforcement by:

- smiling at students after a correct response;
- commending students for their work;
- selecting them for a special project;
- praising students' ability to parents.

Negative reinforcement increases the probability of a response that removes or prevents an adverse condition. Many classroom teachers mistakenly believe that negative reinforcement is punishment administered to suppress behavior; however, negative reinforcement increases the likelihood of a behavior, as does positive reinforcement. Negative implies removing a consequence that a student finds unpleasant. Negative reinforcement might include:

- Obtaining a score of 80 per cent or higher makes the final exam optional.
- Submitting all assignments on time results in the lowest grade being dropped.
- Perfect attendance is rewarded with a "homework pass".

Punishment involves presenting a strong stimulus that decreases the frequency of a particular response. Punishment is effective in quickly eliminating undesirable behaviors. Examples of punishment include:

- Students who fight are immediately referred to the principal.
- Late assignments are given a grade of "0".
- Three tardies to class results in a call to the parents.
- Failure to do homework results in after-school detention (privilege of going home is removed).

Table 25: Reinforcement and punishment comparison

	REINFORCEMENT (Behavior increases)	**PUNISHMENT (Behavior decreases)**
POSITIVE (Something is added)	Positive reinforcement Something is added to increase desired behavior Ex: Smile and compliment student on good performance	Positive punishment Something is added to decrease undesired behavior Ex: Give student detention for failing to follow the class rules
NEGATIVE (Something is removed)	Negative reinforcement Something is removed to increase desired behavior Ex: Give a free homework pass for turning in all assignments	Negative punishment Something is removed to decrease undesired behavior Ex: Make student miss their time in recess for not following the class rules

Extinction decreases the probability of a response by contingent withdrawal of a previously reinforced stimulus. Examples of extinction are:

- A student has developed the habit of saying the punctuation marks when reading aloud. Classmates reinforce the behavior by laughing when he does so. The teacher tells the students not to laugh, thus extinguishing the behavior.
- A teacher gives partial credit for late assignments; other teachers think this is unfair; the teacher decides to give zeros for the late work then.
- Students are frequently late for class, and the teacher does not require a late pass, contrary to school policy. The rule is subsequently enforced, and the students arrive on time.

This book is licensed under a Creative Commons Attribution 3.0 License

Modeling, shaping, and cueing

Modeling is also known as observational learning. Albert Bandura has suggested that modeling is the basis for a variety of child behavior. Children acquire many favorable and unfavorable responses by observing those around them. A child who kicks another child after seeing this on the playground, or a student who is always late for class because his friends are late is displaying the results of observational learning.

> *"Of the many cues that influence behavior, at any point in time, none is more common than the actions of others" (Bandura, 1986, p.45)*

Exhibit 39: In this picture, the child is modeling the behavior of the adult. Children watch and imitate the adults around them; the result may be favorable or unfavorable behavior!

Shaping is the process of gradually changing the quality of a response. The desired behavior is broken down into discrete, concrete units, or positive movements, each of which is reinforced as it progresses towards the overall behavioral goal. In the following scenario, the classroom teacher employs shaping to change student behavior: the class enters the room and sits down, but they continue to talk after the bell rings. The teacher gives the class one point for improvement, in that all students are seated. Subsequently, the students must be seated and quiet to earn points, which may be accumulated and redeemed for rewards.

Cueing may be as simple as providing a child with a verbal or non-verbal cue as to the appropriateness of a behavior. For example, to teach a child to remember to perform an action at a specific time, the teacher might arrange for him to receive a cue immediately before the action is expected rather than after it has been performed incorrectly. For example, if the teacher is working with a student that habitually answers aloud instead of raising his hand, the teacher should discuss a cue such as hand-raising at the end of a question posed to the class.

Behavior modification

Behavior modification is a method of eliciting better classroom performance from reluctant students. It has six basic components:

1. Specification of the desired outcome (What must be changed and how it will be evaluated?) One example of a desired outcome is increased student participation in class discussions.
2. Development of a positive, nurturing environment (by removing negative stimuli from the learning environment). In the above example, this would involve a student-teacher conference with a review of the

relevant material, and calling on the student when it is evident that she knows the answer to the question posed.

3. Identification and use of appropriate reinforcers (intrinsic and extrinsic rewards). A student receives an intrinsic reinforcer by correctly answering in the presence of peers, thus increasing self-esteem and confidence.
4. Reinforcement of behavior patterns develop until the student has established a pattern of success in engaging in class discussions.
5. Reduction in the frequency of rewards--a gradual decrease the amount of one-on-one review with the student before class discussion.
6. Evaluation and assessment of the effectiveness of the approach based on teacher expectations and student results. Compare the frequency of student responses in class discussions to the amount of support provided, and determine whether the student is independently engaging in class discussions (Brewer, Campbell, & Petty, 2000).

Further suggestions for modifying behavior can be found at the mentalhealth.net website. These include changing the environment, using models for learning new behavior, recording behavior, substituting new behavior to break bad habits, developing positive expectations, and increasing intrinsic satisfaction. This informative website's URL is http://mentalhelp.net/psyhelp/chap11/.

Classroom importance

Using behaviorist theory in the classroom can be rewarding for both students and teachers. Behavioral change occurs for a reason; students work for things that bring them positive feelings, and for approval from people they admire. They change behaviors to satisfy the desires they have learned to value. They generally avoid behaviors they associate with unpleasantness and develop habitual behaviors from those that are repeated often (Parkay & Hass, 2000). The entire rationale of behavior modification is that most behavior is learned. If behaviors can be learned, then they can also be unlearned or relearned.

In my own teaching, I have found that a behavior that goes unrewarded will be extinguished. Consistently ignoring an undesirable behavior will go far toward eliminating it. When the teacher does not respond angrily, the problem is forced back to its source—the student. Other classroom strategies I have found successful are contracts, consequences, punishment, and others that have been described in detail earlier in this chapter. Behaviorist learning theory is not only important in achieving desired behavior in mainstream education; special education teachers have classroom behavior modification plans to implement for their students. These plans assure success for these students in and out of school.

References

Bandura, A. (1986). Social foundation of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice Hall.

Behaviorist Learning Theory Term http://mse.byu.edu/ipt/ipt301/jordan/learnterm_b.html.

Brewer, E.W., Campbell, A.C., Petty, G.C. (2000). Foundations of Workforce Education. Dubuque, Iowa: Kendall/Hunt Publishing Company.

Huitt, W., & Hummel, J. (1998). The Behavioral System. Retrieved via the World Wide Web, February 15, 2002. Available at: http://chiron.valdosta.edu/whuitt/col/behsys/behsys.html

This book is licensed under a Creative Commons Attribution 3.0 License

Parkay, F.W. & Hass, G. (2000). Curriculum Planning (7th Ed.). Needham Heights, MA: Allyn & Bacon.

Shaffer, D. (2000) Social and Personality Development (4th Ed.). Belmont, CA: Wadsworth/Thompson Learning.

Skinner, B. (1972). Utopia through the control of human behavior. In John Martin Rich, ed., Readings in the Philosophy of Education. Belmont, CA: Wadsworth.

What is ABA? http://rsaffran.tripod.com/whatisaba.html

This book is licensed under a Creative Commons Attribution 3.0 License

27. Cognitive tools

Editor: Damon Anderson

Authors: Brent Robertson, Laura Elliot, Donna Washington (The University of Georgia, USA)

Scenario

Mario is currently a ninth grader who attends a local area high school. He enjoys most of his classes but his two favorite subjects are his World Studies course and Introduction to Technology. He has discovered both courses to be very informative and decides to combine his interest in both classes into a project for his technology class.

Mr Singletary, his technology teacher, has given Mario's class this task: utilize various kinds of software, websites, and technology for application in a real-life situation. Mario must design a scenario, which incorporates an authentic event while using technology tools as a means to an end. He will also use technology-based tools to develop a strategy as well as solutions for his scenario.

Mario decides his enjoyment of his World Studies course will tie in easily with the technology project. He develops a scenario in which he travels across the world. Mario wants to manage his travel with technology to assist his research as well as document his "experiences". Mario sees a definite connection between the software he is using in his technology class to the goals he plans to accomplish in order to satisfy the project requirements.

Deciding first to draft a route for his virtual trip, Mario chooses to travel in an easterly direction around the world until he makes his way back to Georgia. Mario uses an inspiration board to construct a flow-diagram of the events and procedures in order to aid his planning and implementation of the trip. Mario sees the flow chart being beneficial to organization and believes it will serve also as a visual tool when presenting the project to his classmates.

Mario surfs several well-known search engines such as Google, Galileo, Yahoo, and AltaVista to retrieve information on possible travel destinations and points of interest. He also finds a few sites like Dogpile, Webcrawler, Metacrawler, and AllTheWeb that are unfamiliar to him but he finds an interesting array of data, facts, figures, and statistics.

Mario wants to ensure that each of his artifacts, to the greatest extent possible, demonstrates in detail all that is experienced on this virtual journey. His knowledge base of Microsoft Excel makes organization of essential data simple. Mario uses Excel to calculate approximate mileage of daily travel, determine fuel costs, transportation, food, and lodging expenses as well as other data of interest. Using the information derived from these spreadsheets, Mario creates several charts and graphs to display his daily, weekly, and monthly expenditures.

Mario elects to create a database to store information such as addresses of locations where he stops and tours as well as contact information of organizations, associations, and business contacts he needs to initiate the travel process. Mario also uses the database to keep information of individuals and groups he encounters along his virtual journey.

In order to learn as much as he can about the various places he "visits", Mario exchanges information with several individuals through teleconferencing and viewing web-streaming video. Mario's technology teacher offers a suggestion that Mario go to a website like LearnOutLoud.com to listen to various podcasts on historical, economic, and social aspects as well as current newscasts that may be significant to his travel destinations. He uses podcast information to determine in real time what situations or conditions he may encounter on his trip. For example, after listening to a podcast originating from Tunis, capital of Tunisia, (Mario hears a forecast warning of hurricane-like weather. He is forced to change his travel plans and moves his arrival closer inland to avoid the storm. This is one of several ways Mario is able to use technology to significantly impact an undertaking like a trip around the world.

Mario is interested in having a way to record his thoughts and experiences as he travels virtually across the world. To satisfy this need he constructs a detailed multimedia journal using software called Alpha Journal by the Alpha Realms Company. This software makes easy work of incorporating pictures and documenting comprehensive descriptions of each place he visits. The journal also includes pertinent information giving descriptions of the people, weather, general environment, and socio-economic conditions. Mario also includes several detailed entries of conversations he has with locals through email contact or online chat rooms.

By the conclusion of the project, Mario has a large collection of valuable information, which he carefully organizes and synthesizes into an electronic portfolio using Microsoft PowerPoint. He presents and proudly shares specific information of his virtual travels with his classmates. Mario finds using the tools of his Introduction to Technology course has made his virtual journey a project of genuine possibility.

Background

Unlike earlier direct computer instruction models of the 1980s where technology was used as an Intelligent Tutoring System, Mario's application of technology is as a cognitive tool. Apart from shifting from a behaviorist to constructivist pedagogy, the paradigm shift whereby students learn "with" as opposed to "from" computers is important in several respects.

Many tutorials and integrated learning systems have been developed and deployed in the schools. These applications have had only a very small impact on learning in the schools. In the 1980s and 1990s, research focused on Intelligent Tutoring Systems (ITS) as a possible way of having a greater impact on learning. The empirical data on ITS shows very little promise for educational purposes. Even those who have been most involved in research and development targeted at producing "intelligent tutors" have begun to acknowledge the lack of impact they have had on mainstream education (Lajoie & Derry, 1993, p. 37). In the face of the disappointing results of ITS and traditional tutorials, some experts suggest that "...the appropriate role for a computer is not that of a teacher/expert, but rather, that of a mind-extension 'Cognitive Tool'" (Derry & Lajoie, 1993, p. 5). Those who are interested in cognitive tools have pursued two separate paths. One path was to make use of existing software applications in ways that allowed learners to engage in higher order thinking. The other path has focused on the creation of new software applications that are specifically designed as a cognitive tool. Either way, there was clearly a need for a new direction in technology's role in education.

Secondly, new software tools for educational purposes make it possible for people to perform and learn in far more complex ways than ever before. For example, computer scaffolding enables students to do more advanced activities than they could without such help (Brown, 2000). Mario's project reflects this research. For example, compiling and calculating the data for approximate miles of daily travel, fuel costs, transportation, food, and lodging expenses will be accomplished using a spreadsheet program like Lotus 1-2-3 or Microsoft Excel. These programs will chart, graph, compile, and compare all of the data that is entered. Although paper and pencil

This book is licensed under a Creative Commons Attribution 3.0 License

methods of data analysis will accomplish these goals as well, it will be a much more labor intensive endeavor. The handmade graphs and charts may not have had the same level of professionalism as the computer models. By using a computer spreadsheet and graphing software the level of sophistication of the project was enhanced as well as the learning. Again, the computer can be seen as a cognitive tool to learn “with” as opposed to “from”.

Finally, in combination with other learner-centered strategies described in this book like project-based learning, problem-based learning, and the Six C’s of Motivation, motivation can be significantly increased using the cognitive tools model. Choice would increase in projects using cognitive tools. For example, even something as straightforward as researching the Southern Pacific countries comes to life with cognitive tools. Looking through an Encyclopedia Britannica would not generate the same speed and enthusiasm as it would to travel search on travelocity.com. This supports the results found by researchers, “Learners function as designers using the technology as tools for analyzing the world, accessing information, interpreting and organizing their personal knowledge, and representing what they know to others” (Jonassen, 1991, p. 82). In addition, we can see from this research that using cognitive tools supports a constructivist model of learning. Mario, by using the cognitive tools of the Internet is able to access much more information interactively. He could do a Google search on Sri Lanka and get all of the historical and political background, and then he could continue on to expedia.com and price hotels in Sri Jayawardenapura-Kotte, the capital.

Another perspective of Ccognitive tools can be seen from Pea (1985). “Cognitive technologies are tools that may be provided by any medium and that help learners transcend the limitations of their minds, such as memory, thinking, or problem solving limitations. The most pervasive cognitive technology is language” (p. 37). In this instance, Mario’s example exemplifies language in terms of the tools he uses to communicate. He is able to connect and set up teleconferencing with individuals while collecting his data for his mock travels. He is able to report back to his teacher and classmates using multi-media software. These tools improve the language needed to communicate effectively.

Cognitive tool affordance

What do cognitive tools offer teachers and students? Many cognitive tools have multiple roles. Their roles allow students to interact with information in order to acquire, synthesize, create, and share new knowledge. By examining their roles, educators can consider their implementation and impact on student learning.

27. Cognitive tools

Table 26: The roles of cognitive tools, examples, and specific technologies. The table (adapted from Iyoshi, et al, 2005) lists the 5 roles of cognitive tools followed by examples and specific technologies that demonstrate each role.

Roles of cognitive tools	Examples	Specific technologies
I. Information Seeking: These tools allow student to retrieve and identify information through learning situations that require the seeking of information.	Databases Search engines	Google Yahoo AltaVista
II. Information Presentation: These tools enable information to be presented in a meaningful and appropriate representation.	Graphic organizers Concept maps	PowerPoint Word
III. Knowledge Organization: These support students by allowing them to use a tool to establish relationships among information by structuring or restructuring information by manipulating information.	Spreadsheets Presentation tools Notebook tools	Inspiration Excel Word HyperAuthor
IV. Knowledge Integration: Such tools allow students to connect new information to prior knowledge therefore students are building a larger array of information.	Mapping tools Simulations	Online discussions Teleconferences Video streaming Podcasting (LearnOutLoud.com)

Information seeking

Information seeking is a skill in which students search for information for the purpose of research, personal interests, and problem solving. The computer facilitates this process according to Pea (as cited in Kommers, Jonassen, and Mayes, 1991) by “transcending the limitations of the mind, such as memory, in activities of thinking, learning, and problem solving” (p. 23). The facilitation of this process enables the learner to access and retrieve information beyond the limitations of memory, which enables the student to return to previous information throughout the learning process. According to Kozma (1991), these multiple encounters and processes with information result in a cognitive tool amplifying cognition (p. 24).

Returning to our scenario, Mario researches the places and details of his virtual trip. He must be conscious of how to retrieve relevant and reliable information by utilizing skills such as use of search engines and their functions, planning and conducting research, identifying and evaluating information. He also seeks information from Podcasts and video streaming in order to gain a variety of information suited to his decisions regarding his trip. As his decisions change he can return to previous information, evaluate and reflect on its application to his

This book is licensed under a Creative Commons Attribution 3.0 License

project. Not only are the information seeking tools necessary, but they also facilitate his cognitive processes in planning the details of his trip.

Information presentation

Presenting information involves the organization, format, and verbalization of knowledge conveyed through cognitive tools. The tools should present the knowledge a student has constructed. The variability of tools allows students to effectively present information by: (1) Selecting relevant content, (2) Selecting information that enhances decisions and interpretations, (3) representing content and relationships in different forms (Iiyoshi et al, 2005).

When Mario presents information through a PowerPoint presentation, he engages his ability to select information to interpret and represent in a manner appropriate to him and others. These tools enable him to articulate and allow others to reflect upon his knowledge.

Knowledge organization

Students' facilitate several cognitive abilities through the organization of information as an in depth analysis of relationships among ideas and beliefs between the learner and information. These tools demonstrate how information is distinguishable to each learner, Jonassen and Carr state, "Learners attempt to organize knowledge according to their unique experiences and interpretations, rather than simply 'copying' the organization provided by teachers" (as cited in Iiyoshi, et al, 2005, p. 287). When students examine the relationships within information, they are faced with many cognitive tasks; therefore, cognitive tools share the "cognitive load" of these processes (Iiyoshi, et al, p. 288).

Mario demonstrates this as he decides to use a spreadsheet for his travel expenses and his travel journal recording his virtual trip. These tools mimic real authentic examples of organizing traveling experiences through journaling and the mathematical functions of spreadsheets. With these tools, he efficiently organizes many elements of his trip.

Knowledge integration

By integration of knowledge, students evaluate and synthesize information that modifies and elaborates prior knowledge. Arguably it is necessary for students to test their assumptions and conceptualizations in regard to their research and its organization. Cognitive tools allow this through their ability to allow lower level thinking skills to be managed in order for higher order thinking skills to be stimulated. Jonassen and Carr support tools that support collaborative argumentation and reasoning because these tools may enhance critical thinking abilities, such as assessing, reorganizing, and verifying new and gathered information, elaborating them, and making decisions (as cited in Iiyoshi, et al, 2005, p. 289).

Along with data, Mario accesses video streaming and teleconferencing as tools to gain additional information about the social, cultural, and historical elements of the places he intends to visit. This information is integrated into his decision-making abilities and background knowledge of the places he will visit.

Knowledge generation

The generation of knowledge applies students' abilities to represent knowledge in a meaningful format that mirrors cognitive skills and strategies employed through the interaction with the information. Significant effort is required for students to design and construct their knowledge. These tools illustrate constructivism, "the creation of unique learning artifacts is important to constructivist-inspired views of learning" (Iiyoshi, et al, p. 290).

Mario generates knowledge through his multimedia journal in which he will share through a presentation. His design will reflect his background knowledge, and cognitive processes and decisions through new knowledge, problem solving, and discoveries. Other students will gain new understandings through the sights, sounds, and colors of his trip as it comes alive!

Research on cognitive tools

The University of Michigan conducted an extensive research study in the Detroit Public School system. The study involved the scalability and use of computers as cognitive tools. The project was funded by the National Science Foundation, and showed that while incorporating technological tools in small, highly refined study groups created a heuristic, implementing reform on a large scale is more difficult. "By necessity these cognitively based technologies are developed in 'hothouse' environments where students and teachers receive generous attention from both university faculty and graduate students (or their corporate equivalent for industry-sponsored development projects). The resource environments for these development sites is unusually rich, to make sure that innovations don't fail to work for reasons that can be avoided, such as inadequate numbers of computers or malfunctioning software or limited teacher knowledge" (Soloway, 2001, p. 4).

The Internet was found to be the most baffling cognitive tool. With respect to classroom management, "Students who act out in face-to-face situations will also act out online, but it can be much harder for teachers to monitor and prevent, though they are still responsible" (Soloway, 2001, p. 12). The Internet, being open-ended leaves room for discussion of students being "on task". Also, computers are marketed to schools in labs and not dispersed evenly around the school. This creates scheduling conflicts with teachers wanting to implement a cognitive tools project and not being able to get into the lab. Many students still don't have access to computers with Internet connections at home.

Gilbert's research put in this perspective, "enhancing cognitive power"' can be interpreted in multiple ways, and affect what one considers a cognitive tool. At one extreme, some limit the term to tools that intentionally develop human capability, however that development is accomplished. At the other extreme, tools that augment human performance (and perhaps make some learning unnecessary) are included. In between is a range of programs such as microworlds such as intelligent tutoring systems, expert systems and the now commonplace computer applications usually shelved under "productivity programs"—for example spreadsheets, databases, and word processing programs" (1999, p. 7). In this context we can see examples of past cognitive tools that have been seen from two perspectives. Many educators saw the epistemology of mathematics education change with the advent of the electronic calculator. With the tool many higher level thinking skills were possible because students need not be bogged down with the "manual labor" of long division, multiplication, addition, and subtraction. Yes, even the slide rule tool could be considered labor intensive. With the new calculator tool, despite deficiencies in arithmetic, students could perform problems at a higher cognitive level. The counter-point, however, was teachers found that many of the mental math skills deteriorated to the point where some students could not add two and five without looking for a calculator. Some students became poor estimators, and some could not determine the reasonableness of an answer. So in the same respect, while there may be advantages to using cognitive tools, there may be some disadvantages as well.

This book is licensed under a Creative Commons Attribution 3.0 License

Advantages of cognitive tools

Cognitive tools are distinct in their implications of technology. Jonassen (1994) distinguishes the impact of learning with computers and learning with technology. He states, “When students work WITH computer technology, instead of being controlled by it, they enhance the capabilities of the computer, and the computer enhances their thinking and learning” (p. 4). This interaction empowers learners to become active and responsible filters of information in which they engage in directing their mental processes; therefore, the role of the teacher resumes the “guide on the side”. Cognitive tools should allow students to “activate metacognitive learning strategies” (Jonassen, 1992, p. 2). Metacognitive learning strategies are strategies that are used when students encounter new information, connect it to prior knowledge then construct and revise their schemata. The effective use of cognitive tools should enable learners to undertake this process and assist them in experiencing cognitive processes that would be impossible without such tools (Mayes, 1992, p. 7).

The capacity and skill to design, develop and create thought provoking questions could be augmented with usage of cognitive tools as well. Proper questioning directs research inquiry, as well as provides the basis for appropriate assessment of information. Although asking the appropriate questions may not seem pertinent, individuals from various backgrounds and academic levels continue to struggle to improve their questioning ability. Erickson and Lehrer conducted a two-year study of middle school social studies students. By using cognitive tools, “questions considered worthy of consideration evolved from those that required little effort to answer and even less to evaluate to those that provided opportunities to guide fruitful research and to sustain interest” (Lehrer, 1998, p. 382).

Hypermedia products such as HyperCard, HyperAuthor, as well as PowerPoint are cognitive tools that can increase and assist in the establishment of good design standards of students through recurring creation and evolution of products. Students start out being overly concerned with interesting graphics while omitting essential information. Instructors are able to establish appropriate design standards, which transferred the students’ focus on design to evolve “in ways that aligned communication with presentation” (Erickson et. al., 1998, p. 382). When allowed to play the role of developer/designer, students tend to perform at a higher level than even their teacher felt was possible. Lehrer reflects that these types of tasks “promote the evolution of a wide range of skills that are valued both in the classroom and beyond” (Lehrer, Erickson & Connell, 1994, p. 250). Clearly, having computer skills, being well trained in software applications, and having the ability to navigate the new forms of media in the twenty-first century will be beneficial to all.

Challenges of cognitive tools

Cognitive tools have their challenges. Many researchers state it is difficult to measure how students actually use the tools and process information. The construction of a knowledge base and representing it in a cognitive tool can be challenging for evaluating learning. Another concern is the possibility of students becoming overwhelmed by the introduction of a cognitive tool and the cognitive processes they require. Currently many educational settings are focused upon the traditional instructional and assessment methods of teacher directed lessons. Therefore technology skills for using cognitive tools may be an issue for some educators and students.

Currently, research shows several challenges that may be encountered with the cognitive tools approach to learning. Salomon wrote about the pedagogy of cognitive tools, “No tool is good or bad in and of itself: its effectiveness results from and contributes to the whole configuration of events, activities, contexts, and interpersonal processes taking place in the context of which it is used…If nothing significant changes in the classroom save the introduction of a tool, few if any important changes can be expected" (1993, p. 189). There are some luddites in the educational community that believe computers are a "panacea" for everything that is wrong with education. Teachers also point to falling test scores even with the investment of many millions of dollars of technology in the classroom. Teacher buy-in is critical to the success of cognitive tools.

The research with the Detroit schools found many other challenges with respect to implementing cognitive tools on a scalable fashion as well. The challenges included: teacher training, technology integrated curriculum, assessment, school culture, district policy and management, district capability, changing pedagogical approaches, and cost. For example, the researchers felt that the term "personal computer" was something of an oxymoron. How could it be personal if it is used by between 10 are 50 kids a day? (Soloway, 2001, p. 14).

The use of cognitive tools as an intricate part of the restructuring of schools requires the need for a possible reorganization of several areas of infrastructure within our schools. For example, there is a need for blocks of time so students can form cohesive interactive cooperative groups. Schools need also to provide appropriate space, "so students can work collaboratively with technical tools that are commonplace in every other information environment (e.g. any professional office)" (Lehrer, et. al., 1994, p. 251).

Assessment issues may also become a concern with the implementation of cognitive tools within the school setting. Time constraints accompanied by the difficulty of providing feedback to large numbers of students in a timely manner can be challenging to manage. Providing teachers with appropriate training to administer as well as design suitable assessment tools which can be applied to similar constructivist scaffolding is also a challenge when considering the use of cognitive tools. Design based assessments will require parents, counselors, administrators, and other stockholders "to learn to read a different type of assessment report and to expect different measures of progress" (Carver, Lehrer, Connell, and Erickson, 1992, p. 402).

Implementing cognitive tools

When considering the use of cognitive tools, educators should understand some of the processes that students encounter while using them. Cognitive tools impact student learning by causing them to think about information instead of reproducing and/or recalling information. Information is shifted through and evaluated for its validity, reliability, and applicability to research and problem solving activities. These mental processes support the constructivist pedagogy and uphold the use of higher order thinking skills.

To construct a learning activity in which cognitive tools are utilized, the following guidelines should be considered:

- Identify learning goals or objectives. Clearly defined goals will enable students to comprehend the purpose of the activity and the desired outcomes.
- Select projects for students to achieve goals or objectives. By analyzing learning goals and objectives, teachers can locate many projects based upon state objectives, research lesson plan ideas on the Internet, consult colleagues, and design their own. Typically authentic tasks can motivate students to engage in meaningful learning.
- Select cognitive tool/s. Cognitive tools should facilitate the attainment of the learning goals and objectives. The tools should be appropriate to the learning environment, learning styles of students, appropriate for students' technological skills, and facilitate the desired outcomes of the objectives. Becoming familiar with

This book is licensed under a Creative Commons Attribution 3.0 License

the tool/s may be necessary for effective instructional and scaffolding strategies. Technical assistance from colleagues, tutorials, and the media specialist may be sought.

- Implement the learning experience and cognitive tool/s. Most teachers invest time in planning and assuring learning activities can be executed. Having an alternative plan is essential when relying on technology because the unexpected can happen. Some students may need guidance in their usage of the tool. Collaborative pairs, mini lessons, and one to one assistance can alleviate stress when encountering new technologies.
- Evaluate the learning outcomes. The evaluation of tools is challenging; however, checklists and rubrics can serve as assessments in evaluating students' effective use of them. Also student artifacts are evaluated according to criteria listed on rubrics, peer feedback, and performance evaluation checklists and/or rubrics.

Teachers should consider the following when planning the use of a cognitive tool for learning.

- Cognitive tools function best in constructivist learning environments.
- They can motivate and engage learners through realistic contextual learning.
- The tools should help manage the cognitive work, not increase it.
- A variety of tools can be necessary to support diversified learners and various cognitive processes.
- The same tool may support various functions.
- The tools should provide students the ability to actively address meaningful questions and problem solving that are realistic and offer feedback.
- Scaffolding may be needed in order for the student to effectively use a tool.
- They allow students to focus on higher order thinking and developing an array of knowledge through thinking and reflection.
- Tools need to support the students' expression of knowledge.
- The successfulness of cognitive tools has not been determined therefore many unanswered questions remain about how to facilitate their use and how students actually manipulate them.
- Assessing the products of cognitive tools can be complex and may require alternative assessments for the use and the impact of the tool upon the learning community.
- Cognitive tools can require troubleshooting and encompass other technology issues related to users and designers.

Earlier version of cognitive tools

An earlier version of this chapter was written by Shim and Li. The authors of the current chapter decided that they wanted to write a new chapter rather than an extensive edit of the old one. However, I would like to keep the older one in case others prefer this version. Here is the link to this version: Cognitive Tools in the classroom.

References

Bransford, J. D., Cocking, R. R., & Brown, A. L. (2000). Technology to Support Learning. How People Learn: Brain, Mind, Experience (pp. 206-230). Washington DC: National Academy Press.

Gilbert, L. S. (1999). Where is my Brain? Distributed Cognition, Activity Theory, and Cognitive Tools (Working Paper). Houston, Texas: Association for Educational Communications and Technologies (AECT). (ERIC Document Reproduction Service No. ED436153)

27. Cognitive tools

Iiyoshi, T., Hannifin, M. J., & Wang, F. (2005). Cognitive tools and student-centered learning:Rethinking tools, functions, and applications. Educational Media International, 42, 281-296. Retrieved February 19, 2007.

Jonassen, D. H., & Carr, C. (2000). Mind tools: Affording Multiple Knowledge Representations in Learning. In S. P. Lajoie (Ed.), Computers as Cognitive Tools: Volume Ii, No More Walls (pp. 165-196). Mahwah, New Jersey: Lawrence Erlbaum Associates Inc.

Jonassen, D. H. Technology as Cognitive Tools [IT Forum Paper 1]. Message posted to http://itech1.coe.uga.edu/itforum/paper1/paper1.html

Kennedy, D., & McNaught, C. (2001). Computer-based cognitive tools. Description and design (C. Vitelli, & J. Vitelli, Eds.). Norfolk, Virginia: Ed Media.

Kommers, P. A. M., Jonassen, D. H. & Mayes, T. M. (Eds.). (1992). Cognitive Tools for Learning. (Vol. 81). NATO ASI series. Germany. Springer-Verlag Berlin Heidelberg.

Lajoie, S. P. (2000). Computers as Cognitive Tools: Volume Ii, No More Walls (Rev. ed.). Mahwah, New Jersey: Lawrence Erlbaum Associates Inc.

Salomon, G. (1993). No distribution without individuals cognition: A dynamic interactional view. In G. Salomon (Ed.), Distributed cognition:Psychological and educational considerations (pp. 111-138). New York: Cambridge University Press.

Sewell, D. F. (1990). New Tools for New Minds. London, England : Harvester Wheatsheaf.

This book is licensed under a Creative Commons Attribution 3.0 License

28. Computer mediated instruction

Contributors: Tim Daniels and Melinda Pethel (The University of Georgia, USA)

Today, in this "Digital Age", time seems to go by faster and distances appear to have become shorter. Communication is almost instantaneous from virtually anywhere, anytime. Furtive notes in class are giving way to cryptic messages delivered instantly to screens in the palms of our hands. Students' hovering over books in the library have given way to reading e-texts on a tablet PC or listening to them on an MP3 player.

The effect of this evolving technology on our society and our educational processes has yet to be determined, but there are several questions we need to ask:

- How are our relationships with instructors and classmates influenced by technology?
- In what way does technology affect the educational experience and learning outcomes?
- How do we effectively integrate technology into our learning systems?

Technology-enhanced higher education in the United States is not a new phenomenon. In the late 1950s, college telecourses initially began broadcasting lectures via network television. Later, they migrated to cable channels. PBS's Adult Learning Service telecourses based on traditional college courses boasted enrollment of over 432,000 in 2000. Today we have a myriad of technologies at our disposal for integration into our educational systems.

Computer Mediated Communication

Wikipedia.org defines Computer Mediated Communication (CMC) as:

- Any form of communication between two or more individual people who interact and/or influence each other via separate computers. Notice that this does not include the methods by which two computers communicate, but rather how people communicate using computers.
- CMC most commonly refers to the collection of email, video, audio or text conferencing, bulletin boards, list-servers, instant messaging, and multi-player video games.
- The consequences of switching communication to a more computer mediated form include altered impression formation, deception and lying behavior, group dynamics, disinhibition, and especially relationship formation.

Computer mediated communication has created a major shift in how educators and students think about teaching and learning. By allowing students to learn in more convenient locations and often at more convenient times, distance education opens educational opportunities to previously unreachable populations. It also enables more people to extend the period of their education into a lifelong learning process (Kassop, 2003).

In addition, it changes power and authority relationships between teachers and learners. The traditional hierarchy is flattened and power and control are redistributed often encouraging more equal and open communication than occurs in conventional educational settings (Schrum & Hong, 2002). Because CMC enables institutions to reach students all over the world, learners may gain increased opportunities to experience other cultures and their educational experiences may be enriched.

Implementation of computer mediated communication in an educational setting can take on several forms, each with its strengths and weaknesses. We can get a clearer picture of these technologies if we think in terms of a time-place model.

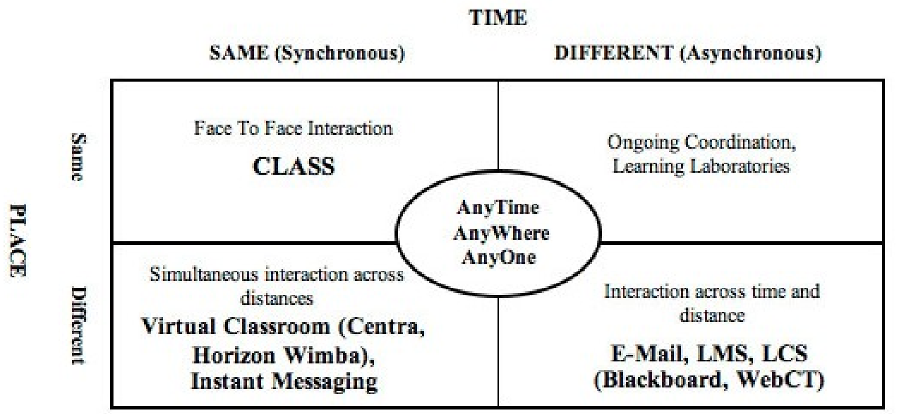

Exhibit 40: This diagram is a Time-Place Matrix used to classify eLearning technologies according to either same or different time or place. In the same time-same place cell we include face-to-face classroom interactions. In the same time-different place cell we include simultaneous interaction technologies such as virtual classrooms (Horizon Wimba and Centra) and Instant Messaging (IM). In the different time-same place cell we include ongoing coordination and learning laboratories and the different time-different place cell includes asynchronous technologies including email, Blackboard and WebCT. SOURCE: Bostrom, 2001 (used with permission of the author).

Asynchronous communication

Asynchronous communication allows participants to post whenever they want to and saves the postings so that the individual participants can view them later, at his or her own convenience. Asynchronous communication tools have been in use for two decades and usually include email, newsgroups, BBS (electronic bulletin board systems), surveys, and assessments. More modern asynchronous technologies include blogs (or web logs–a web application containing time-stamped posts on a common webpage) and wikis (an interactive website with authoring capabilities for users).

The primary benefit of asynchronous communication is its flexibility and ability to fit into everyone's schedule. Individuals can access the system at their own convenience, and many kinds of information including documents and file attachments can be shared, not just text discussions.

It is an ideal delivery mode for individuals in different geographical locations and time zones, or even those whose work schedules or other obligations have kept them from furthering their education. It is also more of a leveler than either face-to-face or synchronous communication because all participants have an equal opportunity to contribute, and those who have trouble speaking up in traditional face-to-face classes because of language differences or other reasons can take time drafting a thoughtful written reply (Mitchell, 2002).

This book is licensed under a Creative Commons Attribution 3.0 License

This mode of communication allows time to think about a given subject and formulate thoughts. Another advantage of the asynchronous environment is that the learning does not have to be geared to the average student. Those who want to research a subject in more depth can do so, and those who are slower learners can review material as many times as needed. Technically, asynchronous environments often do not require a high bandwidth connection and can often be accessed with lower hardware requirements.

One of the drawbacks of an asynchronous environment is that group activities and decisions take longer and timely feedback on ideas is difficult. It also allows for a greater degree of procrastination. According to Hiltz and Wellman (1997), 52 per cent of the asynchronous classroom students reported that they were more likely to stop "attending class" when they were busy. The lack of scheduled classes made it easier for the students to postpone attendance (logging in) and therefore much easier to fall behind in their studies. Without strict deadlines in the asynchronous environment, and with no teacher watching over them, many students fail to contribute to the deliverables. Hiltz (1997) concluded that careful coaching in self-directed learning and online collaboration is essential for the success of these learners.

In addition, as with most computer mediated communication, the student who is new to this form of communication may find that much more information is carried in body language or tone of voice than he or she had realized. Extra care has to be taken to convey priorities and relative importance of statements explicitly through the text or other shorthand such as emoticons. Group dynamics may be radically transformed as a result.

Synchronous communication

Synchronous interaction requires the learner and instructor being online at the same time and communicating in real time. Efficient synchronous communication tools are a more recent development and include: shared whiteboards and live presentation tools, learner control tools including hand raising, approval feedback and audio/video control, live assessment testing and voting, breakout rooms for smaller groups, real-time chat, instant messaging technology, voice streaming, video conferencing, and webcasting. Systems such as HorizonLive/Wimba and Centra include many of these tools (see Exhibit 40).

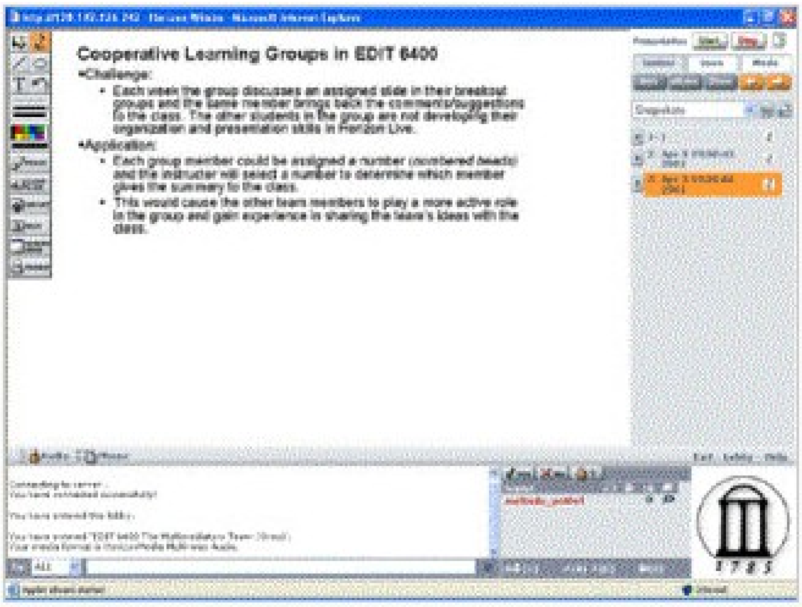

Exhibit 41: Screen shot from Horizon Wimba Live Classroom Session illustrating the shared whiteboard and presentation tools, the text chat box, learner controls for live audience polling and hand raising and the availability of breakout rooms for small group collaborative sessions (used with permission of HorizonWimba).

Synchronous classroom interaction allows students to obtain real-time, interactive feedback on their ideas and clarification of facts as well as opportunities for collaboration with their classmates using small group discussion rooms. It allows guest speakers to address the class remotely from their own computers. Classes taught using synchronous technologies also have a higher motivation and completion rate than asynchronous ones (Hiltz, 2002).

The disadvantages of synchronous learning are logistics and the limitation of time. All parties must be online at the same time, which may be difficult for those in widely-dispersed time zones. Also, synchronous communication works well for short sessions, but can be problematic for longer periods, with individual attention and learning decreasing rapidly. In a classroom setting, the degree of interactivity within an actual live session is controlled by the instructor and as the number of students increases, the interaction process becomes harder to manage; so that fewer students can be effectively managed in a synchronous course than in an asynchronous course (Easton, 2003).

In comparison to asynchronous communication, synchronous communication frequently requires a higher level of technology such as a faster computer or more bandwidth. For the newcomer, the "learning curve" may be much steeper and the student may require more time to become comfortable.

CMC and education

What does this mean for education? What impact does CMC have? How is it being used in today's classrooms? How will future developments in CMC be integrated?

These questions suggest several areas of discussion:

- What are the social implications of CMC? Does communication via a network impact how people interact with each other?
- How does the combination of technology and communications impact education?

This book is licensed under a Creative Commons Attribution 3.0 License

- Some technologies allow for synchronous and asynchronous communications, others simulate classroom learning environments, while still others can be targeted to specific educational theories and learning styles. Which technologies best support my own teaching/learning needs?

Implementing Computer Mediated Communications in the classroom

Computer Mediated Communications offers a rich set of tools that can be used to support a variety of learning experiences. The instructor is not limited to one set of services or tools but can use several to create a learning environment which will best suit his or her students' learning needs.

As illustrated below each tool offers its own strengths and weaknesses.

Blog or weblog

A blog is an asynchronous communication tool that acts as an online space for journaling and gathering links related to topics of interest. In general, blogs are maintained by one person (although some blogs may be set up to allow multiple authors) and entries are loaded in a chronological manner with the newest post located at the top. Blogs allow readers to comment on posts and those comments are attached to the related post. Most blogs have searchable archives. Updated blogs can be "pushed" to users via RSS (Really Simple Syndication or Rich Site Summary) into a blog reader (a tool that allows users to track all of the blogs they are interested in one location). One of the great strengths of weblogs is the ease of linking. If you comment on an article on the web, it is easy to link directly to it. This makes it much easier for the reader to follow up references and research matters in greater depth. It also allows you to comment on items you disagree with and link it to the original so that the reader may make up his or her mind. This allows the reader to interact with the bibliography, rather than the bibliography merely being something at the end of the article.

What works:

- Students have a chance to reflect as individuals.
- Students can collect their research links in one spot.
- Students can receive contextual feedback from their peers and instructor in one space (via the comment function.)
- RSS allow new posts to be 'pushed' to requesting parties.

What does not work:

- Many students do not feel comfortable journaling in an open forum.
- Maintaining a blog takes time and commitment.

Instructional uses:

- Students can be asked to blog (or reflect) about their learning experiences.
- Students can be asked to blog about their portion of a group project (and post links to collected research materials.).
- Students can be asked to blog writing samples (for creative writing classes).
- Students can be asked to comment on blog entries made by other classmates.
- Via RSS the instructor can have new posts and comments pushed to a central reader.

Bulletin board systems (BBS)

Bulletin Boards are an asynchronous communication tool that allows users to post messages, files, and information in a central area. These posts can then be replied to (or downloaded in the case of a file) by members of the bulletin board system. Posts can be tracked by their subject heading (or thread) allowing users to read all of the entries related to a topic in a linear fashion.

What works:

- Great place to park information.
- Following a thread can help a user track a conversation that has taken place over time.

What does not work:

- Users are not aware a new post has been made unless they check the site on a regular basis .
- To track a thread the subject line of the original post must remain intact.

Instructional uses:

- Students can be asked to post messages for other class or group members to respond to.
- Students can be asked to post files for other class or group members to view and respond to.
- Students can share information that may be of help to the whole class or group.
- Students can be asked to discuss a topic and the thread can be followed by the instructor or other class members.

Chat (online chat or instant relay chat)

Chat is a synchronous communication tool allowing multiple users to have a (typed text) conversation in a central environment. Most chat sessions are viewed as an informal conversation with multiple participants.

What works:

- Good environment for informal real time information sharing with a group of users.
- Sessions can be saved and reviewed.
- The whole class or team can participate in the conservation during real time.

What does not work:

- Many users find chat sessions hard to follow as posts may seem to be illogical or disjointed.
- Side conservations distract other students.
- Individual threads are not traceable.
- Saved or logged sessions are not easy to read.
- It is difficult to make lengthy or thoughtful posts.

Instructional uses:

- Chat can be used as a tool for side comments and questions during a real time lecture.
- Chat can be used to have discussions with teams or groups.
- Teams or groups can share ideas and brainstorm.

Email

Email is an asynchronous communication tool that allows users to send messages, letters, and files to each other. Email is more formal than a BBS, chat, or IM.

What works:

This book is licensed under a Creative Commons Attribution 3.0 License

- All students have email accounts.
- Most students know how email works.

What does not work:

- Not all students check their email on a regular basis.
- Many students (and instructors) receive so much email that messages can get lost or overlooked.

Instructional uses:

- Students can be asked to email the instructor assignments or responses to questions.
- Instructors can use email to communicate with the class when the material is not extremely time sensitive.
- Students can use email to schedule meetings or work with others.

Instant messenger (or IM)

IM is a form of chat that is a synchronous communication tool mainly used for discussions between individuals. Many IM clients are expanding beyond simple text exchanges to include video and voice exchanges.

What works:

- real time exchanges
- users can share files and links
- some IM programs allow program sharing

What does not work:

- Not all IM systems work with each other (there are aggregators but you still need an account with individual types of IM).

Instructional uses

- individual conferences
- virtual office hours
- oral discussions (using voice chat)

Listservs

An asynchronous email based communication tool that allows a community to form around a topic or shared interest. Messages that are sent can be requests for help, answers to questions, or general information. Messages submitted to the listserv are distributed to the entire membership of the list.

What works

- All students have email accounts where posts to the list can be received.
- All messages are handled via a single server.
- Most listservs maintain an archive that can be searched.

What does not work:

- Not all students check their email on a regular basis.
- Many students (and instructors) receive so much email that messages can get lost or overlooked.
- If not monitored listservs can become places where basic questions are not welcomed.
- Care must be taken that the listserv's purpose is carefully defined or the "noise to signal ratio" may become too high.

Instructional uses:

- An instructor can set up a listserv where students can share information as a group and information can be pushed to students.

Virtual learning environments (VLE), course management system (CMS), or learning support system (LSS)

Pierre Dillenbourg (2000) explains that Virtual Learning Environments (VLE) have the following characteristics:

> *The information space has been designed, educational interactions occur in the environment, turning spaces into places, the information/social space is explicitly represented, the representation varies from text to 3D immersive worlds, students are not only active, but also actors, students co-construct the virtual space, virtual learning environments are not restricted to distance education, they also enrich classroom activities, virtual learning environments integrate heterogeneous technologies and multiple pedagogical approaches, most virtual environments overlap with physical environments (page 2).*

What works

- VLEs are great for creating a sense of place.
- Many of the needed tools are housed in a central environment.
- VLEs provide tools that are designed to work together.

What does not work

- Some of the technologies are not fully developed.
- It may take some time for users to learn the environment and the tools – learning curve.
- If the network is down all of the tools are inaccessible.

Instructional uses

- VLEs can be used to enhance or replace a regular classroom.
- By taking advantage of a VLE, the instructor can create a sense of place for students giving them computer based tools that simulate real world experiences.

Wiki

Wikis are asynchronous web based forums that allow user groups to post and collectively edit documents. They often take the form of a collaborative online encyclopedia.

What works

- Versioning (so changes can be tracked and removed if need be).
- Allows a group to work on a document stored in a central place.
- Most wikis are searchable.

What does not work

- Since anyone in the group can edit the document some changes can be made that do not reflect the views of the whole group (wikis can, and should, have central editors who can resolve disputes between contributors).

Instructional uses

- The process of documents created by a group can be tracked in a wiki.
- Groups can be asked to post links to research in the wiki.

This book is licensed under a Creative Commons Attribution 3.0 License

Scenario

The College of Education at Southern University has decided to offer several of its master's degrees completely online. Over the past two years, enrollment in face-to-face programs has steadily declined while enrollment has increased in university online degree programs. The faculty is concerned that if this trend continues they will not be able to compete in the global education market. In order to best serve students, the college has selected a versatile electronic course management system (CMS) and a virtual classroom space where real time classes can be held. Each instructor will receive training in developing a class for these electronic environments.

Dr Jones has begun to explore the CMS for his Educational Psychology class. The CMS includes an internal mail system, a chat client, a discussion board, a place where students can take quizzes, and areas where students can retrieve and post assignments. The virtual classroom space allows for two-way synchronous communications via a voice-over IP connection (VOIP) and an interactive white board space where students and the instructor can write, draw, and post slides. The virtual classroom also includes a chat client that allows students to transmit and receive real time messages via the network.

Dr Jones has also decided to use other supporting technologies such as blogs and wikis that exist outside the CMS (but can be linked inside the CMS), and the virtual classroom to provide what he hopes is a successful learning experience for the students in his class.

Dr Jones's class will meet once a week in the virtual classroom where he will present his material to the class, give the students a chance to communicate vocally, create team rooms where students can have peer team discussions, and where each team will give a presentation at the end of the semester.

Dr Jones will use the CMS to post assignments and grades, create asynchronous discussion spaces via the discussion boards, and give the students a place to turn in their assignments and conduct general class business. There will also be links to outside resources including subject- and topic-focused library guides, and a link to virtual real-time reference with a librarian.

The class will be divided into teams and each team will pick a subtopic for its end-of-the-semester presentation. Each student will be asked to set up a blog where they will journal about their learning experience, discuss the subtopic they have picked, and post critical reviews of other blogs related to the class focus and their subtopic. The group will be asked to maintain a wiki for its collaborative work.

At the end of the semester, each student will deposit their final work into the college's repository and their materials will be available to anyone on the internet. The repository will also be used to allow the student to create an e-portfolio. Each e-portfolio will have a persistent URL that will allow students to direct potential employers to examples of their work.

Synchronous and asynchronous communication technologies in the learning environment

For computer mediated communication tools to support and enhance the learning experience, robust ubiquitous computer networks must be developed to make scenarios like the Dr Jones model not only possible but actual. In order for communication tools such as blogs, wikis, instant messaging, chat, and virtual classrooms to be used effectively, experienced instructional designers need to work with instructors to ensure that scaleable learning environments are developed. The technology that Dr Jones uses to teach his or her classes needs to be complex enough to support their needs, but not so complicated that the students spend all their time learning how to use the technology and not learning the subject.

Dr Jones is providing students with the tools they need to have a complete group learning experience even though they are physically removed from each other. Using both the CMS and the Virtual Classroom software as a superstructure around which to develop his assignments and class time, Dr Jones is creating gathering places for online learning communities to form and develop. By requiring students to meet in these places, he is developing a group of users who are comfortable with these technologies. As they progress through the program, these users should become comfortable and adept in this environment.

By employing technologies such as chat and the bulletin board system (via the CMS), Dr Jones is encouraging the students to use both synchronous and asynchronous technologies to interact with one another. Unfortunately, some users find group chat sessions hard to follow and others use the technology to hold side conservations which may or may not be relevant to the discussion at hand. Students frequently find ways to talk to each other about subjects other than what the teacher is saying. In CMC, though, the teacher doesn't have to shout over the students' conversations.

In developing assignments that encourage students to blog, he is providing students an opportunity to journal about their learning experiences and to read and remark on the experiences of others. A collaborative wiki space gives the students a chance to work together in an asynchronous environment that provides a strong framework designed to support project development by groups of dispersed users.

Overall, Dr Jones has created a space that takes advantage of current CMC technology to simulate a traditional, physical, face-to-face learning environment. Learning in this environment is obviously a two-way, online process. Dr Jones is learning from his students' experiences and his responses to questions become more reflective and deliberate. In this setting, instructors must engage in a deeper level of mental processing as they formulate their questions and respond to those of students (Coppola, Hiltz & Rotter, 2002).

Computer mediated social communication

What are the social implications of CMC? Does communication via a network impact how people interact with each other? Does the quality of that interaction change whether we are at home, at work, or at school? The answer is a resounding maybe.

Computer mediated communication for social purposes has developed along with the growth of technologies. One major question is whether true social communication is possible over networks (e.g. in email or bulletin boards). Does communicating through text make CMC low in "social presence" without necessary social contextual cues like eye contact? Social presence theory contends that CMC is incomplete compared to face-to-face communication in social context cues like facial expressions, posture, dress, social status indicators, and vocal cues (Sproull & Kiesler, 1991). However, some researchers (Hiltz, 1978) found that CMC was primarily honest, creative, and positive.

If one defines a face-to-face class as the norm, then one must view a virtual class as “incomplete”. It is certainly different, lacking some of the nuances possible in face-to-face meetings, yet also permitting a degree of thoughtfulness in one’s comments not possible in face-to-face classes. Some of those visual cues encourage communication, others inhibit it.

Despite the claim that true emotional expression is not possible in CMC, computer networks used for social purposes have become more active than non-social networks (Rice & Love, 1987). In contrast to what would be expected from social presence theories (e.g.,communication on the computer is impersonal and cold), friendly and

This book is licensed under a Creative Commons Attribution 3.0 License

relaxed communication styles have been associated with increased use of CMC (Rice, Chang, & Torobin, 1992). Even when the intent was work-related, CMC appears to smooth the progress of social interaction (Murray & Bevan, 1982).

Another issue in computer mediated social communication involves computer communication within the home. Some researchers have cited the negative effects of the internet on traditional social interactions (e.g. Kraut et al., 1998; Nie & Erbring, 2000). Kraut et al. (1998) found that over a one or two-year period, first-time internet users noticeably decreased their traditional social networks and social support. Similar results were obtained by Nie and Erbring (2000).

Other researchers have claimed that the internet enhances traditional relationships and family ties (e.g. Katz & Aspden, 1997; Robinson et al., 2000). Katz and Aspden (1997) found that when the internet was placed in the home it did not result in people "dropping out of real life" and in fact, it augmented involvement in traditional family based activities. Robinson's research suggests that frequent internet users might actually have more active social lives than non-users. A majority of Americans surveyed perceived that communication over the internet has improved their connections to family and friends (Pew Internet & American Life Project, 2000).

Alavi and Leidner (2001) conclude that the internet will probably never replace face-to-face meetings for cultivation of primary group relationships, but it is possible that communities can be created that provide emotional support and companionship to support our traditional exchanges. These online relationships are real and not second rate. They will continue to be used in the same way letters and phone calls were in previous times to sustain these traditional interactions.

Summary - computer mediated education

So, how does this combination of technology and communications effect education?

Research seems to support computer mediated communications as a valid educational tool. Hiltz (1997) summarizes that:

- Mastery of course material in the virtual classroom is equal to or superior to the traditional classroom.
- Virtual classroom students report higher subjective satisfaction than with the traditional classroom on a number of dimensions, including access to professors and overall quality of educational experience.
- Students perceive their learning experience to be group learning rather than individual learning and that the more they judge the experience to be collaborative, the more likely they are to judge the outcomes as superior to the traditional classroom (page 47).

Instructional technologists, educational psychologists, and educators have spent much time developing strategies to use computer mediated communication as a way to enrich and empower student learning. By continuing to explore uses for older technologies and by developing plans to employ new technologies, education professionals are creating an environment where CMC tools are now simply a part of the learning space. They are tools to be used at the point of need and technologies to support multiple learning theories and styles.

Key terms of common CMC terms

BBS – A Bulletin Board System is a computer system that allows users to perform activities such as downloading software and data, uploading data, reading news, and exchanging messages with other users. BBSs were the precursors to the modern World Wide Web.

Blog – Is a weblog or a web application which contains periodic time-stamped posts on a common webpage. These posts are usually shown in reverse chronological order and are typically accessible on the Internet.

Blogs can be many different types including: personal, topical, news related, political, collaborative, corporate, or legal (blawgs) and can contain text, pictures, video, and sound.

Email – Electronic Mail is a method of composing, sending, and receiving messages over electronic communication systems.

IM – Instant Messaging is a conversation that happens in real-time. Most services offer a "presence awareness", that can indicate whether people on a list of contacts are currently online and available to chat. Both parties in the conversation see each line of text right after it is typed (line-by-line), thus making it more like a telephone conversation than exchanging letters (like email).

IRC – Internet Relay Chat is a form of instant communication over the Internet. It is mainly designed for group communication in discussion forums called channels, but also allows one-to-one communication.

Listserv – is a mailing list or a collection of names and addresses used by an individual or an organization to send material via electronic mail to multiple recipients.

LMS – or Learning Management Systems (or CMSs – Course Management Systems) are software systems designed to facilitate management of online educational courses. LMSs usually offer access control, provision of e-learning content, communication tools, and administration of user groups.

SMS – Short Message Service is the text-only messaging system for mobile networks. More recent in this mobile evolution is MMS or multimedia-message service that allows subscribers to compose and send messages with multimedia (digital photos, audio, video) parts.

Wiki – is a web application that allows users to add content, as on an internet forum, but also allows anyone to edit the content. "Wiki" also refers to the collaborative software used to create such a website. The name was based on the Hawaiian term wiki wiki, meaning "quick" or "super-fast".

References

Alavi, M., & Leidner, D. E. (2001). Research commentary: Technology-mediated learning: A call for greater depth and breadth of research. Information Systems Research, 12(1), 1-10.

Computer-mediated communication. (2005, September 12). Wikipedia: the free encyclopedia Retrieved October 12, 2005, from http://en.wikipedia.org/wiki/Computer_mediated_communication

Coppola, N. W., Hiltz, S. R., & Rotter, N. G. (2002). Becoming a virtual professor: Pedagogical roles and asynchronous learning networks. Journal of Management Information Systems, 18(4), 169-189.

Dillenbourg, P. (2000). Virtual learning environments. Workshop on Virtual Learning Environments of the EUN Conference: Learning in the New Millenium: Building New Education Strategies for Schools Retrieved October 12, 2005, from http://tecfa.unige.ch/tecfa/publicat/dil-papers-2/Dil.7.5.18.pdf

Easton, S. S. (2003). Clarifying the instructor's role in online distance learning. Communication Education, 52(2), 87.

Hiltz, S. R. (1978). Controlled experiments with computerized conferencing: Results of a pilot study. Bulletin of the American Society for Information Science, 4(5), 11-12.

Hiltz, S. R., Johnson, K., & Turoff, M. (1986). Experiments in group decision-making: Communication process and outcome in face-to-face versus computerized conferences. Human Communication Research, 13(2), 225-252.

Hiltz, S. R., & Turoff, M. (2002). What makes learning networks effective? Communications of the ACM, 45(4), 56-59.

Hiltz, S. R., & Wellman, B. (1997). Asynchronous learning networks as a virtual classroom. Communications of the ACM, 40(9), 44-49.

Kassop, M. (2003). Commentary: Ten ways online education matches, or surpasses, face-to-face learning [Electronic Version]. The Technology Source. Retrieved October 1, 2007 from

This book is licensed under a Creative Commons Attribution 3.0 License

http://technologysource.org/article/ten_ways_online_education_matches_or_surpasses_facetoface_learning/.

Katz, J. E., & Aspden, P. (1997). A nation of strangers? Communications of the ACM, 40(12), 81-86.

Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukopadhyay, T., & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being? American Psychologist, 53(9), 1017-1031.

Mitchell, A. (2002, October 24). New learning ecologies: Promoting learning in the digital age: A holistic approach. Paper presented at the New Learning Environments (RIBA HEDQF Conference), London.

Murray, D., & Bevan, N. (1985, September 4-7). The social psychology of computer conversations. Paper presented at the IFIP Conference on Human-Computer Interaction--INTERACT '84, London, England.

Nie, N., & Erbring, L. (2000, February 17). Internet and society: A preliminary report. Retrieved October 19, 2005, from http://www.stanford.edu/group/siqss/Press_Release/Preliminary_Report.pdf

Pew Internet & American Life Project. (2000). Internet life report: Tracking online life: How women use the Internet to cultivate relationships with family and friends. Washington, DC: Pew Research Center.

Rice, R. E., & Love, G. (1987). Electronic emotion: Socioemotional content in a computer-mediated communication network. Communication Research, 14(1), 85-108.

Rice, R. E., Shan-Ju, C., & Torobin, J. (1992). Communicator style, media use, organizational level, and use and evaluation of electronic messaging. Management Communication Quarterly, 6(1), 3-33.

Robinson, J. P., Kestnbaum, M., Neustadtl, A., & Alvarez, A. (2000). Mass media use and social life among Internet users. Social Science Computer Review, 18(4), 490-501.

Schrum, L., & Hong, S. (2002). Dimensions and strategies for online success: Voices from experienced educators [Electronic Version]. JALN: Journal of Asynchronous Learning Networks, 6, 57-67. Retrieved October 17, 2005 from http://www.aln.org/publications/jaln/v6n1/pdf/v6n1_schrum.pdf.

Sproull, L., & Kiesler, S. (1991). Connections: new ways of working in the networked organization. Cambridge, Mass.: MIT Press.

Additional readings

Bostrom, R. P. (2003, August 4). E-learning: Facilitating learning through technology. Paper presented at the 9th Americas' Conference on Information Systems, Tampa, FL.

Hiltz, S. R. (1994). The virtual classroom: learning without limits via computer networks. Norwood, N.J.: Ablex Pub. Corp.

Luckin, R., Brewster, D., Pearce, D., Siddons-Corby, R., & du Boulay, B. (2004). SMILE: The creation of space for interaction through blended digital technology. In J. Attewell & C. Savill-Smith (Eds.), Learning with mobile devices: research and development, a book of papers (pp. 87-93). London, England: Learning and Skills Development Agency.

Piccoli, G., Ahmad, R., & Ives, B. (2001). Web-based virtual learning environments: A research framework and a preliminary assessment of effectiveness in basic IT skills training. MIS Quarterly, 25(4), 401-426.

Sharda, R., Romano, N. C., Lucca, J. A., Weiser, M., Scheets, G., Chung, J. M., et al. (2004). Foundation for the study of computer-supported collaborative learning requiring immersive presence. Journal of Management Information Systems, 20(4), 31-63.

28. Computer mediated instruction

Van Dam, A., Becker, S., & Simpson, R. M. (2005). Next generation educational software. Educause Review, 40(2), 26-43.

Citation

APA Citation: Daniels, T. & Pethel, M.. (2005). Computer Mediated Communications.. In M. Orey (Ed.), Emerging perspectives on learning, teaching, and technology. Retrieved <insert date>, from http://projects.coe.uga.edu/epltt/

Retrieved from http://projects.coe.uga.edu/epltt/index.php?title=Computer_Mediated_Instruction

This book is licensed under a Creative Commons Attribution 3.0 License

29. Cooperative learning

Contributors: Guinevere Palmer, Rachel Peters, Rebecca Streetman (The University of Georgia, USA)

Introduction

Scenario

Mrs Solomon teaches a 9th grade Careers course. The class consists of a mixture of ESOL students with limited English proficiency skills, "average" students, and honors students. There are also several students with special needs including learning disabilities and attention deficit disorders.

Mrs Solomon is concerned because there are a high number of students currently failing her class. She has noted that, while the high achieving students tend to score well on Multiple/Choice and True/False questions, none of the students do well on application and scenario-type questions. Frequent absences, along with an apparent lack of motivation among students are also abundant in Mrs Solomon's class. In addition, she has noticed a high number of arguments among the students. In an attempt to better manage her class, she assigned seats. She has determined that the seating arrangement has only escalated the arguments. Mrs Solomon would like to find a way to overcome the difficulties within her classroom and also be able to instill these students with the skills necessary to become productive contributors to the workforce.

She has tried a number of teaching methodologies. Her first attempt was to lecture just as her teachers had done when she was in school. She found that the students were bored and often fell asleep. While most students performed average on objective tests, she had no way of measuring whether the students were grasping the concepts well enough to transfer that knowledge to real-world applications. Any attempts at class discussions during the lecture tended to yield little or no response from the students. Students that did show interest were notably confused. She also found that some of the students were disrespectful to her during the lectures.

She also decided to try to make her classroom more student-centered by turning to a computer-based curriculum. She read that students tend to retain more information when a computer is incorporated into the lessons, so she thought it would be worth a try. She found an interactive CD to supplement the textbook and allowed students time during each unit to work from the CD. Although the computer managed to pique the interest of more students than the lecture did, she found that a large number of students were off task. They would rush through the assignment, if they did it at all, so that they could play games and/or go on the internet. She also felt that the use of the computer without any other forms of instruction prevented students from interacting with one another; thus, the computer-based learning activities were not promoting the interpersonal skills needed for successful employment.

As a last resort, Mrs Solomon decided to try group work. Because of the already escalating tension due to class dynamics, she was reluctant to assign a monumental task on the first try. Instead, she opted for a basic assignment and allowed the students to pick their own groups. She wanted to test their problem-solving and communication skills without interference from an authority figure, so Mrs Solomon gave the students their assignment and waited at her desk for the students to come to her with questions. When she became alarmed at the noise level in the classroom, she finally decided to walk around the room to observe the groups. She was disturbed to find a number of students off-task. Several groups did not even attempt the project, and spent their time initiating conflict with the other groups. As the social problems among the students escalated, the students' test grades continued to be below average. The high-achieving students grouped together while the ESOL and special education students were left together with no leadership in the group.

Mrs Solomon was devastated because she felt that she had lost control of her classroom. Feeling frustrated and defeated, she finally decided to seek help from another teacher in her department that was known for her outstanding teaching abilities. The other teacher suggested she try cooperative learning.

Definition and background

Cooperative learning is defined as students working together to "attain group goals that cannot be obtained by working alone or competitively" (Johnson, Johnson, & Holubec, 1986). The main purpose of cooperative learning is to actively involve students in the learning process; a level of student empowerment which is not possible in a lecture format. The underlying premise is founded in constructivist epistemology. It is a process which requires knowledge to be discovered by students and transformed into concepts to which the students can relate. The knowledge is then reconstructed and expanded through new learning experiences. Learning takes place through dialog among students in a social setting.

Cooperative learning is a methodology that employs a variety of learning activities to improve students' understanding of a subject by using a structured approach which involves a series of steps, requiring students to create, analyze, and apply concepts (Kagan, 1990). Cooperative learning utilizes ideas of Vygotsky, Piaget, and Kohlberg in that both the individual and the social setting are active dynamics in the learning process as students attempt to imitate real-life learning. By combining teamwork and individual accountability, students work toward acquiring both knowledge and social skills. It is a teaching strategy which allows students to work together in small groups with individuals of various talents, abilities, and backgrounds to accomplish a common goal. Each individual team member is responsible for learning the material and also for helping the other members of the team learn. Students work until each group member successfully understands and completes the assignment, thus creating an "atmosphere of achievement" (Panitz, 1996). As a result, they frame new concepts by basing their conclusions on prior knowledge. This process results in a deeper understanding of the material and more potential to retain the material.

Theoretical framework for cooperative learning

There are two major theoretical perspectives associated with cooperative learning: motivational and cognitive (Swortzel, 1997). First, because students perceive that their success or failure is dependent upon their ability to work together as a group, students are likely to encourage each other to do whatever helps the group succeed. They are also more likely to help each other with the task(s) at hand. Therefore, cooperative learning increases student motivation to do academic work (Johnson, Johnson, & Holubec, 1986).

The other theory is that cooperative learning helps students acquire critical thinking skills. Because cooperative learning creates a situation in which students must explain and discuss various perspectives, a greater understanding of the material is obtained. Elaborative thinking is promoted because students give and receive explanations more often (Johnson, Johnson, & Holubec, 1986).

The use of cooperative learning (CL) also helps students clarify concepts and ideas through discussion and debate. Because the level of discussion within groups is significantly greater than in instructor led discussions,

This book is licensed under a Creative Commons Attribution 3.0 License

students receive immediate feedback, thus advancing the level of discussion. It is through this process of interacting with students of differing viewpoints that cognitive growth is stimulated. Emphasis is placed on learning how to cooperate in order to find the best possible solution to a problem. According to the constructivist approach, when students formulate their own solutions in this manner, they are truly thinking critically (Davis, Mahler & Noddings, 1990).

Collaborative vs cooperative learning

Collaborative and cooperative learning are so closely related that the two terms are often used interchangeably. However, let us take a moment to address the similarities and differences in the two. Both learning theories assign specific tasks, both use groups, and both require the students to share and compare their findings. In both cases, discovery approaches are used to teach interpersonal skills and student talks are stressed as a means for working things out.

Collaborative learning has British roots and is based on the findings of English instructors who explored ways to help students take a more active role in their learning. It is a teaching methodology in which "students team together to explore a significant question or a meaningful project" (Disney).

Cooperative learning, which will be the focus of this chapter, was first used in America and can be traced back to John Dewey's philosophy of the social nature of learning. It is a "specific kind of collaborative learning" (Disney). In this setting, not only is the group assessed as a whole, but students are also individually accountable for their work.

A climate such as that created by cooperative learning will help Mrs Solomon to better manage her classroom and help to keep the students on task. By following the guidelines presented in this chapter, Mrs Solomon will be able to help her students use cooperative learning to acquire the knowledge necessary to reach the objectives of the course.

Implementation of cooperative learning

Before beginning to plan a cooperative learning lesson, there are some things that should be done. The instructor should begin by observing other instructors who effectively use CL in their own classrooms. Later, these persons could serve as a mentor or coach. Reading about CL will also be beneficial. Readings will help instructors learn about ways to implement the technique, as well as the benefits and disadvantages of using it; reading about CL will help instructors make an informed decision about whether or not CL is the right choice for their classroom. Next, training in cooperative learning is crucial for the success of the program in any classroom. This training could come in the form of workshops, seminars, etc but it is essential that they are "hands-on" in nature; instructors should be given the opportunity to practice what they will be asking students to do. Training should be an ongoing process. As more is learned about cooperative learning, one should build a library of CL resources for reference. These references will be useful in implementing CL in the classroom, and instructors will be able to refer back to them as they continue implementation. It is also recommended that a support group be formed with other teachers who use CL in their classrooms. This support group will be essential in developing CL lessons; together instructors will be able to share things that worked, as well as things that did not work, in certain CL lessons. By investing time in these steps, one will be able to determine if cooperative learning is the appropriate choice and will become an informed teacher ready to successfully implement CL into the classroom.

Before venturing into the world of cooperative learning, Mrs Solomon will need to observe the teacher whom she went to for advice and possibly other teachers who use CL in their classrooms. She will also need to obtain training in and read about CL. Further, even though it is usually recommended that implementation of cooperative learning takes place at the beginning of the term, Mrs Solomon is in a desperate situation. As soon as she has followed the necessary steps, she should plan for implementation. At that time, she should explain to the students what cooperative learning is, and why she has chosen to use it in her classroom.

Pre-implementation

After deciding to implement cooperative learning, the biggest challenge will be planning and readying the classroom and students for CL. According to Johnson, Johnson, and Smith (1991), there are several tasks that an instructor must accomplish before implementing cooperative learning in the classroom. This section will detail those responsibilities.

Specify Instructional Objectives (academic and social) of CL. The instructor must explain why she is using CL, describe its benefits, and the results typically found from using CL. To aid in this explanation, the instructor might produce and distribute a handout that describes collaborative learning.

Determine Group Size and Assign Students to Groups. Group size can range from two to four students, depending on the CL task. These groups can be homogeneous or heterogeneous. Groups can be formed by putting students together who share common strengths, interests, etc., or they can be randomly assigned. Once the groups are assigned, though, they should not be changed too often; students need time to develop a cohesive group and work together for a while before moving to a different group.

Arrange room. Instructors should optimize the space in their classroom so that students/groups can interact and move about the room easily. It is essential that a group's seats face one another. Further, research tools should be made easily available either in the classroom or in another room near the classroom (see, Resource-based Learning chapter for a more detailed discussion of this).

Plan instructional materials to promote interdependence. The instructional methods and materials that an instructor chooses must allow each individual to contribute to the group's success in a unique and meaningful way. Without these unique contributions, a group's structure and cohesion will be put in jeopardy.

Assign group roles. There is some debate about whether or not the instructor should play a role in this decision. Whether or not an instructor chooses to assign roles within a group, they should make sure there is a distinct role for each student. Also, the instructor should choose or assist the students in choosing roles that use their strengths and improve their areas of weakness. Instructors should also oversee that students do not choose the same role over and over again. Some of the roles that could be chosen or assigned include facilitator, timekeeper, recorder, checker (for understanding), summarizer, elaborator (on prior knowledge or discussion points), research-runner (gets materials), and wild card (does anything else that needs to be done).

Assign task. When picking an assessment task (product to be produced), the instructor should choose one standard to address and match it to the learning approach. The cooperative learning group's task should be interesting, challenging, and motivating. It should also be a performance driven and authentic task. The instructor should clearly explain procedures for the task, provide structure (especially useful for inexperienced CL students), and set a specific time frame for each part and the whole task. Finally, the instructor should question the students to check for understanding of the task and its procedures.

This book is licensed under a Creative Commons Attribution 3.0 License

Explain criteria for success. The instructor should communicate the group-work skills that will be evaluated. A rubric should also be created, possibly with the students' assistance, which will be used to evaluate the group-work skills as well as the assessment task.

Structure positive interdependence and accountability. Group size should be kept small so that each member participates and contributes uniquely to the group. Instructors should also "test" groups and individuals by asking questions of both. A group should be asked to collectively explain its results and individuals should be able to defend their own position as well as the group's as a whole.

Specify desired behaviors. An essential part of cooperative learning's success is teaching students how to work in a group. To accomplish this, the instructor can conduct mini-lessons on ways to respect others (i.e. praise, taking turns, and shared decision making). Students also need to be trained in conflict-resolution. Finally, it would be wise to use icebreaker activities before beginning so that students find that they have something in common.

Before the actual implementation of cooperative learning, students also have several tasks. First, they can help the instructor generate an evaluation rubric, and they could possibly help design the assessment task if the instructor is willing to let the students participate in this capacity. By playing a part in the production of these items, students will have a greater motivation to participate in the group work (see Six C's of Motivation chapter about choice and control as methods to increase motivation). Finally, the students' most important role at this point in CL is to question the instructor if anything is unclear to them. Without students' complete understanding of the goals, objectives, and procedures, cooperative learning will not be a success.

As illustrated in the scenario at the beginning of the chapter, the students in Mrs Solomon's classroom are very diverse and appear not to get along. Before implementing CL, it will be vitally important that Mrs Solomon spend some time teaching respect, conflict-resolution, and other group work skills. It is probably a good idea to use some icebreaker activities so that the students learn that they have some commonalities with other class members. In addition, because of the tension among them, Mrs Solomon will want to assign students to cooperative learning groups; she may even want to assign each individual their role. As Mrs Solomon designs and assigns the task to the students, it will be imperative that she chooses a structured, authentic assignment. This will assist the students in remaining on-task, and it will help with transferring their knowledge to real-world applications.

Implementation

After all the preparations, it is time to begin working. During the implementation phase of cooperative learning, the students play the most important role. Some of their tasks at this stage include:

- working together;
- listening to one another;
- questioning one another;
- keeping records of their work and progress;
- producing the assessment task (product);
- assuming personal responsibility/being involved in the group.

The instructor also has responsibilities during this stage as well. Johnson, Johnson, and Smith (1991) list several roles that an instructor has during the implementation of cooperative learning.

Monitor behavior. During the implementation of cooperative learning, the instructor should circulate throughout the classroom, visiting each group.

Intervene if needed. While circulating, if the instructor notices any group conflict or off-task behavior, she should intervene. Small-group conflict should be resolved as soon as possible, and students should be shown how to prevent problems in the future. The instructor might use a conflict resolution checklist to resolve the group's conflict. This checklist includes items such as explaining the importance of listening to everyone in the group, defining responsibilities, valuing each person's gifts, modeling excellence, and promoting humor. Having these listed on a handout for each group could prevent group discord and off-task behavior.

Assist with needs. While monitoring the groups' work, the instructor should assist groups with their needs. This might involve pointing out additional resources and/or points-of-view, and it also includes helping the students reflect on the work they have completed and their progress.

Praise. Students need to know if they are completing the assignment in a satisfactory manner, especially if they are inexperienced at working in cooperative groups. For this reason, the instructor should let individual students and groups know when they do something right or well.

As the class begins to work on their CL assignment, Mrs Solomon will need to circulate around the room. It is likely, especially at the beginning of implementation, that her class will still have difficulty focusing on the task and getting along with one another. By moving around the class while the students are working, she will be able to assist any group that is facing these problems, and she can help them resolve the issues. At the same time, Mrs Solomon must remember to praise the students and teams who are making an effort to cooperate and who are progressing nicely with the group assignment.

Post implementation

After many hours are spent planning for cooperative learning groups, the plan is then put into action. Johnson, Johnson, and Smith (1991) give three jobs for the instructor to complete after the students have worked together to complete and submit the task.

Provide closure through summarization. The instructor should reconvene the entire group of students. At this point, the instructor can summarize the important points of the lesson/unit. Another suggestion is to have each group summarize their work and points that they think were important. This helps the instructor to know exactly in which knowledge level the groups are working. This is also very much in line with the idea of articulation and reflection in the Cognitive Apprenticeships chapter.

Evaluate students' learning. The instructor should use a rubric to grade/evaluate each group's assessment task. They should also be evaluated on their group work using a rubric. These rubrics should have been created during the pre-implementation phase of cooperative learning, and the students might have had input into their content. After the instructor has completed the evaluations, it is important that they provide feedback to the students about their product and their group performance. Without this information, the students will not be able to improve their cooperative learning skills.

Reflect on what happened. Instructors should keep a record of what worked and why it worked each time they undertook a CL lesson or unit. This information can and should be shared with their cooperative learning support group. The instructor should also adjust their lessons based on the reflection and feedback of the students. This will prevent the stagnation of a CL unit; it will grow and change with each group of students.

After completing the group work and assessment task, the student's job is to reflect on the work that was accomplished in their group. What worked and what did not work? What will they change or keep next time they

This book is licensed under a Creative Commons Attribution 3.0 License

work together? The students should also give feedback to their instructor. They should be able to tell the instructor what worked or what was good about this unit, and they should point out what did not work well. This information can be written down or informally discussed in class.

At the conclusion of Mrs Solomon's first cooperative learning lesson, it will be important for her to get feedback from the students about how they thought the lesson went. In turn, she will also have to provide feedback to the students about their group work skills and their assignment. This may involve teaching or re-teaching group work skills and/or adjusting the procedures for the next cooperative learning lesson.

Helpful hints for cooperative learning lessons

- Begin trying cooperative learning with a homework assignment. Students could check their homework in groups, going over each problem, and clarifying if there were any questions. The groups could then work each problem on the board.
- When beginning to use cooperative learning, start each class with a short lecture and then transition to a CL activity. As the instructor and students gain experience with using CL, begin the class with a CL activity and then conclude with a short lecture to highlight important points.
- Begin implementation by only using pairs for CL groups. Students who are inexperienced in using CL groups will be more likely to participate with just one other person in the group. Having only two students in a group is also an ideal way to teach key group work skills.
- When beginning CL implementation, only use the technique in one class period. Once you and the students have become more adept at using CL, you can increase it to involve more students/classes.
- Begin with worksheets as a form of group accountability. Students who are inexperienced with CL often have a difficult time getting started or reaching their goals. Having a worksheet to guide them will help the groups set their priorities, work towards their goal, and produce the assessment task.

Frequently asked questions about cooperative learning

When is the best time to begin implementing cooperative learning?

The best time to begin using CL in the classroom is at the start of a new term or school year. This way, the students will not be exposed to individual work and then have to "switch gears" and learn to work in a group in the middle of the year.

Do you have to use cooperative learning all the time?

No, it is not necessary to use CL in your classroom at all times. It is often advised to use CL for a unit or two, use another teaching method for a while, and then revisit CL at a later time.

Should you include parents in cooperative learning?

Yes, parents and the community should be included in all school activities, including CL. This can be done through newsletters and/or special programs when parents and the community visit the classroom and view the groups' assessment tasks.

What happens if one group finishes early?

If one group finishes early, the instructor can provide extension activities/tasks for that group. As more groups finish, pairs of groups can team up and share/comment on each other's work.

29. Cooperative learning

Table 27: Forms of cooperative groups.[2]

Name of group	What is this?	Works best for	Benefits	Drawbacks
Pair-share	Two students with one problem share their ideas or questions. Each person speaks, listens, & gives feedback.	Content that requires discussion, reflection, or explanation.	Increased engagement time Helps those who are shy	Fewer perspectives and solutions
Jigsaw	Each member of the small group researches one part of the question /content for a certain amount of time. The members of the group come back together. Each member teaches his/her part to the rest of the group.	Content with four or five parts to research.	Students gain teaching and research skills	Some students feel pressured by a time limit
Split-class discussion	The class is split into half. Each side discusses/debates their knowledge/beliefs, etc.	Debates or discussions	Students may change their opinion or develop a different perspective.	Some students may speak less with such a large group.
Random groups of 3three	Class is split into groups of 3. The groups discuss the topic.	Predicting what will happen, responding to a situation.	Receive a variety of feedback Group members are accountable	Easy to leave out or team up against a shy student or one who has a different opinion.
Ability/interest/ friendship Group	Students are divided into groups based on some quality that they all have in common.	Creating plays/skits or an activity in which students must work together outside of class.	Students can work at a pace that best suits them Students are rarely bored and often motivated.	It is unrealistic to find a completely homogeneous group Weaker or unpopular

2 Information for this chart was derived from http://www.thirteen.org/edonline/concept2class/month5/explor_sub1.html

This book is licensed under a Creative Commons Attribution 3.0 License

				students may be excluded.
Diversity groups	Students are formed into groups where they come from a wide variety of backgrounds, interests, etc.	Exploring geography, history, and diverse lifestyles.	There are many opportunities to gain different perspectives.	Minorities may become alienated.
Multi-aged groups	Students are divided into groups in which there are a mixture of ages	Older students teaching younger students (i.e. science experiments).	Older students- there is less pressure to compete with peers Younger students- feel important that an older person is spending time with them.	Older students may be a bad influence. Older students may not know how to work with a younger child or an "at risk" student.
Peer-led Conferences	Students prepare and lead a discussion of material with parents, instructors, students, etc.	A major project in which students set up stations for several intelligences.	Students get the opportunity to authentically teach Students learn self-confidence.	Students whose parents are inactive in the school may be alienated from those whose parents participate Some students may not be involved in interactions.

Other forms of cooperative learning groups

3-step interview. Members of a group choose one partner from the group. The individuals interview their partners by asking questions. Then, they reverse roles and share their responses with the rest of the group.

3-review. The instructor gives the teams 3 minutes to review/clarify what has been said.

Numbered heads. Group members are assigned a number. The group discusses as one, and then the instructor calls one number. The person with that number answers for the group.

Team-pair-solo. Students do the problem(s) first as a team, then in a pair, and finally, solo.

Circle the sage. The instructor polls the students looking for special knowledge on a certain topic. Those with the knowledge spread out around the room. (They are the sages.) The other students (no two from the same team) circle the sage, take notes on the information they are presenting, and question them. Then, the group reforms and each explains what they have learned. If there is a disagreement, it is aired as a group with the whole class, and it is resolved there.

Structured problem solving. Groups are given a problem to solve within a specified time. All members must agree and all must be able to explain the solution.

Send-a-problem. Several groups generate solutions to problems. The problem is clipped to the outside of a folder, and all solutions from that group are written down and placed inside the folder. The folder is passed to a different group who reads the problem but not the solutions. They write their solutions and put them inside the folder. A third group selects the two best solutions and amends them as necessary.

Drill review pairs. Groups of four split into pairs. The pairs are given two problems. One member is the explainer and one is the accuracy checker. After one problem is complete, they switch roles. When both problems are complete, the group of four reforms. If they are in agreement to the solution, they repeat the process with more problems. If there is disagreement, the problem is reviewed and a consensus is reached.

Benefits of cooperative learning

Ted Panitz (1996) lists over 50 benefits provided by cooperative learning. These benefits can be summarized into four major categories: social, psychological, academic, and assessment.

Cooperative learning promotes social interactions; thus students benefit in a number of ways from the social perspective. By having the students explain their reasoning and conclusions, cooperative learning helps develop oral communication skills. Because of the social interaction among students, cooperative learning can be used to model the appropriate social behaviors necessary for employment situations. By following the appropriate structuring for cooperative learning, students are able to develop and practice skills that will be needed to function in society and the workplace. These skills include: leadership, decision-making, trust building, communication, and conflict-management.

The cooperative environment also develops a social support system for students. Other students, the instructor, administrators, other school staff, and potentially parents become integral parts of the learning process, thus supplying multiple opportunities for support to the students (Kessler and McCleod, 1985).

Students also benefit psychologically from cooperative learning. Johnson and Johnson (1989) claim, "cooperative learning experiences promote more positive attitudes" toward learning and instruction than other teaching methodologies. Because students play an active role in the learning process in cooperative learning, student satisfaction with the learning experience is enhanced. Cooperative learning also helps to develop interpersonal relationships among students. The opportunity to discuss their ideas in smaller groups and receive constructive feedback on those ideas helps to build student self-esteem. In a lecture format, individual students are called upon to respond to a question in front of the entire class without having much time to think about his/her answer. Cooperative learning creates a safe, nurturing environment because solutions come from the group rather than from the individual. Errors in conclusions and thought processes are corrected within the group before they are presented to the class.

Students also tend to be inspired by instructors who take the time to plan activities which promote an encouraging environment (Janke, 1980). Receiving encouragement in a cooperative setting from both the instructor and peers helps to develop higher self-efficacy (see the chapter “Motivation”). As a result of higher self-

This book is licensed under a Creative Commons Attribution 3.0 License

efficacy, student grades tend to increase; thus, cooperative learning methods provide several academic benefits for students. Research indicates that students who were taught by cooperative methods learned and retained significantly more information than students being taught by other methods. Requiring students to verbalize their ideas to the group helps them to develop more clear concepts; thus, the thought process becomes fully embedded in the students' memory. Vygotsky supports this concept in his research on egocentric speech by claiming that verbalization plays a significant role in task solution (Bershon, 1992). Discussions within the groups lead to more frequent summarization because the students are constantly explaining and elaborating, which in turn validates and strengthens thoughts. Students also benefit from cooperative learning academically in the sense that there is more of a potential for success when students work in groups. Individuals tend to give up when they get stuck, whereas a group of students is more likely to find a way to keep going (Johnson & Johnson, 1990). Cooperative learning calls for self-management from students because they must come prepared with completed assignments and they must understand the material which they have compiled. As a result, a more complete understanding of the material is developed.

There are also many benefits of cooperative learning from the aspect of assessment. It provides instant feedback to the students and instructor because the effectiveness of each class can be observed. As instructors move around the room and observe each group of students interacting and explaining their theories, they are able to detect misconceptions early enough to correct them. Only a few minutes of observation during each class session can provide helpful insight into students' abilities and growth.

Cooperative teaching methods also utilize a variety of assessments. Grades are not dependent solely on tests and individual assignments which only allow for right or wrong responses, leaving little or no room for reflection and discussion of error or misconceptions. With cooperative learning, instructors can use more authentic assessments such as observation, peer assessment, and writing reflections.

Cooperative learning benefits in Mrs Solomon's classroom

As Mrs Solomon learns all of the benefits gained from the use of cooperative learning, her curiosity is piqued; however, she still finds herself questioning whether her complex class could overcome all of the barriers that are hindering the learning environment. There is evidence, though, that most of the problems experienced in her class could be solved by using cooperative learning.

Poor attendance. In addition to the four major categories of benefits detailed above, schools utilizing this strategy report an increase in student attendance because students feel that they are a valuable and necessary part of their groups (McBrien & Brandt, 1997).

Classroom disruptions. Students are less likely to act out in a cooperative setting. Students act out to get attention; however, the "stage" is removed in a cooperative environment because it is very difficult to gain the attention of the entire class when students are divided up into smaller groups (Stahl & Van Sickle, 1992). As a result, students are more likely to stay on task and are less likely to be disruptive. Cooperative learning also helps reduce classroom disruptions because students are allowed to socialize during the learning process. Students need peer interaction, and without the integration of interaction among students, the need for social contact emerges in a negative context.

Violence. According to Johnson and Johnson (1990), cooperative learning also helps to reduce violence. If enforced correctly, cooperative activities model non-violent resolutions to problems. Because group consensus is promoted, blame is eliminated and honor, friendliness, and quality are promoted.

Diversity among students. Research shows that cooperative learning also builds diversity awareness among students. It encourages students to use their differences to help each other. Because students are placed in a situation where they are able to interact with peers that they otherwise may never socialize with, behaviors which might appear odd in other settings become understandable when students are given the opportunity to explain and defend their reasoning. In a traditional classroom, there is very little opportunity for students to defend their perspectives. As students observe each other's reasoning processes, there is more room to understand and appreciate their differences (Johnson and Johnson, 1990). As a result, a much deeper understanding of cultural and individual difference is developed (Yager, 1985). In addition, because students are placed in a supportive environment where group-processing skills are essential, they are more likely to accept these differences than they would in a competitive, non-interactive environment. This greater understanding of their differences also helps students learn to resolve social problems which might arise (Johnson and Johnson, 1990).

Students with special needs. Cooperative methods are flexible and can easily be adapted for students with special needs. Because of the reasons mentioned above, this type of learning environment allows for improved social acceptance of mainstreamed students with learning disabilities (Slavin, 1990).

ESL students. Cooperative learning is especially useful in courses where interactions involving the use of language are important, such as ESL courses. It is an ideal way to "facilitate the acquisition of language and to practice the customs of debate and discussion which occur within the classroom" (Brufee, 1993). Research conducted using cooperative learning in classes with ESL students shows significant development in acquiring English-language skills. Cooperative learning helps students learn language better than the drill and practice of traditional language training. It would appear that peer interaction in natural settings is the ideal use of language that is necessary for successfully acquiring second language skills (Neves, 1983). In addition, most educational psychology textbooks now contain "extended discussions of cooperative pedagogics and their effectiveness with regard to improved racial relations, self-esteem, and internal locus of control" (Sherman, 1991).

Arguments among students. Marzano (1992) asserts that in a cooperative setting, students can analyze the effects of the groups and "suggest activities which will promote positive interactions or deal with conflicts or personality problems within each group". It provides a supportive environment within which to manage conflict resolution (Johnson & Johnson, 1990).

Disrespect towards the instructor. In the cooperative classroom, instructors have more opportunities to explain policies and procedures. When instructor expectations are clear, there seems to be less room for personal interpretations, which often leads to a negative attitude toward the instructor. The class could also, potentially, be empowered to contribute to the development and implementation of classroom rules and procedures. This classroom management technique, when intertwined with cooperative activities, could help students overcome resentments which were created as a result of the teacher-centered classroom.

Differences in learning abilities. Performance is improved among weaker students when they are grouped with higher achieving students because the stronger students model successful reasoning processes. Students who usually struggle in academics are able to learn to prepare for tests, check and correct homework, and see alternative solutions to problems. Vygotsky (1978) hypothesizes that the social interaction among students extends the

This book is licensed under a Creative Commons Attribution 3.0 License

students' zone of proximal development (the difference between a student's understanding and their potential to understand). When students work cooperatively in groups the more knowledgeable students are able to help the less knowledgeable students understand new concepts. High achieving students also benefit because they are verbalizing their ideas and actually teaching others. As mentioned earlier, the process of verbalizing thoughts helps to further promote understanding of material.

Cooperative learning also accommodates learning style differences among students because they are utilizing each of the three main learning styles: kinesthetic, auditory, and visual. Material presented by the instructor is both auditory and visual, and students working together use kinesthetic abilities by working with hands-on activities. Discussing issues within the groups further enhances verbal skills, and class presentation of group findings helps to reinforce visual and auditory skills (Midkiff & Thomasson, 1993).

Drawbacks of cooperative learning

Instructors who are unfamiliar with cooperative learning may not initially accept this style of learning because they may feel they will lose control of their classroom, or they may be unsure of the techniques used or possibly even think that it is too time consuming. In this next section, we will discuss some of the possible drawbacks to cooperative learning.

Loss of control. Cooperative learning is a structured approach that requires instructor support and guidance. In order for cooperative learning to be utilized in the classroom, instructors must receive training to be proficient in implementing the techniques. Maximum learning will only emerge if proper training is received by the instructor and then transferred to the student.

Instructors may resist using cooperative learning techniques in their classroom because they are afraid they may lose control of their teaching routine. Cooperative learning takes time to implement; therefore, initial lessons may take longer. Once students and the instructor are comfortable with the process, then the amount of time for each lesson decreases.

Instructors may have a difficult time giving up their control of the content that is being covered (Panitz). They are accustomed to presenting the curriculum to the students and are unable to give students the freedom to learn on their own. Students learning only one part of the curriculum in their group may make an instructor anxious about what their students know.

Showing their expertise in a subject area is important for some instructors. Giving up the opportunity to show off this expertise may deter instructors from using cooperative learning in their classrooms. Also, if students are expected to explore on their own, then they may have questions that the instructor cannot answer. Both of these possibilities may cause an instructor to lose confidence in her teaching abilities. Instructors can still be experts, but they will be using their knowledge as a facilitator rather than a giver of information.

Group work. Depending on the age level, students may resist using cooperative learning in their classrooms. Lecture does not require much interaction and participation from the students; therefore, they can get as much or as little from the class as they like. Being required to work in a group may ruffle a few feathers with the students because now they are being asked to participate and contribute to their learning. In addition, they are also asked to learn new concepts and taught how to work in a group. They may not be accustomed to working in a group, and therefore, may be unsure of the dynamics involved in group work.

29. Cooperative learning

Since cooperative learning is centered on group work, students may be concerned that other members of their group are going to bring their grades down. This is especially true if students are grouped by mixed ability, requiring higher ability students to guide lower ability students.

Deciding how groups should be formed is an important part of the cooperative learning planning process. There has been some debate as to how groups should be formed in order for students to effectively work together and reach their maximum potential.

Mixed ability grouping allows for all group members to be involved, though the type of involvement differs. Advanced students can teach struggling students, but concerns arise about advanced students doing all the work and struggling students not being motivated to be involved at all. There are also concerns that gifted students are held back by the lower ability students in their group. If students are grouped with others of the same ability level, then the lower ability group may feel frustrated and unmotivated to try. This is also true of those who are grouped by gender or race because it may support stereotypes that certain subject areas are dominated by certain groups.

There are also varying opinions about the optimal number of people for small group formation. The consensus seems to agree that no more than 4 people in a group produces higher achievement (Slavin, 1987). Fixed seating and large class sizes may make group arrangement difficult though. Still, even if the room is easily arranged into small groups, instructors may have a difficult time accessing all of the numerous small groups.

Most students are not accustomed to group work, especially in high-school classrooms. Students will have to be taught to work effectively in a group setting. Resolving group conflict can be a major challenge for instructors. Groups will need to make sure that every member listens to and appreciates each group member's contribution. Identifying responsibilities within the group and encouraging each to do their best work needs to be addressed before group work begins. Also, students that work better alone may struggle to succeed in a group atmosphere.

Since the classroom will be made up of several small groups, the noise level will escalate. This can be very uncomfortable for some instructors, especially if they are accustomed to a lecture and seat work classroom. This can also cause problems for those students who have attention difficulties.

Cooperative learning is based on social interaction; thus, grouping students together to work independently even for a short period of time may encourage behavior that is off task. While the instructor is circling the room to observe and interact with the groups, it is difficult to make sure every group is productively working on their assignment. Self-management skills will have to be introduced before students break out into groups and be reinforced as they progress through their work.

Time requirements. With cooperative learning, the textbook is used only as an instructional supplement, so it is necessary for instructors to create additional materials for the students. Usually these materials are made from scratch because many instructors' manuals offer limited suggestions for group activities. Creating these new materials can be very time consuming. So, not only are instructors spending a large amount of time implementing this new way of learning, but they also have to create the materials to go along with it.

Since students have to generate an answer or information within their group, work time may take longer than the traditional lecture. Because of this additional time, instructors may be unable to cover the same amount of curriculum as before when they used teacher directed class discussions. Many times, in a traditional classroom, the quality of the work is compromised in order to teach the entire curriculum.

This book is licensed under a Creative Commons Attribution 3.0 License

Other drawbacks. Since students are working together on a group assignment, it is difficult to assess students with a paper and pencil test. Instructors will have to find another way to assess student work and progress. Since students are used to concrete assessments, it may be difficult for students to adjust to authentic assessments.

Vague objectives, avoidance of teaching, and lack of critical thinking activities are other problems associated with cooperative learning. With the focus on managing groups, it is possible for instructors to overlook the students' objectives and tasks. Therefore, students are not receiving the needed guidance to effectively learn the task at hand. Some critics say that instructors who rely on small group work are avoiding their teaching responsibilities. Students are left on their own to teach themselves the curriculum. In addition, since students are working in small groups that require additional time, instructors may be more apt to assign tasks that do not demand higher level thinking skills. The quality is overlooked in order to increase the quantity of assignments.

Conclusion

Mrs Solomon decided to implement cooperative learning in her Careers course. As mentioned earlier, there was some initial resistance from the students. But she kept a positive attitude about the benefits of cooperative learning and encouraged the students to give it a try. She also started with a fun activity to help boost student morale. She carefully grouped students together, making sure that each group consisted of a diversity of student abilities and backgrounds. She continued to follow the strategies mentioned in this chapter for successful implementation. She was impressed with the results. She found that, once the students had some experience with CL, the higher-achieving students did not resent being paired with lower-ability students. In fact, it helped to build their self-esteem to know that they were able to help their peers. They also found that the students with learning disabilities were actually very creative and could offer new perspectives on how to solve the given problem. The students also began to realize that students from different cultures may struggle to communicate in the English language, but they were very dedicated students who had a desire to do well on given assignments. Interestingly enough, Mrs Solomon also found that absences began to decrease. In the reflection papers that she had students complete at the end of the project, she discovered that students felt valued as part of the group and that they attended her class so that they would not disappoint their peers. After training the students on conflict resolution, cultural diversity, and respect for others, Mrs Solomon noticed that students appeared to get along better while doing the cooperative exercises. But most importantly, student grades actually improved over time. Students of all ability levels took pride in their accomplishments and felt a sense of involvement by being allowed to have input into the activities and classroom expectations. They also seemed to have a more complete understanding of the material and were able to score higher on all types of tests, including application questions. Overall, she saw a dramatic difference in her classroom atmosphere. Both Mrs Solomon and her students were more motivated and enthusiastic about each new chapter. Mrs Solomon realized that there were still situations which would arise periodically within her classroom, and that cooperative learning would be a teaching strategy that she would have to improve on over time. But after learning more about cooperative learning, she believed that she had a whole new perspective on classroom strategies.

References

Bershon, B. L., (1992). Cooperative problem solving: A link to inner speech. In Hertz- Lazarowitz (Ed.) Interaction in Cooperative Learning (pp. 36 - 48) New York: Cambridge Press.

29. Cooperative learning

Brufree, K. (1993). Collaborative learning: Higher education, interdependence and the authority of knowledge. Baltimore, MD: Johns Hopkins University Press.

Cohen, E.G. (1994). Restructuring the classroom: Conditions for positive small groups. Review of Educational Research, 64, 1-35

Davis, R. B., Mahler, C. A. & Noddings, N. (1990). Constructivist views on the teaching and learning of mathematics. Journal for Research in Mathematics Education by National Council of Teachers of Mathematics. Retrieved September 2, 2003, from: http://home.capecod.net/~tpanitz/tedsarticles/coopbenefits.htm

Janke, R. (1980). Computational errors of mentally-retarded students. Psychology in the Schools, 17, 30 - 32.

Johnson, D. W., Johnson, R. T., & Holubec, E. J. (1986). Circles of learning: Cooperation in the classroom. Edina, MN: Interaction Book Company.

Johnson, D.W., Johnson, R., & Smith, K. (1991). Active learning: Cooperation in the College Classroom. Edina, Minnesota: Interaction Bock Company.

Johnson, D. W., & Johnson, R. T. (1989). Leading the cooperative school. Edina, MN: Interaction.

Johnson, D. W., & Johnson, R. T. (1990). Social skills for successful group work. Educational Leadership, 47(4), 29 - 33.

Johnson, D.W. & Johnson, R.T. (1991). Learning together and alone. Englewood Cliffs, N.J.: Prentice Hall.

Kagan, S. Educational Leadership (Jan. 1990). Retrieved September 2, 2003, from: http://home.capecod.net/~tpanitz/tedsarticles/coopdefinition.htm

Kessler, R., & McCleod, J. (1985). Social support and mental health in community samples. In Cohen and Syme (Eds.), Social Support and Health. New York: Academic Press. Retrieved September 2, 2003, from: http://home.capecod.net/~tpanitz/tedsarticles/coopbenefits.htm

Marzano, R. J. (1992). The many faces of cooperation across the dimensions of learning. In Davidson & Worsham (Eds.), Enhancing Thinking Through Cooperative Learning. New York: Teachers College Press. Retrieved September 2, 2003, from: http://home.capecod.net/~tpanitz/tedsarticles/coopbenefits.htm

McBrien, J. L. & Brandt, R. S. (1997). The Language of Learning: A guide to Education Terms. Alexandria, VA: Association for Supervision and Curriculum Development.

McKeachie, W. J. (1986). Teaching tips: A guidebook for the beginning college teacher. Lexington, MA: D. C. Heath and Company.

Myers, J. (1991). Cooperative learning in heterogeneous classes. Cooperative Learning, 11(4). Retrieved September 2, 2003, from: http://home.capecod.net/~tpanitz/tedsarticles/coopdefinition.htm

National Institute for Science Education. (1997). Doing CL. Retrieved October 1, 2003 from http://www.wcer.wisc.edu/archive/cl1/CL/

Neves, A. H. (1983). "The effect of various input on the second language acquisition of Mexican-American children in nine elementary classrooms." PhD Dissertation, Stanford University. Retrieved September 2, 2003, from: http://home.capecod.net/~tpanitz/tedsarticles/coopbenefits.htm

Panitz, T. (1996). A definition of collaborative vs. cooperative learning. Retrieved September 2, 2003, from: http://www.lgu.ac.uk/deliberations/collab.learning/panitz2.html

Radencich, M. & McKay, L. (1995). Flexible grouping for literacy in the elementary grades. Boston, MA: Allyn & Bacon.

This book is licensed under a Creative Commons Attribution 3.0 License

Randall, V. (October, 1999). Cooperative learning: Abused and overused? The Education Digest, 65, 29-32.

Rockwood, R. (1995). Cooperative and collaborative learning. National Teaching and Learning Forum, 4(6). Retrieved September 2, 2003, from: http://home.capecod.net/~tpanitz/tedsarticles/coopdefinition.htm

Sherman, L. W. (1991) revised 1996. "Cooperative learning in post secondary education: Implications from social psychology for active learning experiences." Presented at the annual meeting of the American Educational Research Association, Chicago, IL. Retrieved September 2, 2003, from: http://home.capecod.net/~tpanitz/tedsarticles/coopbenefits.htm

Slavin, R.E. (1990). Research on Cooperative Learning: Consensus and Controversy. Educational Leadership, 47 (4), 52 - 54.

Stahl, R. J. & VanSickle, R. L. (1986). Cooperative learning as effective social study within the social studies classroom. Retrieved September 2, 2003, from: http://home.capecod.net/~tpanitz/tedsarticles/coopbenefits.htm

Swortzel, K. (1997). The effects of cooperative learning methods on achievement, retention, and attitudes of home economics students in north carolina. Journal of Vocational and Technical Education, 13(2). Retrieved September 2, 2003, from: http://scholar.lib.vt.edu/ejournals/JVTE/v13n2/Abu.html.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Cambridge: MIT Press.

Yager, S., Johnson, D. W., Johnson, R. (1985). Oral discussion groups-to-individual transfer and achievement in cooperative learning groups. Journal of Educational Psychology, 77(1), 60 - 66.

Cooperative Learning Theory

http://home.capecod.net/~tpanitz/ebook/contents.html

http://www.thirteen.org/edonline/concept2class/month5/index.html

http://edtech.kennesaw.edu/intech/cooperativelearning.htm

Cooperative Learning Lesson Plans

http://www.henry.k12.tn.us/teachersworkshop/cooplearn/lessons.html

This book is licensed under a Creative Commons Attribution 3.0 License

30. Learning communities as an instructional model

Contributors: Jan Buffington (The University of Georgia, USA)

What do the Chrysler Corporation University of Miami, and The Free School have to do with each other?

- Chrysler Corporation
- University of Miami
- The Free School, Albany New York

Situation one: Chrysler Corporation

In 1988, when Japanese competition was threatening to put the Chrysler Corporation out of business, no one suspected that the resurgence of the company would depend in part on the creation of an innovative knowledge system based on communities of practice. Communities of practice based in the business community have work completion as their goal (in education circles, the term is learning communities, and these communities have learning as their goal). Before this new practice was implemented, the Chrysler Corporation was a traditional organization with directives coming from top officials. Localized function of various units (design, engineering, manufacturing, and sales) limited interactions only to reengineer problems until the vehicle was deemed "manufacturable". No communication between units existed except to resolve problems.

A decision was made to radically reorganize the unit. The units would now be formed along product-oriented, cross-functional lines. Each unit or community was responsible for all phases of development associated with a whole specific vehicle. With the implementation of these new product communities, the product-development cycle was reduced from five to two and a half years.

Even with the success of the new cross-functional product units, former colleagues from the original functional units began to meet informally. Sensing the need for the meeting between these members, informal tech clubs were formed and provided other communities whose members were actively responsible for their areas of expertise in the product-development units.

Companies at the forefront of the knowledge economy are succeeding on the basis of communities of practice, or whatever they call them. Communities of practice (or educational learning communities) are not confined by institutional affiliation. Their potential value extends beyond the boundaries of any single organization (Wenger, McDermott, & Snyder 2002).

("Situation one" was taken from A Guide to Managing Knowledge: Cultivating Communities of Practice by Etienne Wenger, Richard McDermott and William M. Snyder)

Situation two: University of Miami

In a society where more and more students are seeking a college education, the public is showing a growing dissatisfaction with the attention that faculties give to undergraduate learning. Students who come to colleges and universities today reflect a greater diversity of experience, ethnicity, expectations, and preparedness than ever before (Shapiro & Levine, 1999).

A college freshman shows up for a first experience with higher education. Having heard stories from parents and others about the challenges of "adjusting" to college, this freshman is somewhat apprehensive about finding classes, getting from one location to another, and meeting instructors' expectations.

The University of Miami offers one solution to this dilemma through paired clustered courses. With the pairing of courses, a feeling of community occurs because the same students and instructors participate. These courses are paired in order to be more interdisciplinary in nature and to promote a classroom environment where students and faculty get to know each other.

Another approach to the idea of learning communities at a college or university level is the implementation of cohorts. This type of learning community involves enrolling students in groups that move along through the course requirements together and many times encounter the same instructors. The instructor's role in a cohort is that of a facilitator. Through interaction and cooperation, the students form a bond or a learning community that enhances their learning. The School Library Media Program at the University of Georgia is an example of this.

("Situation two" was taken from Creating Learning Communities: A Practical Guide to Winning Support, Organizing for Change and Implementing Programs by Nancy S. Shapiro and Jodi H. Levine)

Situation three: The Albany Free School

Learning is encouraged to come from the bottom-up and not from the top-down. This means that learning is initiated from the students, with students deciding how to investigate their interests and how to approach these interests. Students, not teachers, dictate the topics for learning. These students form learning communities in order to pursue their topics and interests.

When entering The Albany Free School, a glance around a room might include students creating images for the school calendar in conjunction with a math lesson. Other students are observed creating costumes for a play or writing copy for the school newspaper on a computer in conjunction with Language Arts. Still other students are planning a trip to an apple orchard as an activity relating to a social studies lesson. Any of these activities and many more are occurring simultaneously. These activities are a result of the interaction of learning communities and perhaps were planned jointly by students and a teacher or perhaps just by students (Miller, 2000).

("Situation three" was taken from Creating Learning Communities: Models, Resources and New Ways of Thinking about Teaching and Learning edited by Ron Miller)

Approaches to learning communities

Each of these three situations involves the interactions of individuals in the context of a learning community or community of practice. These situations include the same elements even though the contexts vary greatly.

Two approaches to learning

Empowering learners in caring communities brings forth the immense love of learning and potentials that these learners or participants hold inside (Koegel, 2003). A learning environment should foster partnerships within individuals, between people, within our society, and between humans and nature (Koegel, 2003). Two approaches

This book is licensed under a Creative Commons Attribution 3.0 License

exist within the structure of learning. One approach involves the top-down mentality that presents the teacher or top-level management as the possessor of knowledge to be imparted to others. On the other hand, the bottom-up approach stresses the importance of the learner or the worker in the process of determining what is to be learned or pursued in the workplace and how this learning or pursuit will take place.

Bottom-up approach

The three situations presented at the beginning show examples of the bottom-up approach where in each case the student or worker (both at the bottom of the traditional hierarchy) was considered the most important element in determining the direction and content of the learning. The Chrysler Corporation re-organizes its factories in order to implement communities of practice that provide emphasis on product-oriented, cross-functional groups that are worker centered. Learning communities appear on the campus of the University of Miami. These communities emphasize the importance of faculty and student interaction in relation to learning. The use of learning communities at The Albany Free School creates an emphasis on student choice and student/teacher interaction when pursuing learning. The examples of Chrysler, University of Miami, and The Free School exemplify "the object of learning communities which is to create higher levels of learning than traditional approaches" (Banta, 2001). A bottoms-up approach provides workers and students more control over their environment with the potential of leading to improved results and more efficient decision making practices.

Basic structural model

A basic structural model for learning communities is provided by Wenger et al. (2002). This model includes three fundamental elements: domain of knowledge, community of people, and the shared practice that they are developing. The domain creates common ground and a sense of common identity. The domain inspires members to contribute and participate, guides their learning, and gives meaning to their actions. The community creates the social fabric of learning, because it encourages a willingness to share ideas, expose one's ignorance, ask difficult questions, and listen carefully. The practice is a set of frameworks, ideas, tools, information, styles, language, stories, and documents that community members share.

Without commitment to a domain, a community is just a group of people. A shared domain creates a sense of accountability to a body of knowledge and, therefore, to a development of practice. A domain is not a fixed set of problems. It evolves along with the community. A domain is not an abstract area of interest, but consists of key issues, problems, or interests that members commonly experience.

A community of practice or an educational learning community is a group of people who interact, learn together, build relationships, and in the process, develop a sense of belonging and mutual commitment. To build a community, members must interact regularly whether face-to-face in large or small groups or online by means of email, chat rooms, and teleconferencing. In fact, with the opportunity for online discussions, community members are allowed to interact more freely without any social constraints and are allowed the opportunity for additional mentoring supervision by professors (Greer and Hamill, 2003). Membership in a learning community may be self-selected or assigned, but the actual level of engagement is a personal matter. In good communities, strong bonds withstand disagreement, and members can even use conflict as a way to deepen their relationships and their learning (Wenger et al, 2002).

A learning community or community of practice explores both the existing body of knowledge and the latest advances or information on the topic. Each community has a specific means of making its practice visible through the ways that it develops and shares knowledge. Successful practice development depends on a balance between joint activities, in which members explore ideas together, and the production of "things" such as documents, tools, or projects. Successful practice building goes hand-in-hand with community building (Wenger et al, 2002).

The domain can include the interest in designing a better vehicle or planning a field trip to an orchard. The community can include an incoming class of college freshman with apprehension about their future or a group of factory workers concerned about the future of their jobs. The practice can include the ideas of elementary students about how to design scenery for a play or the ideas of college freshmen about how to solve a problem presented in their Math and Science cluster class.

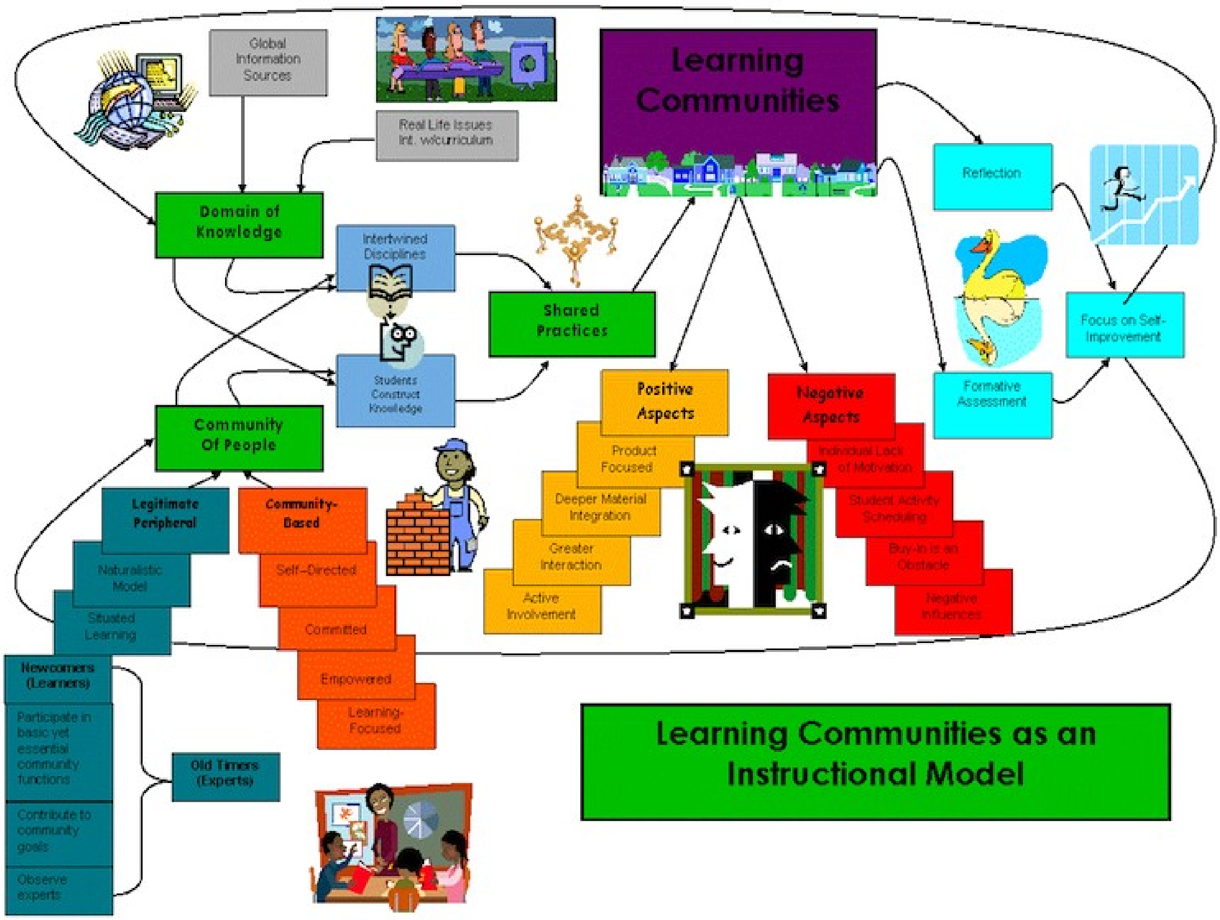

Exhibit 42: Concept map for learning communities. This is a graphic representation of the basic structural model for learning communities as defined by Wenger, et al.

Comparison of features of a traditional setting and a community-based setting

Graves (1992) defines a learning community as "an inherently cooperative, cohesive and self reflective group entity whose members work…toward common goals while respecting a variety of perspectives, values and life styles" (p.94). How does a traditional setting differ from a learning community?

Table 28: Building a learning community from Harada, Lum, & Souza, 2003.

This book is licensed under a Creative Commons Attribution 3.0 License

Traditional	**Community-based**
Students or workers are passive recipients of information.	Students or workers are constructors of knowledge.
Focus is on isolated skills, final products.	Focus is on process as well as product.
Learning is primarily an independent activity	Learning emphasizes social engagements.
Emphasis is on acquiring bits of isolated information.	Emphasis is on making connections, fostering inquiry, and problem solving.
Disciplines are viewed as discrete entities.	Disciplines are viewed as intertwining studies.
Curriculum is built around textbooks, guides.	Curriculum evolves from real-life concerns, student questions.
Information is largely restricted to classroom resources.	Information access includes global sources of information.
Evaluation is summative and final; it focuses on grades.	Evaluation includes formative assessment; it focuses on self-improvement.
There is limited, if any, time for reflection.	Reflection is integral to the process.

In looking at the list of traditional features as opposed to community-based features, it is easy to see how the features apply to our three situations. In the Chrysler Corporation before implementing communities of practice, workers were passive recipients of directives that focused on one isolated part of manufacturing a car and never viewed the process as a whole. In a traditional educational setting, students are passive recipients of a top-down model of instruction with subjects being taught in isolation from one another and never view the subjects as interconnected.

The "curriculum" of the Chrysler Corporation prior to the implementation of communities of practice included guidelines and directives provided from the top executives and managers of the company. The workers were not encouraged to go outside of these prescribed guidelines and investigate new personal or other ideas. Students in a traditional educational setting are locked into a curriculum prescribed by textbooks or county and state guides. The curriculum for these students does not allow the introduction of outside topics of interest.

In the days before communities of practice, the focus for factory workers at Chrysler involved a summative evaluation of the finished vehicle and did not allow for any reflection on issues that might improve the final product. In the top-down model of traditional education, the focus remains on the final grade and at no point is there a time for reflection about the topic of instruction or its importance to the student.

In a knowledge society, people need to learn how to learn (New South Wales Department of Education and Training, 1995). "In a learning community, learning focuses on the processes as well as the content and product. Learning how individuals, teams, and organizations learn, and critically reflecting on the processes or organizational improvement, become essential components of daily work practice" (New South Wales Department of Education and Training, 1995).

Expectations in a community-based environment

Students or workers are empowered, self directed, and committed learners or contributors. Teachers and administrators or top management are themselves committed learners with well-developed habits of continuous inquiry and reflection. In a community-based environment, there is a learning-focused work environment in which both formal learning activities and informal workplace learning are valued.

Collaboration is the key

A culture of collaboration, in which all members of the community contribute to the achievements of shared goals, has the potential to lead to more effective decision making processes and improved outcomes (New South Wales Department of Education and Training, 1995). In a learning community, sharing power is essential. Certain characteristics exist in situations involving these communities including:

- improving continuously;
- experimenting;
- searching for better practices both inside and outside of the community;
- contributing to other people's practices by sharing idea;
- reflecting critically in an open and trusting environment;
- discussing and challenging the purposes, values, and practices of the school or work environment.

Learning is dependent on reflection that comes from the power of "intellectual camaraderie" stemming from discussion, collaboration, sharing ,and building knowledge with peers, as well as those who are more experienced or advanced in the topic or area of inquiry (Fulton, 2003). Through collaboration, each member of the community brings unique abilities that can be utilized and acknowledged by the learning group.

For example, a brakes engineer possesses specialized knowledge and adds this expertise to the group knowledge of producing a "manufacturable" car. Another group member brings a specific knowledge of safety features and another member possesses expertise in the area of passenger comfort features. Each member in this group contributes to the success of the group's goal of a "manufacturable" car.

In another situation a freshman college student has a life-long love of marine science and becomes a valuable resource for the learning group in paired courses, Calculus II and Introduction to Marine Science. Another freshman in this group exhibits an exceptional talent for solving mathematical problems and a third group member shows an aptitude for coordinating the group's collective efforts toward a finished product. Each of these members contributes a specialized part of the whole learning process.

A third example involves an elementary student finding a special talent in the area of writing and becoming the main source of a script that presents a social studies unit in the form of a play. A second learning community member loves to read and contributes the research information for the play. The artistic abilities of still another student are employed in the creation of scenery for the social studies play. Each student becomes a distinctive part of the whole learning community project. These examples show the opportunities for a learning community to utilize the unique abilities of individuals.

Positive aspects of learning communities

Students and business employees find greater involvement in learning communities or communities of practice. Learning communities with the goal of learning can improve general education by bringing students and teachers together in ways that promote greater interaction with each other and deeper integration of the material being

This book is licensed under a Creative Commons Attribution 3.0 License

studied. Learning communities can also be built into developmental studies programs that provide at-risk students with a support network of teachers, peers, and counselors. In the business world, communities of practice with the goal of completing work assignments connect people from different organizations as well as across independent business units (Wenger et al, 2002).

Whether in the work place or an academic situation, there must be some kind of end "product" to a group's efforts. Learning communities can offer assessment efforts a vision worth working toward, one that taps into the intrinsic and extrinsic motivation of faculty, administration, and students (Banta, 2001). In the work place, the final product may be an improved version of an existing product or a brand new product designed by engaged, motivated workers.

Negative aspects of learning communities

Learning communities or communities of practice like all human institutions also have a downside. Getting society at large to buy into the idea of learning communities is a big obstacle. The education system-both public and private-has relied on the traditional view of a top-to-bottom dissemination of information. Learning communities are a huge departure from this tradition. Communities of practice in large impersonal corporations are also a departure from the traditional top-to-bottom organizational structure in the work place.

Designing the communities and scheduling students or employees into these communities also poses a problem. The designing involves the collaboration and cooperation of faculty and administrators or managers and CEOs. If there is an atmosphere of political maneuvering for power, a short-term focus on tangible outcomes, or an emphasis on one year's test scores and an anti-learning culture, then a community of practice or a learning community cannot succeed. Communities of learning alone cannot develop countermeasures to most organizational disorders (Wenger, 2002).

Another possible negative aspect of the community of practice or a learning community is the degree of participation from the individual community members. Since members are free to contribute their own ideas and proposals within the group, they are also free to not contribute and to assume a passive non-participatory role. This freedom can be detrimental to the individual and to the group as a whole.

Outside influences, such as established institutions and society in general, provide outside sources of negative attitudes toward learning communities or communities of practice. Individual attitudes sometimes provide a source of negativity from within the community.

Summary

According to Harada et al. (2003), learning communities with a goal of learning display certain features. Communities of practice with a goal of work completion also display these characteristics. These essential features are that:

- Students (or workers) are constructors of knowledge.
- Focus is on process as well as product.
- Learning or completing work emphasizes social engagement.
- Disciplines are viewed as intertwining studies or areas of expertise.
- Curriculum or product development evolves from real-life questions or concerns.
- Information access includes global sources of information.
- Evaluation includes formative assessment and focuses on self-improvement.

- Reflection is integral to the process.

Earlier version of learning communities

An earlier version of this chapter was written by Evan Glazer. The author of the current chapter decided that she wanted to write a new chapter rather than an extensive edit of the old one. The Glazer chapter focused more on the nature of learning communities while this chapter focuses more on how to create good learning communities within your class (hence, the addition of the clause "as an instructional model"). Here is the link to the earlier version: Learning Communities

References

Banta, T. (2001). Learning communities illustrate principles of good practice. Assessment Update, 13, (4), 3-4.

Fulton, K. (2003). Redesigning schools to meet 21st century learning needs. T.H.E. Journal, 30, (9), 30-35.

Graves, L. (1992). Cooperative learning communities: Context for a new vision of education and society. Journal of Education, 174, (2), 57-79.

Greer, C. & Hamill, L. (2003). Using technology to enhance collaboration between special education and general education majors. TechTrends, 47, (3), 26-28.

Harada, V., Lum, D., & Souza, K. (2003). Building a learning community. Childhood Education, 79, (2), 66-72.

Koegel, R. (2003). The heart of holistic education: A reconstructed dialogue between Ron Miller and Rob Koegel. Encounter, 6, (2), 11-19.

Miller, R. (2000). Creating learning communities: Models, resources, and new ways of thinking about teaching and learning. Brandon, VT: The Foundation for Educational Renewal, Inc.

New South Wales Department of Education and Training (1995). Schools as learning communities. Available on the World Wide: http://www.schools.nsw.edu.au/edu_leadership/prof_read/salc/salc1.php

Shapiro, N., & Levine, J. (1999). Creating learning communities: A practical guide to winning support, organizing for change, and implementing progress. San Francisco: Jossey-Bass Publishers.

Wenger, E., McDermott, R., & Snyder, W. (2002). A guide to managing knowledge: Cultivating communities of practice. Boston: Harvard Business School Press.

Resources

Cotton, K. (2001). New small learning communities: Findings from recent literature. Available on the World Wide Web: http://www.nwrel.org/scpd/sirs/nslc.pdf

Executive Workshop on Value Creation with Communities of Practice (2002). Available on the World Wide Web: http://www.co-i-l.com/coil/knowledge-garden/cop/index.shtml

IBM (2001). Communities of practice and organizational performance. Available on the World Wide Web: http://www.research.ibm.com/journal/sj/404/lesser.html

North West Regional Educational Laboratory (2002). What is a smaller learning community? Available on the World Wide Web: http://www.nwrel.org/scpd/sslc/

North West Regional Educational Laboratory (2002). Schools making progress: A focus on students. Available on the World Wide Web: http://www.nwrel.org/scpd/sslc/descriptions/sierravista/page4.asp

This book is licensed under a Creative Commons Attribution 3.0 License

Wenger, E. (1998). Communities of practice: Learning as a social system. Available on the World Wide Web: http://www.co-i-l.com/coil/knowledge-garden/cop/lss.shtm

This book is licensed under a Creative Commons Attribution 3.0 License

31. Reciprocal teaching

Contributors: Elizabeth Foster and Becky Rotoloni (The University of Georgia, USA)

Introduction

Mrs Clark's third grade class has several students who are reading well below grade level. They can decode, or break words into sounds and blend them enough to say the words, but they just do not seem to be able to comprehend what they are reading. They are becoming very frustrated and reluctant to try because they see themselves as "poor readers". They do not understand what it is that other students are doing when they read that allows them to be able to get the "right" answers on reading tests. These students are unable to comprehend, or understand how the questions are related to what they are reading.

Mrs Clark attends a professional learning seminar on reciprocal teaching and hears testimonials about the progress that students have made when teachers employ this instructional strategy.

What is reciprocal teaching?

Reciprocal teaching is a cooperative learning instructional method in which natural dialogue models and reveals learners' thinking processes about a shared learning experience. Teachers foster reciprocal teaching through their belief that collaborative construction of meaning between themselves and students leads to a higher quality of learning (Allen, 2003). Students take ownership of their roles in reciprocal teaching when they feel comfortable expressing their ideas and opinions in open dialogue. They take turns articulating and thinking out loud—talking through their thoughts—with each learning strategy employed. The learning community is able to reinforce understanding and to see, hear, and correct misconceptions that otherwise might not have been apparent. All members of the community have shared responsibility for leading and taking part in dialogue during learning experiences (Hashey and Connors, 2003).

Reciprocal teaching is based on Vygotsky's theory of the fundamental role of social interaction (dialogue) in the development of cognition. Thinking aloud and discussion of thoughts aid in clarification and revision of thinking and learning, therefore developing cognition. Vygotsky's theory of ZPD (Zone of Proximal Development) is critical to identifying appropriate text and scaffolding activities to support student success (Vygotsky, 1978, as cited in Galloway, 2001). Text must be at a level that can be effectively shared, not too easy and not too difficult. Appropriate support and feedback must be given to facilitate learning during reciprocal teaching activities (Oczkus, 2003).

Effective reciprocal teaching lessons include scaffolding, thinking aloud, using cooperative learning, and facilitating metacognition with each step. Each strategy is taught by the teacher and is clearly understood by students before they go on to the next strategy (Hashey et al, 2003). Procedures are first modeled by the teacher. Then they are practiced and coached with peer and teacher feedback. Finally, the leadership of the group work strategy is handed over to the students (Allen, 2003). Continual teacher and student modeling of cognitive processes for each of the four strategies—predicting, questioning, clarifying, summarizing—is an integral part of the process. The teacher monitors and evaluates to determine where scaffolding is needed to help students to be successful in using strategies. Students become aware of their own learning processes and think critically about them.

Whole class introduction or reinforcement of reciprocal teaching is appropriate, but this should serve as an opening and closing activity. Students who are inattentive, shy, or have other individual needs may not benefit if reciprocal teaching is only used in whole class activities that do not demand their participation. These students will benefit if the same method is also a part of teacher-led small groups, cooperative learning groups, or literature circles where it is easier to keep their attention through frequent involvement and where they can be more comfortable speaking (Oczkus, 2003). Groups should include no less than four and no more than six so that all students have equal opportunity to practice strategies. The teacher can collaborate with the students to create rubrics that make expectations clear and make the class environment comfortable for both the students and the teacher.

Palincsar, Brown, and Campione (1989) define reciprocal teaching as a dialogue between teacher and student. This dialogue is described as reciprocal because each learner acts in response to another. This interaction may occur between teacher and student or between students. The dialogue is structured by the use of four strategies, sometimes known as the Fabulous Four (Oczkus, 2003), which are predicting, questioning, clarifying and summarizing. These four strategies are described in individual vignettes as we follow Mrs Clark and her students through implementation of reciprocal teaching as an instructional method. The goal of reciprocal teaching is to use discussion to enhance students' reading comprehension, develop self-regulatory and monitoring skills, and achieve overall improvement in motivation (Borkowski, 1992 as cited in Allen, 2003).

Mrs Clark decides to try reciprocal teaching to see if she can make a difference for her struggling readers. She does some research, develops lesson plans, and begins to incorporate this method of learning during her reading instruction. Her plans include teaching the four strategies that are associated with reciprocal teaching. These skills do not have to be taught in any particular order, but they should be taught and mastered one at a time. After all four are mastered individually, they are combined and used consistently in all reading experiences in order to magnify understanding of text. The following are vignettes of Mrs Clark's use of each of the parts of this instructional model. Explanations of her use of the teaching strategies are interspersed.

Predicting vignette

Mrs Clark asks the students what the weather forecast is for today. Several students tell her that the weatherman says that it is supposed to be sunny and warm today. She asks: “What is a meteorologist doing when she says what she thinks the weather will do but cannot know for sure because it has not happened yet?” The students quickly answer: “She is predicting the weather.” The class discusses things that are used to make predictions—what you know already, what you have seen happen before, etc. One student raises her hand and says, “But how do you know if you are making a good prediction?” Mrs Clark says, “That is a good question. We are going to practice thinking out loud while we make predictions so that it is easier to see how that works. I am going to model for you.”

Mrs Clark reads a short book to the class. She starts out by looking at the title and the illustrations on the front page and making predictions based on them. Then she thumbs through the pages and uses short phrases and illustrations to make more predictions. She begins to read. Several times in the story, she stops and makes changes in her predictions or points out that her predictions were correct based on what she has read so far. When the story

This book is licensed under a Creative Commons Attribution 3.0 License

is finished, the students discuss which predictions were correct, which changed as the story progressed, and which proved to be incorrect. They talk about things they saw that could have helped Mrs Clark make better predictions.

Mrs Clark tells the students that they are going to watch the video *The Magic School Bus Inside Ralphie*. Before she starts the video, she asks the students what they think will happen in the video. Mrs Clark encourages them to use all the clues in the title of the video to make I think, I'll bet, I wonder if, I imagine, I suppose statements. Because the students are familiar with the series, they can make some predictions.

We think that:

- Ms Frizzle will take the students on a field trip.
- The video will be about something scientific.
- The video must have something to do with Ralphie's heart or stomach.
- There will be a problem with the bus getting back out of Ralphie because that is usually a problem on these videos.
- Ralphie might sneeze the bus out to solve the problem.

Mrs Clark writes down their predictions on a graphic organizer that includes the headings of characters, setting, problem, and resolution. When the video is half finished, Mrs Clark pauses it. She asks the students if their predictions have proven to be correct or incorrect. She then asks if they can make any more predictions based on what has happened so far. The students revise their prediction of how the Magic School Bus will get out of Ralphie's body. The changed prediction is recorded on the graphic organizer.

After the movie has finished, the students discuss their predictions. Mrs Clark explains that the students were able to make the initial, more general predictions based on their prior knowledge of the Magic School Bus series. She compares that to the predictions they made that were more specific to the story. These predictions could only be made after they had seen some of the content of the video and were more specific to the story line. She explains that predicting while reading a book helps to set a purpose for reading, allows interaction with the text, and improves understanding of the reading by increasing interest.

Exhibit 43: This image illustrates the cartoon figure of a weather wolf standing in front of a weather map. In the text, the teacher, Mrs. Clark, used the example of forecasting the weather to teach the students how to make predictions when reading a story. The weather wolf is modeling some of the statements that students can use:I think; I wonder if; I imagine. Predicting helps to increase the students' involvement in the story. Image by Donna Ahlrich, Charmaine Broe-MacKenzie and Jim Brown (2005).

Explanation of predicting

The students in Mrs Clark's class are learning the skill of predicting. Predicting helps a student to be more involved in a story. Graphic organizers serve as visual clues for making predictions and help with confirming and/or revising initial predictions. Most children make casual predictions in the course of their lives: Will I like this movie? If I ask my friend to go skating, will she say yes? When students use the skill of predicting in reading, it helps them to realize the value of picture and word clues. It also helps them to develop higher level thinking about what is going on in the story. Thinking about what has happened and what will happen next makes it easier for the student to foreshadow and understand upcoming events and allows them to focus on the main ideas in the story (Hashey, et al, 2003).

Questioning vignette

Mrs Clark's third grade class gathers in a circle for reading time. This is an enjoyable time for the students as they get to relax and listen to a story read by their teacher. Mrs Clark reads the fairy tale *The Three Little Pigs*. Mrs Clark wants to make the internal process of self-questioning visible for the students, so before she starts the story, she models asking herself questions about the story she is about to read. She asks, “Is this version of this story like the one I remember or is it different?” While she is reading the story, she continues modeling self-questioning about what she is reading. “Why did that pig do that?”, “Were there any other things he could have used to build his house?”, “I wonder why the wolf didn't try to catch him before he built a house.”

When she has finished the story, she models asking herself some fact questions such as:

- What material did the first little pig use to build his house?
- What did the second little pig do when his house was blown down?

She then continues to ask some more reflective questions:

- Why did the first and second pig choose the materials they used?

This book is licensed under a Creative Commons Attribution 3.0 License

- Why did the third little pig allow the others to be safe in his house even though they did nott listen to him when he warned them about the materials they chose?

She adds some more evaluative or opinion questions:

- Which type of little pig would I be? Which building material would I choose? Why?
- If I were the third little pig, would I help my brothers or would I leave them to fend for themselves?

Students discuss these questions and add some that they would ask, and Mrs Clark draws a chart with three columns on it. She writes one of the three kinds of questions at the top of each column and describes the types of questions:

Table 29: Question chart

FACT	**REFLECTIVE**	**OPINION**
Something clearly stated in the book	Think about the information in the book.	What do I think about the choices the characters in the story made?
Remember the answer.	What was the motivation of the characters?	Did the character's actions make sense in the story?
Look back through the reading to find the answer.	Why did the characters do what they did?	According to my value system, did the character make a good or bad choice in their actions?
Important for recalling actual happenings, times, and places.	What is the justification for the characters? actions?	What will the character do next?

The next day in class, the students divide into small groups to read short stories thinking their questions out loud as they read. Mrs Clark works with each group and scaffolds as needed by modeling questions she has about their story. Some of the students have very few questions that go beyond basic fact questions or yes and no answer questions. Mrs Clark encourages them to make their questions fatter. She wants them to get to the real thinking about what they are reading which are reflective, elaborative and opinion questions. Mrs Clark reviews the three types of questions and groups discuss how these questions help them understand what they are reading.

Mrs Clark then reads the tale, *Cinderella*, another simple book that the students know and models self-questioning before, during, and after reading. The class divides into small groups and each person in the group reads a page of the story modeling the think out loud questioning as they read. Each group works to come up with three questions in each of the questioning categories. Mrs Clark listens in on each group's discussions and scaffolds whenever necessary. Once the questions are completed, the groups swap questions and answer them to model question formation and to check their understanding of the reading passage.

The next day, the students continue to work in small groups reading, sharing, and discussing their questions and answers. The teacher guides these discussions by encouraging deep questions to help students toward a deeper understanding of what they are reading.

The class is now ready to try this skill with a more complex chapter book. They read a chapter in class each day. The students write questions they think of during independent reading in their journals and then bring these questions to their group. A different student in each group serves as the group leader each day and guides the discussion to answer the questions.

Exhibit 44: This image illustrates the strategy of questioning , which the teacher introduces to the students while reading the story. *The Three Little Pigs*. The three little pigs are standing in front of the brick house. One pig is asking a fact question: What material did he use?? The second pig is asking a reflective question: Why did he use bricks?? The third pig is asking an evaluative question: Should I help my brothers? The questioning strategy helps students increase their understanding of the story. Image by Donna Ahlrich, Charmaine Broe-MacKenzie and Jim Brown (2005).

Explanation of questioning

Mrs Clark's students have now added the skill of self-questioning to their toolbox of reading strategies. The teacher has introduced, explained, and modeled this skill (Hashey, et al, 2003). The students have had practice in creating and answering each of the three types of questions. The internal process of being a good reader has been demonstrated to the struggling students through the out loud thinking of the teacher and their peers. The students are becoming more confident and eager to take part in class discussions because they are gaining a better understanding of how the reading process works.

Clarifying vignette

Mrs Clark announces to the class that they are going on a nature walk. They go outside and walk across the street to a county nature park. They walk about a half-mile and stop. They sit down and Mrs Clark asks the class to imagine that they are lost. She asks the students to help her come up with some ideas about how they can figure out where they are, and how they will get back to school. One student suggests backtracking until they recognize where they are. Another student suggests walking until someone recognizes a familiar tree or flower as a landmark. Another student suggests that Mrs Clark use her cell phone to call the park supervisor to come and find them.

Mrs Clark relates each of the answers the students give to clarifying what they are reading.

Backtracking is similar to rereading material when you realize that you have lost your way in the story and do not know what is happening. Looking for familiar landmarks is similar to readers activating prior knowledge of vocabulary, grammar, and syntax (Hackey, et al., 2003). Calling the park supervisor on a cell phone relates to referring to outside resources, such as dictionaries or atlases. The students begin to understand that pretending

This book is licensed under a Creative Commons Attribution 3.0 License

they are not lost is not going to get them out of the woods, and pretending to understand what they are reading when they really did not will not enable them to fully understand the reading assignment.

When the class arrives safely to their classroom, Mrs Clark gives the students a reading assignment and a pad of sticky notes. She models reading a short passage and marking words or concepts she is not quite sure of with the sticky notes. Students then practice reading independently and highlight any words or concepts that they do not understand in the text.

The next day, they write the words they marked on the board. Mrs Clark models ways to determine the meaning of the words, such as using a dictionary, using keywords surrounding the unfamiliar word, using picture clues, and rereading. The students are comforted to realize that many students wrote the same words on the board. This helps them to build a community of learners and helps Mrs Clark to identify vocabulary words that need further explanation.

Exhibit 45: This image illustrates the strategy students can use to clarify what they are reading. In the text example, Mrs Clark explains that back-tracking through the woods is similar to rereading material in a story; looking for familiar landmarks is similar to readers activating prior knowledge; and calling for help is similar to referring to outside resources such as a dictionary. Image by Donna Ahlrich, Charmaine Broe-MacKenzie, and Jim Brown (2005)

Explanation of clarifying

Mrs Clark's class has now added the skill of clarifying to their toolbox of reading skills. These skills have been modeled and practiced externally. This is done so that students might understand the internal cognitive processes that good readers use and gradually internalize them for themselves. The students have become more comfortable identifying things that they do not understand and seeking clarification to deepen their understanding. Because their learning community is thinking out loud about this process the entire class is gaining ability and knowledge that individuals could not gain on their own (Hashey, et al, 2003). They are also becoming more and more comfortable sharing things that they do not know as well as things that they do know.

Through the collaborative process of sharing questions students find that they all have information to share that sheds light on their understanding of what they are reading. Much of this knowledge comes from their individual backgrounds and prior reading experience, so individuals find value in themselves (Allen, 2003). Identifying words and concepts that are not fully understood has become a valued skill rather than a perceived weakness.

Summarizing vignette

The students have worked with summarizing as an independent skill before. They understand that a good summary must include the main idea and the most important details to tell what happened in their own words. Some of the class already does an excellent job with this, but others are still struggling because they have a hard time identifying the main idea. They still feel that they must tell all the details or go back and read the text. They are unable to put the summary into their own words.

Mrs Clark begins this class by telling her students that she is very proud of the things they are doing in their reading groups. She says: "Your reading is improving because you have learned to use things you know to predict what will happen, to self-question while you are reading, and to clarify muddy points." She says: "I have just told you in my own words what has been happening in our reading class over the past few days. Now I would like you to tell me what you have learned during this study that helps you with your own reading." The students are excited about their success and eager to talk about it. Mrs Clark says: "Fantastic, you have just done a great job of summarizing! Now we will try that with our reading. Just tell the main idea and the most important details in your own words, and that is it."

Students work in small groups taking turns reading a paragraph and then summarizing. Each member of the group takes a turn being the discussion leader. Mrs Clark listens to group discussions and scaffolds as needed. Her goal is to fade her interventions so the students can interpret the text according to their perceptions (Hacker and Tenent, 2002). Group members also assist each other with summarizing skills.

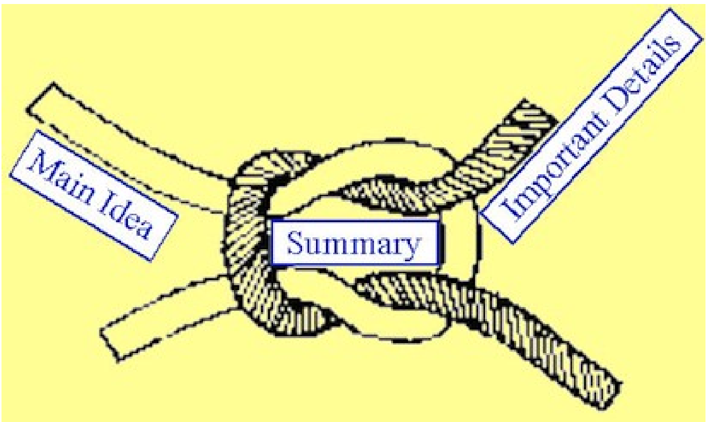

Exhibit 46: This image illustrates the summarizing strategy. A square knot ties together the main idea and the most important details of a story to make a summary. Image by Donna Ahlrich, Charmaine Broe-MacKenzie and Jim Brown (2005).

Explanation of summarizing

Through this process, the internal skill of summarizing while reading that good readers automatically do is modeled externally and practiced. Readers who did not understand how to do this before watch the teacher model

This book is licensed under a Creative Commons Attribution 3.0 License

the strategy, practice with scaffolding, and gradually begin to internalize the process for themselves. As with the other strategies, the teacher models the skill, then hands over the leadership responsibility to the students (Allen, 2003).

Putting it all together

The students now have experience using each of the Fabulous Four strategies that are used together as part of a comprehensive reading program to increase comprehension. From this point, Mrs Clark will encourage her students to use all four of the strategies before, during, and after reading to deepen comprehension. She and the students will continue to take turns being the teacher and thinking out loud while they read. Mrs Clark will use this strategy during reading instruction, but will also employ it to teach science, social studies, and math concepts. The "think out loud" and "taking turns being the teacher" strategies have proven to be very effective in helping students to focus on their learning, share their thinking about what they are learning, and bonding students into a learning community (Hashey, et al. 2003).

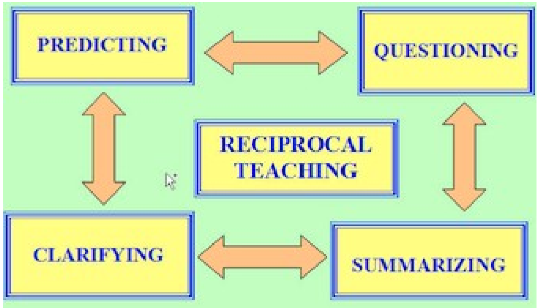

Exhibit 47: This graphic illustrates the Fabulous Four strategies of Reciprocal Teaching: predicting, questioning, clarifying and summarizing, which are used together to increase reading comprehension. Arrows are pointing in both directions towards each strategy because the strategies can be used in any order. Image by Donna Ahlrich, Charmaine Broe-MacKenzie and Jim Brown (2005).

Benefits of reciprocal teaching

A significant body of research (Carter, 1997; Palincsar & Brown 1984, 1986; Palincsar, Brown & Campione, 1989; Palincsar & Klenk, 1991, 1992) has shown that students who have been struggling with reading and are taught how to think about text in this way are able to feel comfortable taking part in discussions and engaging with both fiction and non-fiction grade level texts. They begin to understand how to make sense of what they are reading whether it is in the context of pleasure reading, classroom reading, social studies text, science text, or even in math word problems. Their reading comprehension levels improve dramatically.

Palincsar and Brown (1986, as cited in Oczkus 2003), observed that reciprocal teaching used with a group of students for 15-20 days improved reading comprehension on assessments by 30 to 80 per cent. Palincsar and Klenk (1991) concluded that students improved reading skills immediately and also exhibited that they had maintained these skills on tests performed a year later.

Rosenshine and Meister (1994, as cited in Oczkus 2003) mined data collected through 16 different research studies. They concluded that reading comprehension was improved through the use of this instructional model.

31. Reciprocal teaching

According to a study by Lederer, (2000, as cited in Allen, 2003), students were given reciprocal teaching instruction for 15 to 17 days. The instructor described and demonstrated each strategy that was going to be used in the process to the students prior to teaching it. Feedback was given to the students on a daily basis. The study showed positive changes in the students' abilities to generate questions, answer questions, and summarize information (Allen, 2003).

In a study by Hashey, et al. (2003), the teachers saw increases in students' confidence and success, in their understanding and use of strategies, and in their enjoyment of literature. At the conclusion of the study, one seventh grade student commented that [reciprocal teaching] helps him understand the book more, understand meaningful questions, understand other people's opinions (Hashey, et al, 2003).

Additionally, a modified version of reciprocal teaching can benefit students who struggle to comprehend mathematical word problems. The four major components of this modified approach are: clarifying, questioning, summarizing, and planning (van Garderen, 2004). In a reciprocal teaching math lesson, one student is assigned to be the group leader. That student leads the other students through each of the four steps. The group first clarifies any words or phrases that are not understood. Then the leader uses questions to guide the group into identifying the key parts of the problem. Next, the leader summarizes the purpose of the word problem and finally guides the group in creating a plan to solve the problem. Each person in the group takes a turn being the leader.

Challenges of reciprocal teaching

One challenge of using reciprocal teaching is that constructivists in the field of learning strategies do not agree on how it should be taught (Allen, 2003). One way of teaching it is called reciprocal teaching only, where the strategy is not introduced to the students prior to the group discussions (Allen, 2003). The other way is called explicit teaching before reciprocal teaching; where students were introduced to the strategies before dialogue began (Allen, 2003). The later is the theory on which the examples of Mrs Clark's classroom are based.

Another drawback to reciprocal teaching is that although students make impressive gains in their reading comprehension abilities, the process is not as effective for students with decoding difficulties (Hashey, et al, 2003). Students who are not able to decode or break words down into phonemes and then blend them enough to recognize and say most of the words in the reading passages correctly, could feel uncomfortable or embarrassed when working in the peer group time involved in this instructional method. One strategy to help alleviate this situation is tape-assisted reciprocal teaching (Le Fevre, Moore, and Wilkinson, 2003). Tape-assisted reading involves listening to the reading of a text while following along with the printed text. This strategy has helped students with poor decoding skills participate in reciprocal teaching activities, which allows them to make gains in their metacognitive and comprehension skills (Le Fevre, et al, 2003).

An often overlooked but significant challenge to reciprocal teaching is that this method of instruction relies heavily on the teacher's belief in constructive learning and his/her proficiency with the reciprocal teaching process (Hacker, et al, 2002). Reciprocal teaching is a constructivist method of teaching. The basis of this method is that the students will draw their own meanings from what they read based on their understanding of the text combined with their prior experiences. A teacher who does not support constructivist theory may not be open to teaching using this method. Additionally, teachers who do support the process and want to use the reciprocal teaching strategies need to be trained and have support when they encounter situations that require modifications. The teacher must be able to demonstrate the strategies, gradually give over leadership of the lessons to the students,

This book is licensed under a Creative Commons Attribution 3.0 License

and then become a facilitator for the student groups. Not all teachers are comfortable in this role (Hacker, et al., 2002).

Summary

Palincsar, Brown (Palincsar & Brown, 1984; Palincsar & Brown 1986), and Klenk (Palincsar & Klenk, 1991) used the findings of their research studies to create a model of reciprocal teaching they used to teach procedures that good readers use internally when they read. In the model, four reading strategies normally taught separately are combined in an instructional package. Students are taught to think about what they are preparing to read and make predictions, to develop self-questioning strategies, to recognize and clarify words and passages that they do not understand, and to summarize or retell passages after they read. These good reader practices are normally taking place inside the reader's head so they are not visible and therefore are difficult to teach. The process must be made visible through modeling, thinking out loud, and participating in dialogue about those thoughts. Student learning is intensified by their own verbalization of that learning for others, and by observing the learning process of their peers. Repeated external use and understanding of the reading strategy package becomes an internal way of thinking about reading.

The teacher's role in this instructional procedure changes as the strategies are taught to the students. The teacher starts the instruction of each strategy as the sage on the stage, and ends up as the guide on the side. The teacher has to be proficient in modeling these strategies to the students and then gradually fade away and let the students take over the control of their learning. The ability of the teacher to fill this role greatly affects the learning process.

Although there are some drawbacks to reciprocal teaching such as the debate over how the strategies should be presented to the students and the need for support from the teachers, most studies have shown an increase in standardized test scores in the area of reading comprehension after use of this instructional model (Hacker et al., 2002, Hashey et al., 2003).

References

Allen, S. (2003). An analytic comparison of three models of reading strategy instruction. IRAL: International Review of Applied Linguistics in Language Teaching. 41(4), 319-339.

Galloway, C. A. (2001). Vygotsky's learning theory. In M. Orey (Ed.), Emerging perspectives on learning, teaching, and technology. Available Website: http://projects.coe.uga.edu/epltt/index.php?title=Vygotsky%27s_constructivism

Hacker, D.J, & Tenent, A. (2002) Implementing Reciprocal Teaching in the Classroom: Overcoming Obstacles and Making Modifications. Journal of Educational Psychology. 94 (4), 699-718

Hashey, J. M, & Connors, D. J. (2003). Learn from our journey: Reciprocal teaching action research. Reading Teacher, 57(3), 224-233.

Le Fevre, D. M., Moore, D. W., & Wilkinson, I. A. G, (2003). Tape-assisted reciprocal teaching: Cognitive bootstrapping for poor decoders. British Journal of Educational Psychology, 73(1), 37-59.

Oczkus, L. (2003). Reciprocal teaching at work: strategies for improving reading comprehension. Newark, DE: International Reading Association

Palincsar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. Cognition and Instruction, 2, 117-175.

31. Reciprocal teaching

Palincsar, A. S., & Brown, A. L. (1986). Interactive teaching to promote independent learning from text. The Reading Teacher, 39(8), 771-77.

Palincsar, A. S., & Brown, A. L., & Campione, J. (1989). Structured dialogues among communities of first-grade learners. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, California

Palincsar, A. S., & Klenk, L. (1991). Learning dialogues to promoting text comprehension. (PHS Grant 059). Bethesda, MD: National Institute of Health and Human Development

van Garderen, D. (2004). Reciprocal teaching as a comprehension strategy for understanding mathematical word problems. Reading & Writing Quarterly, 20.

Books on reciprocal teaching or with lessons that strengthen reciprocal teaching

Cooper, J.D., Boschken, I., McWilliams, J., & Pistochini, L. (1999). Soar to success: The intermediate intervention program. Boston: Houghton-Mifflin

Hoyt. L. (1999). Revisit, reflect, retell: Strategies for improving reading comprehension. Portsmouth, NH: Heinemann.

Hoyt, L. (2002). Make it real: Strategies for success with informational texts. Portsmouth, NH:

Lubliner, S. (2001). A practical guide to reciprocal teaching. Bothell, WA: Wright Group

McLaughlin, M., & Allen, M.B. (2002). Guided comprehension: A teaching model for grades 3-8. Newark, DE: International Reading Association.

McLaughlin, M., & Allen, M.B., (2002). Guided comprehension in action: Lessons for grades 3-8. Newark, DE: International Reading Association.

This book is licensed under a Creative Commons Attribution 3.0 License

32. Reading Recovery

Contributors: Kristi Gerig, Jan Perry, and Leanette Spencer (The University of Georgia, USA)

Scenario

Eric is a first grade student at Camelot Elementary, a large school that serves a diverse population of 1200 students. It is classified as a school on the “urban fringe” (being neither completely urban nor suburban). The school receives Title I support because of the large number of students who qualify for either free or reduced lunch. There are ten first grade classrooms within the school, and Eric is one of two hundred first graders. He has recently transferred to Camelot Elementary from another local county school where he completed his kindergarten year.

At the beginning of his first grade year, his teacher, Ms Smith, ranked him in the bottom third of her class based on quick, informal observations on both reading and writing tasks. Often, he could not do tasks assigned to the entire class. For the majority of the day, he was off task and his behavior was slowly beginning to deteriorate. It appeared to Ms Smith that Eric did not know all of the letters of the alphabet or the sound associated with these letters. When asked to write about his summer, Eric turned in a paper with a picture of a swimming pool with random letters across the page. During a quick reading check, Ms Smith observed that Eric could read a level one book. However, the average reader in her class could read a level four book. By the end of the year, Eric will be expected to read at least a level sixteen book accurately with both fluency and comprehension. Ms Smith, concerned about Eric’s lack of progress, is afraid that he is “at-risk” for reading failure.

In order to prevent this from occurring, Ms Smith ranked Eric as one of the lowest performing students in her class and then gave this list to Ms Jones, one of the school’s four trained Reading Recovery (RR) teachers. Ms Jones, along with the other three RR teachers, begins to observe more carefully the reading and writing behaviors of the bottom 20 per cent of first grade students. Then the RR teachers administer the *observation survey* (OS) on an individual basis to their list of 45 slowly progressing first grade students. (Please see the observation survey section below for more information on the tasks given.)

While observing Eric during the OS, Ms Jones noticed and recorded Eric’s strengths in reading and writing as well as any confusions or deficits he demonstrated. After assessing all slowly progressing students, the RR teachers then selected the students with the lowest scores on the OS to work with regardless of perceived intelligence, English proficiency, or potential learning disabilities (Clay & Cazden, 1990). Ms Jones selected Eric as one of the four RR students she will serve.

Over the course of the next 12-20 weeks, Ms Jones will meet with Eric for 30 minutes each day for one-on-one sessions. Sessions are designed to supplement learning that is occurring in the classroom, not replace such learning. Ms Jones will take what Eric knows about both reading and writing, and she will design lessons that build upon his strengths. As a RR teacher, it is Ms Jones’s goal to accelerate Eric’s rate of learning. She will help him develop effective and efficient strategies for both reading and writing in order for him to reach the average reading level of his classroom by the end of twenty weeks (Clay, 1991). The following is a list some of the strategies suggested by Clay that Ms Jones may use to help Eric develop:

- using early strategies such as on- to-one matching and monitoring on known words;
- predicting;
- using picture cues to decipher meaning;
- anticipating language structure;
- making links to Eric's knowledge about the world;
- monitoring by rereading;
- cross checking sources of information (see the theories section for more detailed information);
- searching the text for further cues;
- self-correcting when cues do not match;
- reading with fluency and expression, and;
- problem solving with accuracy and flexibility.

During this extensive process, Ms Jones will scaffold Eric's learning and help him to develop a self-extending system so that he can become an independent reader and writer (Clay, 2005a).

A theory of learning to read

In order to understand Reading Recovery (RR) and the careful ways in which teachers scaffold children throughout the program, it is important to have a clear picture of the theoretical framework under which all trained RR teachers operate. According to Clay (2005a), the theorist who designed the program, reading is a "message getting, problem-solving activity" (p.1). Alternatively, Clay notes, writing is a "message sending, problem-solving activity" (p.1).

The processes that a child uses to either receive or send a message are complex, not easily observed, and different from child to child (Clay, 2005a). Furthermore, according to Cox and Hopkins (2006), it is Clay's belief that children construct their own understanding of the reading process and in addition, bring a wealth of prior knowledge to the task. Indeed, the young learner has already mastered oral language learning, whether or not it is the language used in the classroom, by the time he or she enters kindergarten (Clay, 2005a).

Tied to the fact that learners come to literacy tasks with various backgrounds and knowledge is the belief that children progress through literacy learning by different paths (Clay, 1998). What the child attends to in reading can vary greatly from child to child. Therefore, individualizing learning for slow progressing students is essential. In addition, Clay (2001) sees the act of learning to read as involving change over time. Teachers must be careful observers of this change and must be equipped to make moment-by-moment teaching decisions that support the child's change and new learning.

There are two final theoretical principles on which RR is based. First, reading and writing are connected processes and should be performed in conjunction with each other. Learning in one aspect of literacy supports learning in the other. Second, children learn how to read and write by participating in authentic reading and writing tasks on continuous texts (Cox & Hopkins, 2006).

To further understand the reading process as a message getting activity, it is vital to understand what sources of information a child uses when attempting to retrieve a message from text. Clay believes that readers must constantly monitor and integrate information from a variety of sources (Clay, 2005; Clay & Cazden, 1990). A strategic reader uses multiple sources of information in flexible ways during the reading process in order to derive understanding from the text. These sources include the following:

This book is licensed under a Creative Commons Attribution 3.0 License

- meaning cues (both from within the text and from the reader's own knowledge of how the world works);
- structure cues (making the text semantically correct based on the rules of the given language);
- visual cues (understanding and applying text layout, directionality, and as letter/sound correspondence).

As stated previously, high progress literacy learners are proficient users of strategic activities. These learners use strategies in order to solve problems quickly in both reading and writing tasks. Such readers and writers learn more about both processes each time they participate in reading and writing tasks. Low progress readers, on the other hand, tend to rely on limited strategy use or isolated item knowledge that is not helpful for solving problems (Clay & Cazden, 1990). The purpose of the RR program, therefore, is to scaffold an individual's reading process and to teach low progress readers how to effectively use the previously mentioned sources of information to gain meaning from the text. Clear links to Vygotsky, social constructivism, and scaffolding can be seen in evaluating the theoretical framework underlying the RR program.

Observation survey

With a clear picture of the theories upon which Reading Recovery relies, a further look at the observation survey is necessary. Below, each task is explained in detail and a short summary is given describing Eric's behaviors on the task. Further information about this assessment can be found in Clay's (2002) book An Observation Survey of Early Literacy Achievement.

- Letter identification: This task requires a child to identify 54 letters—26 uppercase letters, 26 lower case letters, and a printer's "a" and "g" letters. The child receives a correct score if he or she can identify a letter by either letter name, the sound the letter makes, or by a word that starts with that letter.
  - On this task, Eric was able to correctly identify 40 letters, mostly by letter name. He confused m with w, b with d, and t with f. He was unable to identify the following letters: r, q, e, K, k, v, V, e, z, and the printer's "a" and "g".
- Word test: On this task, the child is presented with a list of 20 high frequency words. The child receives a correct score for any word he can identify upon sight. The observer also notes responses given and later analyzes these responses in terms of what the child can do at the word level.
  - On this task, Eric was able to identify the word "yes" correctly. On all other words, his response included a word that started like the word on the task. For example, for the word "and," he said "apple," and for the word "the," he said "tiger." This indicates that Eric is attending to the first part of a word and further suggests that he knows what a word is as evidenced by his giving a word for each word presented rather than providing just a letter.
- Concepts about print: During this task, the observer records what a child knows about print. The observer reads a specially prepared book and asks the child questions that encompass early reading strategies such as directionality, one-to-one matching, visual scanning behaviors, letter and word knowledge, and specific concepts about punctuation.
  - On this task, Eric demonstrated that he knew that the message was contained in the print and where to start reading on a page. He identified the front of the book and the meaning of a period correctly. Additionally, he was able to identify a letter and a word. Finally, he could point out a capital letter. However, he was unable to demonstrate some early literacy concepts such as left to right directionality,

return sweep, and word-by-word matching. Furthermore, he demonstrated very little visual scanning or specific concepts about punctuation.

- Writing vocabulary: This task assesses what is known or is partially known about writing words. The observer allows the child to write all the words that he knows within a ten-minute time limit. The observer gives prompts if the child cannot think of words spontaneously. The observer not only looks for words the child knows, but also how the child handles using space, directionality, and letter formation during the writing task.
  - Eric was able to write three words on this task. He could write his name and the words "I" and "a." When prompted to write other words, he sometimes wrote the beginning letter or dominate sounds in that word. On other words, he wrote letters out of sequence. For instance, when asked to write "cat," he wrote "CTA." This demonstrates that Eric is beginning to learn some things about some specific words.
- Hearing and recording sounds in words: This is another task where the child is asked to write. The observer reads 1-2 sentences and asks the child to write the story, allowing him to write what he hears. This is not a test of spelling, but rather a test of hearing and correctly recording sounds in words. A score is given for every sound the child records correctly. Again, the observer not only looks for sounds the child can analyze and record, but how the child handles using space, directionality, and letter formation during the writing task.
  - Eric was able to correctly hear and record 12 out of 37 sounds. Ms Jones again noticed that he mostly wrote the beginning or the dominant sound in words. During writing, she observed that the majority of the time he used upper case letters. He was able to form the letters he knew quickly and automatically. He did not demonstrate directionality in writing as evidenced by writing words randomly across the page.
- Text reading level: The final task of the observation survey involves taking a running record on texts that increase in difficultly. The first few texts are patterned and have strong picture cues. During the running record, the observer notes the accuracy with which the book is read, as well as any behaviors that are presented, such as finger pointing, directionality, one-to-one matching, and fluency. If a child can read a text with at least 90 per cent accuracy, the observer presents another, slightly more difficult, text for the child to read. The observer ceases this activity after the child has read two books that are at his frustrational level.
  - During text reading, Eric was able to read a level 1 text with 92 per cent accuracy. He demonstrated a good memory for text by being able to repeat the pattern of the text given to him. While reading, Ms Jones noted that he did not say one word for every word printed on the page. However, he was able to gather much of his meaning from checking the picture cues.

After giving Eric the observation survey, Ms Jones now has a good idea about Eric's emerging literacy behaviors. She has a record of what he knows and how he demonstrated it across several different literacy tasks. She has a strong sense of his confusions at the letter, word, and text levels. By focusing on his strengths, rather than his weaknesses, she has a good starting point from which she can begin scaffolding his literacy learning (Clay, 2002).

Reading Recovery teachers are trained to give the observation survey during a week-long Observation Survey Institute that precedes their official training year. During this week, teachers learn the purpose of each task, what

This book is licensed under a Creative Commons Attribution 3.0 License

things to observe during the task, and how to correctly score each task. The week includes demonstrations by a trained teacher giving the OS as well as opportunities for new Reading Recovery teachers to practice giving the OS to students. At the end of this institute, novice teachers are then able to sum up what a student knows in a concise yet detailed observation survey summary.

Roaming around the known

For the first two weeks of the child's program, the teacher begins with a period that is called Roaming Around the Known. During this time, Ms Jones will only work with what Eric knows as evidenced by the observation survey. She will not specifically introduce any new learning, but will instead carefully record anything new the child discovers during this time period. During these two weeks, Ms Jones and Eric will have an opportunity to work together and get to know each other better. Eric will be introduced to the authentic reading and writing tasks that he will be expected to perform as lessons progress. Ms Jones can discover things that Eric knows that he did not have the opportunity to express during the observation survey. She can also confirm what he does know, how well he knows it, and the circumstances in which he knows it (Clay, 2005a).

Lesson format in relation to scaffolding

After the period of "roaming", Ms Jones will introduce Eric to the typical lesson format. While this framework remains the same for all RR students, the lessons are quite different. Each RR teacher specifically designs lessons around what each individual child knows, how the child responds to new learning, and what the child needs to learn in order to be successful as the teacher "ups the ante" (Clay, 2005b). Rodgers (2004/2005) specifically states in her work that there is no script for teaching during a RR lesson. In fact, Clay states the following in her *Literacy Lessons Designed for Individuals Part Two: Teaching Procedures*:

> *There are no set teaching sequences; there is no prescription to learn this before that. A highly appropriate recommendation for one child could be an unnecessary one for another child. The teacher must select the activities needed by a particular child after working with him, observing his responses, and thinking about what he needs to learn next. We do not want to see a child spending time on activities that are not moving him forward or lifting the complexity of what he can do. (p.2, 2005b)*

In Reading Recovery, the child and the tutor need to develop a working relationship where the tutor is an astute observer and careful designer of a child's program. In turn, the child must understand the goal of their time together and must become an active participant in both reading and writing tasks. This closely relates to the features of scaffolding, where the teacher understands the learner in such detail that shared goals are set, intentional assistance is given, and an optimal level of help is achieved. In other words, the task, whether reading or writing, must retain some challenges and problem solving tasks without becoming too difficult.

With that in mind, both Clay (2005b) and Hobsbaum & Peters (1996) describe a typical lesson format:

- The child rereads familiar books from previous days. These books are carefully chosen from a wide range of quality published material. During this time, the teacher praises the child when he uses new strategies and encourages reading with fluency, expression, and phrasing. During early lessons, the teacher might model such behavior for the child to replicate.
  - During a typical lesson with Eric, Ms Jones listens to him read familiar stories. Eric is allowed to choose the books that he reads during this time from a limited selection planned by Ms Jones. In early lessons,

Ms Jones praises him when he stops reading because he notices a mismatch of what he says and what is actually printed on the page. She notes in her lesson records that although he cannot correct the problem by himself, he is beginning to monitor his reading. In later lessons, Ms Jones praises him for not only monitoring his reading, but also for self-correcting "tricky" words.

- Next, the child reads a book that was introduced and read once the day before. The teacher switches roles at this point from teacher back to being an observer. She takes a running record of the child's reading behaviors and later analyzes this record according to what sources of information (meaning, structure, or visual cues) the child is using or neglecting.
  - Ms Jones takes a daily running record of Eric's work. During this time, she records all of his reading behaviors and makes careful notes regarding his change over time. This assessment guides her teaching. After this daily reading, she is able to praise him on the use of new strategies and teaches him to use strategies that he is neglecting. As Eric reads each new level of text easily, Ms Jones moves him quickly up text levels. Her goal is to move him one level each week.
- For a brief period of time, no longer than two or three minutes, the child works on letters and, as lessons progress over time, words. The student works with magnetic letters. This gives the learner the opportunity to manipulate the letters easily in order to sort letters, make new high frequency words, or learn words by analogy (going from known words to new words).
  - During early lessons, Ms Jones assists Eric with letter learning. She introduces new letters slowly and is careful to not introduce letters that Eric confuses (in his case, perhaps the "b" and the "d") during the same lesson. When she shifts to word work, she shows Eric how to make new words from words he knows. For instance, when Eric demonstrates that he knows the word "is" during writing, she can use this time to teach him how to go from "is" to "it" and "in" by changing the end of the word.
- Afterwards, the child and the teacher compose a story of a sentence or two in a journal. The journal is made up of blank pages and opens so that there is a practice page on the top and a page for writing the story on the bottom. The story is negotiated after a meaningful conversation involving both parties. The teacher/student partners work together and "share the pen" in order to compose the story. The child writes what he knows, and the teacher fills in the rest. As time progresses, the child is expected to compose most of the story independently. During the writing time, the teacher carefully chooses one or two new things to work on within the practice page. This may take the form of writing new letters with a model, taking high frequency words to fluency, writing new words by sound/letter analysis, or by writing words by analogy.
  - A typical story might be written after Eric and Ms Jones have a discussion about what has happened in Eric's life. For example, after Eric's birthday, which occurred in the mid-point of his program, his story might be " I got a new bike for my birthday". Ms Jones would expect him to write the words "I" and "a" independently and quickly. She may help him analyze the sounds in "got" by using sound boxes. Here, she would use the practice page in his journal to draw three boxes, giving him a visual scaffold of the word. Eric's job would be to say the word slowly and fill in the boxes with the correct letters for the sounds he hears in the word. Most likely, Ms Jones would assist with trickier words such as "new" and "birthday", expecting him to only write the sounds he hears, while she fills in the harder parts. Finally, if

This book is licensed under a Creative Commons Attribution 3.0 License

"or" has become a known word at this point in lessons, she would teach him that he could add an "f" to the beginning of the word "or" to make "for". Again, this work would be done on the practice page.

- Next, the teacher takes the message and constructs a cut-up sentence from it. The child's task is to rearrange the pieces of the story to create the complete text again. As time progresses, this task becomes more challenging. The teacher starts out by cutting the story up word by word. However, across time, she may choose to cut up the words by parts, using onsets and rimes or some other means of breaking words apart.
  - Using the above story, Ms Jones would write, "I got a new bike for my birthday" on a sentence strip. Because Eric has progressed in lessons, she may cut it up the story in the following manner:

I/ got/ a/ new/ b/ike/ f/or/ my/ birthday/./

Eric would have to therefore focus his attention on putting the story back in just the right manner. After completing the task, he would re-read his story one more time in order to check for accuracy. The cut up story is then sent home in an envelope as part of his Reading Recovery homework.

- In the next part of the lesson, the teacher introduces a new text to the student. Before the lesson, the teacher chooses this book with great care and much reflection as to where the child needs to go next and what new learning should be occurring. The new text should offer some opportunities for the child to do some reading work but should not be so difficult that the reading process breaks down and the child must resort to unhelpful reading strategies. During book introduction, the teacher anticipates the "tricky parts" of the books (unfamiliar text structures or new vocabulary) and points them out as the teacher and the pupil engage in conversation surrounding the book.
  - During early lessons, Ms Jones would assist Eric by planting the repeated pattern of the text during the book introduction. She would point out that the pictures match what the text states. For example, in the book Mom, they might have the following conversation:

Ms Jones: "This is a story about the things mom is doing. On this page, "Mom is cooking" (actual text). Oh, and look, on the next page, "Mom is driving." Let's look at the next page. What is mom doing here?"

Eric: "Mom is running."

Ms Jones: "That's right. "Mom is running." And that is what the book says – "Mom is running." Let's read this page with your finger touching each word."

Eric (reading): "Mom is running."

Such a conversation would continue throughout the book. As lessons progress, Ms Jones would give similar book introductions with support that gradually fades.

- In the final lesson component, the child engages in reading the new book. During this time, the teacher praises the child's use of strategies as the student monitors his own reading and makes self-corrections. When the child requires additional support, the teacher uses precise, concise prompts, minimizing teacher talk, in order for the child to achieve success. Across lessons, the books become more challenging, and the teacher support during the new book reading gradually fades. As with writing, the child is expected to take on more of the task independently.
  - As Eric reads the above book, Mom, Ms Jones notices and records his reading behavior on her lesson record. She observes that Eric stops and checks the picture on the page where the text states, "Mom is

> sleeping." She may praise him by saying, "I like the way you checked your picture. That helped you figure out that tricky word, 'sleeping.' You made the story make sense."

As lessons progress and Eric is able to draw from a larger store of learned strategies, the teacher would no longer praise him for checking pictures, a strategy that he has well under control. Instead, she would praise him or help him with new strategy usage. For instance, during the mid-point of his program on the same day that he writes a birthday story, Eric's new book may contain the sentence, "Dad and Rachel and Lucky went to the store." When Eric finds the part of the word "store" that he knows ("or" in this case), Ms Jones praises his self-correction in this manner: "You said 'shop.' That made sense, but it didn't look right. You found the part of the word you knew, 'or', and fixed it to 'store.' You made it look right."

In their work on scaffolding, Wood and Wood (1996) do a thorough job of synthesizing a review of the literature on scaffolding in general. They point out the effective features of scaffolding that have come out of both research and practice. They state that tutors provide a "bridge" between what the child knows and what the child needs to learn. They also say that the tutor provides the structure needed to support the learner's problem solving abilities. In addition, they assert that a crucial point of scaffolding involves the learner taking an active role in the learning process from the start. Finally, they point out that the responsibility for negotiating the task gradually shifts from the tutor to the learner.

In reviewing the daily format for RR lessons above, it is evident that RR provides an excellent model for effective scaffolding. During a child's program, the RR teacher continually strives to stay on the "leading edge of the child's learning", working within a child's Zone of Proximal Development, thus providing the bridge. The tutor also provides the child with the language and prompts necessary to create his own system of metacognitive analysis. In addition, there is a gradual release of support (or fading) as lessons progress and the child develops his own problem solving system. Finally, as evidenced by even the very first "Roaming Around the Known" session, active learning is a continuous expectation for students involved in the RR program (Hobsbaum & Peters, 1996: Rodgers, 2004/2005).

Epilogue

After participating in RR, Eric successfully exited the program following 16 weeks of lessons with Ms Jones. This means that, as a first round student, he participated in 30-minute daily sessions from August until early December. At this point, Ms Jones assessed his learning again by giving him the observation survey. His growth in both reading and writing has been tremendous. On text level reading, he is now reading at level 12 both on the observation survey and within the realm of his classroom. This is just above the average level of his peers in his class. In writing, he has a core of 52 known high frequency words as evidenced by the *writing vocabulary task*. According to the *hearing and recording sounds in words t*ask, Eric can correctly identify 35 out of 37 sounds.

His teacher, Ms Smith, reports that she has seen a tremendous improvement in both behavior and time on task. Eric shows enthusiasm for schoolwork and claims that he "loves to read". Ms Smith, who once considered him a candidate for possible retention, no longer has concerns about his reading and writing ability. His parents confirm Eric's increased enthusiasm for reading and say that he even chooses to read books over other activities during free moments at home. Eric has now developed a self-extending system that will allow him to continue his reading and writing growth independent from the Reading Recovery teacher.

This book is licensed under a Creative Commons Attribution 3.0 License

While not working with him on a daily basis any longer, Ms Jones will monitor his progress in the classroom and will give the observation survey to him again at the end of the year. She should expect to see a continued trend of growth on all tasks given. This check of progress will continue throughout Eric's elementary school years. At the conclusion of each year, she will listen to him read and take a running record to make sure that he remains on grade level with his peers.

Benefits

As seen in the scenario and its conclusion, the benefits of Reading Recovery are countless. Some of the most obvious are highlighted below:

- Students who participate in the program benefit from an increase in metacognitive growth (Cox, Fang, & Schmitt, 1998).
- Students who participate in RR are less likely to be retained in first grade (Lyons & Beaver, 1995).
- Reading Recovery significantly reduces the number of referrals and placements to special education (O'Conner & Simic, 2002).
- Reading Recovery acts as a pre-referral to special education for those students who continue to need further, long-term assistance (O'Conner & Simic, 2002).

Challenges

As with any educational program, however, Reading Recovery has both its drawbacks and its vocal critics. The following is a list from Tumner and Chapman (2003) that outlines some of the potential challenges this program presents:

- Critics feel that Clay's theory of reading has shortcomings. They argue that too much emphasis is placed on meaning and not enough emphasis is place on phonological skills.
- Opponents state that text reading levels, determined by running records, are an unreliable measure of reading achievement.
- Furthermore, they believe that reading instruction should provide "at-risk" readers with less strategy learning and more direct, systematic instruction.
- Finally, critics argue that the "one-to-one" model of instruction is inefficient and costly.

Seemingly, a difference of opinion about reading instruction lies at the heart of the above anxieties. Theoretically, the Reading Recovery program best matches other chapters on scaffolding and constructivism rather than an isolated "skill and drill" model of learning to read. In other words, at the risk of an initial outlay of cost, Reading Recovery truly implements best practices as it works with struggling young readers.

Of the concerns mentioned above, opponents highlight the cost of implementation as the most pressing. Critics feel that the cost to train and employ teachers who work with only one student at a time is too great. However, when considering the alternatives of long-term remediation, retention, or placement in special education, the cost of early intervention seems insignificant. According to O'Conner and Simic (2002), Slavin states it best in the following parable about children who live in a community near a cliff.

The town has to make a decision whether to put up a fence to prevent children from falling off the cliff or place an ambulance at the bottom of the cliff to provide services only after the children have been hurt. If this situation is compared with most school policies, it becomes apparent that schools *have opted to provide the ambulance; in other words, only providing services to children after they have failed academically (p. 636).*

References

Clay, M. M. (1991). Becoming literate: The construction of inner control. Portsmouth, NH: Heinemann.

Clay, M. M. (1998). By different paths to common outcomes. York, ME: Stenhouse.

Clay, M. M. (2001). Change over time in children's literacy achievement. Portsmouth, NH: Heinemann.

Clay, M. M. (2002). An observation survey of early literacy achievement (2nd ed.). Portsmouth, NH: Heinemann.

Clay, M. M. (2005a). Literacy lessons designed for individuals part one: Why? When? and How? Portsmouth, NH: Heinemann.

Clay, M. M. (2005b). Literacy lessons designed for individuals part two: Teaching procedures. Portsmouth, NH: Heinemann.

Clay, M. M., & Cazden, C.B. (1990). A Vygotskian interpretation of Reading Recovery. In L. Moll (Ed.), Vygotsky and education (pp. 206-222). New York: Cambridge University Press.

Cox, B. E., Fang, Z., & Schmitt, M. C. (1998). At-risk children's metacognitive growth during Reading Recovery experience: A Vygotskian interpretation. Literacy Teaching and Learning 3(1), 55-76.

Cox, B. E., & Hopkins, C. J. (2006). Building on theoretical principles gleaned from Reading Recovery to inform classroom practice. Reading Research Quarterly, 41(2), 254-267.

Hobsbaum, A., & Peters, S. (1996). Scaffolding in Reading Recovery. Oxford Review of Education, 22(1), 17-35.

Lyons, C. A., & Beaver, J. (1995). Reducing retention and learning disability placement through Reading Recovery: An educationally sound cost-effective choice. In R.I. Allington & S.A. Walmsley (Eds.), No quick fix: Rethinking literacy programs in America's elementary schools (pp. 116-136). New York: Teachers College Press.

O'Connor, E. A., & Simic, O. (2002). The effect of Reading Recovery on special education referrals and placements. Psychology in the Schools, 39(6), 635-646.

Rodgers, E. M. (2004/2005). Interactions that scaffold reading performance. Journal of Literacy Research, 36(4), 501-532.

Tumner, W. E., & Chapman, J. W. (2003). The Reading Recovery approach to preventative early intervention: As good as it gets? Reading Psychology, 24, 337-360.

Wood, D., & Wood, H. (1996). Vygotsky, tutoring and learning. Oxford Review of Education, 22(1), 5-16