CHAPTER 2: LEARNING THEORIES

Overview of Learning Theories

Over the past century, educational psychologists and researchers have posited many theories to explain how individuals acquire, organize and deploy skills and knowledge. To help readers organize and apply this extensive body of literature, various authors have classified these theories in different ways. For this summary, learning theories are grouped into three basic categories:

- Behaviorist learning theories
- Cognitive-information processing learning theories
- Cognitive-constructivist learning theories

The summary ends with a brief discussion of epistemological perspectives that serve as foundations for the various theories.

Only a brief overview of extensive literature is provided to help you make informed decisions about your personal educational philosophy. If you have good working knowledge of one or more areas underlined above, feel free to scan over those sections and concentrate your attention on the areas you feel less certain. For further detail, readers are also encouraged to search for the corresponding topics in literature.

As you look over the information contained in this document, keep in mind the purpose of your reading. The immediate purpose is to generate an educational philosophy statement (that is, stating what you believe in terms of how and why people learn and what educators should do to facilitate such learning). Your goal is to define a set of quality design standards. As such, you should note concepts and statements that you believe are important for promoting learning and for designing and delivering effective instruction.

Behaviorist Learning Theories

The origins of behaviorist learning theories may be traced backed to the late 1800's and early 1900's with the formulation of "associationistic" principles of learning. The general goal was to derive elementary laws of learning and behavior that may then be extended to explain more complex situations. Inferences were tied closely to observed behavior in "lower organisms" with the belief that the laws of learning were universal and that work with laboratory animals could be extrapolated to humans. It was believed that a fundamental set of principles derived from the study of learning in a basic or "pure" form could then be applied to the broader context of learning in schools. Three experimental approaches are related to the study of associationistic learning including:

1. The use of nonsense syllables and individual words to study the association of ideas
2. The use of animals to study the association between sensations and impulses
3. The use of animals to study association and reflexology

The Association of Ideas

Following a tradition begun by Ebbinghaus (1885), researchers studied learning in terms of memory for individual items, most commonly nonsense syllables and individual words. It was assumed that understanding simpler forms of learning would lead to understanding of more complex phenomena. During this time, the predominate research methods were those of serial list learning and paired associate learning. These methods allowed researchers to study, predict, calculate and calibrate "associations" or the degree/ likelihood that a nonsense syllable or word could elicit a particular response from learners. In short, the basic premise underlying associationistic views of learning was that ideas become connected, or associated, through experience. Furthermore, the more frequently a particular association is encountered, the stronger the associative bond is assumed to be. For example, the stimulus "bread" is likely to elicit the response "butter" more often and more rapidly than the response "milk," because the association between bread and butter has been frequently experienced and thus has become well learned.

The Association between Sensations and Impulses

Like Ebbinghaus, Thorndike was also interested in studying learning in terms of associations, but in terms of actions, rather than ideas. For his research, Thorndike used animals (e.g., cats and chickens) which were placed in "puzzle boxes" and measured learning in terms of the amount of time it took for the animal to operate a latch and escape. The results led Thorndike to believe that animals learned to associate a sensation with an impulse when its action had a satisfying consequence. For instance, an animal may form an association between a sense (the interior of a box) and an impulse (operating a latch) because the action led to a satisfying result--namely, escaping the box. This principle, termed the Law of Effect, helped modify the classical principle of association and later held significant implications

for behaviorism. One of the clearest formulation of associationistic learning principles were made by Hull (1934, 1952) and Spence (1936-1956). Like Thorndike, Hull and Spence based their propositions on data from numerous experiments with laboratory animals. However, unlike Thorndike, Hull and Spence derived equations to explain different actions such as habits, drive and inhibitions. Hull (1952) was able to demonstrate that the elementary laws of learning captured in these equations could account for a number of behaviors such as trial-and-error learning and simple discrimination learning in animals.

Associationism and Reflexology

A third approach to the study of associations, led by Pavlov, brought together the principles of associationism and reflexology. Pavlov noticed that dogs salivated not only to food, but often to a variety of other stimuli, such as the sight of a trainer who brought the food. He called this response a learned reflex that is established through the association between an appropriate stimulus (food) and an inappropriate one (the trainer). In other words, a relatively neutral stimulus is associated with something that causes a response until the neutral stimulus also causes the response. This lead to an extended research program now known as classical conditioning. According to the principle of classical conditioning, an unconditioned stimulus (UCS) biologically and involuntarily elicits an unconditioned response (UCR). For example, the site of food (UCS) elicits salivation (UCR). Then, as a conditioned stimulus (trainer) becomes associated with the unconditioned stimulus (food), it (the trainer) acquires the ability to elicit the same response (salivation). Because the response is now conditioned to a new stimulus, it becomes a conditioned response (Figure 2.1).

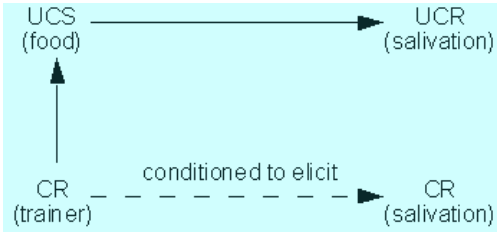

Figure 2.1: *Illustration of Classical Conditioning*

A significant problem became apparent as associationistic research continued. As experimental psychologists made finer and finer distinctions to their research on "trial and error" learning in animals and their studies of rote memory, their results appeared to be less and less relevant for education. The search for general laws that crossed all species and settings was failing. As methods were refined and experiments became more valid internally, they were becoming less valid externally. The "laws of learning" were becoming known as the "laws of animal learning," "the laws of animals learning to make choices in mazes," or the "laws of human rote memory" rather than the universal principles sought after by early associationists. However, not all associationist psychologies resulted in theoretical or applied dead-ends. The so-called radical behaviorists, led by Skinner (1938, 1953), have had a strong impact on both psychology and education.

Like early works by Watson (1924), Skinner rejected the idea that the purpose of psychology was to study consciousness, rather the goal was to predict and control observable behavior. Learners were seen as coming to learning situations tabula rasa, subject to conditioning by their environment. It was believed that by controlling the environmental antecedents and consequences for behavior, people could predict and control that behavior. In addition, by providing positive consequences for behavior and by controlling the schedule by which these consequences were delivered, behavior could be further controlled and shaped. In his research, Skinner demonstrated that laboratory animals were sensitive to manipulation of both antecedents and consequences of their actions and that simple responses, such as bar pressing and pecking, could be predicted with high confidence. Based on these observations, Skinner proposed a basic stimulus-response-stimulus (S-R-S) relationship as depicted below (Figure 2.2).

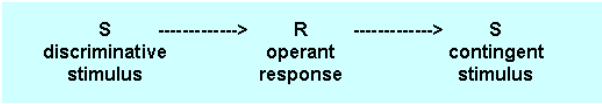

Figure 2.2: *Basic S-R-S Relationship*

In brief, the nature of the contingent stimulus is believed to determine what happens to the response, whether it is reinforced or lost. In other words, behavior is more likely to reoccur if it has been rewarded or reinforced. Similarly, a response is less likely to occur again if its consequences have been aversive. These principles are referred to as the contingencies of reinforcement which suggest that to understand learning, one must look for the change in behavior that occurred and determine what consequences were responsible for the change (Skinner, 1969). The basic S-R-S relationship provides the framework from which most behavioral learning principles and their applications for instruction and education are derived. Behavioral learning theories have contributed to instruction and education in several significant ways. The three applications summarized here include:

1. Behavior Modification
2. Classroom Management

Behavioral Modification

Also known as behavior therapy or contingency management, behavior modification is typically used to treat behavior problems in social, personal, or school situations. Some clinical applications include treatments for phobias, obsessions or eating disorders. Educational applications involve the treatment of school-related problems such as the lack of attention, hyperactivity, temper tantrums, or other behaviors that interfere with the regular workings of a classroom. Special education teachers are typically well trained in behavioral modification. In each of these instances, the S-R-S model and its resulting principles are used to shape, modify and otherwise control behavior.

Classroom Management

While behavioral therapists and special education teachers apply behavioral learning principles to address individuals, teachers in regular classrooms may use the same principles to help manage the behavior of twenty to thirty children. For instance, teachers may set up group contingencies (a standard reinforcement given to a group) for following certain rules of conduct. A kindergarten teacher, for example, may take his/her students out to the playground 10-15 minutes early if they all pick up their things. One common means of applying group contingencies that some teachers find useful is the token economy (Ayllon & Azrin, 1968). In this system, tokens serve as conditioned reinforcers that can later be exchanged for objects or privileges. Tokens are earned for good conduct--whatever behaviors have been selected by the teacher for strengthening. Since tokens operate like money, students may also be fined for breaking the rules or engaging in undesirable behavior.

Management of Instruction

Behavioral principles have proved useful, not only for managing student behavior, but also for managing the way instruction is delivered. The most prominent examples of how behavioral learning theories have been applied to the management of instruction include the development of behavioral objectives, contingency contracts, and personalized systems of instruction (PSI). Behaviorists, as well as others, argue that the only evidence of learning comes from the study of overt behaviors. How can one be sure that a student acquired knowledge or a skill unless we can see them actually do something with that knowledge or skill? Thus, to assess the degree to which a student achieved an objective, it is important to specify desired instructional outcomes in terms of clear, observable behaviors (behavioral, instructional, learning, or performance objectives). An instructional application that often makes use of both behavioral modification and instructional objectives is the contingency contract. Used with individual students, the contract sets out the terminal behavior the student is to achieve, along with the conditions for achievement and the consequences for completion (or noncompletion) of assigned tasks. Keller (1968) proposed a whole new approach to college instruction based on behavioral principles known as the personalized system of instruction (PSI). PSI calls for course materials to be broken up into units, each with a set of behavioral objectives. Students tackle course materials on their own, often aided by study guides which provide practice on unit objectives. To proceed, students are required to demonstrate mastery by taking a unit quiz. Students receive feedback immediately and if they pass, they can go on to the next unit. If they fail, they must remediate and take the quiz again, but with no penalty.

Cognitive-Information Processing Theories

No single point in time signaled the end to the associationistic or behavioral era, and the beginning of the cognitive revolution. Early on, the cognitive revolution was a quiet one. However, as psychologists became increasingly frustrated with the limitations of behavioral theory and methods, and persuasive arguments against radical behaviorist theories were being put forth by linguists studying language development, the "time was right" for the emergence of cognitivism. Another prominent factor was the development of computers (Baars, 1986), which provided both a credible metaphor for human information processing, and a significant tool for modeling and exploring human cognitive processes.

One major group of cognitive theories may be classified as cognitive-information processing learning theories. According to the cognitive information processing (CIP) view, the human learner is conceived to be a processor of information, in much the same way a computer is. When learning occurs, information is input from the environment, processed and stored in memory, and output in the form of a learned capability. Proponents of the CIP model, like behaviorists, seek to explain how the environment modifies human behavior. However, unlike behaviorists, they assume an intervening variable between the environment and behavior. That variable is the information processing system of the learner.

Most models of information processing can be traced to Atkinson and Shiffrin (1968) who proposed a multistage theory of memory in which information received by the processing system undergoes a series of transformations before it can be permanently stored in memory. This flow of information, as it is generally conceived, is depicted in Figure 2.3. Displayed in the figure are three basic components of memory (i.e., sensory memory, short-term memory, and long-term memory) along with the processes assumed to be responsible for transferring information from one stage to the next. This system provides the basic framework for all learning theories classified under the cognitive-information processing category.

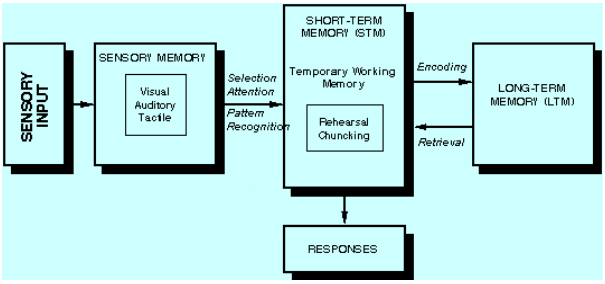

Figure 2.3: *Information Processing Model of Human Learning*

The following is a brief summary of each major component of the information-processing system and their implications for instruction.

Sensory Memory

Sensory memory represents the first stage of information processing. Associated with the senses (vision, hearing, etc.), it functions to hold information in memory very briefly, just long enough for the information to be further processed. It is believed that there is a separate sensory memory corresponding to each of the five senses, but all are assumed to operate in the same way.

Selection Attention

Selective attention refers to the learners' ability to select and process certain information while simultaneously ignoring other information. The degree to which an individual can spread their attention across two or more tasks (or sources of information) or focus on selected information within a single task depends on four factors:

1. The meaning of the task or information to the individual
2. The similarity between competing tasks or sources of information
3. Task complexity or difficulty
4. The individuals ability to control attention

Pattern Recognition

Just attending to information is not enough to ensure its further processing. Attention is believed to be necessary but not sufficient; information must be analyzed, and familiar patterns must be identified to provide a basis for further processing. Pattern recognition refers to the process whereby environmental stimuli are recognized as exemplars of concepts and principles already in sensory memory.

Short-Term Memory

Short-Term Memory (STM) functions as a temporary working memory where further processing is carried out to make information ready for long term storage or a response. At this stage, concepts from long-term memory (LTM) are also activated for making sense of the incoming information. STM or working memory has been likened to consciousness. When we actively think about ideas and are therefore conscious of them, they are said to be in working memory. STM, however, only holds a certain amount of information for a limited amount of time.

Rehearsal & Chunking

Rehearsal and chunking are two processes that may help individuals encode information into long-term memory. When you repeat a phone number to yourself over and over again, you are engaged in rehearsal. Chunking is the grouping of ideas, letters, phrases, etc. into bits of information to facilitate the encoding process. Take for example, the following span of letters: JFKFBIAIDSNASAMIT. As individual letters, they more than exceed the capacity of working memory. However, as five chunks--JFK, FBI, AIDS, NASA, and MIT--they are easily processed.

Encoding

Encoding refers to the process of relating incoming information to concepts and ideas already in long-term memory in such a way that the new material is more memorable. Encoding serves to move information from STM to LTM. There are too many studies and methods for facilitating encoding to review here in any meaningful way. In short, it is believed that individuals impose their own subjective organization to materials in order to learn them. However, techniques such as outlining, hierarchies, concept trees, mnemonics, mediation and imagery have all been shown to aid the encoding process.

Long-Term Memory

Long-term memory (LTM) represents our permanent storehouse of information. Anything that is to be remembered for a long time must be

transferred from STM to LTM. Although forgetting is a phenomenon we have all experienced, it is assumed that once information has been processed into LTM, it is never truly lost. As far as we know, LTM is capable of retaining an unlimited amount and variety of information. It has limitations in our retrieval process, that are believed to constrain our ability to remember. There are a number of different views of how information is stored in LTM including, but not limited to, schemas and mental models.

Retrieval

The process of retrieval from long-term memory is relatively simple to understand. Previously learned information is brought back to mind, either for the purposes of understanding some new input or for making a response. Using previous knowledge to understand and learn new material has already been discussed as encoding. Using previous knowledge to make a response is known as retrieval.

There are a number of alternative cognitive theories, including, but are not limited to: Levels or Depth of Processing, Meaningful Learning, Schema Theory, and Mental Models. These all relate learning with information processing, which is why they are grouped here. However, they do not necessary adhere to the CIP model as the method used by individuals to process information, or they focus on only one or a few components of the CIP model.

Cognitive-Constructivist Learning Theories

Since space limitations prevent an extensive discussion of constructivism, in addition to those cited in the following paragraphs, interested readers are referred to the works of von Glasersfeld (1989, 1981), Jonassen (1991), Marra and Jonassen (1993) and Rorty (1991). In brief, there is no single constructivist theory. Constructivist approaches to teaching and learning is grounded in several research traditions (Perkins, 1991; Paris & Byrnes, 1989).

The roots of constructivism may be traced back to a little known Latin treatise, De antiquissima Italorum sapientia, written in 1710 by Giambattista Vico (as cited in von Glasersfeld, 1991). Vico suggested that knowledge is knowing what parts something is made of, as well as knowing how they are related. "Objective, ontological reality, therefore, may be known to God, who constructed it, but not to a human being who has access only to subjective experience" (p. 31, von Glasersfeld, 1991).

A second, related path to constructivism comes from Gesalt theories of perception (Kohler, 1924) that focus on the ideas of closure, organization and continuity (Bower & Hilgard, 1981). Like Vico, Gesalt psychologists suggest that people do not interpret pieces of information separately and that cognition imposes organization on the world.

Theories of intellectual development provide a third research tradition contributing to the notion of cognitive construction (e.g. Piaget, 1952, 1969, 1971; Baldwin, 1902, 1906-1911; Bruner, 1974). Developmentalists believe that learning results from adaptations to the environment which are characterized by increasingly sophisticated methods of representing and organizing information. Developmental scientists also forward the notion that children progress through different levels or stages which allow children to construct novel representations and rules.

A fourth line of research depicts learning as a socially mediated experience where individuals construct knowledge based on interactions with their social and cultural environment. Like Piaget and Bruner, Vygotsky (1962, 1978) believed that the formation of intellect could be understood by studying the developmental process. However, like Bruner, Vygotsky felt that intellectual development could only be fully understood within the sociocultural context in which the development was occurring.

Current conceptualizations of constructivist learning focus on the 3rd (developmental) or 4th (social) line of research. The two lines of research do not represent opposing perspectives, but rather differences in focus. Where developmental-constructivist tend to focus on the individual and how he or she constructs meaning of the world around him or her, social-constructivists emphasize the group and how social interactions mediate the construction of knowledge.

The following tables, created by Bonk and Cunningham (1998) contrasts key concepts associated with developmental-constructivist and social-constructivist views of learning.

These sources provide the groundwork for constructivism applied to education. The common belief that knowledge is constructed within a social context is the foundation for this group of learning theories. No discussion of learning theories, however, is complete without examining their epistemological foundations.

Mind: The mind is in the head; hence, the learning focus in on active cognitive reorganization.

Raw Materials: Use raw or primary data sources, manipulatives, and interactive materials.

Student Autonomy: Ask students for personal theories and understandings before any instruction. Allow student thinking to drive lessons and alter instruction based on responses. Place thinking and learning responsibility in students' hands to foster ownership.

Meaningfulness and Personal Motivation: Make learning a personally relevant and meaningful behaviour. Relate learning to practical ideas and personal experiences. Adapt content based on student responses to capitalize on personal interests and motivation.

Conceptual Organization/Cognitive Framing: Organize information around concepts, problems, questions, themes, and interrelationships, while framing activities using thinking-related terminology (e.g., classify, summarize, predict).

Prior Knowledge and Misconceptions: Adapt the cognitive demands of instructional tasks to students' cognitive schemes, while building on prior knowledge. Design lessons to address students' previous misconceptions, for instance, by posing contradictions to original hypotheses and then inviting responses.

Questioning: Promote student inquiry and conjecture with open-ended questions. Also, encourage student question-asking behaviour and peer questioning (Individual Exploration).

Generating Connections: Provide time for the selection of instructional materials and the discovery of information, ideas, and relationships. Also, includes encouraging students to generate knowledge connections, metaphors, personal insights, and build their own learning products.

Self-Regulated Learning: Foster opportunity for reflection on skills used to manage and control one's learning. Help students understand and become self-aware of all aspects of one's learning, from planning to learning performance evaluation. Given the focus on individual mental activity, the importance of cooperative learning or peer interaction is in the modelling of and support for new individual metacognitive skill.

Assessment: Focus of assessment is on individual cognitive development within predefined stages. Use of authentic portfolio and performance-based measures with higher order thinking skill evaluation criteria or scoring rubrics.

Table 1: *Developmental Constructivist Practices and Principles*

Mind: The mind is located in the social interaction setting and emerges from acculturation into an established community of practice.

Authentic Problems: Learning environments should reflect real-world complexities. Allow students to explore specializations and solve real-world problems as they develop clearer interests and deeper knowledge and skills.

Team Choice and Common Interest: Build not just on individual student prior knowledge, but on common interests and experiences. Make group learning activities relevant, meaningful, and both process and product oriented. Give students and student teams choice in learning activities. Foster student and group autonomy, initiative, leadership, and active learning.

Social Dialogue and Elaboration: Use activities with multiple solutions, novelty, uncertainty, and personal interest to promote student-student and student-teacher dialogue, idea sharing and articulation of views. Seek student elaboration on and justification of their responses with discussion, interactive questioning, and group presentations.

Group Processing and Reflection: Encourage team as well as individual reflection and group processing on experiences.

Teacher Explanations, Support, and Demonstrations: Demonstrate problems steps and provide hints, prompts, and cues for successful problem completion. Provide explanations, elaborations, and clarifications where requested.

Multiple Viewpoints: Foster explanations, examples, and multiple ways of understanding a problem or difficult material. Build in a broad community of audiences beyond the instructor.

Collaboration and Negotiation: Foster student collaboration and negotiation of meaning, consensus building, joint proposals, prosocial behaviors, conflict resolution, and general social interaction.

Learning Communities: Create a classroom ethos or atmosphere wherein there is joint responsibility for learning, students are experts and have learning ownership, meaning is negotiated, and participation structures are understood and ritualized. Technology and other resource explorations might be used to facilitate idea generation and knowledge building within this community of peers. Interdisciplinary problem-based learning and thematic instruction in incorporated wherever possible.

Assessment: Focus of assessment is on team as well as individual participation in socially organized practices and interactions. Educational standards are socially negotiated. Embed assessment in authentic, real-world tasks and problems with challenges and options. Focus on collaboration, group processing, teamwork, and sharing of findings. Assessment is continual, less, formal, subjective, collaborative, and cumulative.

Table 2: *Social Constructivistic Practices and Principles*

Summary of Epistomological Beliefs

Over the past century, social psychologists have taken a number of alternative approaches to explain how the mind acquires knowledge. One extreme is characterized by an objectivist (positivist, logical empiricism) epistomology that suggests that reality is external to individuals and is based on natural laws, physical properties and their relationships. Objectivists believe that the mind processes symbols and mirrors reality, and that thought is governed by, and reflects external reality. Objectivists believe that meaning is external to and independent of the understanding of individuals. The polar opposite of objectivism is interpretivism (constructivist, subjectivist).

Interpretists believe that knowledge is constructed. The mind interprets sensory data and organizes it through active and dynamic processes according to innate perceptual categories such as numerosity and animacy. Furthermore, interpretists emphasize concepts, such as perceptual relations (Gibson, 1966) and the structure of language (Chomsky, 1965) that are imposed upon the world by individuals. Interpretists believe that reality is internal to the organism and that meaning is dependent on individual understanding. An alternative to both objectivism and interpretivism is pragmatism (Driscoll, 1994).

Pragmatists also believe that reality is "constructed." However, the meaning derived by individuals are believed to be negotiated within a social context. Unlike interpretists, pragmatists believe that individuals' reality is mediated by their prior knowledge structures and their interactions with the environment and with others. They believe that the mind builds symbols and interprets nature, and that thought is governed by individuals' perceptions that reflect their internal reality. Pragmatists believe that meaning is constructed by individuals based on their interpretation and understanding of reality. A further comparison of objectivism, pragmatism and interpretivism (Driscoll, 1994) is given here (Table 3).

For more extensive discussions of epistemological beliefs, interested readers are referred to the works of von Glasersfeld (1989, 1981), House (1980, 1983a, 1983b), Jonassen (1994, 1991), Lebow (1993) and Rorty (1991) among others.

What is the relation with Design Standards?

Distance education programs are grounded on research and theory in four basic foundations:

1. Psychological Foundation
2. Instructional Foundation
3. Technological Foundation
4. General Systems Foundation

Based on findings and key concepts associated with each of the four foundations, various sets of design standards that can be used to help guide the development of on-line coursework and distance education programs, have been generated.

Psychological Foundations

Psychological foundations reflect views on how individuals acquire, organize and deploy skills and knowledge. Some of the conclusions are:

1. DE students need to be active participants in the planning and evaluation of their learning
2. Experiences (including mistakes) form the bases for knowledge construction
3. DE students are most interested in learning subjects that have immediate relevance to their job or personal life
4. DE students' learning is problem centered rather than content-oriented
5. DE students prefer to build on prior learning and experience

Moreover, it is generally believed, in contrast to constructivist or positivist epistemologies, that there is a true reality that is external to, but can not be known directly by humans. Knowledge, however, is thought to be provisional, not absolute. It is considered that reality is "constructed" and that meaning derived by individuals is negotiated within a social context. An individual's reality is mediated by his or her prior knowledge structures and interactions with the environment and with others. It is believed that the mind builds symbols and interprets nature, and that thought is governed by an individual's perception that reflects his or her internal reality. Therefore, DE students are presented with a range of learner-centered and teacher-directed methods based on the desired learning outcomes, learners' prior knowledge and experience, and each faculty member's strengths and beliefs.

Learner-centered methods are best suited for facilitating learning of higher-order thinking skills and when students have prior knowledge of and/or experience with the subject matter. In comparison, teacher-directed methods are appropriate when teaching well defined sets of procedures and when dealing with novice learners who are totally unfamiliar with the content or instructional strategies. Furthermore, in several cases, a combination of these strategies may be

applied successfully within a course, as well as across courses within a program of study.

However, some argue against the use of an eclectic approach (e.g., designing instruction from multiple theoretical perspectives) because it is said to strip concepts, strategies and tools of meaning and utility. "Problems arise ... when tools developing in the service of one epistemology are integrated within instructional systems designed to promote learning goals inconsistent with it" (Bonk & Cunningham, 1998, p. 25).

In contrary, others feel that an eclectic approach based on a pragmatist epistemology is appropriate for the design and delivery of on-line instruction for a number of reasons:

- Different theories have their own strengths and weaknesses, and continue to evolve. We should not totally discard one just because something new is trendy. For example, behaviorist theories of human learning are not necessary wrong, but rather fail to explain certain phenomenon. Thus, cognitive information processing and cognitive constructivist theories have developed to explain a greater degree of variance. Behaviorist theories, however, still clarify certain behaviors quite well. Thus, one could utilize the strengths of different approaches when appropriate.
- Instructional strategies should be based on desired learning outcome and learners' prior knowledge, experience and interests. For example, when teaching basic procedures (simple algorithms), direct instruction may be more efficient and appropriate than social-constructivist approaches to teaching and learning. In contrast, when the primary learning objective is to have students' critically analyze, interpret and apply an ill defined body of research, constructivist approaches may be more appropriate than teacher-directed methods.
- Students differ in terms of learning requirements and preferred learning methods. To reach and satisfy as many students as possible, different approaches should be utilized when appropriate.
- Like students, instructors have their own strengths, weaknesses and beliefs. Therefore, instructors should also be able to apply what is best suited to their teaching and management style.
- Things change. We must stay abreast of changes, remain flexible and adapt our approaches accordingly to accommodate these changes.
- There is no one set of principles or single theory that explains everything related to human learning and behavior. In other words, there is no panacea. Therefore, we should not limit ourselves to one particular theory, model or approach. Rather, we should be working toward understanding the context and conditions for which different methods and means are best suited.
- The real proof, that either validates or refutes arguments for or against eclectic models of instruction, lie in student test scores and work samples, as well as attitude, motivation and satisfaction measures. Theoretical and conceptual arguments are interesting, particularly for academics and theoreticians, but for students, if multiple methods and means from differing theoretical perspectives results in positive attitudes, motivation, learning and performance it would be difficult to argue against an eclectic approach from a pragmatic standpoint.

Instructional Foundation

Instruction emphasizes how information is conveyed to learners and focus on the activities, methods, and structures of the environment that are designed to facilitated learning. Principles associated with student-centered learning, situated cognition and performance assessments form the basic instructional foundations.

Student-Centered Learning

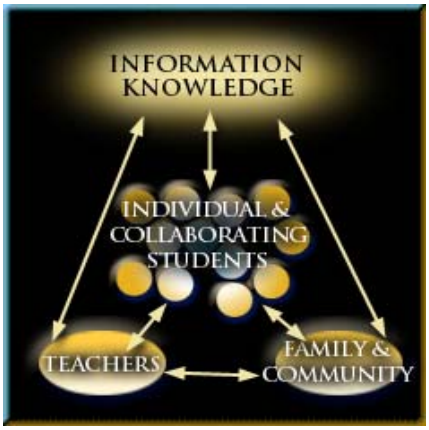

Figure 2.4: *Student centered learning environment.*

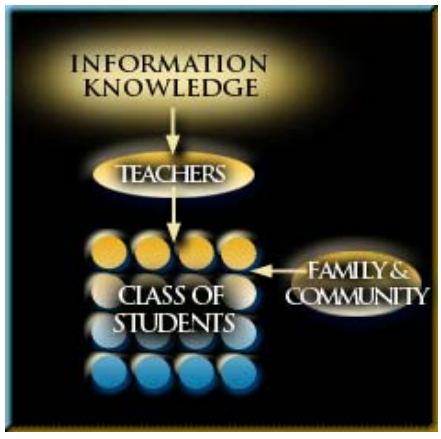

Figure 2.5: *Teacher centered learning environment.*

Figures 2.4 and 2.5 illustrate both student-centered and teacher-centered models of instruction. Under the traditional teacher-centered approach, teachers serve as the center for epistemological authority, directing the learning process and controlling students' access to information. This model evolved to increase the number of students receiving instruction from an instructor; a necessity during the agricultural and industrial eras. Under this paradigm, students are treated as "empty vessels" and learning is viewed as an additive process with new information that is geared to the "average" students is simply added on top of existing knowledge and everyone is forced to progress at the same pace. Family and community members may contribute to student learning, but rarely in any systematic fashion.

Research, however, indicates that students are not empty vessels. They come to class with their own perceptual frameworks and learn in different ways. Learning is no longer viewed as a passive process where static bodies of facts and formulas are passed along to the uninitiated. Rather, learning is an active, dynamic process in which connections are constantly changing and the structure is continually reformatted. In short, students construct their own meaning by talking, listening, writing, reading, and reflecting on content, ideas, issues and concerns. In student-centered environments, learners are given direct access to the knowledge base and work individually and in small groups to solve authentic problems. In such environments, parents and community members also have direct access to teachers and the knowledge base, playing an integral role in schooling process.

Situated cognition suggests that learning is determined by both contextual and human factors. For knowledge to be useful, it is believed that learning must be situated in authentic tasks to enable transfer to similar situations. In short, instruction should be embedded in real-life contexts, and address issues that are familiar to students, and are relevant to their needs and interests. DE providers "situate" learning by asking students to apply learned skills and knowledge, develop work samples and complete course assignments that are based on problems confronted at their work setting.

Performance Assessment

Concepts associated with performance assessment represent the final basic instructional foundation. Performance assessments differ from conventional paper and pencil tests in two key respects. First, unlike conventional measures that tend to evaluate students' possession of knowledge, performance assessments judge students' ability to apply knowledge. Second, performance assessments are used as an integral part of learning. Rather than sorting students, such assessments tell students and their instructors how well they are developing their skills and knowledge and what they need to do to develop them further. This provides students with profiles of their emerging skills to help them become increasingly independent learners. The majority of DE courses are project-based, asking students to demonstrate their achievement of course standards by applying learned skills and knowledge. Efforts are also concentrated in place to design, implement and evaluate a program wide portfolio assessment system.

Situated Cognition

	Objectivism	**Pragmatism**	**Interpretivism**
Assumptions about reality	Reality is objective, singular, fragmentable	Reality is interpreted, negotiated, consensual	Reality is constructed, multiple, holistic
Nature of truth statements	Generalizations, laws, focus on similarities	Working hypotheses, focus on similarities and differences	Working hypotheses, focus on differences
Sources of knowledge	Experience	Experience and reason	Reason
Types of research designs	Experimental, a priori	Any design may be useful for illuminating different aspects of reality	Naturalistic, emergent
Associated learning and instructional theories	Behaviorism, Cognitive information processing, Gagne instructional theory	Educational semiotics, Bruner's and Vygotsky's views of learning and development	Piaget's developmental theory, radical constructivism

Table 3: *Comparisons of Objectivism, Pragmatism and Interpretivism*