

# Reflections on Behaviorism, Cognitive Information Processing, and Constructivism in Distance Learning

## *Introduction*

This paper introduces the three predominant theories of learning and instruction – behaviorism, cognitive information processing, and constructivism. Each is discussed briefly to provide a foundation for the remainder of the paper which evaluates each theory from the perspective of an instructional designer for distance learning.

## *Major Learning Theories*

### **Behaviorism**

Behaviorism is characterized by a focus on observable behavior in response to environmental stimuli.

**Respondent behavior** is an involuntarily response to either conditioned or unconditioned stimuli, as Pavlov showed in his **classical conditioning** experiments in which he evoked respondent behavior by presenting an unconditioned stimulus, both neutral and unconditioned stimuli, and finally the neutral stimulus alone to which the subject was then conditioned to respond. Operant behavior is under the control of the individual and recurs depending on the consequences of that behavior, as Skinner showed in his **operant conditioning** experiments. Operant behaviors are strengthened by consequences of **positive and negative reinforcement** and weakened by consequences of **punishment** and reinforcement removal. There is no consideration of mental states, cognitive processes, or motivation -- only behavior that can be observed and measured.

### **Cognitive Information Processing**

Cognitive information processing is based on a computer **information processing model**. The learner, from a cognitivist's viewpoint, receives information through the senses, and stores it in **short-term memory**, using the processes of **chunking** or **rehearsal**. In order for the information to be available in the long term, it must be transferred to **long-term memory** through an **encoding** process by which the new information is related to prior knowledge resulting in knowledge persistence and **meaningful learning**. Cognitive information processing is concerned with the actual structures that are constructed in memory to store, organize, and aid in the retrieval of the information. **Metacognition**, which is an awareness of the structures and processes involved, is also important principle in cognitive information processing learning theory that affects learning.

### **Constructivism**

Constructivism is based on the assumption that knowledge is constructed by the learner based on the learner's experiences and unique frame of reference. While both behaviorism and cognitive information processing follow the epistemological tenets of **objectivism**, constructivism is solidly grounded in **interpretivism**. While constructivists recognize the processes by which learners create mental structures, these structures are the result of active learning, are unique to the individual, and do not necessarily reflect an external reality. Due to this

recognition of multiple perspectives, constructivists believe that higher-order thinking comes about as a result of **social negotiation** and **collaborative learning** by which ideas and viewpoints are shared, resulting in a transformation of the individual's internal representation of knowledge. Constructivism encourages exposure to multiple perspectives and multiple modes of learning and knowledge representation in a complex, meaningful learning environment. Learning is more student-centered than teacher-centered, resulting in a higher degree of ownership by the learner and an awareness of his or her own knowledge construction process.

### ***Learning Theories from a Distance Learning Instructional Design Perspective***

#### **Behaviorism**

Whether one is developing face-to-face instruction or distance learning, most instructional design models commonly used today are variations of the ADDIE approach (analysis, design, development, implementation, and evaluation). This model is based on behaviorism, with measurable objectives developed for which instruction is designed and against which student performance is measured. This emphasis on behaviorism has its advantages in a distance learning environment.

When designing distance learning, it is often desirable for objectives and expectations to be stated up front. Distance students, even though they tend to be fairly self-motivated and self-directed, still want to know what they can expect to learn from a given instructional unit and how mastery can be assessed. Clear, well-defined objectives help a distance student identify what is to be learned, and can be a type of learner-instructor interaction in which the instructor is communicating the learning goals to the student, or learner-content interaction where the instructional objectives are part of the course content.

Reinforcement of certain types of behavior (or learning) can also be facilitated in a distance environment. In modern distance learning environments, the student is usually interacting with a computer system, either locally or remotely. The student can often work at his or her own pace and can receive immediate feedback to reinforce learning. An instructional designer can design the courseware in such a way that the student's mastery of the material is assessed as the learner moves through the instruction, with frequent positive feedback provided to reinforce the learning and remedial instruction provided when mastery is not achieved, resulting in individualized instruction. In addition, learner-instructor and learner-learner interaction through electronic means should be designed into the instruction to provide learners with the reinforcement and feedback as they move through the instruction. (Note that in some distance environments this can be a challenge.)

But a pure behaviorist approach has its drawbacks in a distance environment as well. Since a behaviorist approach assumes a "right" answer – the correct response elicited by the presentation of a stimulus – it does not adequately address the acquisition of higher-level critical thinking skills and problem-solving. While this is as true

in the face-to-face environment as the distance learning environment, there is a tendency when designing instruction in some distance environments to focus on the types of learning that can be automatically assessed by a computer, like drill-and-practice, matching, multiple choice, true/false, and fill-in-the-blank questions.

### **Cognitive Information Processing**

Cognitive information processing, with its focus on how knowledge is received, processed, stored, and retrieved, has a lot insight to offer distance learning instructional designers. Starting with sensory input, it is important to recognize that the distance instruction can and often should be both auditory and visual, with audio narration used to elaborate and explain visual input without overloading the learner's sensory input.

As information is stored in the learner's short-term memory, it is important for the instructional designer to recognize the limitations of short-term memory. The content should be designed in such a way that the learner's attention is focused on the important points and not distracted or overloaded by extraneous information on the computer screen or in the audio narration.

By understanding how information is transferred from short-term memory to long-term memory, the instructional designer can organize the instruction to facilitate meaningful learning, using techniques such as advance organizers or schema signals to relate the information to be learned to knowledge that already exists in the learner's long-term memory. In a web-based distance learning environment, hypertext links can be used to actually connect the new concepts to related prerequisite information to help activate prior knowledge.

With an understanding of cognition and cognitive skills, instructional designers can use computer technology in a distance learning environment to enhance the learning experience. Recognizing that some learners are visual learners, graphics and video can be used to convey information. Recognizing that other learners are auditory learners, sound and narration can be used for effective learning. In addition, the computer can be used way to teach higher-level skills like reasoning and problem-solving. Artificial intelligence programs (expert systems) can be used as examples of how complex problems can be solved through reasoning, explicitly modeling problem-solving skills and knowledge representation, resulting in learning how to solve problems, but also an awareness of learning process (metacognition).

But the remote nature of distance learning can be a problem for instructional designers. The analysis phase of the ADDIE process, for example, often includes analysis based on cognitivism. Cognitive tasks are analyzed to determine the tasks and subtasks, the learners are analyzed to determine the best way to design the instruction so that the information is more easily assimilated, and the learning and performance environment is analyzed to determine any barriers or limitations that would restrict meaningful learning. But in a distance

environment, the learner population may not be easily identifiable or accessible and the learning environment is varied and often unknown.

### **Constructivism**

Constructivism offers the most opportunity and the biggest challenges to the designer of distance learning. The use of hypertext in a web-based distance learning environment allows for learner control over the sequencing of instruction, with information connected and accessed in a web rather than in a linear fashion. This allows the instruction to be tailored by the learner to the learner's needs. But it also allows the learner to be "lost in cyberspace" as he or she clicks through the vast web of information available on the Internet.

But this vast web of information also supports exposure to multiple perspectives and the juxtaposition of instruction content that is important in constructivist theory. An instructional designer can judiciously draw upon the variety of information available on the Internet and other electronic sources, providing multiple viewpoints and ideas as well as multiple modes of representation. The learner-content interaction can be rich and varied, especially when multimedia presentation of information is employed in the instructional design.

The constructivist principles of social negotiation and collaborative learning can be a challenge in a distance learning environment where the instructors and students are all remote from one another. The instructional design must include opportunities for the exchange of ideas to replace the natural, face-to-face interaction that normally takes place in a classroom. Technologies such as email, discussion boards, instant messaging, chat rooms, and teleconferencing or voice over IP can all be used to facilitate collaboration.

The slightly impersonal nature of collaboration in a distance environment, however, may be advantageous to some distance learners who are uncomfortable speaking up in a classroom environment or who may avoid the somewhat confrontational nature of social negotiation. Collaboration in a distance learning environment, if designed well, can also lead to more thoughtful interaction between the participants, especially in an asynchronous environment where the learners can take the time compose their thoughts and express themselves fully and accurately.

### **Conclusion**

All three learning theories can contribute to the instructional design of distance learning. Distance learning has many different forms and meets many different needs, so there is no "one size fits all" approach, whether one is talking about applicable learning theory or instructional design. Because learners and learning environments can vary so much in distance learning, a hybrid approach that combines behaviorist, cognitivist, and constructivist theory to meet the learner's needs while using technology to its best advantage in a distance environment seems like the best approach.