Educational Theory Comparison & Analysis: Behaviorism and Information
Processing Theory

Jamie Cyphers
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Abstract

The purpose of this analysis is to compare two prominent theories in the field of educational psychology - Behaviorism and Information Processing. I hope to accomplish this by looking at history, principles, and practitioners of each theory, and, more specifically, by looking at conditioning theories and the Gestalt theory and review methods of application in educational settings today.

Educational Theory: Comparison & Analysis

Behaviorism & Information Processing

As an educator, it is imperative to have a clear understanding of educational theory and practices in order to become an effective instructor. These theories and practices are rooted in educational psychology and the study of human learning processes and are essential to creating successful learning environments. This comparative analysis will look at the history, principles, and practitioners of two prominent theories in the field of educational psychology - Behaviorism and Information Processing - , and, more specifically, at conditioning theories and the Gestalt theory and review methods of application in educational settings today. The analysis of Behaviorism and Information Processing will also help lay the foundation for the development of my own personal theory of teaching and learning and will have far-reaching effects on my instructional practices well beyond the scope of this research essay.

Behaviorism

Simply put, Behaviorism is the scientific study of human behavior. Breaking against the standing schools of thought at the time, behaviorism became prominent in the early 20$^{\text{th}}$ century. John Watson, or "the father of modern behaviorism" (Schunk, 2012), held the belief that it was entirely possible to apply scientific principles to the study of human behavior. Ivan Pavlov's conditioning model was a major influence on Watson's idea that behavior was both observable and measurable and contributed to Watson's belief that these same principles could also account for "diverse forms of learning" (Schunk, 2012).How does this apply to education and the process of learning? Behaviorist techniques are not only used to promote desirable behavior and discourage undesirable behavior, but also have many practical classroom applications

(Standridge, 2002). While Watson's work didn't relate specifically to education, his focus on the importance of environment can be seen in conditioning theories of learning that are still prominent in education today.

Specifically, conditioning theories "explained learning in terms of environmental events" and believed that "mental processes were not necessary to explain the acquisition, maintenance, and generalization of behavior" (Schunk, 2012). While most theorists now believe that these ideas do not provide an accurate picture of the human learning process, conditioning theory principles can be observed in various aspects of teaching and learning today. Historically, the most influential conditioning theorists are Edward Thorndike, Ivan Pavlov, Edwin Guthrie, and B.F. Skinner. Although the theories developed by Thorndike, Pavlov, Guthrie, and Skinner are very different, they "each view learning as a process of forming associations between stimulus and responses" (Schunk, 2012).

Thorndike's theory of learning, connectionism, states "the most fundamental type of learning involves the forming of associations (*connections*) between sensory experiences (perceptions of stimuli or events) and neural impulses (responses) that manifest themselves behaviorally" (Schunk, 2012). This assumption was expressed in Thorndike's *Laws of Exercise and Effect* which states that "the idea that a response that is followed by satisfaction is more likely to occur in the future under the same circumstances, and a response that is followed by dissatisfaction is less likely to occur" (Mayer, 2003). In essence, learning boils down to "strengthening and weakening of associations between a stimulus(S) and a response(R) through a process of reward and punishment" (Mayer, 2003). Although Thorndike eventually revised these laws to accommodate the assumption that learning occurred slowly based on trial and error when

he discovered that they were not supported by research, he provided valuable contributions in education that influenced principles of teaching and curriculum development.

Russian physiologist Ivan Pavlov is best known for his work on classical conditioning. During his work on animals' digestive system response, Pavlov noticed that "dogs often would salivate at the sight of the attendant bringing them food or even at the sound of the attendant's footsteps" (Schunk, 2012). As the attendant was not a normal stimulus for triggering salivation, Pavlov determined that the dog associated the attendant with food which, in turn, caused the salivary response. Based on these observations, "Pavlov realized ... it was, nevertheless, an observable response to stimuli (Pavlov, 1903/1951c) that revealed the brain's neural processes" (Windholz, 1997). This led to the development of Pavlov's classical conditioning, a multistep method where an unconditioned stimulus is presented and elicits an unconditioned response. While the majority of Pavlov's experimentation was on animals, classical conditioning principles are certainly applicable to humans and still have many classroom implications today.

Edwin Guthrie, in contrast to Thorndike, developed the contiguous conditioning theory which stressed "contiguity of stimulus and response instead of the impact of reward" (Asher, 2003) and established learning principles based on associations. These principles were centered on key behaviors called acts and movements and applied specifically to learning and memory. In contiguity theory, the idea is that behavior in a specific situation will be repeated when that same situation reoccurs. Guthrie believed the key to learning was through the close pairing of between stimulus and response (Schunk, 2012). As Guthrie's theory doesn't account for the cognitive process, contiguous conditioning isn't considered viable in today's classroom setting; however, contiguity is very much a central feature of school learning (Schunk, 2012).

While the work of Thorndike, Pavlov, and Guthrie had a huge impact on the advancement of behaviorism in learning, B.F. Skinner's operant conditioning theory is arguably the most well-known. Skinner developed his operant conditioning model in the 1930s and based his assumptions on the idea that behavior could be strengthened through reinforcement. Skinner's theory claims "if the occurrence of an operant is followed by presentation of a reinforcing stimulus, the strength is increased....If the occurrence of an operant already strengthened through conditioning is not followed by the reinforcing stimulus, the strength is decreased" (as cited in Schunk, 2012). Essentially, in operant learning, success and failure are tied directly to reinforcement and punishment; reinforcers increase behavior and punishers suppress behavior (Baum, 2005).   Like previously discussed conditioning theories, Skinner's operant conditioning theory does not provide an accurate picture of human learning due to lack of inclusion of cognitive processes. In spite of this, operant conditioning principles are still being applied to enhance teaching and learning (Schunk, 2012).

As today's educator is concerned with the cognitive processes involved in learning, are conditioning theories still relevant in the 21st century classroom? The answer is a resounding yes! As a developmental writing instructor, one of the most important aspects of the writing process is feedback. The feedback (both positive and negative) I provide students helps them determine how to revise and edit their work and helps reinforce good writing habits. In a developmental reading course I teach, principles of behaviorism are enacted through mastery learning and programmed instruction. The course relies on programmed instruction to deliver course content, instruction, and assessment. A mastery learning approach allows students to progress through the programmed instruction model at his or her own pace. I function primarily as a facilitator. During my undergraduate work, I worked with several students with IEPs (or individualized

education program). Those IEPs demonstrated principles of behaviorism in that they outlined clear, specific measurable behavioral goals. Although behaviorism does not allow for cognitive processes in learning, the principles are still applicable in classrooms today.

Information Processing Theory

Information Processing Theory is a cognitive approach that became dominant in psychology in the early 1950s and 1960s. According to Schunk, "there is no one dominant theory" (Schraw, 2009) that defines information processing, but there are several basic assumptions that most theorists agree on. First, humans are seen as "active learners rather than they are passive receivers" (Ozel, 2009). Second, information processing happens in stages. Third, the learning process is similar to how a computer processes information: input, process, and output. And finally, theorists believe that information processing is a part of all cognitive activities (Schunk, 2012). Despite the many differences between information processing theories, most focus on how individuals deal with environmental features, memory storage and retrieval, and knowledge organization. Technological advances have also played an important role in the development of information processing models.

As information processing theory is used as a blanket term for theories "dealing with the sequence and execution of cognitive events" (Schunk, 2012), chasing down a single idea or model to represent the theory was extremely difficult. Research led to copious amounts of information that seemed to lack a cohesive, unifying example. After reviewing my research material, I chose three models to review based on nothing more than my own personal interest. The two-store model is concerned with three specific types of memory – sensory, working, and long-term – and the process stages involved with learning. Robert Mills Gagne's theory of

cumulative learning revolved around intellectual skills and a hierarchy of learning. The Gestalt

theory model focuses on meaningful perception and principles of organization. Despite the

relevance of all three models to classroom practices, I was especially interested in the Gestalt

theory model and how it plays into my future work in instructional technology.

The two-store model looks at learning as it occurs in three memory stages. First, a

stimulus affects the senses. From there, the sensory input is received and is assigned meaning.

The information attached to the input is then transferred to short-term, or working, memory. That

information remains in limbo until related knowledge has been pulled from long-term memory.

Once this occurs, the existing knowledge is combined with the new information (Schunk, 2012).

The whole process occurs very quickly and efficiently. Despite the efficiency, there are

limitations to the amount of information working memory can hold, and theorists are concerned

the model is not specific enough about how some of the processes occur during each memory

stage.

Robert Mills Gagne's theory of cumulative learning is "based on the premise that new

learning depends primarily on combining previously acquired and recalled learned entities, as

well as other on their potentialities for transfer of learning" (as cited in Ertmer, Driscoll, &

Wager, 2003). Gagne believed that unless an individual was able to recall prerequisite skills (or

knowledge) it would be impossible for that individual to learn a new task. He created and

organized a hierarchy of intellectual skills that explained what "which types of skills were

prerequisites for which other types of skills" (Ertmer, Driscoll, & Wager, 2003). There are five

steps in Gagne's hierarchy: discriminations, concrete concepts, defined concepts, rule using, and

problem solving. While Gagne's principles play a major role in my classroom practices now and

will continue to do so as I work towards becoming a professional in the field of instructional

technology and design, I am most intrigued in how the Gestalt theory will factor into course and web design.

Gestalt psychology is rooted in 1920s European psychology and makes that assumption that "objects or events are viewed as organized wholes" (Schunk, 2012). This assumption relates to information processing in that it focuses on the organization of an individual's perception of environmental features and stresses the importance of viewing stimuli as more than just a sum of its parts. Gestalt theorists believe that the human "visual system automatically imposes structure on visual input and is wired to perceive whole shapes" (Johnson, 2010). It was this belief that led to the development of Gestalt principles of visual perception: proximity, similarity, continuity, closure, symmetry, figure/ground, and common fate (Johnson, 2010). These principles are invaluable, I discovered, in web and user interface design.

In my opinion, each of the information processing models discussed has practical applications in classroom settings. In my writing classroom, I apply information processing principles through the use of instructional strategies like guided discover, advanced organizers, chunking, and verbal cues. Gagne's principles have also been a major influence on how I design my courses and instructional material. In my Instructional Technology coursework, I have applied Gestalt principles of visual perception to the design and development of a professional web portfolio. I have also used those same principles as a tool for web design evaluation and usability testing.

Analysis

Behaviorism and Information Processing Theory are two very different schools of thought. Behaviorism focuses on stimulus and response, the influence of external factors on learning, and   methods of reinforcement, punishment, and reward. Information processing focuses on prior knowledge and the influence of internal factors on learning. While information processing takes cognitive processes into account, behaviorism is concerned with behaviors that can be observed or measured. Both perspectives agree on the importance of associations in learning, they just have differing opinions on why those associations are important. Both perspectives are concerned with human behavior, but, again, they have differing opinions on what aspects matter in terms of learning.

Personal Reflection on Teaching and Learning

I have been teaching part time for almost five years. In those five years, my methods and ideas have continued to evolve. I do not think it is possible to be an effective instructor by remaining static in ideology or methodology. With that in mind, I have given considerable thought to how I feel about each of these theories and what their implications are in terms of my classroom practices. There are aspects of each theory I agree with. I believe reinforcement in the classroom is essential, so learners are fully aware during the learning process. I also believe cognitive processes are huge factors in the learning process and make accommodations for those processes regularly through content and instruction modifications.

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