

Learning Theories

Learning theories provide a pedagogical/andragogical basis for understanding how our students learn. As [McLeod](#) notes, "Each theoretical perspective offers benefits to designers but the perspectives must be taken into context depending upon the situation, performance goal(s), and learners. And since the context in which the learning takes place can be dynamic and multi-dimensional, some combination of the three learning theories and perhaps others should be considered and incorporated into the instructional design process to provide optimal learning."

| Comparisons Among Learning Theories | | | |
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| | Behaviorism | Cognitivism | Constructivism |
| List of Key Theorists | B.F. Skinner Ivan Pavlov Edward Thorndike John B. Watson | Jean Piaget Robert Gagne Lev Vygotsky | John Dewey Jerome Bruner Merrill Lev Vygotsky Seymour Papert |
| Role of Learners | <ul style="list-style-type: none"> · Learners are basically passive, just responding to stimuli | <ul style="list-style-type: none"> · Learners process, store, and retrieve information for later use—creating associations and creating a knowledge set useful for living. The learner uses the information processing approach to transfer and assimilate new information. | <ul style="list-style-type: none"> · Learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge, social interactions, and motivation affect the construction. |
| Role of Teachers | <ul style="list-style-type: none"> · Instructor designs the learning environment. · Instructor shapes child's behavior by positive/ negative reinforcement · Teacher presents the information and then students demonstrate that they understand the material. Students are assessed primarily through tests. | <ul style="list-style-type: none"> · Instructor manages problem solving and structured search activities, especially with group learning strategies. · Instructor provides opportunities for students to connect new information to schema. | <ul style="list-style-type: none"> · Educators focus on making connections between facts and fostering new understanding in students. Instructors tailor their teaching strategies to student responses and encourage students to analyze, interpret, and predict information. Teachers also rely heavily on open-ended questions and promote extensive dialogue among students. · Constructivism calls for the elimination of a standardized curriculum. Instead, it promotes using curricula customized to the students' prior knowledge. Also, it emphasizes hands-on problem solving. |

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| <p>Key Concepts</p> | <p>Behaviorism is a theory of animal and human learning that only focuses on objectively observable behaviors and discounts mental activities. Behavior theorists define learning as nothing more than the acquisition of new behavior.</p> <p>Experiments by behaviorists identify conditioning as a universal learning process. There are two different types of conditioning, each yielding a different behavioral pattern:</p> <ol style="list-style-type: none"> 1. Classic conditioning occurs when a natural reflex responds to a stimulus. The most popular example is Pavlov's observation that dogs salivate when they eat or even see food. Essentially, animals and people are biologically "wired" so that a certain stimulus will produce a specific response. 2. Behavioral or operant conditioning occurs when a response to a stimulus is reinforced. Basically, operant conditioning is a simple feedback system: If a reward or reinforcement follows the response to a stimulus, then the response becomes more probable in the future. For example, leading behaviorist B.F. Skinner used reinforcement techniques to teach pigeons to dance and | <p>Cognitivism focuses on the "brain". How humans process and store information was very important in the process of learning.</p> <ul style="list-style-type: none"> · Schema - An internal knowledge structure. New information is compared to existing cognitive structures called "schema". Schema may be combined, extended or altered to accommodate new information. · Three-Stage Information Processing Model - input first enters a sensory register, then is processed in short-term memory, and then is transferred to long-term memory for storage and retrieval. <ul style="list-style-type: none"> o Sensory Register - receives input from senses which lasts from less than a second to four seconds and then disappears through decay or replacement. Much of the information never reaches short term memory but all information is monitored at some level and acted upon if necessary. o Short-Term Memory (STM) - sensory input that is important or interesting is transferred from the sensory register to the STM. Memory can be retained here for up to 20 seconds or more if rehearsed repeatedly. Short-term memory can hold up to 7 plus or minus 2 items. STM capacity can be increased if material is chunked into meaningful parts. o Long-Term Memory and Storage (LTM) - stores information from STM for long term use. Long-term memory has unlimited capacity. Some materials are "forced" into LTM by rote memorization and over learning. Deeper levels of processing such as generating linkages between old and new information are much better for successful retention of material. · Meaningful Effects - Meaningful information is easier to learn and remember. If a learner links relatively meaningless information with prior | <p>Constructivism focuses on how learners construct their own meaning. They ask questions, develop answers and interact and interpret the environment. By doing these things, they incorporate new knowledge with prior knowledge to create new meanings.</p> <ol style="list-style-type: none"> 1. Multiple perspectives and representations of concepts and content are presented and encouraged. 2. Goals and objectives are derived by the student or in negotiation with the teacher or system. 3. Teachers serve in the role of guides, monitors, coaches, tutors and facilitators. 4. Activities, opportunities, tools and environments are provided to encourage metacognition, self-analysis -regulation, - reflection & -awareness. 5. The student plays a central role in mediating and controlling learning. 6. Learning situations, environments, skills, content and tasks are relevant, realistic, authentic and represent the natural complexities of the 'real world'. 7. Primary sources of data are used in order to ensure authenticity and real-world complexity. 8. Knowledge construction and not reproduction is emphasized. 9. This construction takes place in individual contexts and through social negotiation, collaboration and experience. 10. The learner's previous knowledge constructions, beliefs and attitudes are considered in the knowledge construction process. 11. Problem-solving, higher-order thinking |
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| | <p>bowl a ball in a mini-alley.</p> | <p>schema it will be easier to retain.</p> <ul style="list-style-type: none"> · Serial Position Effects - It is easier to remember items from the beginning or end of a list rather than those in the middle of the list, unless that item is distinctly different. · Practice Effects - Practicing or rehearsing improves retention especially when it is distributed practice. By distributing practices the learner associates the material with many different contexts rather than the one context afforded by mass practice. · Transfer Effects - The effects of prior learning on learning new tasks or material. · Interference Effects - Occurs when prior learning interferes with the learning of new material. · Organization Effects - When a learner categorizes input such as a grocery list, it is easier to remember. · Levels of Processing Effects - Words may be processed at a low-level sensory analysis of their physical characteristics to high-level semantic analysis of their meaning. The more deeply a word is processed the easier it will be to remember. · State Dependent Effects - If learning takes place within a certain context it will be easier to remember within that context rather than in a new context. | <p>skills and deep understanding are emphasized.</p> <ol style="list-style-type: none"> 12. Errors provide the opportunity for insight into students' previous knowledge constructions. 13. Exploration is a favored approach in order to encourage students to seek knowledge independently and to manage the pursuit of their goals. 14. Learners are provided with the opportunity for apprenticeship learning in which there is an increasing complexity of tasks, skills and knowledge acquisition. 15. Knowledge complexity is reflected in an emphasis on conceptual interrelatedness and interdisciplinary learning. 16. Collaborative and cooperative learning are favored in order to expose the learner to alternative viewpoints. 17. Scaffolding is facilitated to help students perform just beyond the limits of their ability. 18. Assessment is authentic and interwoven with teaching. |
| <p>How Does Learning Take Place</p> | <p>Skinner</p> <ul style="list-style-type: none"> · Known for operant conditioning · A stimulus is provided · A response is generated. · Consequence to the response is present. · Type of consequence is present. · Reinforcement is provided which | <p>Piaget</p> <ul style="list-style-type: none"> · Human intelligence and biological organisms function in similar ways. They are both organized systems that constantly interact with the environment. · Knowledge is the interaction between the individual and the environment. · Cognitive development is the growth of logical | <p>Constructivism promotes a more open-ended learning experience where the methods and results of learning are not easily measured and may not be the same for each learner.</p> <p>Piaget</p> <ul style="list-style-type: none"> · All knowledge is a human construction. · The learner starts with a blank slate. |

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| | <p>could be positive or negative.</p> <p>Pavlov</p> <ul style="list-style-type: none"> · Known for classical conditioning. · A spontaneous reaction that occurs automatically to a particular stimulus. · To alter the “natural” relationship between a stimulus and a reaction was viewed as a major breakthrough in the study of behavior. <p>Thorndike</p> <ul style="list-style-type: none"> · Thorndike concluded that animals learn, solely, by trial and error, or reward and punishment. All learning involves the formation of connections, and connections are strengthened according to the law of effect. Intelligence is the ability to form connections and humans are the most evolved animal because they form more connections than any other being. <p>The "law of effect" stated that when a connection between a stimulus and response is positively rewarded it will be strengthened and when it is negatively rewarded it will be weakened. Thorndike later revised this "law" when he found that negative reward, (punishment) did not necessarily</p> | <p>thinking from infancy to adulthood.</p> <p>Vygotsky</p> <p>Vygotsky’s components of Cognitive Development:</p> <ul style="list-style-type: none"> · Mastering symbols of the culture and developing the cultural forms of reasoning. · Complex functions begin as social interactions between individuals; gradually acquire meaning and are internalized by the learner. · Speech and other symbols are first mastered as a form of communication and eventually structure and manage a child’s thinking. · Zone of Proximal Development focuses on interactive problem solving. | <ul style="list-style-type: none"> · Not logical thinking. <ol style="list-style-type: none"> 1. Learning is an internal process that occurs in the mind of the individual. 2. Cognitive conflict is essential to the learning process. <p>Dewey</p> <ul style="list-style-type: none"> · Education’s connection with society, outside world, life. · What we learn should have meaningful relevancy. · Instruction should center around the child’s experience <p>Bruner</p> <ul style="list-style-type: none"> · Learner constructs new ideas or concepts based upon their current/past knowledge · Learning by discovery through developmental stages. · Benchmarks reveal each stage of child’s development, interaction & discovery is learning. · Education relevant to student’s need, stages in cognitive development <p>Merrill</p> <ul style="list-style-type: none"> · knowledge is constructed from experience · learning is a personal interpretation of the world · learning is an active process in which meaning is developed on the basis of experience · conceptual growth comes from the negotiation of meaning, the sharing of multiple perspectives and the changing of our internal representations through collaborative learning · learning should be situated in realistic |
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| | <p>weaken bonds, and that some seemingly pleasurable consequences do not necessarily motivate performance.</p> <p>The "law of exercise" held that the more an S-R (stimulus response) bond is practiced the stronger it will become. As with the law of effect, the law of exercise also had to be updated when Thorndike found that practice without feedback does not necessarily enhance performance.</p> <p>Looking more specifically at academic learning, i.e. the content of a lesson, rather than managing the behavior within it, Thorndike's "Theory of Transfer of Identical Elements" represents the central behaviorist stance, that the amount of learning that can be generalized between a familiar situation and an unfamiliar one is determined by the number of elements that the two situations have in common. He concluded that education does not generalize easily and that if it is to be preparation for life beyond school, then it should be as life-like as possible (footnote 6).</p> <p>Also Thorndike maintained that a skill should be introduced when a learner is conscious of their need for it as a means of satisfying some useful purpose. Regarding material,</p> | | <p>settings; testing should be integrated with the task and not a separate activity</p> <p>Vygotsky's theory presents three principles:</p> <ol style="list-style-type: none"> 1. Making meaning - the community places a central role, and the people around the student greatly affect the way he or she sees the world. 2. Tools for cognitive development - the type and quality of these tools (culture, language, important adults to the student) determine the pattern and rate of development. 3. The Zone of Proximal Development - problem solving skills of tasks can be placed into three categories: Those performed independently by the learner. Those that cannot be performed even with help. Those that fall between the two extremes, the tasks that can be performed with help from others. <p>Seymour Papert</p> <ul style="list-style-type: none"> · Mathetics—the art of learning. · Guidelines for the art of learning. First principle-Give yourself time. Second principle-discussion. Third principle-look for connections. · The building of knowledge is the goal. Decrease amount of teaching and increase student projects. |
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| | <p>Skinner specified that to teach well, a teacher must decide exactly what it is they want to teach - only then can they present the right material, know what responses to look for and hence when to give reinforcement that usefully shapes behavior.</p> <p>He suggested 3 principles which teachers should use to promote effective learning:</p> <ol style="list-style-type: none"> 1) present the information to be learned in small behaviorally defined steps. 2) give rapid feedback to pupils regarding the accuracy of their learning (learning being indicated by overt pupil responses) 3) allow pupils to learn at their own pace. <p>Building on these he proposed an alternative teaching technique called programmed learning/instruction and also a teaching machine that could present programmed material.</p> <p>Watson Watson believed that humans are born with a few reflexes and the emotional reactions of love and rage. All other behavior is established through stimulus-response associations through conditioning.</p> | | |
| Relevance to | · Identify possible reinforcers by | Cognitivists believe learners develop learning through | As opposed to an objective approach to |

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| Educational Technology | observing behaviors of learners <ul style="list-style-type: none"> · Select Stimulus · Identify and describe the terminal objective - observable behavior · By a process of shaping and smaller steps achieve goals · Mastery learning is an example of behavioral approach · Behaviorism still continues to play a large role in motivation, classroom management, and special education needs | receiving, storing and retrieving information. With this idea, it is important for instructional designers to thoroughly analyze and consider the appropriate tasks needed in order for learners to effectively and efficiently process the information received. Likewise, designers must consider the relevant learner characteristics that will promote or impede the cognitive processing of information. <ul style="list-style-type: none"> · Do task analysis and learner analysis · Create tests · Create learning materials according to any one of the Instructional Design Models | learning, constructivism is more open-ended in expectation where the results and even the methods of learning themselves are not easily measured and may not be consistent with each learner. <ul style="list-style-type: none"> · Case-Based Learning · Authentic situations · Multiple cases to build cognitive flexibility · Social interactions, collaborations · Assessment of activity · Shift teachers role to scaffolding, modeling, coaching of learners · Experiences are critical · Shift from behavioral objectives to activity goals · Advance organizers |
| Possible Learning Activities | <ul style="list-style-type: none"> · Instructional cues to elicit correct response · Practice paired with target stimuli · Reinforcement for correct responses · Building fluency (get responses closer and closer to correct response) · Multiple opportunities/trials (Drill and practice) · Discrimination (recalling facts) · Generalization (defining and illustrating concepts) · Associations (applying explanations) · Chaining (automatically performing a specified procedure) | <ul style="list-style-type: none"> · Explanations · Demonstrations · Illustrative examples · Gestalt Theory · Matched non-examples · Corrective feedback · Outlining · Mnemonics · Dual-Coding Theory · Chunking Information · Repetition · Concept Mapping · Advanced Organizers · Analogies · Summaries · Keller's ARCS Model of Motivation · Interactivity · Synthesis · Schema Theory · Metaphor · Generative Learning | <ul style="list-style-type: none"> · Modeling · Collaborative Learning · Coaching · Scaffolding · Problem-Based Learning · Authentic Learning · Anchored Instruction · Cognitive Flexibility Hypertexts · Object-based Learning |

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| | | <ul style="list-style-type: none"> · Organizational strategies · Elaboration Theory | |
| Learning and Instructional Design | <p>One of the key areas where behaviorism impacts instructional design is in the development of instructional objectives.</p> <p>Computer-assisted instruction was very much drill-and-practice - controlled by the program developer rather than the learner. Little branching of instruction was implemented.</p> <p>The systems approach developed out of the 1950s and 1960s focus on language laboratories, teaching machines, programmed instruction, multimedia presentations and the use of the computer in instruction. Most systems approaches are similar to computer flow charts with steps that the designer moves through during the development of instruction.</p> <p>Implications When designing from a behaviorist/cognitivist stance, the designer analyzes the situation and sets a goal. Individual tasks are broken down and learning objectives are developed. Evaluation consists of determining whether the criterion for the objectives has been met. In this approach the designer decides what</p> | <p>Computers process information in a similar fashion to how cognitive scientists believe humans process information: receive, store and retrieve. This analogy makes the possibility of programming a computer to "think" like a person conceivable, i.e. artificial intelligence. Artificial intelligence involves the computer working to supply appropriate responses to student input from the computer's data base. A trouble-shooting programs are examples of these programs.</p> <p>Implications When designing from a behaviorist/cognitivist stance, the designer analyzes the situation and sets a goal. Individual tasks are broken down and learning objectives are developed. Evaluation consists of determining whether the criterion for the objectives has been met. In this approach the designer decides what is important for the learner to know and attempts to transfer that knowledge to the learner. The learning package is somewhat of a closed system, since although it may allow for some branching and remediation, the learner is still confined to the designer's "world".</p> | <p>Instructional design considerations within a framework of constructivism begin with taking into account the learner's prior knowledge, understandings, and interests.</p> <p>Constructivism is not compatible with the present systems approach to instructional design.</p> <p>Jonassen points out that the difference between constructivist and objectivist, (behavioral and cognitive), instructional design is that objective design has a predetermined outcome and intervenes in the learning process to map a predetermined concept of reality into the learner's mind, while constructivism maintains that because learning outcomes are not always predictable, instruction should foster, not control, learning. With this in mind, Jonassen looks at the commonalities among constructivist approaches to learning to suggest a "model" for designing constructivist learning environments.</p> <p>One of the most useful tools for the constructivist designer is hypertext and hypermedia because it allows for a branched design rather than a linear format of instruction. Most literature on constructivist design suggests that learners should not simply be let loose in a hypermedia or hypertext environment, but that a mix of old and new (objective and constructive) instruction/learning design be implemented. Reigeluth and Chung suggest a prescriptive system which advocates increased learner control. In this method, students have some</p> |

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| | is important for the learner to know and attempts to transfer that knowledge to the learner. The learning package is somewhat of a closed system, since although it may allow for some branching and remediation, the learner is still confined to the designer's "world". | | background knowledge and have been given some instruction in developing their own metacognitive strategies and have some way to return along the path they have taken, should they become "lost". To design from a constructivist approach requires that the designer produces a product that is much more facilitative in nature than prescriptive. The content is not prespecified, direction is determined by the learner, and assessment is much more subjective because it does not depend on specific quantitative criteria, but rather the process and self-evaluation of the learner. The standard pencil-and-paper tests of mastery learning are not used in constructive design; instead, evaluation is based on notes, early drafts, final products, and journals. |
| Strengths—related to ID | <p>The strength of instructional design grounded in behaviorism is that when there are specific goals to be met, the learner is focused clearly upon achieving those goals whenever there are cues to prompt the learner's behavior.</p> <p>-Clearly stated objectives allow the learner to focus on one goal. -Cueing responses to behavior allows the learner to react in a predictable way under certain conditions. In a stressful situation like combat or flying a plane, cued responses can be a very valuable tool.</p> | <p>Unlike behaviorism, which is environment-focused, cognitivism directs instructional designers to consider the learner as the focus of the design process.</p> <p>- The goal is to train learners to do a task the same way to enable consistency. Because learners are trained to perform a function the same way based on specific cues, their behavior will be consistent with others who are trained in the same manner. - The context of a learner - their thoughts, beliefs and values are influential in the learning process.</p> | <p>Content can be presented from multiple perspectives using case studies, learners can develop and articulate new and individual representations of information, and active knowledge construction is promoted over passive transmission of information.</p> <p>Because the learner is able to interpret multiple realities, the learner is better able to deal with real life situations. If learners can problem solve, they may better apply their existing knowledge to a novel situation.</p> |
| Weaknesses | Since behaviorism is stimulus – | A major weakness of cognitivism lies in its strength. | Since constructivism promotes individual |

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| <p>—related to ID</p> | <p>response based, instructional design is dependent on the workplace or classroom having and maintaining the appropriate stimuli to continue the intended behavior. Thus, if a certain incentive is not present or does not occur, then the expected and desired performance may not take place. Additionally, learning is a reactionary process to an environmental condition and knowledge is considered finite.</p> <p>Skinner realized there is a burden on the instructor to maintain reinforcement. “Behavior that is not reinforced is likely to become less frequent and may even disappear” (Merriam and Caffarella, 1999, p. 252).</p> <p>The learner might find himself in a situation where he needs to respond, but the mental "cues" he has learned to respond to might not exist.</p> <p>Behaviorism does not explain some learning--such as the recognition of new language patterns by young children--for which there is no reinforcement mechanism.</p> | <p>Whereas schemas help to make learning more meaningful, a learner is markedly at a disadvantage whenever relevant schemas or prerequisite knowledge do not exist. To account for this, an instructional designer will need to ensure that the instruction is appropriate for all skill levels and experiences. Designing such instruction could be costly and time-consuming.</p> <p>One additional weakness of cognitivism is similar to behaviorism in the belief that there are only finite, predetermined goals. Having predetermined goals may be in fact desirable for an organization since it offers clear direction and purpose but such a fixed set of expectations can limit the potential of the learning. Learners and instructors may become satisfied with obtaining minimum competencies or carry the attitude that “if it’s not broke, then don’t fix it!” when the learning experience could actually be designed better (McLeod, n.d.)</p> <p>As with behaviorism, the learner knows a certain way to do things based upon specific cues, but that way may not always be the best, most efficient, or safest way to do something in the advent of different environmental stresses or scenarios.</p> | <p>learner interpretations and interests, this can pose an instructional problem. There could potentially be problems in adequately evaluating learning. Learners may each have different experiences within the learning process but each have valid and sufficient learning take place (McLeod, n.d.)</p> <p>In a situation where conformity is essential divergent thinking and action may cause problems.</p> |
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