**Comparison of Learning Theories**

**Introduction**

After reading different theories, the author reviewed and compared Radical Behaviorism (Skinner) and Genetic Epistemology (Piaget) based on the idea that somehow these two are still the two dominant theoretical positions in the field of learning with interactive courseware (Jonassen, 1991; Atkins, 1993; Hannafin, Hannafin, Hooper, Rieber, & Kini, 1996). According to Deubel (2003), developments in design of such materials appear to have followed shifts in the dominant paradigms within psychology. Early computer-based materials are seen to be influenced by behaviorist concepts while discovery learning materials are felt to be founded on later cognitive models of information processing and constructivism. The increase in cognitive approaches in the 1980s may be due as much to technology developments in object-oriented programming, hypermedia, and interactive video as to the rise within psychology of cognitive theorists (Atkins, 1993).

**Operant Conditioning or Radical Behaviorism**

This theory was developed by Skinner based on a previous philosophical proposal initiated by Watson called the Behaviorist Revolution. According to Fuentes (2000) its philosophical roots are empirism and positivism and its epistemological paradigm could be defined as objectivism where reality exists outside of the individual, and knowledge is a copy from reality.

B.F Skinner’s Radical Behaviorism was based on the idea that learning is a change function that results in an observable behavior. As stated in TIP (2006), changes in behavior are the result of an individual's response to events (stimuli) that occur in the environment. Reinforcement is the key element in Skinner's S-R theory. A reinforcer is anything that strengthens the desired response. Good grade, a pat on the back, a verbal
praise or increased satisfaction are examples of positive reinforcements. Skinner’s theory also covers negative reinforcers, as the withdrawal of positive reinforcement that differs from aversive stimuli (punishment).

Skinner’s theory, according to TIPS (2006) also focuses on schedules of reinforcement and their effects on establishing and maintaining behavior. One of the distinctive aspects of Skinner's theory is that it attempted to provide behavioral explanations for a broad range of cognitive phenomena. For example, Skinner explained drive (motivation) in terms of deprivation and reinforcement schedules.

Scope/Application:
Operant conditioning has been widely applied in clinical settings (i.e., behavior modification) as well as teaching (i.e., classroom management) and instructional development (e.g., programmed instruction). Parenthetically, it should be noted that Skinner rejected the idea of theories of learning (Skinner, 1950).

**Principles of behavior management.**

Strengthening or weakening operant behaviors: 1) Behavior that is positively reinforced will reoccur; intermittent reinforcement is particularly effective (i.e. gambling addiction). 2) Information should be presented in small amounts such that responses can be reinforced ("shaping"). 3) Weakening a response: Punishment defined by Driscoll (2000) as the presentation of an aversive stimulus cogent?? upon a response that reduces the rate of that response. (Its effectiveness is short lived since it is not necessarily forgotten.)

Reinforcements will generalize across similar stimuli ("stimulus generalization") producing secondary conditioning.
**Strengths**

Good methodology for self learning, where the student has to concentrate on clear goals and needs to respond automatically when a situation emerges, is related to these goals. Soldiers were conditioned to react to the silhouettes of enemy planes so their response would be automatic.

**Limitations**

The learner could be in a situation which the stimulus for a correct answer never occurs so he doesn’t respond and there is no proof that learning took place (example of the email for the manager Driscoll p.33).

Behaviorism was incapable of explaining certain social behaviors (i.e. kids do not imitate all behaviors that were reinforced; on the contrary, they could develop new patterns of conduct after the observation without any reinforcement. Due to these observations Bandura and Walters differ on the sole justification of operative conditioning, where the kid must behave in a certain way and receive reinforcement before learning takes place. According to Bandura & Walters (1963) an individual can adopt behaviors through observations on the behavior of a third party. This postulation brought what is known as the Cognitive-Social theory.

**Genetic Epistemology (J. Piaget) Theories of Cognitive Development**

Over a period of six decades, Jean Piaget conducted a program of naturalistic research that has profoundly affected our understanding of child development. Piaget called his general theoretical framework "genetic epistemology" because he was primarily interested in how knowledge developed in human organisms. Piaget had a background in both Biology and Philosophy and concepts from both these disciplines influenced his theories and research in child development.
As stated by Driscoll (2000), Piaget was highly critical of empiricism, but he was not particularly comfortable in presuming that knowledge is entirely innate (the nativist position). Instead, he evolved a view, consistent with interpretivism, that suggested a compromise between nativism and empiricism. He sometimes labeled his view interactionism, since cognition was assumed to be an interaction between heredity and environment. (p. 187)

The concept of cognitive structure is central to his theory. Cognitive structures are patterns of physical or mental action that underlie specific acts of intelligence and correspond to stages of child development. According to Fuentes (2000) its epistemological paradigm is subjectivism where reality is discovered and constructed by the learner and knowledge is a human construction by consensus.

There are four primary cognitive structures (i.e., development stages) according to Piaget (1929): sensorimotor, preoperations, concrete operations, and formal operations. In the sensorimotor stage (0-2 years), intelligence takes the form of motor actions. Intelligence in the preoperation period (3-7 years) is intuitive in nature. The cognitive structure during the concrete operational stage (8-11 years) is logical but depends upon concrete referents. In the final stage of formal operations (12-15 years), thinking involves abstractions.

Cognitive structures change through the processes of adaptation: assimilation, accommodation and equilibration. Assimilation involves the interpretation of events in terms of existing cognitive structure whereas accommodation refers to changing the cognitive structure to make sense of the environment. Equilibration, according to Piaget, is the master developmental process, encompassing both assimilation and accommodation. Equilibration, as stated by Driscoll (2000) particularly characterizes the child’s transition from one stage to the next.
Cognitive development consists of a constant effort to adapt to the environment in terms of assimilation and accommodation.

While the stages of cognitive development identified by Piaget are associated with characteristic age spans, they vary for every individual. Furthermore, each stage has many detailed structural forms. For example, the concrete operational period has more than forty distinct structures covering classification and relations, spatial relationships, time, movement, chance, number, conservation and measurement.

*Scope/Application:*

Piaget explored the implications of his theory to all aspects of cognition, intelligence and moral development. Many of Piaget's experiments were focused on the development of mathematical and logical concepts. The theory has been applied extensively to teaching practice and curriculum design in elementary education (e.g., Bybee & Sund, 1982; Wadsworth, 1978). Piaget's ideas have been very influential on others, such as Seymour Papert, who developed LOGO as one of the first educational computer language applications for kids.

*Strengths.*

One of Piaget’s central insights is that we learn through repeated conceptual reorganization. Intellectual development is one of the progressive adaptations detected as concepts and the physical environment interact. As we learn, concepts are modified and/or are woven into an ever richer web of conceptual connections.

*Limitations:*

As stated by Driscoll (2005), Jean Piaget’s theory of cognitive development remains unmistakably the most complete and widely accepted view. However, developmental theorists recognize now that the Piagetian account is wrong in some aspects and incomplete in others. (p. 186).
The student learns to perform a task, but it could be suggested that it is not the best or more adequate solution for the learner or the situation. The problem in determining the effectiveness of cognitive design characteristics lies in the difficulty of knowing what is going on in the mind of learners. Evaluators are, therefore, forced back on measures such as apparent time on task, apparent engagement with the task presented, and subject estimations of its effectiveness (Atkins, 1993).

Epistemological Comparison between Radical Behaviorism and Genetic Epistemology

The foundational epistemology of Skinner’s Radical Behaviorism learning theory, as described by Driscoll (2005) was to set out in search of functional relationships between environmental variables and behavior. Skinner’s approach to understanding learning and behavior is commonly described using the metaphor of the learner as a black box. The learner is a black box and knowing what’s inside the learner is not essential for determining how behavior is governed by its environmental antecedents and consequences.

Cognitive Theory in general and Genetic Epistemology in particular, on the other hand, have a main goal: the acquisition of new knowledge and the interactions between the different elements of the environment. They have dedicated their work to the study of internal processes such as memory, attention, perception, language, reasoning. Their core belief is that the mind directs the person and not the external stimulus.

As stated by Deubel (2003), the view of mental activities as actions, as opposed to their being considered indications of the presence of a consciousness or mind as a separate entity, are central differences between behavioral and cognitive orientations. Deubel (2003) continues by reinforcing that cognitive psychology is associated with mind; behaviorism is associated with body. Cognitive notions include schema, knowledge
structures, and duplex memory, for example, and are structured ways through which to investigate consciousness. There are no behavioral equivalents.

Behaviorists value success as motivating and place more importance on extrinsic rewards, goal setting, and goal achievement, rather than on intrinsic rewards. Cognitivists emphasize the motivating affect of learners as problem solvers or information seekers. Emphasis is on intrinsic feelings of success perceived by learners who view their learning as individually worthwhile in return for their effort. (Atkins, 1993).

**Impact on Curriculum Development**

**Radical Behaviorism**

The goals when developing a curriculum under this approach should be:

- Control output behavior of the learner.
- Transmit cultural elements and trends.

A curriculum design under a behaviorist epistemology should consider the following key elements:

a) Behavior modification is relatively permanent and observable on the organism due to practice. b) Learning is achieved when the learner exhibits an appropriate response after a specific environmental stimulate. A response that is reinforced immediately after has more probability of repeating in the future; c) External conditions determine learning; d) From the behaviorist perspective, instruction is made explicit with tasks and subtasks broken up into lessons and modules. e) Behaviorists, when designing a curriculum, will identify only explicit and observable learning objectives. f) Students’ role is considered to be receptive, and g) the teacher’s role would be considered, according to Fuentes (2000), as a technologist, a behavior engineer that monitors behavior and implements behavior modification through reinforcement strategies.
Cognitivism: Genetic Epistemology

The genetic epistemological key elements or pillars to take into consideration when designing a curricula would be:

New knowledge construction is based on previous learning, development and maturation stages. In other words, learning consists of meaning construction from the learner’s previous experience and his maturation level (Fuentes, 2000).

The processes are considered qualitative change processes and are classified as: Assimilation, accommodation and equilibration. (Fuentes, 2000)

These processes imply the construction of cognitive schemas contrasting new knowledge, cognitive obstacles and searching for balance (equilibration) to reach conceptual change.

Learning is a mental activity. Mind filters input from the external world to produce their own and unique reality. (Piaget, 1929)

Constructivism recognizes that the importance of individual experiences with the environment is critical, but human beings create meaning. The learners interpret reality. Within a learning process, the variables are: learner developmental stage, environment conditions (including the teacher) and the interaction of these components. New application of previously learned concepts generates a constant concept modification or reconstruction (evolution).

Culture issues as well as individual desires and previous experiences are of particular interest for curriculum design.

Transference is based on the degree of effectiveness of the knowledge structure of the learner that could facilitate his thinking and performance by applying the tools learned within the environment where these tools are needed.
While science educators have applied piagetian theory extensively for at least the last 35 years, profound and difficult questions about the developmental appropriateness of content and process are still a source of disagreement among educators. (Kamii, 1984).

Impact on Instructional Design.

Radical Behaviorism

Willis (1995) stated that instructional planning within the behaviorist model feature a sequential and linear process and top down, systematic planning. Objectives guide development. Experts, having special knowledge, are critical of instructional design work. Careful sequencing and teaching of sub-skills is important. The goal is delivery of preselected knowledge using direct instruction methods (e.g., drill and practice, tutorials, use of computer as information deliverer, evaluator, and record keeper). Summative evaluation is valued because it will determine whether the material works. Collection and analysis of objective data from identifying entry behaviors to task and concept analysis, pretests, embedded tests, and posttests are also critical. Instructional design should include input behavior (previous knowledge) that needs to be assessed to determine how new content should be included as well as verbal hints for wrong answers and verbal reinforcements for correct answers (Fuentes, 2000).

According to Deubel (2003) Instructional design based on the theory of Radical Behaviorism would need to include the following elements:

Instruction is made explicit with tasks and subtasks broken up into lessons and modules.

Material is broken down into small, logically discrete instructional steps and is often presented as a rule, category, principle, formula, or definition. Positive examples are given to reinforce understanding, followed by negative examples to establish conceptual boundaries.
Activities are sequenced for increasing difficulty or complexity. The sequence and pacing through the material is usually without learner control. To maximize learning efficiency, learners may be routed to miss or repeat certain sections of material based on performance on a diagnostic test, or on tests within the sequence of learning activities. The amount of practice or revision they require may also vary based on performance.

Design emphasizes low error rate and the use of remedial loops back through material, if learner test performance seems to warrant it. Extrinsic or intrinsic reinforcement messages are used to maintain motivation.

Behaviorists value success as motivating and place more importance on extrinsic rewards, goal setting, and goal achievement, rather than on intrinsic rewards. Driscoll (2005) stated that desired instructional outcomes should be described as clear and observable behavior. These goal-centered statements are variously called behavioral objectives, instructional objectives or performance objectives. (p.58)

Programmed Task Analysis in small steps, first emphasizes simpler tasks before attempting more complex challenges.

According to Atkins (1993), assessment or tests of some kind (e.g., multiple-choice tests or solving problems with right answers) seek to measure performance in a quantifiable way on decontextualized packets of learning.

One means of applying group contingencies in the classroom that some teachers find useful is the token economy (Ayllon & Azrin, 1968). In this system, according to Driscoll (2005), tokens serve as conditioned reinforcers that can later be exchanged for objects or privileges.

*Cognitivism: Genetic Epistemology*

Kamii (1984) noted that Piaget once “stated that a school based on his theory would
be radically different….” How? What would it look like? According to Kamii (1983), Piaget’s most important ideas are intellectual, moral autonomy and constructivism. For Piaget, autonomy—being governed by oneself—is more likely to be developed when adults “exchange points of view with children.” This includes having students explain their reasoning, taking a stand and confronting opposing opinions and/or interpretations, and negotiating meaning. The kind of conversation that is implied by the above can only occur when all ideas, including wrong ones, are used and respected and when classrooms emphasize the kind of persuasion a scientist uses when presenting the results of her research. What is the meaning of experimental and discrepant experimental results? What if…? How would you design and perform a confirmatory or disconfirmatory test?

Metaphorically and in practice, the piagetian classroom is a construction zone (Roth, W-M. 1993) where students are involved actively and collaboratively, using materials and minds, in the construction of knowledge. It is important that students work and talk with other students. This can help expose concepts for discussion and facilitate the construction of both new conceptual knowledge and procedural knowledge.

According to Driscoll (2005), there is no set of teaching practices that constitutes a Piagetian approach to instruction, but rather suggests broad instructional principles:

Principle 1: The learning environment should support the activity of the child. Discovery, play, direct manipulation and establishing their own roles are keystones to this principle.

Principle 2: Children’s interaction with their peers is an important source of cognitive development. Even preoperational (egocentric) children need peer relationships that have similar cognitive structures (Piaget, 1951) so that they can be more effective in communicating or offering feedback regarding his logical constructions. Instructional
design should include peer teaching and social negotiation during problem solving. (p. 215)

Principle 3: Adopt instructional strategies that make children aware of conflicts and inconsistencies in their thinking. Driscoll (2005) asserts that two important points relevant to this principle are that a) teachers should critically diagnose previous knowledge and what they think about it and b) take into account the order in which the concepts emerge in cognitive development for conflict instruction to better design questioning process to induce conflict.

Willis (1995) indicated that the ID process in constructivist models is recursive, nonlinear, and sometimes chaotic. Planning is organic developmental, reflective, and collaborative. Objectives emerge from design and development work. General instructional design experts do not exist. Instruction emphasizes learning in meaningful contexts (e.g., anchored instruction, situated cognition, cognitive apprenticeships, cognitive flexibility hypertext, problem solving, and the use of hypermedia/multimedia navigable resources). The goal is personal understanding. Formative evaluation, not summative, is critical to improve the product. Subjective data from sources such as interviews, observations, user logs, and expert/user critiques may be the most valuable.

References:


