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The Cognitive Perspective on Learning: Its Theoretical Underpinnings and Implications for Classroom Practices

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Abstract: Learning theories are essential for effective teaching in that they shed light on different aspects of the learning process. The spectrum of learning theories can be categorized into three main areas: behaviorism, cognitivism, and constructivism. *Behaviorism* as a teacher-centered instructional framework for a long time dominated educational settings, shaping every aspect of curriculum and instruction. In contrast to behaviorism, *cognitivism* is a relatively recent learning theory and its features are not well known or are confused with *constructivism* by teachers. This article aims to provide an overview of the core characteristics of cognitivism, its philosophical and theoretical basis, its implications for classroom practices, and its illustrative teaching methods. Cognitive apprenticeship, reciprocal teaching, anchored instruction, inquiry learning, discovery learning, and problem-based learning are explicated as the most distinctive methods of the cognitive perspective on learning.

Keywords: cognitivism, cognitive learning theory, instructional frameworks, teaching methods

Familiarity with subject matter is not enough for teachers to engage in effective and pedagogically meaningful instructional practices. This is because professionalism in teacher education and development demands that teachers have not only a disciplinary knowledge base related to their subject but also a strong command of learning theories and their applications for instructional practices in the classroom. In other words, teachers should possess both subject-matter knowledge and pedagogical-content knowledge and skills to be able to effectively accomplish their subject's goals. They also need to understand what philosophical assumptions and theoretical perspectives characterize a given instructional framework without succumbing to the notion that teachers first and foremost should be concerned with day-to-day practical issues and problems in the classroom rather than the theoretical ones that are supposed to concern academics or theorists. This artificial divide between the theoretical world and the practical world in the eyes of teachers ought to be eliminated if new and innovative reform efforts are to be put into practice successfully in actual classroom settings (Yilmaz 2008a). As Fosnot (1996) argues: "We again run the risk of short-lived reform unless educators understand the theory behind the practice" (x).

There are a plethora of labels used to describe a variety of learning theories. However, the typology of learning theories can be classified into three main domains: behaviorism, cognitivism, and constructivism. As a dominant approach to teaching, behaviorism provided the primary theoretical bases of curriculum development and implementation in schools for decades. The behaviorist approach was basically preoccupied with objectively observable and measurable teacher and student behaviors through a stimulus-response framework. Even though behaviorism did explain how behaviors got changed, it failed to account for how conceptual change occurred. Because it does not explore mental processes or what is going on in human minds, cognitivism, and its varieties that view learning as an active process of knowledge construction, came to

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compete with the behaviorist orientation. Cognitivism now constitutes an alternative framework for teaching. But, the cognitive perspective on learning is not well-known by teachers. A review of recently published works on educational psychology or teaching methods indicates that teachers do not recognize how learning is viewed or defined from a cognitive perspective (Yilmaz 2008b). Hence, it is imperative that cognitivism be given a full consideration to help teachers make sense of it. Interested in addressing this need, this article aims to elucidate the essential characteristics of cognitivism. It explains the philosophical and theoretical basis of cognitive learning theory and its implications for classroom practices. Methods of teaching drawing on cognitive principles are also explained.

Cognitivism

The genesis of cognitivism as a learning theory can be traced back to the early twentieth century. The shift from behaviorism to cognitivism stemmed from the behaviorist tradition's failure to explain why and how individuals make sense of and process information (i.e., how the mental processes work). In other words, it was the limitations of behaviorism that spawned the cognitive movement. Dissatisfied with behaviorism's heavy emphasis on observable behavior, many disillusioned psychologists challenged the basic assumptions of behaviorism. They claimed that prior knowledge and mental processes not only play a bigger role than stimuli in orienting behavior or response (Deubel 2003) but also intervene between a stimulus and response (Winn and Snyder 1996). It is argued that people are neither machines nor animals that respond to environmental stimuli in the same way (Matlin 1994).

The works of Edward Chase Tolman, Jean Piaget, Lev Vygotsky, Jerome Bruner, and German Gestalt psychologists were instrumental in engendering the dramatic shift from behaviorism to cognitive theories. Edward Tolman is usually considered a pioneer in initiating the cognitive movement (Bruner 1990, 2). In the 1920s, Tolman's experiment with rats suggested that rats knew how the maze in which they were put was structured because they had its mental map. Accordingly, Tolman asserted that rather than an automatic response to an event, behavior had both purpose and direction and occurred without reinforcement. He saw motivation as the key to transmuting expectations into behavior. For these reasons, "Tolman's system was often justly treated as a precursor of contemporary cognitive psychology" (Greenwood 1999, 9).

It was during the mid-1950s that the impact of cognitive theories in education was so tremendous as to be called the "cognitive revolution." The second half of the twentieth century witnessed an outburst of theoretical and empirical works on such cognitive processes as memory, attention, concept formation, and information processing within a cognitive framework. This new line of research is characterized by a search for new ways to understand what learning is and how it occurs. These cognitive psychologists investigated mental structures and processes to explain learning and change in behavior. Like behaviorists, they have also observed behavior empirically but only in order to make inferences about the internal mental processes. As opposed to behaviorist orientation's emphasis on behavior, the cognitive school focuses on meaning and semantics (Winn and Snyder 1996). The primary emphasis is placed on how knowledge is acquired, processed, stored, retrieved, and activated by the learner during the different phases of the learning process (Anderson, Reder, and Simon 1997; Greeno, Collins, and Resnick 1996).

The cognitive school views (1) learning as an active process "involving the acquisition or reorganization of the cognitive structures through which humans process and store information" and (2) the learner as an active participant in the process of knowledge acquisition and integration (Good and Brophy 1990, 187; Merriam and Caffarella 1999, 254; Simon 2001, 210). This theory describes knowledge acquisition as a mental activity involving internal coding and structuring by the learner (Derry 1996; Spiro et al. 1992) and suggests that learning happens best under conditions that are aligned with human cognitive architecture (Sobel 2001). Cognitive psychologists place more emphasis on what learners know and how they come to acquire it than what they do. For this reason, the cognitive approach focuses on making knowledge meaningful and helping learners organize and relate new information to prior knowledge in memory. Instruction should be based on a student's existing mental structures or schema to be effective (Ertmer and Newby 1993).

Contributors to the Theory: Major Types of Cognitivism

Cognitivism is not based on the works of a single theorist or a unified group of theorists. Rather, it is informed by a number of theorists' contributions and is quite multifaceted. The following theorists and accompanying theories have contributed to the continuous growth of cognitive theories: Piaget's *theory of individual cognitive development*, Vygotsky's *theory of social cognitive growth* or *zone of proximal development*, Festinger's *cognitive dissonance theory*, Spiro's *cognitive flexibility theory*, Sweller's *cognitive load theory*, Bruner's *cognitive constructivist learning theory*, and Tolman's *theory of sign learning* as a bridge between behaviorism and cognitive theory.

Out of the spectrum of cognitive theories, the individual cognitive trend deriving from Piaget's studies and the sociocultural trend based on Vygotsky's works constitute the backbone of cognitivism (Deubel 2003; Duffy and Cunningham 1996; Fosnot 1996; Gillani 2003). Both theories have also been inspirational for the subsequent constructivist movement (Fosnot 1996,

23; Gillani 2003, 49). For this reason, rather than address each ramification of cognitivism, I will document the core ideas and assumptions of these two distinct strands of cognitivism.

Piaget's Theory of Cognitive Development

Piaget explored the genesis of cognitive structures and the process that underlies learning and knowledge construction. Trained as a biologist, Piaget later shifted his interest to how human beings make sense of their environment and experience. The key notions that Piaget employed to elucidate his cognitive theory basically derive from biological concepts. According to Piaget, the process of intellectual and cognitive development resembles a biological act, which requires adaptation to environmental demands (Gillani 2003). Having done a large number of experiments to explore the ways children think, Piaget argued that children do not passively receive environmental stimulation. Rather, they actively seek it, naturally exploring and acting on their world in order to understand it (Bransford, Brown, and Cocking 2000, 80; Fox 2001). Piaget's studies and ideas focused on the mechanism of learning within the context of natural sciences instead of the type of logic that learners use (Booth 1994; Fosnot 1996). He posited that the biological maturation that human beings go through causes distinct stages in cognitive development. Each of these stages is sequential, dependent on one another to develop, characterized by acquisition of discernable skills, and reflects qualitative differences in cognitive abilities (Fosnot 1996; Gillani 2003; Jarvis, Holford, and Griffin 2003; Piaget 1970).[1]

According to Piaget, the mechanism of change in cognition is equilibration, which is a dynamic interplay of progressive equilibria, adaptation and organization, and growth and change in the master developmental process (Fosnot 1996, 13–14; Ho 2004). Once encountered with a new learning situation, the individual draws on his or her prior knowledge to make the new experience understandable (Gillani 2003). Experiencing a new event, situation, or learning environment at times engenders contradictions to one's present understandings, which in turn makes them insufficient and leads to perturbation and a state of disequilibration in the mental schemata (Fosnot 1996; Gillani 2003; Ho 2004; Palincsar 1998). To handle this situation and to form a comfortable state of equilibrium in the cognitive structure, the individual needs to modify or reorganize his or her schemata via adaptation. This internal process of restructuring the schemata is done through assimilation and accommodation (Gillani 2003). While assimilation is a process of integrating new information with existing knowledge, accommodation is a process of modification or transformation in existing cognitive structures in response to a new situation. Once confronted with an imbalance, learners may resort to three kinds of accommodations. They may (1) disregard the contradictions and adhere to their original scheme; (2) vacillate by maintaining both theories simultaneously and trying to cope with the contradiction via viewing each theory as separate or specific cases; or (3) form a new, modified notion to explain and resolve the prior contradiction. In each type of response to contradiction, the learner's internal and self-regulatory behavior leads to the compensations (Fosnot 1996, 16).

The concept of schema occupies a central place and has an explanatory power in Piaget's theory. Schema[2] refers to a hypothetical mental structure for organizing and representing generic events and abstract concepts stored in the mind in terms of their common patterns. They can be considered "as a series of interrelated index cards that represent different environmental patterns in one's mental structure" (Gillani 2003, 50). Schemata constantly get restructured as one encounters new patterns in his or her learning experiences. Three processes characterize the schemata acquisition and the changes in existing schemata: (1) *accretion*, which refers to remembering new information on the basis of existing schema without altering the schema; (2) *tuning*, which happens when new information that does not fit the existing schema causes schema to get modified in order to be more compatible with experience; and (3) *reconstructing*, which is characterized by the formation of totally new schema on the basis of previous ones that cannot accommodate new experience (Rumelhart and Norman 1978). Implications of schema theory for instruction can be summarized as follows:

- Provide unifying themes for content, because information that lacks a theme can be difficult to comprehend, or, worse, the learner may "accrete" the information to the wrong schema.
- Provide a relevant context for learning in order to activate an existing schema.
- Develop and apply techniques for students to use to impose structure on what they learn and thus make it more memorable, such as the use of information mapping or advance organizer.
- Represent what the experts know in order to facilitate the learning process and use case-based reasoning for knowledge representation.
- Make instructional material meaningful by identifying the learner's mental model and providing conceptual models invented by teachers, designers, scientists, or engineers to help make some target system understandable.
- Choose texts with "standard" arrangement so that they conform to student expectations.
- Encourage students to read titles and headings.
- Point out the structure of particular kinds of texts; for example, what are the common features of published research articles?

- Ask questions to determine what students' current schemata might be.
- Pay attention to student answers and remarks that may give clues about how they are organizing information; that is, what schemata are they using? (Alexander 2003; Ho 2004)

Vygotsky's Social Cognitivism

While Piaget attempted to study and explain learning in terms of the role of contradiction and equilibration, Vygotsky explained learning by means of dialogue (Fosnot 1996). Another key difference between their works is that while Piaget explored the development of logical thinking, Vygotsky focused on categorical perception, logical memory, conceptual thinking, and self-regulated attention (Gredler 1997, 269). In contrast to Piaget's assertion that children's development must precede their learning, Vygotsky posited that social learning is likely to precede development. Vygotsky's social cognition learning model views culture as playing a key role in the development of cognition. Vygotsky' s study of learning concentrated on the interplay between the individual and society, and how social interaction and language come into play in affecting learning or the development of cognition (Fosnot 1996; Gredler 1997; Jarvis, Holford, and Griffin 2003; Schunk 2004).

The following principles come to the fore in Vygotsky's work (Fosnot 1996; Palincsar 1998): the general law of *genetic development*, *auxiliary stimuli*, and the *zone of proximal development* (ZPD). The general law of genetic development states that every complex mental process is first and foremost an interaction between people. The auxiliary stimuli affects the mastery of one's own behavior. That is, the individual can remember and think in an innovative ways by means of auxiliary stimuli. The ZPD is defined by Vygotsky (1978) as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (86). That is, the ZPD represents the potential levels of development or what one can do with assistance. It basically proposes that learning should be compatible with the child's level of development, and interaction should orient instruction toward the ZPD if it is to avoid lagging behind the development of the child (Palincsar 1998).

ZPD stipulates that concepts are not in a ready-made form for learners to absorb. Instead, they go through significant development depending on the existing level of the child's ability to grasp the adult's model (Fosnot 1996, 19). A child's spontaneous concepts emerging naturally from everyday experiences meet scientific concepts evolving out of the structured activity of classroom instruction as more formal abstraction and logically defined concepts. For example, "Historical concepts can begin to develop only when the child's everyday concept of the past is sufficiently differentiated—when his own life and the life of those around him can be fitted into the elementary generalization in the past and now" (Vygotsky 1986, 194). Vygotsky's work on social cognition was further explored in subsequent works by other psychologists who developed the notion of scaffolding (Fosnot 1996). The instructional implications of Vygotsky's social cognitive theory can be summarized as follows:

- *Instruction should provide learners with authentic situations in which they must resolve dilemmas.* From Vygotsky's perspective, the child has not yet learned to operate at an entirely abstract level; thus, instruction should focus on tasks and goals that are relevant to the child. After all, according to Vygotsky, the very origin of human thought is in socially meaningful activity.
- *Instruction should lead (i.e., precede) development.* Instruction should be targeted at the "leading" edge of the zone of proximal development. For example, suppose a particular nine-year-old can solve most arithmetic problems independently, can solve some simple algebraic problems with guidance from a teacher, and cannot solve calculus problems no matter how much help she is given. We would say that algebra problems are within her ZPD, and that this is the level at which instruction will be most profitable.
- *In an instructional setting, social "partners" should be at different levels of development, and they should jointly construct the problem solution.* This helps to ensure that the teacher or more advanced student can assist the less advanced one, and that they will be operating within his or her ZPD.
- *Individualized testing (which is generally the only kind we do) can give only a partial picture of the child's capabilities because it fails to account for the ZPD* (Perry 2002).

Implications of Cognitivism for Classroom Practices

Instruction based on cognitive principles should be authentic and real. The teacher is expected to provide a rich classroom environment that fosters a child's spontaneous exploration. Students are encouraged to explore instructional materials and to become active constructors of their own knowledge through experiences that encourage assimilation and accommodation (Wadsworth 1996). Teaching is tailored to the needs, interests, and backgrounds of students (Fenstermacher and Richardson 2005; McLeod 2003). The teacher is more concerned with constructing a meaningful context than directly teaching specific skills. From the cognitive perspective, because students learn by receiving, storing, and retrieving information, the teacher is urged to thoroughly analyze and consider the instructional

materials, proper tasks, and relevant learner characteristics to help learners to effectively and efficiently process the information received (McLeod 2003).

Instructional materials should include demonstrations, illustrative examples, and constructive feedback so that students can have mental models to embody. Because information contained in instructional material is first processed by working memory, for schema acquisition to occur instruction should be designed to reduce working memory load and to facilitate the changes in the long-term memory associated with schema acquisition (Sweller 1988). In order to activate and utilize schema for learning, Barton states that the learner should be "made aware of his background knowledge and exposed to strategies to 'bridge' from pre-requisite skills to learning objectives" (in McLeod 2003). The teacher also is expected to have a set of schemata for instructional activities in order to adroitly handle interactions between disparate goals and activities. "These schemata include structures at differing levels of generality, with some schemata for quite global activities such as checking homework and some for smaller units of activity such as distributing paper to the class" (Leinhardt and Greeno 1986). The teacher uses advanced organizer techniques to help students understand and organize ideas, concepts, themes, issues, and principles (Marzano 1998). Students are encouraged to use metacognitive strategies such as goal specification, process specification, process monitoring, and disposition monitoring (Marzano 1998, 127). To help students process information effectively and efficiently, the teacher needs to employ the following strategies and principles when teaching their subjects:

- *Provide organized instruction.* Make the structure and relations of the material evident to learners through concept maps or other graphic representations. In multimedia instruction, present animation and audio narration (and/or text descriptions) simultaneously rather than sequentially.
- *Use single, coherent representations.* These allow the learner to focus attention rather than split attention between two places, for example, between a diagram and the text or even between a diagram with labels not located close to their referents.
- *Link new material with what is currently known.* This provides a sort of mental "scaffolding" for the new material.
- *Carefully analyze the attention demands of instruction.* Count the number of elements in instructional messages. Make sure that the learner will not attend to too many different elements at the same time.
- *Recognize the limits of attention (sensory register).* Help learners focus their attention through techniques such as identifying the most important points to be learned in advance of studying new material.
- *Recognize the limitations of short-term memory.* Use the concept of chunking. Do not present 49 separate items. Make them 7 groups of 7. Use elaboration and multiple contexts.
- *Match encoding strategies with the material to be learned.* For example, do not encourage the use of mnemonic techniques unless it is essential to memorize the material. If you want it to be processed more "deeply," then find encoding strategies that are more inherently meaningful.
- *Provide opportunities for both verbal and imaginal encoding.* Even though it is not clear whether these are actually two different systems, imaging does help students remember.
- *Arrange for a variety of practice opportunities.* The goal is to help the learner generalize the concept, principle, or skill to be learned so that it can be applied outside of the original context in which it was taught. Provide for systematic problem-space exploration instead of conventional repeated practice. Provide worked examples as alternatives to conventional problem-based instruction.
- *Eliminate redundancy.* Redundant information between text and diagram has been shown to decrease learning.
- *Help learners become "self-regulated."* Assist them in selecting and using appropriate learning strategies such as summarizing and questioning (Perry 2002; Wilson 1995).

Basic characteristics of a classroom instruction based on cognitive theories can be summarized as follows:

- Emphasis on the active involvement of the learner in the learning process (learner control)
- Metacognitive training (e.g., self-planning, monitoring, and revising techniques)
- Use of hierarchical analyses to identify and illustrate prerequisite relationships (cognitive task analysis procedures)
- Emphasis on structuring, organizing, and sequencing information to facilitate optimal processing (use of cognitive strategies such as outlining, summaries, synthesizers, advanced organizers, etc.)
- Creation of learning environments that allow and encourage students to make connections with previously learned material (recall of prerequisite skills; use of relevant examples, analogies) (Ertmer and Newby 1993)

Teaching Methods Based on Some Principles of Cognitive Learning Theory

Cognitive apprenticeship, reciprocal teaching, anchored instruction, inquiry learning, discovery learning, and problem-based learning are the most distinctive

methods of teaching based on a cognitive perspective on learning. These teaching approaches are explained in the following sections.

Cognitive Apprenticeship

Cognitive apprenticeship is a method of helping students grasp concepts and procedures under the guidance of an expert such as the teacher. Its basic principles lie in the works of Vygotsky, including his theory of the zone of proximal development. This approach to instruction is marked by the following phases of instruction.

- *Modeling*: The teacher performs a task or explains a process for students to observe, which helps them understand what it takes to accomplish the learning task. Modeling provides students with the opportunity to generate conditionalized knowledge (i.e., when, where, and how to use knowledge to solve problems of different kinds).
- *Coaching*: While students do the same task, the teacher observes students and provides hints, cues, feedback, and help, if needed.
- *Articulation*: Students are asked to think out loud about how they performed the task and offer reasons for the strategies that they used. Having students articulate their implicit knowledge and strategies makes them explicit. The teacher can detect whether students have any misconceptions or use improper and inadequate strategies.
- *Reflection*: Students retrospectively think of their performance on completing the task and compare their actions with the teacher's or other students' actions.
- *Exploration*: The teacher urges students to identify a problem, formulate a hypothesis, and seek needed information to solve it. Students look at the different aspects of the problem from different perspectives on their own. This strategy is intended to promote students' ability to think independently (Collins, Brown, and Newman 1989, 481–82; Wilson and Cole 1991; Wilson, Jonassen, and Cole 1993).

Reciprocal Teaching

Reciprocal teaching is based on *information processing theory*, a branch of cognitive learning theory. Palincsar (1986), who developed this method together with Brown, defines it as an instructional activity in the form of a dialogue happening between teachers and students about parts of text. The aim is to bring meaning to the text in question to facilitate learning and understanding. The teacher incorporates four strategies into the dialogue by asking students to employ cognitive techniques of summarizing, question generating, clarifying, and predicting. Reciprocal teaching is composed of modeling, coaching, scaffolding, and fading to achieve instructional objectives especially in the area of reading (Palincsar and Brown 1985; Palincsar 1986; Wilson and Cole 1991). This method aims at promoting the effort between the teacher and students or among peers of students to make sense of the instructional materials (Palincsar 1986; Saskatchewan Education 1997).

Anchored Instruction

Anchored instruction refers to designing and implementing instruction around anchors (i.e., cases, stories, or situations) that involve some kinds of case-study or problem situation. As its name implies, anchored instruction anchors teaching and learning in realistic contexts by urging the teachers and students to formulate and seek answers to questions (Bransford, Sherwood, Hasselbring, Kinzer, and Williams 1990). It is essentially problem-based and technology-supported learning in which interactive videodisc materials serve as anchors for the subsequent teaching and learning. Technology tools facilitate students' exploration of the subject matter. John Bransford is a pioneer in developing what came to be known as anchored instruction. The Cognition and Technology Group at Vanderbilt (1993) explains how this method works:

> The design of these anchors was quite different from the design of videos that were typically used in education. . . . our goal was to create interesting, realistic contexts that encouraged the active construction of knowledge by learners. Our anchors were stories rather than lectures and were designed to be explored by students and teachers. (52)

Inquiry Learning

This teaching method grows out of Piaget's theory of cognitive development and resembles the scientific inquiry method. The primary goal is to help students develop their higher-order thinking skills by engaging them in a process of either investigating an issue or formulating and testing a hypothesis in order to find solutions to a problem (Saskatchewan Education 1997). Three types of reasoning especially underlie this approach. Learners engage in combinational, propositional, and hypothetical-deductive reasoning to successfully practice inquiry learning (Gillani 2003). Combinational reasoning involves considering and examining several different issues simultaneously from different angles in order to solve a problem. Propositional reasoning entails an examination of assumption and proposition to solve problems. Hypothetical-deductive reasoning requires a consideration of different hypotheses in addressing a problem. Instruction based on inquiry method is composed of the following five phases:

1. *Phase One*: Puzzlement or intellectual confrontation by presenting students with the problem to create a state of disequilibrium in their mind.
2. *Phase Two*: Students will hypothesize a reason for the puzzlement.
3. *Phase Three*: Students will gather new information in regard to the hypothesis. Then they isolate relevant information and organize it based on some core concept or theme.
4. *Phase Four*: Students analyze the data they have gathered and organized, and they postulate a possible answer for the hypothesis, which explains the original puzzlement.
5. *Phase Five*: Students test their hypothesis as a possible answer (Gillani 2003, 60–61).

While implementing this method of teaching, the teacher first engenders a state of disequilibrium in students' minds by presenting a situation that is complex and perplexing to students, and then provides students with sources in the environment. Next, students are asked to formulate and test a hypothesis about the intellectual puzzlement by gathering and analyzing information. Finally, students explain their answers to the hypothesis. The whole process may take several days, weeks, or months. Research findings report the effectiveness of the inquiry approach for both elementary and secondary students (Gillani 2003).

Discovery Learning

As is the case for inquiry learning, this teaching method is informed by Piaget's theory of cognitive development. Ormrod (1995) defines discovery learning as "an approach to instruction through which students interact with their environment by exploring and manipulating objects, wrestling with questions and controversies, or performing experiments" (442). As its name suggests, discovery learning encourages students to discover principles and important relationships by engaging them in such activities as asking questions, formulating hypothesis, doing experiments and research, and investigating a phenomenon (Schunk 2004, 244). The way students manipulate and process information is more important than the outcome or the product students produce, such as finding a specific answer to the question. Implementing discovery learning involves identifying a problem, formulating a hypothesis, gathering and analyzing data, and making a conclusion (Gillani 2003, 62). As a pioneer in proposing the basic principles of this approach, Bruner argued that discovery learning inherently urges learners to take responsibility for their own learning and helps them not only remember important factual information but also develop their high-order thinking skills (Gillani 2003). The assumption behind this method is that when students discover concepts by themselves rather than being told by the teacher, those concepts are likely to be firmly stored in memory and consequently are more easily retrieved and activated later when needed (Ormrod 1995). Jansen and Culpepper (1996, as cited in Gillani 2003) have suggested some questions for facilitating inquiry-based projects as follows:

- What needs to be done?
- What can I use to find what I need?
- Where can I find what I need?
- What information can I use?
- How can I put my information together?
- How can I know if I did my job well?

To increase students' understanding of contemporary issues confronting society via discovery learning, the following procedure is suggested: (1) identify and focus on the issue, (2) establish research questions and procedures, (3) gather and organize data, (4) analyze and evaluate data, (5) synthesize data, (6) plan for individual or group action, (7) operationalize the action plan, (8) evaluate the action plan process, and (9) begin a new inquiry (Saskatchewan Education 1997).

Problem-based Learning

Problem-based learning involves presenting students with an ill-structured, open-ended, authentic or real-life problem with many possible correct solutions and asking them to find answers to that authentic problem. As opposed to traditional instruction that teaches facts and skills first and then introduces the problem, this method introduces the problem at the very beginning of instruction on the basis of what students already know (or students' existing knowledge) and teaches facts and skills in a relevant context. Rather than a well-structured set of resources, this approach provides students with access to substantial resources for research. To practice this method, the teacher follows these steps:

- Students are divided into groups
- A real problem is presented and discussed
- Students identify what is known, what information is needed, and what strategies or next steps should be taken
- Individuals research different issues and gather resources
- Resources are evaluated in a group
- The cycle repeats until students feel that the problem has been framed adequately and that all issues have been addressed
- Possible actions, recommendations, solutions, or hypotheses are generated
- Tutor groups conduct peer and self-assessments (FDI 2002)

Conclusion

A wide variety of learning theories can be classified on a continuum in terms of whether they place the teacher and overt behaviors or the learner and internal mental processes at the center of instruction. While one end of the continuum represents behaviorism, the other end of the continuum represents cognitivism and constructivism. Whereas behaviorist theoretical framework characterizes the underpinnings of teacher-centered instruction, cognitive and constructivist perspectives come into play in shaping learner-centered instruction. It is now commonly suggested that rather than behaviorism, cognitivism and its accompanying teaching methods should be integrated into teachers' instructional agendas. Teachers are expected to teach their subject in accordance with the principles of cognitive learning theories. New curriculum programs urge them to embrace and practice those teaching approaches that pay attention to individual differences in students' cognitive structures or previous knowledge bases in order to help students integrate new knowledge with the knowledge they already have. Omnipresent in new curriculum development is the notion that teachers do their best to find innovative ways that not only facilitate but also optimize students' learning to the greatest extent possible. Because cognitivism is concerned with illuminating how the process of learning occurs in different contexts by offering strategies that promote students' learning, teachers can benefit from this invaluable learning paradigm in their effort to help students attain the subject's goals.

Notes

1. The implications of Jerome Bruner's theory of learning for instruction resemble those of Piaget in some respects (e.g., teaching new concepts to students via enactive, iconic, and symbolic presentations).
2. Bartlett is the originator of the notion of schema in the early 1930s.

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