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Constructivism: A new paradigm in teaching and learning

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Abstract
Constructivism represents one of the big ideas in education. Its implications for how teachers teach and learn to teach are enormous. If our efforts in reforming education for all students are to succeed, then we must focus on students. To date, a focus on student-centered learning may well be the most important contribution of constructivism. This article, therefore, discusses Constructivism as a paradigm for teaching and learning. Constructivism is learning theory found in Psychology which explains how people might acquire knowledge and learn. It therefore has direct application to education. The theory suggests that humans construct knowledge and meaning from their experiences. Conceptual understanding of the theory was discussed as well as basic characteristics of constructivists learning environment. Seven pedagogical goals of constructivist learning environments and six benefits of constructivism were outlined in this article. Significant difference between traditional classroom and constructivist classroom were spelt out in tabular form. Furthermore, principles of constructivism and several implications of constructivism for teaching and learning were received. The study, therefore, concluded that teacher needs to reflect on their practice in order to apply these ideas to their work and that constructivist teachers need to reflect on their practice in order to apply these ideas to their work and that constructivist teachers encourage students to constantly assess how the activity is helping them gain understanding.

Keywords: constructivism, learning theory, paradigm, teaching and learning

Introduction
An important restriction of education is that teachers cannot simply transmit knowledge to students, but students need to actively construct knowledge in their own minds. That is, they discover and transform information, check new information against old, and revise rules when they do not longer apply. These constructivist views of learning consider the learner as an active agent in the process of knowledge acquisition. Constructivist conceptions of learning have their historical roots in the work of Dewey (1929) [6], Bruner (1961) [4], Vygotsky (1962) [14], and Piaget (1980) Bedner, Cunningham, Duffy and Perry (1992) [1] and von Glaserfeld (1995) have proposed several implications of constructivist theory for instructional developers stressing that learning outcomes should focus on the knowledge construction process and that learning goals should be determined from authentic tasks with specific objectives. It is important to note, in this respect, that constructivism is embodied in numerous ways and that these different views share important overlaps, but also contain major differences.

Constructivism is an approach to teaching and learning based on the premise that cognition (learning) is the result of "mental construction". In other words, students learn by fitting new information together with what they already know. Constructivist believes that learning is affected by the context in which an idea is taught as well as by students' beliefs and attitudes. Constructivism is a learning theory found in psychology which explains how people might acquire knowledge and learn. It therefore has direct application to education. The theory suggest that humans construct knowledge and meaning from their experiences. Constructivism is not a specific pedagogy. Piaget's theory of Constructivist learning has wide ranging impact on learning theories and teaching methods in education and is an underlying theme of many education reform movements.

Constructivism Theory of Learning Explained
Constructivism is basically a theory which is based on observation and scientific study, about how people learn. It says that people construct their own understanding and knowledge of the world, through experiencing things and reflecting on those experience (Bereiter, 1994) [2]. When we encounter something new, we have to reconcile it with our previous ideas and experience, may be changing what we believe, or may be discarding the new information as irrelevant. Constructivism has roots in philosophy, psychology, sociology and education. But while it is important for educators to understand constructivism, it is equally important to understand the implication this view of learning has for teaching and teacher professional development (Tam, 2000) Constructivism's central ideas is that human learning is constructed, that learners build new knowledge upon the foundation of previous learning. This view of learning sharply contrasts with one in which learning is the passive transmission of information from one individual to another, a view in which reception, not construction, is key. Two important notions orbit around the simple idea of constructed knowledge. The first is that learners construct new understandings using what they already know. There is no tabula rasa on which new knowledge is etched. Rather, learners come to learning situations with knowledge gained from previous experience, and that prior knowledge influences what new or modified

knowledge they will construct from new learning experiences (Phillips, 1995).

The second notion is that learning is active rather than passive. Learners confront their understanding in light of what they encounter in the new learning situation. If what learners encounter is inconsistent with their current understanding, their understanding can change to accommodate new experience. Learners remain active throughout this process: they apply current understandings, note relevant elements in new learning experiences, judge the consistency of prior and emerging knowledge, and based on that judgment; they can modify knowledge (Phillips, 1995).

Constructivism is often compared to objectivism, which is usually quoted as being the counter point or direct opposite of constructivism. Much of objectivist theory is based on the work of behaviorists such as Skinner (1953). Objectivists believe that information itself is knowable outside the bounds of any human mind, and that any individual pieces of information as symbols or currency that can be acquired by humans, and can be transferred from human to human should the correct learning conditions exist. (Jonassen, 1991) [10].

While much of the early work in formal instructional design derived from objectivist theory, modern academic minds have come to accept that learning environments which more closely match the needs of constructivist learning may be more effective. The perceived benefits of constructivist learning may be particularly valuable where the teaching of complex skills, such as problem solving or critical thinking skills are concerned (Tam, 2000).

If we accept that constructivist theory is the best way to define learning, then it follow that in order to promote students learning it is necessary to create learning environments that directly expose the learner to the material being studied. For only by experiencing the world directly can the learner derive meaning from them. This gives rise to the view that constructivist learning must take place within a suitable constructivist learning environment. One of the central tenants of all constructivists learning is that it has to be an active process (Tam, 2000); therefore, any constructivist learning environment must provide the opportunity for active learning.

Basic characteristics of Constructivist Learning Environments

Tam (2000) lists the following four basic characteristics of constructivist learning environments, which must be considered when implementing constructivist instructional strategies:

1. Knowledge will be shared between teachers and students.
2. Teachers and students will share authority.
3. The teacher's role is one of a facilitator or guide.
4. Learning groups will consist of small numbers of heterogeneous students.

Pedagogical Goals of Constructivist Learning Environments

Honebein (1996) [9] summarizes what he describes as the seven pedagogical goals of constructivist learning environments as:

1. To provide experience with the knowledge construction process (students determine how they will learn).
2. To provide experience in and appreciation for multiple perspectives (evaluation of alternative solutions).
3. To embed learning in realistic contexts (authentic tasks).
4. To encourage ownership and a voice in the learning process (students centered learning).
5. To embed learning in social experience (collaboration).
6. To encourage the use of multiple modes of representation, (video, audio text etc).
7. To encourage awareness of the knowledge construction process (reflection, metacognition).

Benefits of Constructivism

1. Children learn more, and enjoy learning more they are actively involved, rather than passive listeners.
2. Education works best when it concentrates on thinking and understanding, rather than on rote memorization. Constructivism concentrates on learning how to think and understand.
3. Constructivist learning is transferable. In constructivist classrooms, students create organizing principles that they can take with them to other learning settings.
4. Constructivism gives students ownership of what they learn, since learning is based on student's questions and explorations, and often the students have a hand in designing the assessments as well. Constructivist assessment engages the student's initiatives and personal investments in their journals, research reports, physical models, and artistic representations. Engaging the creative instincts develops students' abilities to express knowledge through a variety of ways. The students are also more likely to retain and transfer the new knowledge to real life.
5. By grounding learning activities in an authentic, real-world context, constructivism stimulates and engages students. Students in constructivist classrooms learn to question thing and to apply their natural curiosity to the world.
6. Constructivism promotes social and communication skills by creating a classroom environment that emphasizes collaboration and exchanges of ideas. Students must learn how to articulate their ideas clearly as well as to collaborate on tasks effectively by sharing in groups projects. Students must therefore exchange ideas and so must learn to "negotiate" with others and to evaluate their contributions in a socially acceptable manner. This is essential to success in the

real world, since they will always be exposed to a variety of experiences in which they will have to cooperate and navigate among the ideas of others.

Difference between Traditional Classroom and Constructivist Classroom

In the constructivist classroom, the focus tends to shift from the teacher to the students. The classroom is no longer a place where the teacher ("expert") pours knowledge into passive students, who wait like empty vessels to be filled. In the constructivist model, the students are urged to be actively involved in their own process of learning. The teacher functions more as a facilitator who coaches, mediates, prompts and helps students develop and assess their understanding and thereby their learning. And, in the constructivist classroom, both teacher and students think of knowledge not as inert factoids to be memorized, but as a dynamic, ever-changing view of the world we live in and the ability to successfully stretch and explore that view.

The chart below compares the traditional classroom to the constructivist classroom. One can see significant difference in basic assumptions about knowledge, students and learning.

Table 1

Traditional Classroom	Constructivist Classroom
Curriculum begins with the parts of the whole. Emphasizes basic skills.	Curriculum emphasizes big concepts, beginning with the whole and expanding to include the parts.
Strict adherence to fixed curriculum is highly valued.	Pursuit of student's questions and interests is valued.
Materials are primarily textbooks and workbooks.	Materials include primary sources of material and manipulative materials.
Learning is based on repetition.	Learning is interactive, building on what the students already knows.
Teachers disseminate information to students; students are recipients of knowledge.	Teachers have a dialogue with students, helping students construct their own knowledge.
Teacher's role is directive, rooted in authority.	Teacher's role is interactive, rooted in negotiation.
Assessment is through testing, correct answers.	Assessment includes student works, observation and a point of view, as well as tests. Process is as important as product.
Knowledge is seen as inert.	Knowledge is seen as dynamic, ever changing with our experiences.
Students work primarily alone.	Students work primarily in groups.

Principles of Constructivism

Constructivist teaching is based on recent research about the human brain and what is known about how learning occurs. Caine and Caine (1991) [5] suggest that brain-compatible teaching is based on 12 principles:

1. The brain is a parallel processor. It simultaneously processes many different types of information, including thoughts, emotions and cultural knowledge. Effective teaching employs a variety of learning strategies.
2. Learning engages the entire physiology. Teachers can't address just the intellect.
3. The search for meaning is innate. Effective teaching recognizes that meaning is personal and unique, and that student's understandings are based on their own unique experiences.
4. The search for meaning occurs through 'patterning'. Effective teaching connects isolated ideas and information with global concepts and themes.
5. Emotions are critical to patterning. Learning is influenced by emotions, feelings, and attitudes.
6. The brain processes parts and wholes simultaneously. People have difficulty learning when either parts or wholes are overlooked.
7. Learning involves both focused attention and peripheral perception. Learning is influenced by the environment, culture and climate.
8. Learning always involves conscious and unconscious processes; Students need time to process 'how' as well as 'what' they have learned.
9. We have at least two different types of memory: a spatial memory system and a set of systems for rote learning. Teaching that heavily emphasizes rote learning does not promote spatial, experienced learning and can inhibit understanding.
10. We understand and remember best when facts and skills are embedded in natural, spatial memory. Experiential learning is most effective.
11. Learning is enhanced by challenge and inhibited by threat. The classroom climate should be challenging but not threatening to students.
12. Each brain is unique. Teaching must be multifaceted to allow students to express preferences.

Implications of constructivism for teaching and learning

Central to the tenet of constructivism is that learning is an active process. Information may be imposed, but understanding cannot be, for it must come from within. Constructivism requires a teacher to act as a facilitator whose main function is to help students become active participants in their learning and make meaningful connections between prior knowledge, new knowledge and the processes involved in learning. Brooks and Brooks (19930 summarize a large segment of the literature on descriptions of 'constructivist teachers'. They conceive of a constructive teacher as someone who will:

1. Encourage and accept student autonomy and initiative;
2. Use a variety of materials, including raw data, primary sources and interactive materials and encourage students to use them;
3. Inquire about students' understandings of concepts before sharing his/her own understanding of those concepts;

4. Encourage students to engage in dialogue with the teacher and with one another;
5. Encourage students enquiry by asking thoughtful, open-ended questions and encourage students to ask questions to each other and seek elaboration of students' initial response;
6. Encourage students in experiences that show contradictions to initial understanding and then encourage discussion;
7. Provide time for students to construct relationships and create metaphors;
8. Assess students' understanding through application and performance of open-structured tasks.

Conclusion

Constructivism is a theory that asserts that learning is an activity that is individual to the learner. This theory hypothesizes that individual will try to make sense of all information that they perceive and that each individual will, therefore, "construct" their own meaning from that information. Constructivism represents one of big ideas in education. Its implications for how teachers teach and learn to teach are enormous. If our efforts in reforming education for all students are to succeed, then we must focus on students. To date, a focus on students-centered learning may well be the most important contribution of constructivism. The principles of constructivism, increasingly influential in the organization of classrooms and curricula in schools, can be applied to teaching and learning. The principles appeal to our modern views of learning and knowledge but conflict with traditional practices. Teachers need to reflect on their practice in order to apply these ideas to their work. Constructivist teachers encourage students to constantly assess how the activity is helping them gain understanding. By questioning themselves and their strategies, students in the constructivist classroom ideally become "expert learners". This gives them ever-broadening tools to keep learning. With a well-planned classroom environment, the students learn how to learn.

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