

CONSTRUCTIVISM & STUDENT CENTERED LEARNING

1. CONSTRUCTIVISM: THEORIES & PRACTICES

1.1. Foundation of Constructivism

Constructivism is a theory of knowledge (epistemology) that argues that humans generate knowledge and meaning from an interaction between their experiences and their ideas. During infancy, there is an interaction between human experiences and their reflexes or behavior patterns. Jean Piaget called these systems of knowledge “schemata”. Piaget's theory of constructivist learning has had wide ranging impact on learning theories and teaching methods in education and is an underlying theme of many educational reform movements. Research support for constructivist teaching techniques has been mixed, with some research supporting these techniques and other research contradicting those results. In past centuries, constructivist ideas were not widely valued due to the perception that children's play was seen as aimless and of little importance. Jean Piaget did not agree with these traditional views, however. He saw play as an important and necessary part of the student's cognitive development and provided scientific evidence for his views. Today, constructivist theories are influential throughout much of the non-formal learning sector.

Formalization of the theory of constructivism is generally attributed to Jean Piaget, who articulated mechanisms by which knowledge is internalized by learners. He suggested that through processes of accommodation and assimilation, individuals construct new knowledge from their experiences. When individuals assimilate, they incorporate the new experience into an already existing framework without changing that framework. This may occur when individuals' experiences are aligned with their internal representations of the world, but may also occur as a failure to change a faulty understanding; for example, they may not notice events, may misunderstand input from others, or may decide that an event is a fluke and is therefore unimportant as information about the world. In contrast, when individuals' experiences contradict their internal representations, they may change their perceptions of the experiences to fit their internal representations. According to the theory, accommodation is the process of reframing one's mental representation of the external world to fit new experiences. Accommodation can be understood as the mechanism by which failure leads to learning. When we act on

the expectation that the world operates in one way and it violates our expectations, we often fail, but by accommodating this new experience and reframing our model of the way the world works, we learn from the experience of failure, or others' failure. It is important to note that constructivism is not a particular pedagogy. In fact, constructivism is a theory describing how learning happens, regardless of whether learners are using their experiences to understand a lecture or following the instructions for building a model airplane. In both cases, the theory of constructivism suggests that learners construct knowledge out of their experiences. However, constructivism is often associated with pedagogic approaches that promote active learning, or learning by doing. There are many critics of learning by doing (discovery learning) as an instructional strategy that will be explored at the end of this research. To some it would appear that constructivism remains more of a philosophical framework than a theory that either allows us to precisely describe instruction or prescribe design strategies. This is unfortunate because there is quite a bit of promise to the educational philosophy behind constructivism, but constructivists seem to be having difficulties defining testable learning theories.

1.2. Teaching and Learning Within Constructivism

Social constructivism not only acknowledges the uniqueness and complexity of the learner, but actually encourages, utilizes and rewards it as an integral part of the learning process. Social constructivism or socio-culturalism encourages the learner to arrive at his or her version of the truth, influenced by his or her background, culture or embedded worldview. Historical developments and symbol systems, such as language, logic, and mathematical systems, are inherited by the learner as a member of a particular culture and these are learned throughout the learner's life. This also stresses the importance of the nature of the learner's social interaction with knowledgeable members of the society. Without the social interaction with other more knowledgeable people, it is impossible to acquire social meaning of important symbol systems and learn how to utilize them. Young children develop their thinking abilities by interacting with other children, adults and the physical world. From the social constructivist viewpoint, it is thus important to take into account the background and culture of the learner throughout the learning process, as this background also helps to shape learning.

Furthermore, it is argued that the responsibility of learning should reside increasingly with the learner. Social constructivism thus emphasizes the

importance of the learner being actively involved in the learning process, unlike previous educational viewpoints where the responsibility rested with the instructor to teach and where the learner played a passive, receptive role. Some emphasized that learners construct their own understanding and that they do not simply mirror and reflect what they read. Learners look for meaning and will try to find regularity and order in the events of the world even in the absence of full or complete information. Another crucial assumption regarding the nature of the sustaining motivation to learn is strongly dependent on the learner's confidence in his or her potential for learning. These feelings of competence and belief in potential to solve new problems, are derived from first-hand experience of mastery of problems in the past and are much more powerful than any external acknowledgment and motivation. This links up with Lev Vygotsky's "zone of proximal development" where learners are challenged within close proximity to, yet slightly above, their current level of development. By experiencing the successful completion of challenging tasks, learners gain confidence and motivation to embark on more complex challenges.

According to the social constructivist approach, instructors have to adapt to the role of facilitators and not teachers. Whereas a teacher gives a didactic lecture that covers the subject matter, a facilitator helps the learner to get to his or her own understanding of the content. In the former scenario, the learner plays a passive role and in the latter scenario the learner plays an active role in the learning process. This dramatic change of role implies that a facilitator needs to display a totally different set of skills than a teacher. A teacher tells, a facilitator asks; a teacher lectures from the front, a facilitator supports from the back; a teacher gives answers according to a set curriculum, a facilitator provides guidelines and creates the environment for the learner to arrive at his or her own conclusions; a teacher mostly gives a monologue, a facilitator is in continuous dialogue with the learners. A facilitator should also be able to adapt the learning experience 'in mid-air' by taking the initiative to steer the learning experience to where the learners want to create value.

The learning environment should also be designed to support and challenge the learner's thinking. While it is advocated to give the learner ownership of the problem and solution process, it is not the case that any activity or any solution is adequate. The critical goal is to support the learner in becoming an effective thinker. This can be achieved by assuming multiple roles, such as consultant and coach. A few strategies for cooperative learning include;

- Reciprocal Questioning: Students work together to ask and answer questions
- Jigsaw Classroom: Students become "experts" on one part of a group project and teach it to the others in their group
- Structured Controversies: Students work together to research a particular controversy

Social constructivism, strongly influenced by Vygotsky's work, suggests that knowledge is first constructed in a social context and is then appropriated by individuals. According to social constructivists, the process of sharing individual perspectives called collaborative elaboration results in learners constructing understanding together that wouldn't be possible alone. Social constructivist scholars view learning as an active process where learners should learn to discover principles, concepts and facts for themselves, hence the importance of encouraging guesswork and intuitive thinking in learners.

1.3. The Role of the Curriculum

Knowledge should not be divided into different subjects or compartments, but should be discovered as an integrated whole. This also again underlines the importance of the context in which learning is presented. The world, in which the learner needs to operate, does not approach one in the form of different subjects, but as a complex myriad of facts, problems, dimensions, and perceptions. Learners should constantly be challenged with tasks that refer to skills and knowledge just beyond their current level of mastery. This captures their motivation and builds on previous successes to enhance learner confidence. This is in line with Vygotsky's zone of proximal development, which can be described 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).

Vygotsky further claimed that instruction is good only when it proceeds ahead of development. Then it awakens and rouses to life an entire set of functions in the stage of maturing, which lie in the zone of proximal development. It is in this way that instruction plays an extremely important role in development. To fully engage and challenge the learner, the task and learning environment should reflect the complexity of the environment that the learner should be able to function in at the end of learning. Learners must not only have ownership of the learning or

problem-solving process, but of the problem itself. Where the sequencing of subject matter is concerned, it is the constructivist viewpoint that the foundations of any subject may be taught to anybody at any stage in some form. This means that instructors should first introduce the basic ideas that give life and form to any topic or subject area, and then revisit and build upon these repeatedly. This notion has been extensively used in curricula.

It is also important for instructors to realize that although a curriculum may be set down for them, it inevitably becomes shaped by them into something personal that reflects their own belief systems, their thoughts and feelings about both the content of their instruction and their learners. Thus, the learning experience becomes a shared enterprise. The emotions and life contexts of those involved in the learning process must therefore be considered as an integral part of learning. The goal of the learner is central in considering what is learned. It is important to achieve the right balance between the degree of structure and flexibility that is built into the learning process. The more structured the learning environment, the harder it is for the learners to construct meaning based on their conceptual understandings. A facilitator should structure the learning experience just enough to make sure that the students get clear guidance and parameters within which to achieve the learning objectives, yet the learning experience should be open and free enough to allow for the learners to discover, enjoy, interact and arrive at their own, socially verified version of truth.

1.4. Criticism & Confusion of Educational Constructivism

Several cognitive psychologists and educators have questioned the central claims of constructivism. It is argued that constructivist theories are misleading or contradict known findings. In the neo-Piagetian theories of cognitive development it is maintained that learning at any age depends upon the processing and representational resources available at this particular age. That is, it is maintained that if the requirements of the concept to be understood exceeds the available processing efficiency and working memory resources then the concept is by definition not learnable. This attitude toward learning impedes the learning from understanding essential theoretical concepts or, in other words, reasoning. Therefore, no matter how active a child is during learning, to learn the child must operate in a learning environment that meets the developmental and individual learning constraints that are characteristic for the child's age and their possible

deviations from their age's norm. If this condition is not met, construction goes astray.

Several educators have also questioned the effectiveness of this approach toward instructional design, especially as it applies to the development of instruction for novices. While some constructivists argue that learning by doing enhances learning, critics of this instructional strategy argue that little empirical evidence exists to support this statement given novice learners. It has been argued that novices do not possess the underlying mental models, or schemas necessary for learning by doing. Indeed, a review of the literature found that fifty years of empirical data do not support using the constructivist teaching technique of pure discovery. In those situations requiring discovery, it has been suggested by some to use guided discovery instead. As a result, it is argued that not all teaching techniques based on constructivism are efficient or effective for all learners, suggesting many educators misapply constructivism to use teaching techniques that require learners to be behaviorally active.

In contrast, some describe constructivist teaching methods as unguided methods of instruction. They suggest more structured learning activities for learners with little to no prior knowledge. Here constructivism is described as an example of fashionable but thoroughly problematic doctrines that can have little benefit for practical pedagogy or teacher education. Kirschner *et al.* group a number of learning theories together (Discovery, Problem-Based, Experiential, and Inquiry-Based learning) and stated that highly scaffolded constructivist methods like problem-based learning and inquiry learning are ineffective. Kirschner *et al.* described several research studies that were favorable to problem-based learning given learners were provided some level of guidance and support. Mayer's point is that people often misuse constructivism to promote pure discovery-based teaching techniques. He proposes that the instructional design recommendations of constructivism are too often aimed at discovery-based practice. Sweller found evidence that practice by novices during early schema acquisition, distracts these learners with unnecessary search-based activity, when the learner's attention should be focused on understanding (acquiring schemas). This would agree with Mayer's viewpoint that even though constructivism as a theory and teaching techniques incorporating guidance are likely valid applications of this theory, nevertheless a tradition of misunderstanding has led to some question "pure discovery" techniques.

The math wars controversy in the United States is an example of the type of heated debate that sometimes follows the implementation of constructivist inspired

curricula in schools. In the 1990s, mathematics textbooks based on new standards largely informed by constructivism were developed and promoted with government support. Although constructivist theory does not require eliminating instruction entirely, some textbooks seemed to recommend this extreme. Some parents and mathematicians protested the design of textbooks that omitted or de-emphasized instruction of standard mathematical methods. Supporters responded that the methods were to be eventually discovered under direction by the teacher, but since this was missing or unclear, many insisted the textbooks were designed to deliberately eliminate instruction of standard methods.

Additionally, many people confuse constructivist with maturationist views. The constructivist stream is based on the idea that the dialectic or interactionist process of development and learning through the student's active construction should be facilitated and promoted by adults. Whereas, the romantic maturationist stream is based on the idea that the student's naturally occurring development should be allowed to flower without adult interventions in a permissive environment. In other words, adults play an active role in guiding learning in constructivism, while they are expected to allow children to guide themselves in maturationism. In recent decades, constructivist theorists have extended the traditional focus on individual learning to address collaborative and social dimensions of learning. In fact, some see social constructivism as a bringing together of aspects of the work of Piaget with that of Bruner and Vygotsky.