Constructivist Approach to Learning based on the Concepts of Jean Piaget and Lev Vygotsky
An Analytical Overview

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Abstract

The goal of learning is not to store piles of information but to engage children's minds by constructing powerful and useful concepts. The behaviorist approach to learning focuses only on the behaviour that can be externally observed without considering the influence of the unconscious mind. The constructivist approach to learning can facilitate individuals by providing meaningful and relevant information, by giving opportunities to discover or apply ideas themselves and by teaching them to be aware of and consciously use their own strategies for learning. Here, the learners must be capable of discovering basic skills and knowledge to solve complex problems or transform complex information into convenient and suitable information. Jean Piaget viewed children as discovering or constructing virtually all knowledge about their world based on their cognitive levels. According to Vygotsky, the socio-cultural context also profoundly affects children's learning. This paper discusses the different strategies and methods for facilitating constructive learning with broad emphasis on the views of Jean Piaget and Lev Vygotsky.

Keywords: Learning, Cooperative, Discovery, Scaffolding, Cognitive Development

INTRODUCTION

In the job to instruct student teachers, the constructivist approach to learning is introduced to minimise deficits and utilise the strengths of the student teachers through which

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they in turn can enhance the learning opportunities of their students. There are no boundaries in learning and teaching—teachers, students, and learning cannot be limited to the confines of the classroom. Constructivist learning is a student-driven process in which students develop or construct their understanding of information. The learners incorporate their own experiences and perspectives as well as those of others to develop their own understanding of concepts rather than only receiving information from the instructor (Anthony, 1996). Knowledge is not seen as fixed and existing independently outside of the learner but rather learning is a process of accommodation or adaptation based on new experiences or ideas (Jenlick and Kinnucan-Welsch, 1999). The constructivist pedagogies represent a synthesis of cognitive and social perspectives where knowledge is seen as personally constructed and socially mediated. The act of teaching is co-constructing knowledge with students, acting as conceptual change agent, mentoring apprentices through the zone of proximal development and supporting a community of learners (Windschitl, 2002). Learners can learn by integrating information from the external world with their pre-existing schemas of knowledge to develop their own understanding of concepts (Collay, Gangon and Schmuk, 2006). The constructivist approach allows space for the learner's curiosity by providing flexible time to experiment,

think and reflect about what they are doing and learning (Grennon-Brooks and Brooks, 1999). In the process, the teacher is the mediator, who guides the learning process by asking questions, making suggestions and explaining concepts, instead of explicitly forcing to memorise the correct answer to the learner.

Behaviourism and constructivism are two learning theories that have stemmed from two philosophical schools of thought that have influenced educators' view of learning. Behaviourism refers to a psychological approach which emphasises scientific and objective methods of investigation concerning observable stimulus-response behaviours (McLeod, 2017). Watson (1878–1958), Pavlov (1849–1936), Thorndike (1874–1949) and Skinner (1904–1990), the major proponents of behaviourism believed that all behaviours were the result of interaction with the environment and only observable, measurable and outward behaviours were worthy of scientific inquiry (Bush, 2006). Their direction of research in learning was focused on behavioural changes manipulated by conditioning of the external environment

> Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select — doctor, lawyer, artist, merchant-chief and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations and the race of his ancestors (Watson, 1924).

Behaviourist teaching methods tend to rely on the so-called "skill and drill" exercises to provide the consistent repetition necessary for effective reinforcement of response patterns. Positive reinforcements such as verbal praise, good grades and prizes are common (Morrison, Ross and Kemp, 2004). In contrast, constructivism views learning as a search for meaning and describes elements that help predict what students understand at different stages of development (Rummel, 2008). Whereas a behaviourist is mainly concerned with the learning contents and the effect of conditioning on learning, a constructivist would be more interested in understanding the learners attempt to construct meaning (Bush, 2006). Behaviourism can clearly define behaviour and measure behavioural changes from a scientific angle. Important factors that influence behaviour, like emotions, expectations, higher-level motivation, etc., are not discussed; rather it focuses only on the behaviour that can be externally observed. Therefore, this learning theory faces criticism from the psychodynamic approach of Sigmund Freud as it does not take into account the influence of the unconscious mind on behaviour. Humanistic psychology also rejects the nomothetic approach to behaviourism as humanism views humans as being unique that cannot be compared with animals. In due course, researchers sought ways to identify the cognitive processes in learning (Fisher, 2008). This led to the development of cognitive science, which "includes the study of thinking, perception, emotion, creativity, language, consciousness and learning" (Harman, 2008). Many psychologists have worked on constructivism, postulating an answer to the question 'how people know what they know?' John Dewey (1938) was credited for beginning the constructivist movement. The essence of constructivist theory is the idea that learners must individually discover and transform complex information if they are to make it their own. The constructivist revolution draws heavily on the works of Jean Piaget (1896–1980) and Lev Vygotsky (1896–1934) on cognitive development, that is how thinking and knowledge develop with age. The present discussion is concerned with the critical analysis of constructivism in the views of Piaget and Vygotsky.

CONSTRUCTIVISM IN THE VIEWS OF PIAGET AND VYGOTSKY

Jean Piaget explained the learning process as adaptation (building of schemes, that is, organised ways of creating information on how things work through direct interaction with the environment), assimilation (introduction of new information into the existing schemes) and accommodation (transforming existing schemes or creating new ones). The learner is inclined to adapt to his new environment and restore the disequilibrium between the existing

schemes and what is encountered in the environment. Continuous interactions among existing schemes, assimilation, accommodation and equilibration create a strongly interconnected cognitive system for new learning. Piaget divided the psychological development of the young learner into four sequential stages. During the sensorimotor stage (birth to the age of 2), sensory experiences and motor activities dominate. Advances in mental representations but limitations in thinking mainly intuitive in nature occur during the preoperational stage (from age 2 to age 7). At the concrete operational stage (from age 7 to 11), the intelligence of the child is logical and more organised with the ability to decentre and reverse thinking and dependent on concrete references. The formal operational stage (after 11 years of age) is the stage when abstract thinking starts and the learner engages in hypothetic-deductive reasoning.

Piaget's theory provides a solid framework for understanding children's way(s) of doing and thinking and their capabilities at different levels of their development. Children have their own views of the world that are extremely coherent and robust. Their ways of doing and thinking are mostly well suited to their current needs and possibilities. The views are continually evolving with the expansion of knowledge from within, and through self-organisation, thus requiring a better theory to abandon

a believe system or a working theory. Piaget believes that a constructivist classroom must provide a variety of activities to challenge students to accept individual differences, increase their readiness to learn, discover new ideas, and construct their own knowledge (Ackermann, 2001).

Lev Vygotsky, known for his socio-cultural theory of constructivism, believes that children develop cognitively through the process of socialisation and education. Vygotsky agreed with Piaget that children are active, constructive beings but unlike Piaget who emphasised children's independent efforts to make sense of their world, Vygotsky viewed cognitive development as a socially mediated process dependent on the assistance that children received from adults and more expert peers in tackling new challenges (Berk, 2007). The perceptual attention and memory capacities of learners are provided by their culture. For learning to occur, the child first makes contact with the social environment at an interpersonal level and then internalises this experience to think and solve problems. The earlier notions and new experiences influence the child, who then constructs new ideas through self-regulation.

Children learn best the concepts that are in their zone of proximal development. Children are working within their zone of proximal development when they are engaged in tasks that they could not do alone

but can do with the assistance of peers or adults. When children are working together, each child is likely to have a peer performing on a given task at a slightly higher cognitive level exactly within the child's zone of proximal development. In the views of Vygotsky, cognitive development is limited to a certain range at a particular age. With the help of social interaction, such as assistance from a mentor, learners can comprehend concepts and schemes that they cannot know on their own.

In scaffolding or mediated learning, the teacher is the cultural agent who guides instruction so that students will master and internalise the skills that permit higher cognitive functioning (Vygotsky, 1978). The ability to internalise cultural tools relates to the learner's age or stage of cognitive development and once acquired, the internal mediators allow greater self-mediated learning (Slavin, 2009). In practical terms, scaffolding might include giving students a great deal of support at the early stage of learning and gradually turning responsibility over to them to operate on their own (Rossenshine and Meister, 1994). Vygotsky's emphasis on scaffolding or mediated learning is important in the modern constructivist approach. Students should be given complex, difficult, realistic tasks and then be given enough help to achieve these tasks. This is the underlying principle for the classroom projects, simulations, explorations in the community,

writing for real audiences, and other authentic tasks (Byerly, 2001).

Piaget's "cognitive constructivism" views that humans are unable to automatically understand and use information that they have been given, because they need to "construct" their own knowledge through prior personal experiences to enable them to create mental images (Chambliss, 1996). Therefore, the primary role of the teacher is to motivate the children to create their own knowledge through their personal experiences (Rummel, 2008). Vygotsky's "social constructivism" is similar to Piaget's assumptions about how children learn but places more importance on the social context of learning. In Piaget's theory, the teacher played a limited role whereas in Vygotsky's theory, the teacher played an important role as a facilitator in learning.

CONSTRUCTIVISM IN TEACHER EDUCATION

Due to differing views, educators have the daunting task to design instruction and develop a curriculum that will promote student learning in a diverse society. In Teacher Education programmes, student teachers' learning can be the result of experiences gained in schools and/or new inputs acquired from the Teacher Education courses which are often associated with practical works both in the classrooms and the field. The constructivist perspective is appropriate in Teacher Education because it is not oriented

towards absolute truth but intended for understanding of appropriate teachings. Pedagogy classes provide an understanding to student teachers on how students learn and the student teachers construct useful strategies within their own teachings. This constructivist perspective of Teacher Education has reversed the earlier view of teachers as merely exhibiting prescribed behaviours in the classroom. Teachers can be viewed as critical thinkers who use their unique background experiences to construct their own understanding during their professional preparation (Noel, 1993). Constructivism has been relevant to the teaching of various disciplines, such as, mathematics (NCTM, 1991), science (Lakatos, 1970), reading, comprehension (Spivey, 1989), arts (Simpson, 1996), etc. The constructivist wave has been entering the scene of the Indian educational discourse during the last decade. Before, the term 'constructivism' appeared only in journals and Teacher Education and Education Technology textbooks. The National Curriculum Framework for Teacher Education (NCFTE, 2010) requires teachers amongst others to view learners as active participants in their own learning and not as mere recipients of knowledge; to encourage their capacity to construct knowledge; and to ensure that learning shifts away from rote methods. Learning is to be viewed as a search for meaning out of personal experiences, and knowledge generation as a continuously evolving

process of reflective learning. The framework envisages that Teacher Education must engage with theory along with field experiences to help trainees to view knowledge not as external to the learner but as something that is actively constructed during learning. In the National Curriculum Framework (NCF 2005), learning is understood mainly as the construction of knowledge. Several education technology companies such as Educomp, Mexus Education, TATA, etc., have entered the Indian market and deployed their systems in numerous private schools. Constructivism has now become a widely adopted slogan applied in various ways and in several contexts. The philosophy or belief that learners create their own knowledge based on interactions with their environment including people, views learning as an interpretive, recursive and building process by active learners interrelating with the physical and social world (Draper, 2002). Constructivism requires the teacher to assume the role of a guide who relinquishes his authority figure to allow the students to be actively engaged and take some responsibility for their own learning (White-Clark, DiCarlo and Gilchriest, 2008). The teacher concentrates on showing students relevance and meaningfulness in what they are learning and to pose realistically complex and personally meaningful problems to the students.

In the backdrop of the views of Piaget and Vygotsky, some of

the constructivist approaches to education are discussed below.

Cooperative Learning

Constructivist approaches to teaching typically make extensive use of cooperative learning where students work together in small groups to help each other learn. The emphasis on the social nature of learning and the use of groups of peers to model appropriate ways of thinking and exposing each other's misconceptions are key elements of Piaget's and Vygotsky's conceptions of cognitive change (Pontecorvo, 1993).

Discovery Learning

It is an important component of the modern constructivist approaches that has a long history in education innovation. In discovery learning (Bergstrom and O'Brien, 2001), students are encouraged to learn largely on their own through active involvement with concepts and principles, and teachers encourage students to have experiences and conduct experiments that permit them to discover principles for themselves. Summer camps and innovative science programs (Singer et al., 2000) are based on principles of discovery learning. Discovery learning arouses students' curiosity, motivating them to continue to work until they find answers. Students also learn independent problem-solving and critical-thinking skills,

because they must analyse and manipulate information.

Self-regulated Learning

In self-regulated learning, the learners are metacognitively, motivationally and behaviourally active in their own learning (Zimmerman, 1989). Self-regulated learners use specific self-directive processes that transform their pre-existing mental abilities into academic skills or task related behaviour in diverse areas (Zimmerman, 2002; Zimmerman, 2013). The motivation for self-regulation of the learners mainly arises from their underlying beliefs including perceived efficacy and also from their intrinsic interests. Self-regulated learning involves the use of specific processes that are effective learning strategies for each learning task (Zimmerman, 2002; Slavin, 2009). The learners look for ways to simplify complex problems, decide when and how to go for deep understanding, etc. (Greeno and Goldman, 1998; Zimmerman and Kitsantas, 1999; Slavin, 2009).

Active Engagement

Physical and mental manipulation of materials and ideas enable students to gain experiences where they can think about and reproduce and consequently develop a relationship with the information and concepts involved. The instructor is required to design learning activities that provide opportunities for experimentation and discovery, and guides the learning

process through questions and feedback (Johnson et al., 2005a). In B.Ed. courses, for example, student teachers are asked to prepare teaching aids for teaching demonstration. A student teacher was required to prepare a chart of the digestive system of human body. During the preparation of the teaching aid, various situations arise, like fixing the size of the chart, borders, fonts, line weight, line spacing, related organs, size, proportion and colour of the organs, process involved, etc. As the activity proceeds, the student teachers discuss ideas among themselves, hear from students of biology background, consult books, web pages, etc. By actively engaging in the process of making a chart, the student teacher develops one's own enhanced understanding of the digestive system, the importance and functions of the digestive system. The instructor mediates the learning process by asking questions, making suggestions, and explaining basic concepts of instruction through chart, and the learning is driven by the student teacher's needs and interests.

Intentionality

Although exclusive focus on performance goals can cause anxiety and stress for learners and inhibit their ability to retain knowledge after task completion, limited performance goals can be helpful in building confidence in learners because they can see productive outcomes and accomplishments result from their learning (Grabowski and Song, 2006). Learning environments designed with specific learning goals help learners understand why the information they are working with is important and relevant (Grabinger, 2001). Goals can also be performance-based, in which the learner seeks public recognition for a result. In the B.Ed. programme, one aspect is the co-curricular activity with performance-oriented goals. In one of the sub-activity, the student teachers are to present a one-act play on social and educational issues. While the supervisor explains the concept of the issue, it is for the student teachers to bring out the play with educational implications in a way to be appreciated by the audience. Instructors working with these students support learning goals by stressing the importance of taking time to understand the concept and not rushing through the process. The performance goal encourages them to slow down and think about how they want other people to see their efforts. It also encourages the learners to take pride in their work and complement each other.

Complexity

Physical growth is enhanced by physical exercise whereas cognitive growth is enhanced by complex thinking. Adults must strike a balance between a child's existing cognitive development and the level of thinking that a child is capable of when assisted by a more informed person.

Oversimplifying may not help curious children who ask about everything from where babies come and why the sky is blue to why there is war and why people die. The child's age, our own knowledge, social circumstances, and experiences influence our responses to such inquiries. Learners need to be exposed to and engaged in such complicated discussions in order to develop higher order thinking skills. Exposing a child to ideas and tasks that are more complicated than those that the child is already familiar with helps that child develop more elaborate cognitive processes (Wertsch, 1988). As children understand complex ideas and meet complicated challenges, they build confidence in their ability to perform such tasks and are better prepared to later build more complex structures of knowledge (Collay et al., 2006).

Collaboration

Social interactions can expand our thinking and expose us to new ideas. In collaborative learning environments, individuals must balance their dependency on others with their own accountability to the group in order to reach shared objectives (Johnson et al., 2005b). As individuals work to communicate, resolve disagreements, and achieve goals, they are forced to examine and modify their own thinking, behaviours, and relationships with others (Costa, 2000). Collaboration can also develop individuals' self-esteem because they are needed for the group. When

group members share responsibly and support one another, individuals within that group can develop an emotional sense of self-worth and usefulness because they are needed to advance the shared group goal (Biehler and Snowman, 2003). The successful completion of a joint effort also brings individuals within that collaboration closer together through the shared achievement of reaching the mutual goal.

Conversation

Conversational learning helps learners develop and expand their concepts of knowledge and information by exposing them to new information and alternatives. In addition to exposing learners to new information and alternative perspectives, the exchange of ideas and personal sharing that occurs in conversation can also help people recognise their similarities, develop bonds, and learn from one another as models of behaviour and thinking; as people talk and share their thoughts with one another, a trust and understanding can be built that can open those involved to new perspectives (Baker, Kolb and Jensen, 2002). Additionally, when people articulate their ideas and explain their thinking to others, they think through their reasoning and re-examine their ideas (Biehler and Snowman, 2003). During the community contact programme for the B.Ed. course, the student teachers are divided into groups and each group is allotted a topic

for the contact programme. Student teachers with different backgrounds, experiences and qualifications have an opportunity to share their ideas among themselves for finalisation of the methodology of presentation. Their views are in turn shared with the community having families of different socio-economic status. Such conversation facilitates student teachers to generate better ideas of the topic and at the same time, recognise and understand the importance of the topic in practical applications.

Reflection

Conversation provides opportunities for learners to reflect on their thinking and analyse the process they used to reach opinions and ideas; as individuals attempt to explain their ideas to someone else, answer questions and respond to feedback, they think through their reasoning and re-examine their ideas (Biehler and Snowman, 2003). Such re-evaluation may help people reaffirm their ideas to their own mind or may cause them to reconsider some of their positions, but in either case, reflection allows learners to follow their own thought processes (Lochhead, 2000). As people learn to follow their thought processes, they learn to recognise inadequacies in their understanding of information and can thereby ask questions and seek information to gain clarity. Such thinking about thinking, or metacognition, teaches learners that thoughts do not just magically

happen, but that thoughts can be directed and guided by the thinker (Swartz, 2000). Reflection also helps learners build knowledge constructs, because as they reflect on their thinking and thinking processes, they relate their own personal experiences and associations to the information and make that knowledge their own (Martin, 2000). This personal identification and the act of reflecting on thinking helps the learner to retain information and increase his ability to transfer that knowledge to other contexts (Johnson and Johnson, 2000). In a project work for extraction of caffeine from tea, the student was required to determine the melting point of the caffeine extract. The caffeine extract was put inside a flask and was to be melted by placing the flask on boiling water. In the process, the temperature of the water when the caffeine started to melt was to be recorded as the melting point of caffeine. The child was feeling frustrated as the caffeine never started to melt that whole day. The instructor only reminded the basics, that is the temperature of liquids will not rise above their boiling points. The child succeeded in melting the caffeine extract and recording the melting point by replacing water with a liquid having higher boiling point. Drawing the child's attention to his own thinking and working process not only helps one discover one's own errors, but also initiates the habit of thinking to avoid repeated errors in the future.

IMPACT ON CURRICULUM DEVELOPMENT AND INSTRUCTIONAL DESIGN

The curricula developed with due consideration of the constructivist learning model actively engage the students in their learning process. Learning occurs due to an internal cognitive activity where learners construct knowledge from classroom experience. The teacher's role is to facilitate and negotiate meaning, rather than to dictate an interpretation (Driscoll, 2005). Curriculum specialists and lesson plan builders can use the zone of proximal development as a guiding reference. The constructivism oriented instructional framework developed by Kumar (2006) suggested a repertoire of heuristic instructional strategies that facilitated students' independent construction of scientific knowledge. Learners select and process information through constructing hypotheses, decision making, and giving meaning and organisation to experiences. Constructivists frame all instructional goals in experiential terms, specifying the kinds of learner problem addressed; the kinds of control learner's exercise over the learning environment; the activities in which they engage and the ways those activities could be shaped by leaders or instructors; and the ways in which learners reflect on the results of their activity together (Weegar and Pacis, 2012).

In a constructivist classroom, teachers and peers support and contribute to learning through the concepts of scaffolding, cognitive apprenticeship, tutoring, and cooperative learning and learning communities (Brown, 1994; Rogoff, 1998). The teachers create situations that review the assumptions of traditional teaching and learning. Constructivists always re-evaluate assumptions about knowledge and attitude towards 'the expert'; do not have any problem by ambiguity but are enticed by complexity; and venture on the never-ending quest for truth and learning through the process of construction in which the knower participates (Belenky, Clinchy, Goldberger, and Tarule, 1986). Reflecting on teaching practice enables the teacher to move on from the traditional teaching to a constructivist and transactional one which is the purpose of constructivism (Mezirow, 1990).

According to the social constructivist approach, instructors are facilitators (Bauersfeld, 1995). 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. The learner plays a passive role while the instructor just teaches; however, the learner plays an active role while the instructor facilitates the learning process and helps learners to learn. 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 predetermined curriculum, a facilitator provides guidelines and

creates appropriate environment for the learner to arrive at his or her own answer and conclusions; a teacher gives monologue, a facilitator is in continuous and interactive dialogue with the learners (Rhodes and Bellamy, 1999).

With the growing popularity of online learning vis-à-vis constructivism, software packages focus on interactive problem-based environment where the student is empowered to take charge of his or her own learning. Hypermedia and multimedia online instructional approaches can be constructivists in nature by emphasising problem solving to the learners. The creation of these rich learning environments may include fully integrated courses complete with texts, reference sources, multimedia, social networking, etc. (Shield, 2000). Problem-based learning (PBL) is one method which allows students to apply their knowledge to real world applications through online learning (Camp and Doolittle, 1999). Students work in cooperative groups to explore possible answers, develop a product, and present findings to the selected audience (Carbonell, 2004). Threaded discussions and problem - based learning project activities online enable the learners to think critically and provide discovery learning.

CONCLUSION

Both Piaget and Vygotsky appreciated constructivist learning. Knowledge is not merely a commodity to be transmitted, encoded, retained, and re-applied, but a personal experience to be constructed. Constructivist learning environments promote the learner to gather, filter, analyse, and reflect on the information provided for their own understanding. Piaget's theory has been criticised for relying exclusively on the sequential stages and underestimating children's abilities and progress but Piaget's influence on concepts of cognitive constructivism and developmentally appropriate instruction are important in educational reforms.

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