An Introduction to Cognitive Constructivism in Education

RAJESH KUMAR* and V.K. GUPTA**

Abstract

Many theories of learning have been proposed in the last century until recently, behavioural psychology has influenced education to such a starting degree that it had a virtual stronghold on how textbooks were defined and how teachers planned and implemented lessons. Constructivism reflects this philosophy; Cognitive Constructivism is based on the work of Swiss developmental psychologist Jean Piaget. Piaget's theory of cognitive development proposes that humans can not be 'given' information which they immediately understand and use. Instead, humans must 'construct' their own knowledge. They build their knowledge through experience. Experiences enable them to create schemes – mental models in their heads. These schemes are changed, enlarged and made more sophisticated through two complimentary processes: assimilation and accommodation.

History of Constructivism

As a philosophy of learning, constructivism can be traced back to the eighteenth century and to the work of the philosopher Giambattista Vico, who maintained that human can understand only what they have themselves constructed. A great many philosophers and educationists have worked with these ideas, but the first major contemporaries to develop a clear idea of what Constructivism consists in, were Jean Piaget and John Dewey.

According to John Dewey, education depends on action. For him, mind is a means of transforming, reorganising, reshaping, accepted meanings and values, a means of attending to "the lived situations of life." Dewey kept telling his readers, "Mind is active, a verb and not a noun" (Fosnot, 1996). Dewey stressed the importance of having a student's knowledge grow from experience. Knowledge and ideas come only from a situation where learners had to draw them out of experiences that had meaning and importance to them.

Jean Piaget was another psychologist who had a great influence on the theory of Constructivism. Piaget was interested

* *Lecturer,* University College of Education, Kurukshetra University, Kurukshetra.
** *Principal,* University College of Education, Kurukshetra University, Kurukshetra.

in the way that children think. Piaget's constructivism was based on his view of the psychological development of children. He believed that the fundamental basis of learning was discovery: "To understand is to discover, to reconstruct by rediscovery, and such conditions must be complied with if in the future individuals are to be formed who are capable of production and creativity and not simply repetition."

Constructivism certainly has a long history in education and philosophy, and there is much to be learned from that history. However, a review of that history could easily be a book in itself and cannot be presented in the constraints of a paper.

Meaning of Constructivism

The Verb 'to construct' is derived from the Latin word 'Con struere' which means to arrange or to give structure. Ongoing structuring (organising) processes are the conceptual heart of constructivism. Constructivism is a theory about knowledge and learning; it describes what "knowing" is and how one comes to know (Fosnot, 1996). "A basic assumption is that children learn when they are in control of their learning and know that they are in control," (Green & Gredler, 2002).

Constructivist epistemology assumes that learners construct their own knowledge on the basis of Interaction with their environment. Constructivism focuses on knowledge construction, and not on knowledge reproduction. Our view of the external world differs from others because of our unique set of experiences.

"We don't describe the world we see; we see the world we can describe."

Types of Constructivism

1. Radical constructivism (Propagated by Von Glasersfield)
2. Social constructivism (Propagated by Lev Vygotsky)
3. Cognitive constructivism (Propagated by Jean Piaget)

This paper specially deals with cognitive constructivism in view of its specific implications for teaching-learning process at school without going into the purview of social radical and constructivism.

Cognitive Constructivism — Introduction

Cognitive constructivism is based on the work of developmental psychologist Jean Piaget. Piaget's theory has two major parts: an "ages and stages," which predicts what children can and cannot understand at different ages, and a theory of development that describes how children develop cognitive abilities (Chambliss,1996). The theory of development is the major foundation of cognitive constructivist approaches to teaching and learning. Piaget's theory of cognitive development suggests that humans cannot be "given" information which they automatically understand and use, they must 'construct' their own knowledge.

Humans have to build their knowledge through experiences. An experience allows them to create mental images in their head. The role of the teacher in Piaget's theory is to provide a classroom full of interesting things to encourage the children to construct their own knowledge and to have the ability to explore. The classroom must give the

students opportunity to construct knowledge through their own experiences. They cannot be 'told' by the teacher. There is less emphasis on directly teaching specific skills and more emphasis on learning in a meaningful context.

Cognition in Piagetian constructivism generally regard the purpose of education as educating the individual child in a fashion that supports the child's interests and needs; consequently, the child is the subject of study, and individual cognitive development is the emphasis. This approach assumes that students come to classrooms with ideas, beliefs and opinions that need to be altered or modified by a teacher who facilitates this alteration by devising tasks and questions that create dilemmas for students. Knowledge construction occurs as a result of working through these dilemmas.

Theory of Cognitive Constructivism

Piaget work has identified four major stages of cognitive growth that emerge from birth to about the age of 14-16.

A child will develop through each of these stages until he or she can reason logically.

The learner is advanced through three mechanisms:

1. Assimilation – fitting a new experience into an existing mental structure (schema).
2. Accommodation – revising an existing schema because of new experience.
3. Equilibrium – seeking cognitive stability through assimilation and accommodation.

Principles of Cognitive Constructivism

There are two key Piagetian principles for teaching and learning:

Learning is an active process: Direct experience, making errors, and looking for solutions are vital for the assimilation and accommodation of information. How information is presented is important. When information is introduced as an aid to problem solving, it functions as a tool rather than an isolated arbitrary fact.

Approximate Age	*Stage*	*Major Development*
Birth to 2 years	Sensory motor	Infants use sensory and motor capabilities to explore and gain understanding of their environments.
2 to 7 years	Preoperational	Children begin to use symbols. They respond to objects and events according to how they appear to be.
7 to 11 years	Concrete operational	Children begin to think logically.
11 years and beyond	Formal operational	Children begin to think about thinking. Thoughts are systematic and abstract.

Learning should be whole, authentic, and 'real': Piaget helps us to understand that meaning is constructed as children interact in meaningful ways with the world around them. That means they give less emphasis on isolated 'skill' exercises that try to teach something like long division or end of sentence punctuation. Students still learn these things in Piagetian classrooms, but they are more likely to learn them if they are engaged in meaningful activities (such as operating a class store, bank or writing and editing a class newspaper). Whole activities, as opposed to isolated skill exercises and authentic activities which are inherently interesting and meaningful to the student, and real activities that result in something other than a grade on a test or a "Great, you did well" from the computer lesson software, are emphasised in Piagetian classrooms.

Within the field of educational computing, the best-known cognitive constructivist theoretician is Papert (1993), who characterises behavioural, approaches as 'clean' teaching whereas Constructivist approaches are 'dirty' teaching. The contrast emphasises the differences between approaches that isolate and break down knowledge to be learned (clean) versus approaches that are holistic and authentic (dirty).

Difference between Cognitive Constructivism and Social Constructivism

	Cognitive Constructivist	Social Constructivist
The mind is located:	in the head	in the individual-in-social interaction.
Learning is a process of:	active cognitive reorganisation	acculturation into an established community of practice
Goal is to account for:	the social and cultural basis of personal experience	constitution of social and cultural processes by actively interpreting individuals
Theoretical attention is on:	individual psychological processes	social and cultural processes
Analysis of learning sees learning as:	cognitive self-organisation, implicitly assuming that the child is participating in cultural practices	Acculturation, implicitly assuming an actively constructing child
Focus of analyses:	building models of individual student's conceptual reorganisation and by analyses of their joint constitution of the local social situation of development	individuals' participation in culturally organised practices and face-to-face interactions
In looking at a group, we stress:	the heterogeneity and eschew analyses single out pre-given social and cultural practices	that the homogeneity of members of established communities and to eschew analyses of qualitative differences.

Different Aspects in Cognitive Constructivism

Knowledge

Behaviourists maintain that knowledge is a passively absorbed behavioral repertoire. Cognitive constructivists reject that claim, arguing instead that knowledge is actively constructed by learners and that any account of knowledge makes essential references to cognitive structures. Knowledge comprises active systems of intentional mental representations derived from past learning experiences. Each learner interprets experiences and information in the light of their extant knowledge, their stage of cognitive development, their cultural background, their personal history and so forth. Learners use these factors to organise their experience and to select and transform new information. Knowledge is therefore actively constructed by the learner rather than passively absorbed; it is essentially dependent on the standpoint from which the learner approaches it.

Learning

Because knowledge is actively constructed, learning is presented as a process of active discovery. The role of the instructor is not to drill knowledge into students through consistent repetition, or to goad them into learning through carefully employed rewards and punishments. Rather, the role of the teacher is to facilitate discovery by providing the necessary resources and by guiding learners as they attempt to assimilate new knowledge to old and to modify the old to accommodate the new. Teachers must thus, take into account the knowledge that the learner currently possesses when deciding how to construct the curriculum and to present the sequence, and structure new material.

Motivation

Unlike behaviourist learning theory, where learners are thought to be motivated by extrinsic factors such as rewards and punishment, cognitive learning theory sees motivation as largely intrinsic, because it involves significant restructuring of existing cognitive structures. Successful learning requires a major personal investment on the part of the learner (Perry, 1999). Learners must face up to the limitations of their existing knowledge and accept the need to modify or abandon existing beliefs. Without some kind of internal drive on the part of the learner to do so, external rewards and punishments such as grades are unlikely to be sufficient

Instruction

Cognitivist teaching methods aim to assist students in assimilating new information to existing knowledge and enabling them to make the appropriate modifications to their existing intellectual framework to accommodate that information. Thus, while cognitivists allow for the use of "skill and drill" exercises in the memorisation of facts, formulae, and lists, they place greater importance on strategies that help students to actively assimilate and accommodate new material. For instance, asking students to explain new material in their own words can assist

them in assimilating it by forcing them to re-express the new ideas in their existing vocabulary. Likewise, providing students with sets of questions to structure their reading makes it easier for them to relate it to previous material by highlighting certain parts and to accommodate the new material by providing a clear picture because learning is largely self-motivated in the cognitivist framework. Some cognitivists have also suggested methods which require students to monitor their own learning. For instance, the use of upgraded tests and study questions enables students to monitor their own understanding of the material. Other methods that have been suggested include the use of learning journals by students to monitor progress and highlight any recurring difficulties, and to analyse study habits (Campione, Shapiro and Brown 1995).

Comparison of Classroom Scenario

Brooks & Brooks (1993) offer an interesting comparison of the visible differences between the traditional and the cognitive constructivist classroom:

A cognitive constructivist classroom provides children opportunities to observe, work, explore, interact, raise question enquire and above all share their experiences with others.

Traditional Classroom	*Cognitive Constructivist Classroom*
Student primarily work alone.	Students primarily work in groups.
Curriculum is presented part to whole, with emphasis on basic skills. (bottom-up) Curriculum is presented whole to part with emphasis on the big concept (top-down).	Strict adherence to a fixed curriculum is highly valued. Pursuit of student questions is highly valued.
Curricular activities rely heavily on textbooks of data and manipulative materials. Curricular activities rely heavily on primary sources.	Students are viewed as "blank slates" onto which information is etched by the teacher. Students are viewed as thinkers with emerging theories about the world.
Teachers generally behave in a didactic manner, disseminating information to students.	Teachers generally behave in an interactive manner mediating the environment for students.
Teachers seek the correct answers to validate students lessons.	Teachers seek the student's point of view in order to understand student learning for use in subsequent conceptions.
Assessment of student learning is viewed as separate from teaching and occurs almost entirely through testing.	Assessment of student learning is interwoven with teaching and occurs through teacher observation of students at work and through exhibitions and portfolios.

They build up school knowledge on their experience base and get a task of understanding. They often are assessed on what they know rather then what they don't know. Here it is important to quote from the National curriculum framework 2005 the following:

"In the construcvists perspective, learning is a process of construction of knowledge. Learners actively construct their own knowledge by connecting new ideas to existing ideas on the basis of materials/activities presented to them. The curriculum must enable children to find their voices, nurture their curiosity- to do things, to ask questions and to pursue investigations, sharing and integrating their experiences with school knowledge rather than their ability to reproduce textual knowledge. Reorienting the curriculum to this end must be among our highest priorities, informing the preparation of teachers, the annual plans of schools, the designs of textbooks, learning materials and teaching plans, and evaluation and examinations patterns." (NCF 2005 p.17)

REFERENCES

ANDERSON, W.T. 2003. *The next Enlightenment.* St. Martin's Press, New York.

BROOKS, G.J. and G.M. BROOKS. 1993. *In Search of understanding: The case for constructivis classrooms.* Association for Supervision and Curriculum Development, Alexandria, VA.

CHAMBLISS, J. 1996. History of Philosophy of Education in J. Chambliss (ed.). *Philosophy of Education : An Encyclopedia.* pp. 461-472. Garland Publications, New York.

CAMPIONE, J.C. SHAPIRO, A.M. and BROWN, A.L. 1995. Forms of Transfer in Communities of Learners: Flexible Learning and Understanding, In A. Mckeough, J. Lupart and A. Marini (Eds), *Teaching for Transfer*, Lawrence Erlbaum Associates: New Jersey. 35-68.

DEWEY, JOHN.1938. *Experience and Education.* Macmillan, New York.

FOSNOT, C.T. 1996. *Constructivism : Theory, Perspectives and practice.* Teachers College, Columbia University, New York.

GREEN, S. and M. GREDLER. 2002. "A review and analysis of constructivism for school based practice", *School Psychology Review,* 31 (1), 53-70.

National Curriculum Framewok 2005. National Council of Educational Research and Training: New Delhi, p, 17.

PAPERT, S. 1993. *The Children's Machine: Rethinking School in the age of the Computer.* Basic Books, New York.

PERRY, W.G. 1999. *Forms of Ethical and Intellectual Development in the College years.* Jossey-Bass Publishers, San Francisco.

PIAGET, JEAN. 1973. *To understand is to invent.* Grossman, New York.

ROGERS, C.R. 1969. *Freedom to Learn.* Merrill, Columbus, OH.

VON GLASSERFIELD,E. 1995. A Constructivist approach to teaching, In L. steffe and J Gale (Eds), *Constructivism in Education.* Lawrence Erlbaum Associates, New Jersey.

VYGOTSKY, L. 1978. *Mind in Society: The Development of Higher Psychological Process.* Harvard University Press, M.A.

—— 1986. *Thougth and Language,* MIT Press, Cambridge, MA.