CONSTRUCTIVISM based Teaching Methods & Evaluation Patterns

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Dear Friends,

Thanks for the overwhelming response to the theme by the way of the research articles from the length and breadth of this country. We started focusing the research journal towards a specialized theme; perhaps it is a new practice initiated.

Some one has greatly said, if you are rich, then you are intelligent, good looking, religious, generous and knowledgeable and even a good singer too. For the young researchers it was a fashion and now it has become a habit to peep onto Westwards whenever they need to deal with a new theme. Almost all of the article contributors exposed the work done by the American and European philosophers in the field of constructivism in education, instead of bothering to look into the work of ancient Indian philosophers. Regarding 'Constructivism', though this word seems to be new in the field of education, but certainly it was a practice in India in ancient times.

Constructivism says that people construct their own understanding and knowledge of the world, through experiencing things and reflecting on those experiences. When we come across some thing 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. Here it can be said that, we are active creators of our own knowledge. Constructivists believe that knowledge and truth are constructed by people and therefore do not exist outside the human mind that has been discussed.

Swami Vivekanada' in his philosophy of education clearly stated that– 'Knowledge is inherent in man, no knowledge comes from outside; as it is all inside'. When we say a man 'knows' it should in psychological language be, what he 'discovers' or 'unveils'. What a man 'learns' is really what he discovers by taking the cover off his own soul, which is a mine of infinite knowledge.

Shri Aurobindo suggested three principles of teaching, which are–

1- Nothing can be taught.
2- The mind has to be consulted in its own growth.
3- Education is to work from the near to far, from that which is to that which shall be.

According to Hindu mythology, knowledge is revelatory. Its function is to

manifest the object by removing from it the veil of unknown-ness, without affecting it any way. It presents but does not represent. It is cogitation but not cognition. The empirical situation of knowledge demands the distinction of three factors cognizer, cognition and object cognized. If knowledge is held to be constructive or interpretative only, then nothing can be known as it is. The Advaita School of Vednta, there are six distinct means of valid knowledge – *Perception* (external-by five sense organs and internal), *Inference* (based on the sensible facts beyond the reach of senses), *Verbal-testimony* (using authentic words spoken or written). A man, who is free of all defects, becomes capable of acquiring knowledge from three more sources which are – *Comparing*, *Postulation* and *Non-apprehension*.

Let us start our journey from the perceptual to non-perceptual and then to transcendental level of knowledge.

(B. V. Ramana Rao)

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About
RESEARCHERS ORGANIZATION, BILASPUR (C.G.)
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The prime objectives of this organization are -

Ö To promote research in the area of school and higher education and to extend academic and technical support to the young researchers.

Ö To extend support in the implementation of the government policies in the area of education, social-welfare and environment.

Ö To provide a platform to the young writers for publication of their books.

Ö To publish research journals in various subjects.

Ö To develop and publish various research tools, scales of measurement in various subjects.

Ö To conduct research experiments in education and other subjects.

Ö To provide consultancy services to young researchers.

Ö To organize national and state level seminars, conferences, workshops etc.

Ö To conduct various projects in school and higher education fields in consultation with the apex bodies of the country.

Secretary
Researchers Organization, Bilaspur (C.G.)

<u>**Sub Theme - 1**</u>
Constructivist Pedagogy & Learning

CONSTRUCTIVIST PEDAGOGY :
Teaching for Knowledge Construction

Mrs. Bharati. B. Ganiger * & Prof. D. R. Goel *

Abstract

The latest catchword in educational circle is constructivism which is applied to both learning theory and epistemology. Constructivist approaches to learning based on distinctly different epistemic and pedagogical assumptions than classical approaches to instructional design. Here the role of teacher is as a facilitator who encourages learners to reflect, analyze, design and develop the process of knowledge construction and the learners are active agents who engage in own knowledge construction by integrating new information into their schema. Learning can be seen as a process that of understanding and contextualizing socially, culturally, historically and politically relevant issues. Hence it is important that the teachers' role has to be revitalized and the teacher education system has to inculcate the culture of germination of new ideas, incubation, innovation, creation and construction.

Introduction:

"In order for any discipline to survive, it must accommodate changes in theory and practice and do so in a way that adds value to the discipline" (Kuhn, 1972). Pedagogy is a collaborative, interactive process between teachers and learners and other members of the community. Pedagogy evolves progressively in the ebb and flow of context and conditions. Teachers are always curious to design, develop and deploy the most compatible pedagogy.

A distinction is often made between Pedagogy and Education. This is more than mere semantics, although the words do have different Greek and Latin derivations. Pedagogy comes from the Greek *paidagogos* (the leading of the child), where as education comes from the Latin *educare* (to bring up/nourish). The discipline and discourse of education is more likely to be descriptive and normative, whereas pedagogy is relatively creative and constructive. Pedagogy is more than the accumulation of techniques and strategies, more than arranging class-room, formulating questions and developing explanations. It is informed by a view of mind of learning and learners and the kind of knowledge and outcomes that are valued.

Learning is a social process. This view of leaning takes a broad view of learners' trajectories through the world- their sense of self, where they are coming from, where they think they are going, what sort of person they want to be. Pedagogy must

build the self-esteem and identity of learners, developing their sense of what they believe or indeed hope themselves to be capable of. Developing habits of mind that are questioning and critical is central to pedagogy. The latest catchword in educational circle is *Constructivism*, applied to both learning theory and epistemology. Constructivist pedagogy is the link between theory and practice. Instruction that is based on constructivist principles is extremely demanding for the teacher.

Pedagogical constructivism views the individual learner as the only location where knowledge is generated and maintained. Knowledge is bound to the person who generates it. And a person's knowledge always depends on how a person approaches a learning experience, what he or she actively does during the experience, and how the resulting knowledge is integrated into what the person knows. Interactions with others and with nature may influence the learner's construction of knowledge. The notion of constructivism with its roots in ancient philosophy has been informed over time by wide range theories. Jean Piaget and John Dewey were the first major contemporaries to develop a clear idea of constructivism as it might be applied to childhood development and classrooms. That major tenet of all aspects of constructivism is that *knowledge is constructed*, not transmitted or absorbed.

Although constructivism embraces many theoretical perspectives on learning and does not itself suggest particular pedagogy. This view takes learner agency as a given and has spawned a wide range of pedagogic strategies by which learners can be encouraged and enabled to select and transform information, construct their own hypotheses and can be active in their own learning.

This approach to learning impacts strongly on view of the teachers' role. By emphasizing the interaction between the learner and the activity, the focus moves away from the teacher and the content to learning mechanisms and learners' cognitive processes. From a constructivist perspective, teachers need to adopt the role of facilitator.

The constructivist studies investigate children's scientific thinking, that is, their intuitive conceptualizations of natural phenomena (Brumby, 1982; Gilbert et al., 1982; Muthukrishna, Carnine, Grossen, & Miller, 1993). When the elementary child arrives in science class he or she has successfully experienced ways of observing and interacting with the world outside of school. In order for the child to successfully learn new science ideas, it is necessary to bring to light their already existing ideas about natural phenomena. This information provides the teacher with an understanding of ways in which the old ideas may interfere with the present interactions.

Principles of constructivist pedagogy:

1. Construction of knowledge is an active process involving mental action of the learner. Constructivism needs active engagement of learning in social setting. It involves enquiry, debating, questioning, application and reflection leading to theory building and the creation of ideas. *Piaget*, as reported by *Kamii (1974)* says that good pedagogy must involve presenting the child with situations in which he himself experiments and tries to see what happens, manipulating symbols, posing questions and seeking his own answer, reconciling what he finds one time with what he finds at another, comparing his finding with that of other children.

2. Intellectual activity based on actual experiences occupies priority in constructivist pedagogy. Construction of knowledge takes place when mind actively reacts and interacts with

physical and social world of experiences. Design for any experiments, their results, interpretations of their findings all result from sharing, thinking and decision making. To create social interaction researches have called for the creation of "communities of learners" within classrooms *(Brown & Campione,1994).* Learning communities encourage students to take responsibility for their own learning through cooperative ventures. *Vygotsky (1986)* believes that the learning is meaningful to children when it builds (scaffolds) on experiences they have already with them. Children are more likely to retain knowledge that they build or generate themselves rather than which they simply receive passively.

3. The critical dimension of constructivist pedagogy is structuring learning around primary concepts and "big" ideas *(Brooks & Brooks 1993).* When designing curriculum, constructivist teachers organize information around conceptual clusters of problems, questions and discrepant situations. Students are most engaged in learning when problems and ideas are presented holistically rather than in separate, isolated parts.

4. Constructivist focus on children's' ability to solve the real life practical problems and constructivist methods call for students to construct knowledge themselves without receiving it from teachers. In contrast to directed instructions, where a teacher sets the goal and delivers most of the instructions, the job of the teacher in constructivist is to arrange required resources and acts as a guide to children while they set their own goals and learn themselves.

5. Constructivism believes on the principle of unstructured knowledge domain which bears significance for designing curriculum for constructivist classroom. *Papert (1980)* feels that learning activities should be fairly unstructured and open ended with no goal in mind other than discovery of powerful ideas. In the similar line, *Spiro et al.,(1991)* call for the varied opportunities for exploration when learning takes place in ill-structured knowledge domains, through advocate for at least acquisition of some specific skills and information. Experiences and activities to be selected for engaging learners for knowledge construction process in construction process in elementary school should be relevant from social and individual points.

6. Constructivist pedagogy is based on principle of problem oriented activities. Constructivist method focuses on problem posing and persuasion of peers *(Jungck, 1991).* Problems may be posed in terms of specific goals as 'what...if' questions, open ended questions.

7. Constructivist pedagogy centers on the principle of assimilation when it is held that learners construct knowledge by relating new information to the existing knowledge which they already possess. Fundamental knowledge originated from ones' own culture serves as a base upon which new knowledge is built by assimilating new incoming information into it meaningfully.

8. Seeking and valuing students' points of view is also essential constructivist education. These are windows into a students' reasoning. It helps teacher to challenge students, making school experiences both contextual and meaningful. Each student's point of view is an instructional entry point. Teachers who operate without awareness of students' points of view often doom students to dull, irrelevant experiences and even failure.

Nature of Knowledge

Knowledge as constructivist believed is situated in the real world. Constructivists argue 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 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. Learners use these factors to organize their experience and to elect and transform new information. It is essentially dependent on the standpoint from which the learner approaches it. It recognizes the construction of new understanding as a combination of prior learning, new information and the readiness to learn. Individuals make choices about new ideas to accept and how to fit them into their established views of the world. *Immanuel Kant* elaborates this idea by asserting that human beings are not passive recipients of information. Learners actively take knowledge, connect it to previously assimilated knowledge and make it their own interpretation *(Cheek, 1992)*.

Constructivist View of Learning:

Learning takes place not only adopting new ideas, but also ... modifying or abandoning pre-existing ones" This is the constructivist sense of constructing meaning and Learning. Students make sense of their experiences via a Piagetian accommodation.

• It is necessary to take into account what is already in the learner's mind for they come into the classroom with a pre-established worldview.

• Individuals construct their own meaning of events which is filtered by prior beliefs and experiences.

• The construction of meaning is a continuous and active process; learning may involve conceptual change, that is, a kind of a radical re-organization which requires effort and purposeful activity.

• Learners have the responsibility for their learning.

The child's active action is necessary for the learning process, as a problem can only emerge in an action. A problem in the action is a prerequisite for an individual to learn new things. According to *Mead (Rucker 1968, p. 151)*, the human being has qualities that enable "creative faculties of imagination" and, further, the emergence of thinking. *Mead* suggests that three different levels can be found in the construction and development of thinking. On the first level, the child "awakes", becoming conscious of his/her own possibilities to make selections and combinations of objects in the action environment instead of blindly following the organs of sight and hearing. In this way the child can tell apart different objects in the action environment and keeps these objects under examination. The second level of creative imagination is the "logical state", in which the child becomes conscious of his/her resources for combining things and ideas. then comes the "philosophic stage", at which time the child chops his/her world up into pieces and tries to reassemble everything as it was before and absorbs everything into his/her own thinking.

Dewey describes the experiences as follows: "When we experience something we act upon it, we do something with it; then we suffer or undergo the consequences." The "educative experience" produces ways of action that make it possible to control and predict action. Learning refers to a situation in which the results of an individual's action can be identified and it can be established that a new result of action has arisen as a result of the action *(Dewey, 1955).*

Learning also means that the new model or way of action arising as a result of the action is a combination of different ways of action. According to *Dewey (1966, p. 323)*, the image is a factor that enables learning. The nature of an image is such that it represents some fact of reality. An image can be understood as the realization of an immediate experience and as a mediating factor that enables transition from one experience to another.

Constructivist classrooms:

A constructivist classroom must obviously operate in the backdrop of constructivist learning environments and key principle of constructivism. Here the focus will be on students, this classroom is no longer a place where the teacher pours knowledge into the passive students, and instead students are actively involved in the learning process. According to *Brooks and Brooks (1993)*, student's autonomy and initiative are accepted and encouraged, the teacher asks open-ended questions and provides ample time for discussion and responses, higher level thinking is encouraged, students are engaged in dialogue with a teacher and with each other, students are engaged in experiences that challenge hypotheses and encourage discussion. The class uses raw data, primary sources, and manipulative, physical and interactive materials. Constructivist classrooms are based on the theory of Collaboration, Cooperation, Interaction, and Project based activities. The classroom environment is in such a way that full freedom is given to the learners to think freely in multidirectional ways on single idea. Providing rich experiences to the learner will relatively help him to construct the knowledge and meaning.

Constructivist Teacher:

In the context of constructivist pedagogy the teacher is a facilitator who encourages learners to reflect, analyze, classify, predict, create and interpret in the process of knowledge construction (NCF, 2005). Constructivist teachers recognize that what the learner already knows is a critical factor affecting learning and that it is incumbent upon teachers to ascertain the understandings held by their students *(Brooks & Brooks, 1999)*. In regular teaching learners' prior understandings are frequently discounted, and learning paths are not well designed to lead to new understanding for students *(Duit & Treagust, 1998)*. Teachers with a constructivist orientation believe that the learning opportunities they plan are the mediating processes that help students move from their current understanding to a new understanding. They can reflect on what learning experiences can be provided to encourage the development of conceptual understanding.

The teachers own role in children's cognition could be enhanced if they assume a more active role in relation to the process of knowledge construction in which children are engaged. Allowing children to ask questions that require them to relate what they are learning in the school to things happening outside, encouraging children to answer in their own words and from their own experiences, rather than simply memorizing and getting answers right in just one way. Intelligent guessing must be encouraged as a valid pedagogic tool. Quite often, children have an idea arising from their everyday experiences or because of their exposure to the media but they are not quite ready to articulate it in ways that a teacher might appreciate. It is in this zone between what you know and what you almost know that new knowledge is constructed that is metacognition. Such knowledge often takes the form of skills, which are cultivated outside the school, at their home or the community. Constructivist teachers provide time for students to

construct relationship and create metaphor. A sensitive and informed teacher is aware of this and is able to engage children through well-chosen tasks and questions, so that they are able to realize their developmental potential (NCF, 2005). Teachers require a conceptual framework to guide group activities in which students cooperatively construct new knowledge. They must have a clear picture of the desired goals of the overall concept and nurture students' natural curiosity through frequent use of learning cycle model. Teacher's role should be like guide on the side.

Constructivist Instructional Strategies:
Constructivist Instructional Strategies should be mainly based on three elements *(Brooks & Brooks, 1999).*

1. Students Prior Knowledge which affects future learning because what a learner already knows interacts with the new conception to which the learner has been exposed.
2. Students construct meaning through interaction with others, with materials and by observation and exploration of interesting and challenging activities.
3. Students should construct understanding around core concepts and big ideas.

So constructivist teachers ascertain the understanding of their students, plan mediating events that assist students in moving from a current understanding to a more scientifically accepted understanding and provide time for discussion on any needed additional experiences for students to construct deep conceptual understanding.

Many learning designs based on constructivist assumptions are available in the literature of constructivism. Constructivist pedagogy is not attached to a single model or strategy, but it will provide a view of various strategies that suggests specific instructional principles that can be a great use to create constructive learning environment in the classroom. The important worth mentioning designs which have drawn attention of educators in the past several years are,

Constructivist learning cycle design:
Exploration, Concept/Skill Development and Concept/Skill Application

Fig. 1
Constructivist learning Cycle
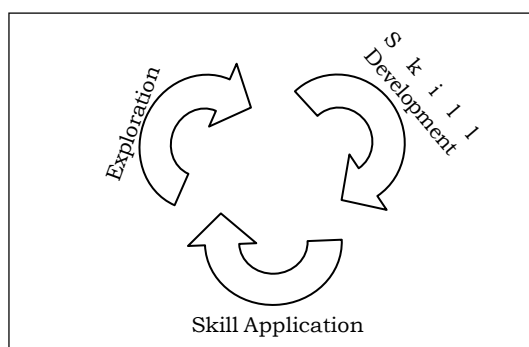
5E model Proposed by *Bybee in 1997* which include,
Engage, Explore, Explain, Elaborate and Evaluate.

Fig. 2
5E model Proposed by Bybee
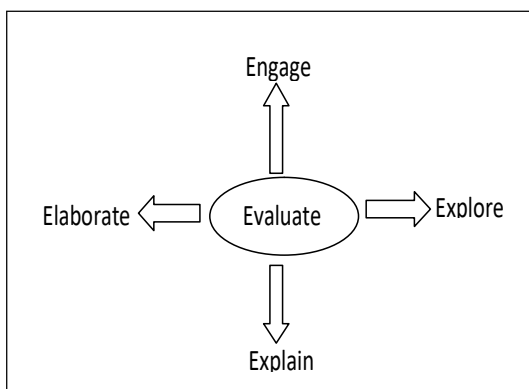
7E model Proposed by *Arthur Eisenkraft in 2003* include, :
Elicit, Engage, Explore, Explain, Elaborate, Evaluate, and Extend

Fig. 3
7E model Proposed by Arthur Eisenkraft
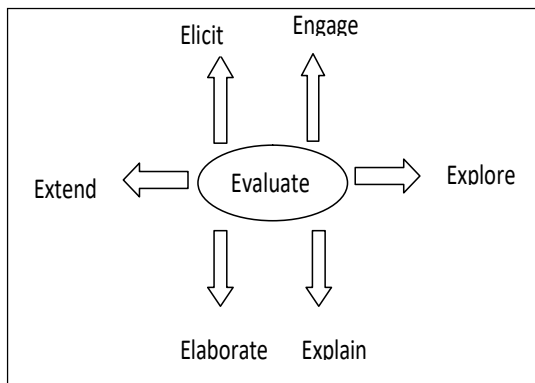
Constructivist view of Assessment:

Assessment in the class should be an opportunity for the students to reveal their changed conceptual understanding of the course content. In constructivist perspective, assessments are made using portfolios, rubrics, teacher's rating, observation, interview and challenging questions to solve complex real world problems. Since learning is largely self motivated in this pedagogy, learners self assessment of their own learning can be used to help students to assess themselves about what they have learnt. Brown (1985) has suggested methods, like, use of learning journals by students to monitor progress and highlight any recurring difficulties and analyze study habits. Student discussions and observation of discussions provides the teacher with valuable information about all aspects of student achievement, conceptual understanding, and logical quality of arguments. This helps the teacher to modify the instructional planning. When the teachers' plans are well matched with the students' previous learning, the prediction is that students' future achievement will be enhanced. In toto, it should be an ongoing process, evaluation of student learning should not be judged only on the specific knowledge, but whether the student can solve the problem posed with viable solution.

Conclusion:

The constructivist view of the world gives new status to the learner as the active constructor within the learning activity instead of being the passive respondent to externally determined world of education. Constructivism develops thinking skills, Communication skills and social skills; encourages alternative methods of assessment; helps students to transfer skills to the real world; and promotes intrinsic motivation to learn. Their implications on educational practice are enormous. Constructivist pedagogy offers a bold departure from traditional classroom strategies. The goal is for the learner to plan an active role in assimilating knowledge into one's existing cognitive structure. The constructivist approach requires the teacher to relinquish one's role as sole information–dispenser and instead to continually analyze one's curriculum planning and instructional methodologies. Constructivist argues that knowledge is actively constructed by the learners and that any account of knowledge makes essential references to cognitive structures. Each learner interprets experience information in their light of their extant knowledge. Study topics could include the constructivist implementation of cooperative learning, scaffolding techniques, problem-based learning, or multi faceted assessment strategies. At the same time there are various new demands on the part of teachers; Constructivism is a culture - not a fragmented collection of practices. Crafting instruction based on constructivism is not as straightforward as it seems. It could be developed as a culture of the class.

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CONSTRUCTIVISM*: Teaching the way Children Learn*

Mukesh Tanwer *

Abstract

Constructivism is basically a theory; 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 experiences.This article describes constructivist teaching, highlighting some of its essential elements. It demonstrates how a constructivist approach to teaching calls on teachers to be learners themselves. It also pays focus on the importance of constructivist teaching methods and the assessment patterns with the changing roles of students and teachers in the class room.

Introduction :

The last several decades in our nation has witnessed growing concern about preparing citizens to develop the skills and knowledge they need to live and work successfully in today's complex society. Call for the change has centered on the need to provide opportunities for students to engage in activities that promote in-depth understanding, critical thinking, creative problem solving, and the ability to use knowledge in real-life settings.

In response to these concerns school improvement efforts have proliferated, aimed at all aspects of the educational system - school structures, organization, governance; family and community involvement; as well as curriculum content, instructional methods, individual and system-wide assessments and National Curriculum Framework, 2005 is the best example of these reforms. However, various commissions *(Kothari commission, 1964-65)*, National Policy on Education, 1986 and Report of National Advisory Committee, 1993 *(Yashpal Committee)* also showed their concern towards the quality of education, inappropriate curriculum and pedagogy, passive and submissive role of the learner, traditional behaviorist practices of the teacher, non-supportive atmosphere in the school and in the education system, but National curriculum Framework proposes the solution to these problem as it clearly defines the role of the teacher and the learner and what should be the instructional practices in the classroom. **NCF, 2005** favors the role of student as an active constructor of knowledge, teacher's role as a facilitator, guide and classroom as an atmosphere for active

exploration and further states that the teaching and assessment methods should be constructive.

Constructivism

"I hear and I forget. I see and I remember. I do and I understand." - Confucius

These words of Confucius clearly states what constructivism means. In contrast to the transmission-of-knowledge model of teaching, newer

understandings of how people learn present a conception of teaching that focuses on developing *"thinking"* students who understand and can use what they learn. This conception is termed *"constructivist" because it sees learning as a dynamic internal process in which learners actively "construct" knowledge by connecting new information to what they already know,* rather than as a process in which learners are passive recipients of information transferred to them from external sources.

This newer conception's emphasis is on developing students' capacities for analysis and problem-solving, rather than on having them "cover the curriculum" in the most efficient manner possible.

Rooted in the assumption that all human beings have a deep drive to make sense of the world *(Carini, 1987),* constructivism sees learning as motivated by interest and shaped by individuals' cultural and linguistic backgrounds as well as their different learning styles and strengths *(Gardner, 1983).* From the perspective of the constructivist view, learning is supported by multiple experiences and social interactions, rather than by solitary drill and rote memorization *(Dewey, 1916, 1956; Piaget, 1973, 1980; Vygotsky, 1978).*

It is a nonlinear process that requires extended periods of time to visit and revisit ideas until they are organized into coherent, stable, and generalizable understandings (*Bruner, 1966; O'Brien, 1987).*

Teaching-Learning Process

In the classroom, the constructivist view of learning can point towards a number of different teaching practices. In the most general sense, it usually means encouraging students to use active techniques (experiments, real-world problem solving) to create more knowledge and then to reflect on and talk about what they are doing and how their understanding is changing. The teacher makes sure she understands the students' preexisting conceptions, and guides the activity to address them and then build on them.

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. For example: Groups of students are discussing a problem in science. Though the teacher knows the "answer" to the problem, she focuses on helping students restate their questions in useful ways. She prompts each student to reflect on and examine his or her current knowledge. When one of the students comes up with the relevant concept, the teacher builds upon it, and indicates to the group that this might be a fruitful avenue for them to explore. They design and perform relevant experiments. Afterward, the students and teacher talk about what they have learned, and how their observations and experiments helped (or did not help) them to better understand the concept.

The constructivist teacher provides tools such as problem-solving and inquiry-based learning activities with which students formulate and test their ideas, draw conclusions, and convey their

knowledge in a collaborative learning environment. Constructivism transforms the student from a passive recipient of information to an active participant in the learning process.

A. Constructivist classrooms-
Constructivist classrooms operate on the premise that learning in school need not, and should not, be different from the many rich natural forms of learning that students have experienced before they have ever entered the corridors of a school. Real-life situations form the basis for learning. Classrooms provide opportunities for students to actively explore, inquire, discover, and experiment. These classes offer a variety of learning situations and instructional formats - projects, trips, readings, reports, discussions, field work, and internships. They challenge students to reason, question, draw connections, communicate, evaluate viewpoints, frame problems, acquire and use evidence, and create new knowledge, understandings, relationships and products. Constructivist learning environments are organized to include ample opportunities for students to collaborate and to exchange ideas with peers and adults. Classrooms are set up to include cooperative learning and peer teaching situations so that students can talk together freely as well as question and argue with each other about ideas.

To enhance this exposure to different ideas and perspectives constructivist classrooms are structured to include students of different ages and abilities as well as students of different cultural and linguistic backgrounds. The more diverse student groupings are - and the more opportunities that are provided for exchange of ideas among this diversity - the better students are prepared to reach beyond their own frames of reference, to appreciate a range of ideas, and to understand the viewpoints of others.

NCF, 2005 also states that "our children need to feel that each one of them, their homes, communities, languages and cultures, are valuable as resources for experience to be analyzed and enquired into a school; that their diverse capabilities are accepted". The curriculum in constructivist classrooms is generally interdisciplinary in nature. It provides opportunities for students to extend the continuity of their thoughts through inquiry into big ideas organized around generative themes.

Students are not blank slates upon which knowledge is etched. They come to learning situations with already formulated knowledge, ideas, and understandings. This previous knowledge is the raw material for the new knowledge they will create. The teacher coaches, moderates, suggest, but allow the students room to experiment, ask questions, try things that don't work. Learning activities require the students' full participation (like hands-on experiments). An important part of the learning process is that students reflect on, and talk about, their activities. Example: In a history class, asking

Fig. 1
Characteristics of Constructive Classroom
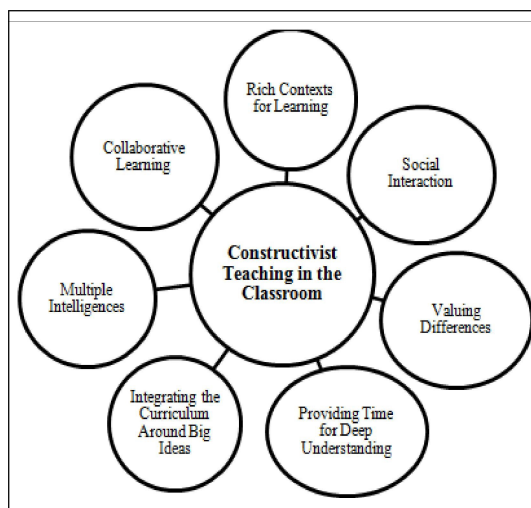
students to read and think about different versions of and perspectives on "history" can lead to interesting discussions. Is history as taught in textbooks accurate? Are there different versions of the same history? Whose version of history is most accurate? How do we know? From there, students can make their own judgments. The main activity in a constructivist classroom is solving problems. Students use inquiry methods to ask questions, investigate a topic, and use a variety of resources to find solutions and answers. As students explore the topic, they draw conclusions, and, as exploration continues, they revisit those conclusions. Exploration of questions leads to more questions.

Role of the Learner in the Constructive Classroom

Students in a traditional classroom are passive. They listen and react to the teacher's direct instruction. **NCF, 2005** articulates that "children's voices and experiences do not find expression in the class. It further says that children will learn only in an atmosphere where they feel they are valued and our schools still do not convey this to all children". Therefore, NCF strongly recommends for the classrooms and teaching-learning environment where learner can be placed at the core of the process and learner can play the role of active explorer and constructor of his/her own knowledge. In a constructivist classroom, students are active. They exchange ideas with the teacher and with one another. Students in a constructivist classroom are expected to connect all learning to prior knowledge. This leads to greater internalization and comprehension of facts and concepts.

Learner in the constructivist classroom is self-directed, creative, and innovative. It is important to take into account the background and culture of the learner throughout the learning process, as this background also helps to shape the

knowledge and truth that the learner creates, discovers and attains in the learning process. *Von Glasersfeld (1989)* 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 learner concerns the level and source of motivation for learning. This links up with Vygotsky's "zone of proximal development" *(Vygotsky 1978)* 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. Thus, learner is at the core of the constructivist learning theory.

Role of the Teacher in the Constructive Classroom

The role of the teacher in the teaching learning process is to give the students center stage in the classroom, providing a setting in which the students play an

Fig. 2
Role of the learner in the constructivist classroom
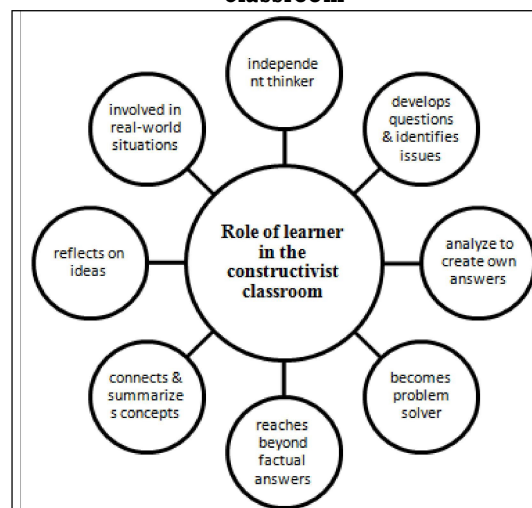
active, inquiring role in their learning. Teachers act as guides, coaches, mentors, and advisors, building bridges between their students' individual interests and understandings and the common skills and knowledge society expects them to acquire. Questioning is an important part of the teacher in constructivist setting. Teachers use questions as a scaffold for learning, asking questions that help their students to become good questioners themselves: Have you seen anything new? What do you think happens if...? Can you find another way? How might we find out? Can you give me an example? How does this relate to what we concluded yesterday? Questions like these call for analysis, synthesis, and evaluative judgment. They have no one, obvious right answer. They help students to understand differing perspectives and to differentiate between opinions and facts *(Wiggins, 1987).*

Mistakes are greatly valued in this process. They not only reveal information about students' thinking but provide important opportunities for students to rethink their ideas. Constructivist teachers try to incorporate as many as possible of student's interests and strengths in their curriculum. They do this because they know that no motivator for learning is as powerful as deep and compelling interest in something *(Eisner, 1991).*

Assessment that supports Teaching &- Learning

It is very necessary to use proper assessment techniques because it helps the students to identify their strengths and interests. Constructivist paradigm provides a wide range of assessment techniques which also help teachers to gain insight into students' different strategies for learning and to determine student progress and achievement.

Teachers can keep documented observations of their students, skills

Fig. 3,
Role of the Teacher in the Constructivist Classroom
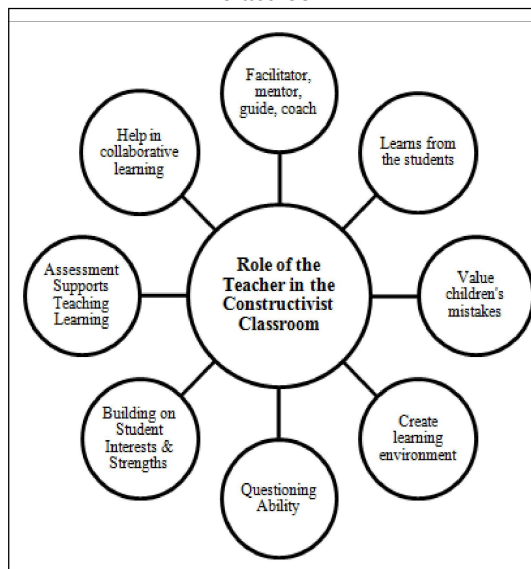
inventories, checklists and developmental scales that provide them with information about what they can appropriately expect from their students at different ages and stages. Teachers can also keep portfolio collections of student work that are compiled over time and that include selected "best works," as well as products and processes that reveal the idiosyncrasies of each individual learner. Teachers can also incorporate students' self-assessment of their own learning. Some can even involve the families of the students in commenting on and evaluating student work. Following are some points to think about evaluating the students' learning:

1. Evaluating student progress by examining the thinking process of the student. This can be done in a number of ways. By asking the students to develop a solution to a problem and then to defend their decisions. For example, after a study of animals and their habits, teacher might present a new set of animals to the class. Then offer the following problem: Choose three animals from the set and construct

a habitat that will support all of them.

2. Telling students to document their learning through journal or diary-like activities and reflect on their learning. Then students will see how their understanding has progressed and how it connects to other topics and learning.

3. Prompting students to create new problem-solving environments.

These kinds of assessments provide richer information than traditional paper and pencil types of tests. They are flexible enough to recognize and allow for differences in the ways that students demonstrate knowledge.

How do I as a Teacher apply Constructivism in the Classroom

After discussing all the important areas of the constructivism, now it's the time to know how constructivism can be applied to the classrooms. A teacher can follow some basic principles to apply constructivism in his/her classroom. These are:

1: Pose problems that are or will be relevant to the students and they will approach it sensing its relevance to their lives.

2: Structure learning around essential concepts- Encourage students to make meaning by breaking wholes into parts. Avoid starting with the parts to build a "whole." Essential concepts can be linked to other subjects also. Thus, it will be interdisciplinary in nature.

3: Be aware that students' points of view are windows into their reasoning- The challenging of ideas and the seeking of elaboration threatens many students. Constructivist learning environment have open-ended, nonjudgmental questioning. Students also need to have an opportunity to elaborate and explain.

4: Adapt curriculum to address students' suppositions and development- Presenting developmentally appropriate work is a place to start.

5: Assess student learning in the context of teaching- Authentic assessment occurs most naturally and lastingly when it is in a meaningful context and when it relates to authentic concerns and problems faced by students.

Thus, it's not difficult to incorporate constructivism in the regular traditional classroom but it strongly requires the positive and always learning attitude of the teacher with the in-depth knowledge of the constructivist paradigm as well as support from the school and system. There should be readiness among teachers, parents and our school system to give space to the student as an active constructor of the knowledge.

Conclusion

Constructivism proposes that learning environments should support multiple perspectives of reality, knowledge construction, and context-rich, experience-based activities. If our schools are to provide experiences for students that fire their spirits, identify and nurture their capacities as learners, and enable them to be independent thinkers, then new forms of teaching need to be developed that are solidly based on emerging understandings of how human beings engage in learning.

These understandings call for changes in the processes, contexts, and content of teacher education - changes guided by constructivist pedagogy that educate teachers to be learners themselves.

Teacher learning for constructivist teaching needs to include many opportunities to engage directly in the struggles of learning, the risk-taking and the thrill of generating new ideas; continually investigate the learning process so that teachers gain ever deeper understandings of how disciplines connect and involve different modes of inquiry; become ever more conscious and responsive to the ways in which differences impact on the learning

process; communicate clearly what they know and how they teach to support student growth and development. Changes such as these in teacher education will support teachers to become powerful thinkers. Powerful thinkers make powerful teachers, and it is this kind of educator that is required to provide the students of our nation with an education that supports them to be powerful themselves, developing the skills and capacities they need to take charge of their thinking and their own lives. Only these types of teachers will teach the children the way they learn.

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Sub Theme - 1
Constructivist Pedagogy & Learning

Constructivism: Future Implications for Teaching and Learning

Dr. Raminder Singh *

Abstract

This paper discusses about 'Constructivism' as a new theory applied to the field of teaching and learning. The latest innovations in teaching methodologies for the future classrooms are based on theory of constructivism. Various aspects of teaching and learning like methods of teaching, discipline, evaluation and role of teacher have been discussed in relation to the constructivist principles in detail. All these innovative aspects discussed in this paper constitute a complete constructivism teaching theory system which can contribute a lot to improve the future teaching and learning.

Introduction:

Constructivism, which is a new cognitive theory, describes learning as a change in meaning constructed from experience. This theory believes that knowledge and truth are constructed by people and therefore do not exist outside the human mind. Constructivism believes in construction of knowledge instead of imparting or receiving it. *Von Glaserfeld (1984)* describes it in the following words: "..........learners construct understanding. They do not simply mirror and reflect what they are told or 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".

While comparing constructivism to both behaviourism and cognitivism; *Cooper (1993)* summarizes: "The constructivist ..... sees reality as determined by the experiences of the knower. The move from behaviorism through cognitivism to constructivism represents shifts in emphasis away from an external view to an internal view. To the behaviourist, the internal processing is only of importance to the extent to which it explains how external reality is understood. In contrast, the constructivist views the mind as a builder of symbols – the tools used to represent the knower's reality. External phenomena are meaningless except as the mind perceives them .... constructivists view reality as personally constructed, the state that personal experience determines reality, not the other way round".

Objectivists view learning as the acquisition and accumulation of a finite set of skills and facts. Whereas constructivism is radically different from this conception of learning. The central

theme of constructivism is that learning is an active process. In other words, information may be imposed on the learners, but understanding cannot be, for it must come from within. Therefore constructivism requires teachers to act as facilitators whose main function should be to help the students become active participants in their learning and should make meaningful connections between prior knowledge, new knowledge and the process involved in learning.

From *Kant* to *Vygotsky*, constructivism has a variety of schools of thought and degrees of epistemological extremism *(Philip, 1995, Reeves & Okey, 1996).* However, there are at least four general (common) constructivist assumptions *(Wilson et. al. 1995; Lebow, 1995, Bereiter and Scardamalie, 1992).* They are:

i. Knowledge is constructed, not discovered, by the learner;

ii. Learning is a social process of negotiated meanings;

iii. The role of a teacher is to scaffold student's learning, and

iv. Learners should participate in establishing goals, tasks, and methods of instruction.

These assumptions have the capacity to affect all the aspects of teaching and learning:

A. Methods of Teaching:

Constructivism suggests to make use of only those methods of teaching which encourage the students to discover principles for themselves. The main goal of these methods should be that the students learn how to learn by giving them training to take initiative for their learning experiences. These methods should facilitate a process of learning in which students should be encouraged to be responsible for their learning *(Bencze, 2005).* Teachers should encourage students' direct intellectual involvement through:

(a) Small group work

(b) Student presentation

(c) Debate

(d) Simulations

(e) Brain-storming and

(f) Individual study

Constructive classes of the future should be student-centered, most of the activities should be done by students. They should be encouraged to be independent thinkers and problem solvers. Learners should be engaged in experiences that go beyond factual responses and provide opportunities to hypothesize, to analyze, to interpret and to predict *(Shneiderman, 1993).* Another essential component for students should be to communicate and collaborate with others. Thus allowing reinforcement and elaboration of ideas and concepts. The constructivist teachers should set up problems and monitor students' exploration and should guide the direction of students inquiry and promote new.

B. Discipline:

Constructivism promotes humanistic and student-centered discipline models. Founders of these models include *Carl Rogers, Abraham Maslow and Thomas Gordon.* These models of discipline which should be tried in future schools are:

(i) Logical Consequences Model:

It focuses on the causes and consequences of behavioral problems. Students will behave properly if they are convinced about logical consequences of their misbehavior. Logical consequences model increases student autonomy by providing opportunity to the students to understand the reasons of their actions in the classroom. *(Celep: 2002)*

(ii) Reality Therapy Model:

This model focuses on the needs of students, their understanding about their misbehaviours' reasons and learning how to behave more logically. According to the assumption of this model students manage their behavior so they can learn how to manage their behavior (ibid).

Reality therapy model gives the students the opportunity to see all the possible results of their behaviours and it helps them to solve the problems, understand their needs and know how to meet them legally.

(iii) Teacher Effectiveness Teaching Model:

This model is based upon the assumption that every individual has got specific qualities and it is very difficult to manage the students by taking these qualities into account. The main point is to make students trust themselves on solving problems and making decisions (ibid). Thus this model develops good relationship between teacher and student. It helps teachers and learners to evaluate how their own behaviours effect the others and to recognize their needs.

(iv)Responsible Classroom Management Model:

This model is based upon the idea that every student passes of different developmental stages. A student's behaviour, attitude, cognitive efficiencies and physical qualities determine these developmental stages. It is assumed that students envy the behaviours of important people in their lives such as teachers and they accept their values. Therefore teachers can be role models for students with their behaviours, values and attitudes (ibid). By this way students can be responsible individuals and they can take the responsibility of their own behaviours.

Prevention of Problems of Indiscipline:

Prevention is always better than cure. A teacher needs to know how to prevent the occurrence of these problems. First of all s/he should define various stages of a lesson very clearly. Students must be made aware of what they are doing at that time and what they will be doing next. Secondly, a clear and an appropriate start to the lesson is crucial to create a positive atmosphere in the classroom. *Phillimy (2006)* suggests some organizational strategies to maintain discipline in the class. To exemplify, the teacher needs to give clear instructions to make the students understand what they will do. Another aspect of organizational strategies is keeping the pupils busy with their tasks every time so that they will not have time to create problems. Another organizational strategy is introducing the rules early and explicitly. For not to break them students must know what the rules are. The rules should be as few, reasonable and positive as possible. In addition to these the teachers should use interpersonal strategies to prevent indiscipline problems.

C. Evaluation:

Assessment and evaluation practices in future can be planned well by relating these to the curricular as well as the student needs. Evaluation is a part of good teaching. There are some effective constructivist evaluation strategies which are very relevant for use in future schools:

a. Anecdotal Records: Anecdotal records are a form of ongoing assessment of observation of students in the classroom. These jot-notes give the teacher information about how the student is processing information, collaborating with students and general observations on learning styles, behaviours and attitudes.

b. Celebration of Learning: This is a demonstration where students can share their expertise in different subjects areas with other students, teachers and parents.

c. Exit Cards: This is a short and easy activity for checking student knowledge before, during and after a lesson.

d.Graphic organizers:Graphic organizers are instructional tools and they are used for illustrating prior knowledge.

e. Journals: Teacher can use journals for assessing for process of learning and

student growth. Open-ended and reflective questions for the students to answer can be journals. Journals provide insight on how the learners are synthesizing their learning.

f. **Oral presentations**: Students can easily share their knowledge verbally in oral presentations. Some students may prefer to do an oral presentation by using multi media.

g. **Peer assessment**: This is an assessment in which learners give written or verbal feedback to another learner. Checklists, rubics or give a written response to beer work can be used by peers.

h. **Portfolio:** A portfolio means a representative collection of a student's work. A student portfolio includes best work to date and a few "works in progress" that show the process. Students can also show their knowledge, skills and abilities by using different ways apart from traditional media such as exams and essays.

i. **Project-Based Learning**: This is an instructional strategy that gives opportunity to students to discover answers to their questions through real-world investigation. These are learning opportunities that motivate students and integrate many curriculum aims.

j. **Rubrics:** Rubrics means making guideliness or set of expectations used to assess student level of understanding. These are very useful to promote learning as students know the expectations and what they need to do in order to be more efficient.

k. **Simulation:** It is role playing during the operation of a comparatively complex symbolic model of an actual or hypothetical social process; usually includes gaming. It is a quite useful method of evaluation.

D. Teachers' Duties:

As summarized by *Brooks and Brooks (1993)* future constructivist teachers

should:

i. Encourage and accept student autonomy and initiative;

ii. Use a wide variety of materials, including raw data, primary sources and interactive materials and should encourage students to use them;

iii. Inquire about student's understandings of concepts before sharing his/her own understanding of those concepts;

iv. Encourage students to engage in dialogue with the teacher and with one another;

v. Encourage student inquiry by asking thoughtful, open-ended questions and encourage students to ask questions to each other and seek elaboration of student's initial responses; engage students in experiences that show contradictions to initial understandings and then encourage discussion;

vi. Engage students in experiences that show contradictions to initial understandings and then encourage discussion;

vii. Provide time for students to construct relationships and create metaphors;

viii. Assess students understanding through application and performance of open-structured tasks.

Hence, a constructivist perspective, implies that, the primary responsibility of the teacher should be to create and maintain a collaborative problem-solving environment, where students should be allowed to construct their own knowledge, and the teacher should act as a facilitator and guide.

Concluding Remarks:

Based on the above discussion about implications of constructivism for various aspects of learning and teaching, we can conclude that constructivism as a learning theory puts forward new explanations for learning and teaching according to which students are the subjects in teaching and thus teachers

should offer more humanism cares for students and create a favourable teaching environment for them. Thus constructivism emphasizes on the initiatives and the interaction between teacher and students as well as among students themselves. Thus students in future schools should be asked to focus on exploration learning and cooperative learning based on previous knowledge and experiences by means of interactive actions. By this way, students can improve their cognitive ability continuously. Teachers can help the students in using the positive techniques and develop the positive attitudes and good habits in learning. All these innovative ideas constitute the complete constructivism teaching theory system, which can contribute a lot to future teaching methodologies. Hence constructivism as a teaching theory has important meanings for education of the future generations that focuses on improving students' comprehensive quality.

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Constructivism and Pedagogical Strategies

R. Pushpa Namdeo *

Abstract

Constructivism is a philosophy of learning founded on the premise, that by reflecting on our experience we construct our own understanding of the world we live in. Each one of us generates our own "mental models" and "rules" which we use to make sense of our experiences. Learning therefore is simply the process of adjusting our mental models to accommodate new experiences. Constructivists allow academic freedom to the students and encourages cooperative learning and sharing of thoughts among students. For developing better understanding in students pedagogical strategies should also change looking on to constructivist philosophy. Teachers use various strategies like, problem- based learning, discovery learning, experiential learning, cognitive apprenticeship, situated cognition, self regulated learning, scaffolding, brainstorming, debate etc. In these strategies the focus is on how cognitive processes are facilitated in students through social interaction.

Introduction:

The National Curriculum Framework (NCF)-2005 prepared by NCERT has proposed a shift in the approach of teaching and learning from the earlier behaviorist approach basically because of the shift in the theories of learning. The new shift is on the constructivist approach where it is believed that a child constructs his own knowledge. The prevalent approach was based on behaviorism which emphasized that the purpose of teaching learning was to bring about desired change in the child's behavior through drill and practice. The metacognitive skills like reasoning, creative thinking, application of knowledge, interpretation and inferences etc. were neglected and did not give child,

any opportunity to think and reason out on his own in the behaviorist approach of teaching. But in constructive approach teacher provides children with some understanding with the help of which they could learn and create their own vision of knowledge as they interact with the world and meet the needs of the society.

Constructivism is basically a theory based on observation and scientific study about how pupil learns. It says that pupil construct their own understanding through experiencing things and reflecting on those experiences. Constructivism is the process of construction of knowledge. It is the philosophy that views learning as an active process in which learners

construct their own understanding and knowledge of the world through action and reflection and by connecting new ideas to the existing on the basis of materials presented to them. Construction indicates that each learner individually and socially construct meaning as they learn. According to *Dewey,* knowledge is constructed by the knower and there is a relationship between the individual, the community and is mediated by socially constructed ideas. *(Oxford, 1997, pp: 35-66).*

Construction of knowledge has two focal points i.e. cognitive constructivism and social constructivism. *Cognitive constructivism* as the name defines deals with the cognitive processes associated with constructing knowledge as individual make senses of new information with which they interact. *Social constructivism* lays emphasis on social and cultural process that takes place in there day to day activity.

According to constructivist perspective *'knowledge is personally constructed and socially mediate'.* We construct new knowledge, when we experience new information that is incongruent with our prior knowledge. When we make sense of such knowledge we are in the state of equilibrium regarding that knowledge. The focus of the cognitive constructivism is how individual learn, constructivist who emphasize social processes view knowledge as having both individual and social components and hold that there is no meaningful way in which these components can be viewed separately. According to *Vygotsky :* social, cultural, historical perspective learning is first accomplished through the language that flows between the individuals. Language and actions were the tools of mediation for learning. Speaking organizes our thinking and our language comes to us as a cultural heritage through our interaction with others.

Constructivist paradigm calls for a change in the classroom culture, attitude, beliefs and practices. Role of teacher in this paradigm shifts from transmitter of the knowledge to the explorer or investigator of the knowledge. Role of student changes from 'knowledge acquisitions' to the 'knowledge constructor'. In the constructivist classroom, students design, experiment, hypothesize, draws conclusion and compares its findings and results with those of others. Teacher is the manager and the organizer of the class whereas in the objective classroom teacher is the controller of the class. It leads to major shift from teacher centered direct instruction towards student centered understanding based teaching.

Constructivism is based on following assumptions:

-Knowledge is constructed from experience.

-Knowledge is socially constructed.

-Learning is an active process and teacher is a facilitator.

-Problem solving is a part of learning.

Characteristics of Constructivism:

1. According to constructivism learning is not a process of transmission of information from teachers to students. It provides a group situation which enhances collaborative learning for negotiation of meaning, sharing of multiple views and changing the internal representation of the external reality.

2. Active role of teacher enhances student's cognition. Allowing students to ask questions which relate learning in school with outside, encouraging students to answer their question from their own perspective will increase their understanding. A sensitive and informed teacher engages children through well chosen tasks, questions, activities etc. so that students are able to realize their potential. Active engagement involves inquiry,

exploration, questioning, debates, application and reflection leading to theory building and creation of new ideas. School must provide opportunities for all these.

3. Basic processes which are involved in constructivist learning situation are observation, contextualization, cognitive apprenticeship, collaboration, interpretation construction, multiple interpretations and multiple manifestations.

Assumptions of Constructivist Pedagogy

• Learning should take place in authentic and real world environment.

• Learning should involve social negotiation and mediation.

• Content and skills should be made relevant to the learner.

• Content and skills should be understood within the framework of the learner's prior knowledge.

• Students should be assessed formatively, serving to inform future learning experiences.

• Students should be encouraged to become self regulatory, self-mediated and self aware.

• Teacher serves primarily as guides and facilitators of learning not instructors.

• Teacher must provide for and encourage multiple perspectives and representations of content.

• Encouragement and acceptance of student's autonomy and initiative.

• Encouragement of students to engage in dialogue, both with teacher and with one another.

• Encouragement of student's inquiry by asking thoughtful, open ended questions and encouraging them to ask question with one another.

• Pursuit of elaboration of student's initial response.

• Engagement of students in experience

that engender contradiction to their hypothesis and then encourage discussion.

Constructivist Teaching Strategies

Under the theory of constructivism, teachers focus on making the connections between facts and fostering new understanding among the students. Strategies provide the methods to help students formulate questions into something that can be explored, develop the skill necessary for the exploration and identify the format that would be best for the investigation. Each strategy is appropriate for particular circumstances. Teachers tailor their teaching strategies to student's responses and encourage students to analyze, interpret and predict information. Teacher also relies heavily on open ended questions and promotes extensive dialogue among students. When we look on to assumptions of constructive teaching as well as characteristics of constructivist classroom we can say that the strategy used for teaching in constructivist classroom is also different. There are many strategies which can be employed in constructivist classroom. These are:

Co-operative Learning

Social interaction is important for learning because higher mental function such as reasoning, comprehension and critical thinking originate in social interaction and are then internalized by individual. Thus co-operative learning provides a social support that students need to move learning forward. David and Roger Johnson, lists five elements that defines co-operative learning groups:

1. Face to face interaction.
2. Collaborative skills.
3. Positive interdependence
4. Group processing
5. Individual identity.

There are three major benefits of co-operative learning: first higher achievement and greater productivity,

second more positive relationship and greater psychological health thirdly social competence and self esteem. Learning can be enhanced in cooperative learning through rehearsal and elaboration, creation and resolution of disequilibrium or scaffolding of higher mental processes. The possible strategies of cooperative learning are: Jigsaw-A cooperative structure in which each member of a group is responsible for teaching other member of the group one section of material. Reciprocal questioning-It is the approach where groups of two or three students ask and answer each other questions after a lesson. Scripted cooperation-A learning strategy in which two students take turn summarizing material and critiquing the summaries. Thus cooperative learning is an effective teaching strategy in constructivist classroom.

Problem- based learning
It is a student centered, contextualized learning. In this learning begins with the problems to be solved inspite of content to be mastered. Problem based learning aims at-developing scientific understanding through real world situation, developing reasoning strategies, developing self directed learning strategies. Ideally the problem is real; student's action matters and they collaborate to find the solution. Problem based learning has five phases:

1. Student's orientation to the problem, where the teacher recalls the objectives of the lesson, describe important logistical requirements, and engage students to the self selected problem solving activities.
2. Organise students for study, where teacher help student to organize and define study tasks.
3. Assist independent and group investigation, in which students are encouraged to gather appropriate information, conduct experiments and

search for explanation and solution.
4. Develop and present artifacts and exhibits.
5. Analyse and exhibits the problem solving process.

Discovery Learning
Discovery is the process of self learning in which learners generates concepts and ideas. It concentrates upon the closure on some important process, facts, principle or law which is required by syllabus of particular subject. In discovery method, teachers decide in advance the concepts, the theory, law or piece of knowledge which is to be discovered or uncovered by the students. The lesson proceeds through a hierarchy of stages which may be associated with Bruner's level of thoughts i.e. Stage

1. Enactive level in which pupils perform activities which are directly related to what is to be discovered.
2. Iconic level in which the teacher directs the thinking of the students to deal with the experiential situations in terms of mental images of the object used in the activities on which the discovery is to be based.
3. Symbolic level in which students move to replace the mental images with symbols in a move to increase generality and abstraction which results in the discovery planned by the teacher in advance.

Experiential Learning
It lays the importance of critical reflection on learning. It basically emphasizes four steps that is concrete experience, observation and reflection, forming abstract concepts and testing it in new situation. It is not just a praxis i.e. connecting of learning to real life situations on the other hand it is the theory that defines the cognitive process of learning and gives importance to critical reflection.

Cognitive Apprenticeship
It is the term for the instructional process

that teachers provides and supports student with scaffolds as the students develop cognitive strategies. The basic processes in cognitive apprenticeship are: 1.Students observe the teacher's performance as model.

2.Students get external support through coaching and tutoring.

3.Students receives scaffolding which gets faded when students become expert in particular field.

4.Students articulate their knowledge through their understanding of the process and content being learned.

5.Students reflect on their progress and performances.6.Students explore new ways to apply what they have learnt.

Situated Cognition

It is based on the idea that skills and knowledge are tied to the situation in which they were learned. It emphasize that the real world is not like studying in school it is more like an apprentice where novices with the support of the expert guide and model take on more and more responsibility until they are able to function independently. It emphasizes apprenticeship, coaching, collaboration, multiple practices and articulation of learning skills, stories and technology. It also emphasize sharing and doing and constructing meaning in social unit. Situated cognition in classroom practice can be applied in cognition through presenting situation in the authentic context and by encouraging social interaction and collaboration.

Self Regulated learning

It has played an important role constructivist theory. This learning is the combination of self observation, self judgment and self reaction. This theory teaches students to become active, motivated, self-regulated learner. Authentic and meaningful classroom activities that are relevant to real life situation are likely to engender student's cognitive activity and conceptual change.

Teachers should equip students with self regulated strategies so that they become independent thinkers and life long learners.

Scaffolding

It is the process by which a teacher provide student with temporary frame work of learning. It occurs when a less skilled learner works at the side of an expert. It includes modeling, coaching and gradually removing support as the apprentice becomes proficient.

Debate

It facilitates articulation of thoughts through the use of language. It can range from highly structured, formal interaction to quite casual exchange of view points. It leads to the positive as well as negative interpretation of views about particular topic thus leading to multiple interpretations and multiple manifestations.

Case-Method

It provides an opportunity to enhance learning through real life situation. This method is important as constructivist approach emphasize on experiential learning. It provides information about the situation either simulated or real and learners responds to the predetermined questions.

Brainstorming

It supports constructivist learning principles through the facilitation of collaborative group process where shared understanding is negotiated through a sociolinguist process. In this process a new solution to the existing problem is found, it inspire collective creativity and effect group synergy. It promotes imaginative expression, develops fellow feeling and understanding, increase cooperation, causes interest, develops efficient group work, saves time and it is said to facilitate creative problem solving. Brainstorming is preferred as it provides freedom to the students to generate new ideas.

Conclusion:

Constructivist view focuses on how individuals construct their knowledge on the basis of their prior experience in a particular learning situation. Some of the experiences bring the world to the classroom, and other extends the classroom to the world. Therefore we can say that teaching strategies are of outmost importance in constructivism and it is upon the teachers how they use these strategies in the different context. Constructivist approach places students at the centre of the classroom process. These takes into account student's developmental stages, maturity, metacognitive and cognitive skills, prior knowledge and experiences, motivation and interest level, personality ,context and culture. Thus pedagogical strategies suggest that students should participate in experiences that accommodate these ways of learning. Teacher must provide authentic learning situation, complex learning environment and facilitate negotiation and also a range of strategies to support individual students understanding.

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Constructivism Based Teaching : Making Learning Inclusive

Dr. Kundalini Mohanty *

Abstract

Children are the nation builders of tomorrow hence it is necessary to develop them into logical, creative and optimally thinking individuals. Mere bookish knowledge that prepares high achievers and other graded learners to be ready with set solutions makes them feel embarrassed in the face of fast changing situations in the job-market. So it is the time for revision of curriculum and pedagogy learning towards constructivism based teaching is on the top of priority agendas for implementation at all levels- global, national, regional and local. Constructivist teaching provides a rich, problem-solving arena that encourages the learner's investigation, invention and inference. The constructivist teacher values learner reflection, cognitive conflict and peer interaction. Keeping in view the merits constructivism based teaching; there is a very need of constructivism based teaching in Indian classrooms from LKG to PG.

Introduction

Children, the citizens of tomorrow, are the future builders of the nation. Therefore, it becomes essential to develop a child's logical and creative thinking optimally. But these days thinking process and academic achievement of students have been suppressed by competitive environment of our schools. How students perceive each other and interact with one another is an often neglected aspect of instruction. There are three basic ways in which students can interact with each other as they learn. They can compete to see who is "best", they can work individualistically towards a goal without paying attention to other students or they can work cooperatively with a vested interest in each other's learning as well as their own. Of the three interaction patterns, competition is presently most dominant. It is time that a revision of curriculum and pedagogy learning towards constructivist ways of learning is on the top of priority agendas for implementation at all levels- global, national, regional and local. Authorities and agencies behind education and evaluation systems at all graded levels across the globe have a terrific challenge and responsibility in ensuring that all forms and modes of education and evaluation are geared towards a deeper understanding of the vision, theory, research and practices of Constructivism based teaching methods.

Constructivism Based Teaching

Constructivist teaching methods are based on constructivist learning theory. Constructivist learning theory says that

knowledge is constructed from a base of previous knowledge. Children are not a blank slate and knowledge cannot be imparted without the child making sense of it according to his or her current conceptions. Therefore children learn best when they are allowed to construct a personal understanding based on experiencing things and reflecting on those experiences. Constructivism is a view of learning based on the belief that knowledge isn't a thing that can be simply given by the teacher at the front of the room to students in their desks. Rather, knowledge is constructed by learners through an active, mental process of development; learners are the builders and creators of meaning and knowledge. Constructivism draws on the developmental work of *Piaget (1977)* and *Kelly (1991). Twomey Fosnot (1989***)** defines constructivism by reference to four principles: learning, in an important way, depends on what we already know; new ideas occur as we adapt and change our old ideas; learning involves inventing ideas rather than mechanically accumulating facts; meaningful learning occurs through rethinking old ideas and coming to new conclusions about new ideas which conflict with our old ideas. A productive, constructivist classroom, then, consists of learner-centered, active instruction. In such a classroom, the teacher provides students with experiences that allow them to hypothesize, predict, manipulate objects, pose questions, research, investigate, imagine, and invent. The teacher's role is to facilitate this process. *Piaget (1977)* asserts that learning occurs by an active construction of meaning, rather than by passive recipient. He explains that when we, as learners, encounter an experience or a situation that conflicts with our current way of thinking, a state of disequilibrium or imbalance is created. We must then alter our thinking to restore equilibrium or balance. To do this, we make sense of the new information by associating it with what we already know, that is, by attempting to assimilate it into our existing knowledge. When we are unable to do this, we accommodate the new information to our old way of thinking by restructuring our present knowledge to a higher level of thinking. Similar to this is Kelly's theory of personal constructs *(Kelly, 1991).* We develop ways of construing or understanding the world based on our experiences. When we encounter a new experience, we attempt to fit these patterns over the new experience. For example, we know from experience that when we see a red traffic light, we are supposed to stop. The point is that we create our own ways of seeing the world in which we live; the world does not create them for us. Constructivist beliefs have recently been applied to teaching and learning in the classroom.

Characteristics of Constructivism Based Teaching

According to Audrey Gray, the characteristics of a Constructivist classroom are as follows:

- the learners are actively involved
- the environment is democratic
- the activities are interactive and stud-ent -centered
- the teacher facilitates a process of learning in which students are encouraged to be responsible and autonomous

Furthermore, in the constructivist classroom, students work primarily in groups and learning and knowledge are interactive and dynamic. There is a great focus and emphasis on social and communication skills, as well as collaboration and exchange of ideas. This is contrary to the traditional classroom in which students work primarily alone, learning is achieved through repetition, and the subjects are strictly adhered to and are guided by a textbook. Some

activities encouraged in constructivist classrooms are:

- *Experimentation:* students individually perform an experiment and then come together as a class to discuss the results.
- *Research projects:* students research a topic and can present their findings to the class.
- *Field trips:* This allows students to put the concepts and ideas discussed in class in a real-world context. Field trips would often be followed by class discussions.
- *Films:* These provide visual context and thus bring another sense into the learning experience.
- *Class discussions :* This technique is used in all of the methods described above. It is one of the most important distinctions of constructivist teaching methods.

Constructivist approaches can also be used in online learning. For example, tools such as discussion forums, wikis and blogs can enable learners to actively construct knowledge.

Role of Teachers in Constructivism Based Teaching

In the constructivist classroom, the teacher's role is to prompt and facilitate discussion. Thus, the teacher's main focus should be on guiding students by asking questions that will lead them to develop their own conclusions on the subject.

David Jonassen identified three major roles for facilitators to support students in constructivist learning environments:

- Modeling
- Coaching
- Scaffolding

Constructivist Learning Environments (CLEs)

Jonassen has proposed a model for developing constructivist learning environments (CLEs) around a specific learning goal. This goal may take one of

several forms, from least to most complex:

- Question or issue
- Case study
- Long-term Project
- Problem (multiple cases and projects integrated at the curriculum level)

Depending on students' prior experiences, related cases and scaffolding may be necessary for support. Instructors also need to provide an authentic context for tasks, plus information resources, cognitive tools, and collaborative tools.

Constructivist Assessment

Traditionally, assessment in the classrooms is based on testing. In this style, it is important for the student to produce the correct answers. However, in Constructivist teaching, the process of gaining knowledge is viewed as being just as important as the product. Thus, assessment is based not only on tests, but also on observation of the student, the student's work, and the student's points of view. Some assessment strategies include:

- Oral discussions. The teacher presents students with a "focus" question and allows an open discussion on the topic.
- KWL(H) Chart (What we know, What we want to know, What we have learned, How we know it). This technique can be used throughout the course of study for a particular topic, but is also a good assessment technique as it shows the teacher the progress of the student throughout the course of study.
- Mind Mapping. In this activity, students list and categorize the concepts and ideas relating to a topic.
- Hands-on activities. These encourage students to manipulate their environments or a particular learning tool. Teachers can use a checklist and observation to assess student success with the particular material.
- Pre-testing. This allows a teacher to determine what knowledge students

bring to a new topic and thus will be helpful in directing the course of study.

Conclusion

Constructivism promotes social and communication skills by creating a classroom environment that emphasizes collaboration and exchange of ideas. Students must learn how to articulate their ideas clearly as well as to collaborate on tasks effectively by sharing in group 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. Keeping in view the above merits of Constructivism, there is a very need of Constructivism based teaching in Indian class rooms from LKG to PG. Learning proceeds more effectively than usual when exchanges among teachers and learners are frequent and specifically directed towards students' problems and interests.

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Constructivism Based Teaching and Learning

Dr. Jagannath K. Dange *

Abstract

This paper describes the meaning and importance of constructivism based teaching and learning, teaching strategies of constructivism, the role of teachers, etc. One component of the current development in all subject-area curricula is the change in focus of instruction from the transmission curriculum to a transactional curriculum. Constructivist classrooms are structured so that learners are immersed in experiences within which they may engage in meaning-making inquiry, action, imagination, invention, interaction, hypothesizing and personal reflection. Teachers need to recognize how people use their own experiences, prior knowledge and perceptions, as well as their physical and interpersonal environments to construct knowledge and meaning.

Introduction:

By the 1980's, the research of Dewey and Vygotsky had blended with Piaget's work in developmental psychology into the broad approach of constructivism. The basic tenet of constructivism is that students learn by doing rather than observing. Students bring prior knowledge into a learning situation in which they must critique and re-evaluate their understanding of it. This process of interpretation, articulation, and re-evaluation is repeated until they can demonstrate their comprehension of the subject.Constructivism is a philosophi cal position that views knowledge as the outcome of experience mediated by one's own prior knowledge and the experience of others.

Constructivism's central idea 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.

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 *(Wesley A. Hoover, 1996).*

The term constructivism refers to the idea that learners construct knowledge for themselves-each learner individually (and socially) constructs meaning-as he or she learns. Constructing meaning is learning; there is no other kind. The dramatic consequences of this view are twofold;

1) We have to focus on the learner in thinking about learning (not on the subject/lesson to be taught):

2) There is no knowledge independent of the meaning attributed to experience (constructed) by the learner, or community of learners. *(George E. Hein 1991)*

Constructivism is basically a theory - 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 experiences *(Vygotski, L. and Cole, M .1978).* When we encounter something new, we have to reconcile it with our previous ideas and experience, maybe changing what we believe, or maybe discarding the new information as irrelevant. In any case, we are active creators of our own knowledge. To do this, we must ask questions, explore, and assess what we know. The National Curriculum Framework,2005 also recommends that curriculum should help learners to become constructors of knowledge and emphasizes the active role

of teachers in relation to the process of knowledge construction.

"It is assumed that learners have to construct their knowledge individually and collectively. Each learner has a tool kit of concepts and skills with which he or she must construct knowledge to solve problems presented by the environment. The role of community other learners and teacher is to provide the setting, pose the challenges and offer the support that will encourage constriction" (*Davis, Noddings, 1990).*

Five basic assumptions of Constructivism are:

1. Knowledge is actively constructed by the learner, not passively received from the environment.

2. Much human activity is devoted to ordering process the organizational patterning of experience by means of tacit, emotional meaning-making process.

3. The organization of personal activity is fundamentally self-reliant or recursive.

4. Individuals cannot be understood apart from their organic embeddness in social and symbolic systems.

5. All of his active, meaningful and socially embossed self-organization reflects an ongoing development flow in which dynamic dialectical tensions are essential.

Constructivist Teaching Strategies: Constructivist teaching is based on constructivist learning theory. This theoretical framework holds that learning always builds upon knowledge that a student already knows; this prior knowledge is called a schema. Because all learning is filtered through pre-existing schemata, constructivists suggest that learning is more effective when a student is actively engaged in the learning process rather than attempting to receive knowledge passively. A wide variety of methods claim to be based on constructivist learning theory. Most of

these methods rely on some form of guided discovery where the teacher avoids most direct instruction and attempts to lead the student through questions and activities to discover, discuss, appreciate, and verbalize the new knowledge. *(Twomey Fosnot, C. 1989).*

The basic Principals which are essential to constructivist teaching as given by *Brooks J.G. and. Brooks M.G are:*

1. Encouragement and acceptance of student autonomy and initiative.
2. Utilization of raw data and primary sources along with manipulative, interactive, and physical materials.
3. When planning, teachers use cognitive terminology such as "classify", "analyze", and "create."
4. Allowance of student responses to drive lessons, shift instructional strategies, and alter content.
5. Inquiry concerning students' understanding of concept before sharing their own understanding of those concepts.
6. Encouragement of students to engage in dialogue, both with the teacher and with one another.
7. Encouragement of student inquiry by asking thoughtful, open-ended questions and encouraging students to ask questions of each other.
8. Pursuit of elaboration of students' initial responses.
9. Engagement of students in experiences that might engender contradictions to their initial hypotheses and then encourage discussion.
10. Allowances for wait time after posing questions.
11. Providing time for students to construct relationships and create metaphors.
12. Nurturing students' natural curiosity through frequent use of the learning cycle model.

Examples of constructivist activities

Furthermore, in the constructivist classroom, students work primarily in groups and learning and knowledge are interactive and dynamic. There is a great focus and emphasis on social and communication skills, as well as collaboration and exchange of ideas. This is contrary to the traditional classroom in which students work primarily alone, learning is achieved through repetition, and the subjects are strictly adhered to and are guided by a textbook *(Waite-Stupiansky, S. 1997).* Some activities encouraged in constructivist classrooms are:

- **Experimentation:** students individually perform an experiment and then come together as a class to discuss the results.
- **Research projects:** students research a topic and can present their findings to the class.
- **Field trips:** This allows students to put the concepts and ideas discussed in class in a real-world context. Field trips would often be followed by class discussions.
- **Films:** These provide visual context and thus bring another sense into the learning experience.
- **Class discussions:** This technique is used in all of the methods described above. It is one of the most important distinctions of constructivist teaching methods.

Constructivist approaches can also be used in online learning. For example, tools such as discussion forums, wikis and blogs can enable learners to actively construct knowledge.

Role of Teachers: In the constructivist classroom, the teacher's role is to prompt and facilitate discussion. Thus, the teacher's main focus should be on guiding students by asking questions that will lead them to develop their own conclusions on the subject. Constructivist teachers encourage students to constantly assess how the

activity is helping them gain understanding. By questioning them selves 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'. *David Jonassen(1999)* identified major roles for facilitators to support students in constructivist learning environments:

• Modeling
• Coaching
• Scaffolding
• Encourages and accepts students' autonomy and initiative and encourages students to engage in dialogue with the teacher and with one another.
• Teacher relationship must shift from authority and control to guidance, support and facilitating.
• Teacher's role is interactive rooted in negotiation providing tools such as problem solving and inquiry based learning activities with which students formulate and test their ideas, draw conclusions and inferences and pool and convey their knowledge in a collaborative learning environment.

Constructivist Classroom

Students are not blank slates upon which knowledge is etched. They come to learning situations with already formulated knowledge, ideas, and understandings. This previous knowledge is the raw material for the new knowledge they will create. The student is the person who creates new understanding for him/herself. The teacher coaches, moderates and suggests, but allows the students room to experiment, ask questions, try things that don't work. Learning activities require the students' full participation (like hands-on experiments). This process makes them experts of their own learning. The teacher helps create situations where the students feel safe questioning and reflecting on their own processes, either privately or in group discussions. The teacher should also create activities that lead the student to reflect on his or her prior knowledge and experiences. Talking about what was learned and how it was learned is really important.

The constructivist classroom relies heavily on collaboration among students. There are many reasons why collaboration contributes to learning. The main reason it is used so much in constructivism is that students learn about learning not only from themselves, but also from their peers. When students review and reflect on their learning processes together, they can pick up strategies and methods from one another. The main activity in a constructivist classroom is solving problems. Students use inquiry methods to ask questions, investigate a topic, and use a variety of resources to find solutions and answers. As students explore the topic, they draw conclusions, and, as exploration continues, they revisit those conclusions. Exploration of questions leads to more questions.

Students have ideas that they may later see were invalid, incorrect, or insufficient to explain new experiences. These ideas are temporary steps in the integration of knowledge. For instance, a child may believe that all trees lose their leaves in the fall, until she visits an evergreen forest. Constructivist teaching takes into account students' current conceptions and builds from there. *(Mahoney M.J 2004)*

Conclusion: Many researchers suggest that constructivist teaching is an effective way to teach. It encourages active and meaningful learning and promotes responsibility and autonomy, because constructivist teaching is beneficial in achieving desirable educational goals for students it is important for teacher to grow professionally towards a

constructivist practice. The responsibility for the professional development of teacher falls largely on teachers themselves. To encourage incentive, the teachers need to be provided with opportunities, resources, support encouragement and recognition in their professional development pursuits. They need to know that their efforts are being supported by their colleagues, administrators and school boards. 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.

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<u>**Sub Theme - 1**</u>
<u>**Constructivist Pedagogy & Learning**</u>

Constructivism: A New Paradigm in Education

Dr. Savita Sharma *

Abstract

Constructivism is an emerging pedagogy across the world and (NCF-2005) has strongly recommended it in Indian classroom situation. In this paper, the broader meaning of Constructivism in its pedagogic version, the distinct features of the Constructivist classroom, Constructivist teaching learning process as well as instructional strategies, Constructivist evaluation and its tools and its techniques have been discussed. By focusing on how to learn Constructivist teaching can actually enable the learners to be self-initiating active Constructivist with in the mind and active co-constructivist with others for constructing socially and culturally defined knowledge and values.

Introduction

Education has been undergoing a slow but continuous evolution : from teacher-centred to learner-centred and more recently to learning-centred system and this demands revolutionary changes in the instructional process. In the present era of globalisation and knowledge explosion, when learners have easy access to more information channels, there learning styles have also changed. In addition to this, with the implementation of Programme of Universalisation of Elementary Education and with The Right to Education- 2009, majority of students in classrooms are first-generation students besides hailing from diverse backgrounds. In such a scenario of heterogeneity, for a curriculum to be effective in the classroom it must consist of different ways of motivating the students, different methods of teaching and individualised opportunities for the learners.

The National Curriculum Framework (NCF-2005) recommends a paradigm shift for rote memory to learning by understanding where in schools, instead of filling students, minds with mare facts, rather should facilitate the process of knowledge construction. The NCF-2005 underscores this fact by emphasising that 'child-centred pedagogy means giving primacy to children's experiences, their voices and their active participation. Our school pedagogic practices, learning tasks and the texts for learners tend to focus on the socialisation of children and on the receptive features of children's learning. Instead, we need to nurture and build on their active and creative abilities-their inherent interest in making meaning, in relating to the world in real

ways through acting on it creating and in relating to other humans.'

Three Theories of learning

Behavioural, Cognitive and Constructivist theories have specially influenced the system of instructional design in the past about 150 years.

1. Theory of Behaviourism :

   The main focus of Behaviourism is on overt behaviours of students that are observable and measurable. By seeking to establish human mind as a 'black box' that observes stimulus and response qualitatively.

2. Theory of Cognitivism :

   It emphasises that prior knowledge has a direct impact on the new learning tasks. By recognising that learning involves associations established through contiguity and repetition, it acknowledges the importance of re-enforcement. Knowledge is not imparted as it already exists in the human mind and is only brought forth.

3.Theory of Constructivism :

   The Constructivist approach to education is not a new concept though this is the in thing today. According to this approach learning is a process of construction/creation of knowledge by connecting new ideas to existing ideas. The teacher's role as a facilitator, ' a guide on the site' is to pose problems that challenge the thinking of learners towards more complete understanding.

Historical Perspective

The concept of Constructivism has roots in classical antiquity, going back to Socrates dialogues with his followers in the streets of Athens, in which he asked direct questions to ignite their minds to arrive at new generalisations. As a philosophy of learning constructivism goes back to 18th century in the works of Giambattista Vico, who commented, "One only knows something if one can only explain it". But the first major cotemporaries could develop a clear idea of constructivism are *Jean Piaget* and *John Dewey*.

Meaning of Constructivism

The term refers to the idea that individuals, through their interaction with the environment construct their own knowledge and meaning. It has a metaphorical reference to construction, meaning thereby that human beings are builders, shapers and designers who have been creating artifacts from simple pots to skyscrapers. The Constructivist paradigm as advocated by *Piaget* and *Bruner*, stresses that whatever gets into the mind has to be constructed by the individual through knowledge discovery. Thus, learning is an interaction between the learner and the learning environment. During this interaction, prior knowledge is used as a basis to interpret and construct new understanding.

Basic Assumptions of Constructivism

- Knowledge is actively constructed by the learner, not passively received from the environment.
- Much human activity is devoted to ordering process -the organizational patterning of experience.
- The organization of personal activity is fundamentally a self- reliant one.
- Individuals cannot be understood apart from their organic embeddedness in social and symbolic systems.
- All of his active, meaningful and socially embossed self-organization reflects an ongoing development flow in which dynamic dialectical tensions are essential.

Features of a Constructivist classroom

The constructivist classroom relies heavily on collaboration among students. In a classroom where constructivist ideology is followed :

- learning experiences are provided by asking questions with adequate time for higher level thinking.
- students autonomy and initiative are accepted and encouraged thereby

developing their own intellectual identity.

- discussing/sharing ideas with the group and the teacher; thereby one will be able to find out whether his idea is true or false, sufficient or insufficient, etc.
- providing opportunities for students to test their hypothesis by encouraging the discussion of concrete experiences.
- generating abstract concepts through the use of primary sources and through manipulative and interactive materials.

Role of a Teacher

Constructivism modifies the role of a teacher from a manager, supervisor, 'a sage on the stage' to a mediator, mentor, actuator, facilitator, 'a guide on the site'. A teacher helps students by providing tools such as problem-solving and enquiry-based learning activities with which students formulate and test their ideas, draw conclusions and inferences and pool and convey their knowledge in a collaborating learning environment.

Instructional Strategies

For facilitating cognitive processes in the minds of learner, some instructional strategies that help cognitive processing are following :

1. Team Teaching is suitable in case of a need to pool resources, interests and expertise in order to devise and implement a scheme of instruction suitable to the needs of the learners as well as to the facilities of the school. It is a shared accomplishment of integrative teaching built around topics resulting in the integration of subjects. Because of flexibility of teaching methods, time and process, it helps the learners with varying degrees to construct their own knowledge.

2. Brainstorming promotes imaginative expression, develops fellow feelings and understanding . It is more appropriate when a problem to be solved requires collective rummaging for ideas by making each member of the group give free expression to his/her ideas by withholding all criticism or evaluation and listing all major ideas from the important stages in brainstorming. The essence of this technique is the solution generation rather than the solution evaluation.

3. Experiential Learning connotes learning by experience or learning by doing, when changes in judgments, feelings, knowledge or skills result for a particular person from living through an event. A model developed by *Kolb & Fry (1975)* depicts learning as a four-stage cycle with each stage requiring different abilities and skills on the part of the learner. The stage (a) is a concrete personal experience which is followed by (b) observation and reflection of that experience. These reflections are connected into (c) abstract concepts and generalizations which are(d) then tested in new situations.

4. Cooperative Learning provides opportunity to students to interact face-to-face. Group members experience positive interdependence. They need each other for support, explanations, and guidance. Even though they work together and help each other, members of the group must ultimately demonstrate learning on their own.

5. Cognitive Apprenticeships is a relationship in which a less experienced learner acquires knowledge and skills under the guidance of an expert. By working alongside a master and perhaps other apprentices, young people have learned many skills, trades, and crafts. In this way teachers provide experiences, guide discussions, and assume a supportive role in the process of students' attempts at developing understanding.

6. Problem-Based Learning confront students with a real problem that has meaning for them. Ideally, the problem is real, students actions matters, and

they collaborate to find solutions. Generally it has five phases :
(i)orienting students to the problems.
(ii) organising students for study.
(iii) assisting independent and group investigation.
(iv) developing and presenting reports, videos, models etc. and
(v) analysing and evaluating the problem solving process.

7.Discovery Learning refers to a process of self-learning whereby learners generate concepts and ideas. In the knowledge construction process, learners use discovery processes in the initial perplexing phases of thinking, whereas inquiry processes in the more advanced formal verification phases.

Constructivist Evaluation Practices

Constructivism calls for a reconsideration of evaluation and grading procedure. Students are expected to take an active part in their own assessment of their knowledge and in the assessment of learning situations. Evaluation of the student understanding and performance must be ongoing and cumulative, rather than the summative evaluation. Periodic, focused assessments becomes the tools of evaluation. *Paulu (1994)* has made the following strong recommendations for designing new evaluation system and strategies.

• Evaluation programmes must be combined with high performance standards and must encourage and lead learning... not just measure it.
• Evaluation must measure what is valued and not just those skills that are quick and easy to measure.
• Evaluation should be part of the learning rather than to terminate learning
• Evaluation should be fair and equitable as well as valid and reliable.
• Teachers must be involved in the design of evaluation programmes.

These are the pertinent questions to be taken into consideration for Evaluation:

1. What should be evaluated?
Along with final performance of the students, the teacher must know :
- the prior knowledge of the learners in the particular area,
- the personal and social attributes of the learners,
- the physical and health development of the learners for evaluating the ideas by the learner.

2. How should it be evaluated?
Several types of tools and techniques as well as records are necessary to do holistic evaluation of the students' learning and to encourage conceptual understanding as well as process of skill development.

a) Anecdotal Records : These are a form of jotted notes of ongoing assessment of observation of student in the classroom. These provide the teacher with information about the way a student is processing information with students as well as general observations on learning styles, attitude and behaviour.

b) Celebration of Learning: A demonstration where students have an opportunity to share their expertise in several subjects areas with other students teachers and parents.

c) Exit Cards : These involve an easy, a few minutes activity to check student's knowledge before, during and after a lesson or complete unit of study. Student responds to three questions posed by the teacher.

d) Portfolios : A representative collection of an individual student's work. Students show their knowledge, skills and abilities in a variety of different ways.

A few special evaluation techniques for authentic assessment are given below :

a) Reflective Questioning
- It requires students to reflect on the content and to use their knowledge differently from what they experienced in the lesson.

- It encourages students to use a variety of approaches to solve a problem.
b) Hands-On Assessment/Performance Assessment
 - Students must manipulate materials from the lesson in order to complete tasks that enable them to demonstrate what they understand.
 - Students must use their knowledge and skills in a practical way to solve a problem.
c) Pictorial Assessment
 - It requires students to complete reasoning tasks that differ from traditional fill-in, multiple choice and one-answer task.
 - It uses pictures that represent familiar objects and events. Students are required to apply what they have learned and to communicate what they have understood.
d) Concept Mapping : These are essential tools for planning and teaching and can help improve students' concept conceptions.

Conclusion

Constructivism advocates a curricular emphasis on learning, how to learn and on critical thinking as opposed to stress on accumulating ready-made verbalised knowledge. Learners learn more and enjoy learning when they are actively involved in real-world context activities. It also transforms the role of a teacher from mere manager, a sage on the stage to a mentor, mediator, a guide on the site and metamorphoses the student from active listener and passive recipient of the information to active thinker and self-initiating active constructivist. Students learn how to articulate their ideas clearly and to collaborate on tasks by sharing in group projects. Thus, constructivist paradigm, a meaningful framework for replacing, analysing and evaluating educational events, provides true meaning to education, expressed in the words of William Butler Yeats, "Education is not the filling of a pail, but the lighting of a fire".

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Sub Theme - 1
Constructivist Pedagogy & Learning

Constructivist Classroom – Characteristics and Teacher's Role

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Abstract

Constructivism has received considerable attention in education and its policy formation recently. It has been heralded as a natural, relevant, productive and empowering framework for both teacher education and school education. It is basically a theory–based on observation and scientific study – about how people learn. A constructivist classroom exhibits some marked features that are different from a traditional classroom. In the constructivist perspective, classroom environment is maintained in such a way that students actively participate in learning which involves inventing and constructing knowledge and new ideas. The role of teacher has also shifted from the transmitter of knowledge to facilitator of knowledge. This paper identifies major forms of constructivism in conjunction with the characteristics of a constructivist classroom and the role of teacher in a constructivist classroom.

Introduction

Constructivism has greatly influenced the field of education. It has been at the forefront of academic debates among researchers and practitioners. Constructivism is an outgrowth of cognitive science. Constructing knowledge on the basis of previous knowledge is called constructivism. The role of teacher undergoes a major transformation from the imparter of knowledge to facilitator of conditions, which will help learner in the process of knowledge construction.

Constructivism is an epistemology, a learning or meaning-making theory, that offers an explanation of the nature of knowledge and how human beings learn. It maintains that individuals create or construct their own new understandings or knowledge through the interaction of what they already know and believe and the ideas, events, and activities with which they come in contact *(Richardson, 1997)*. Learning activities in constructivist settings are characterized by active engagement, inquiry, problem solving, and collaboration with others. Constructivist approaches are regarded as producing greater internalization and deeper understanding than traditional methods.

The constructivist epistemology asserts that the only tools available to a knower are the senses. It is only through seeing, hearing, touching, smelling and tasting that an individual interacts with the environment. The individual builds a picture of the world using these senses only. Therefore, constructivism resides in

students and that knowledge can not be transferred without any transformation from the head of a teacher to the heads of students.

National Curriculum Framework (NCF 2005) has given guiding principles of constructivism, which are as follows :

- Learning is a process of construction of knowledge.
- Knowledge is constructed by the students.
- Constructing meaning is learning.
- Child constructs knowledge from experiencing the world.
- By interacting with the environment the child constructs knowledge and derives meaning.
- Local knowledge has to occupy a major place in school knowledge.

According to constructivism, learning is not a treasure hunting game where students are trying to guess what is in teacher's head but a process that creates meaning and knowledge. So the main focus is *"how to learn"* rather than *"what to learn"*.

The constructivist epistemology is based on the premise that learning does not involve discovering the reality, but constructing the reality. According to the constructivist theory, knowledge is being actively constructed by the individual and learning is an adoptive process based on the experiences of individual (*Hendry, 1996).* Therefore, learning is not mere absorption of knowledge and learner is no longer controlled respondent to stimuli as in the behaviourist approach *(Jonassen, 1999).*

Vadeboncoeur (1997) identifies three significant strands within these interpretations – Piagetian, sociocultural, and emancipatory, constructivism – strands differentiated primarily by 1. the subject of study, 2. views about how cognitive forms develop, and 3. "the liberatory power of the pedagogical approaches derived". In general, two broad interpretations can be found among contemporary educators – psychological constructivism, most notably articulated by Piaget, and social constructivism, associated with Vygotsky.

Psychological Constructivism

Psychological or Piagetian constructivists 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. Learning is primarily an individualistic enterprise. This is a child-centered approach that seeks to identify, through scientific study, the natural path of cognitive development *(Vadeboncoeur, 1997).* 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. Characteristic instructional practices include "discovery learning" and hands-on activities, such as using manipulatives; student tasks that challenge existing concepts and thinking processes; and questioning techniques that probe students' beliefs and encourage examination and testing of those beliefs *(Richardson, 1997).*

To a large extent, internal development is the focus of the teaching environment, and the social and historical context, as well as issues of power, authority, and the place of formal knowledge in the learning environment are not emphasized *(Richardson, 1997).* It is essentially a decontextualized approach to learning and teaching. Critics of the psychological constructivist approach depreciate its lack of attention to "the influence of the classroom culture and the broader social context" *(Vadeboncoeur, 1997),* as well as

disregard for power issues, particularly power issues related to knowledge production *(Martin, 1994; Richardson, 1997; Vadeboncoeur, 1997).*

Social Constructivism

Social or Vygotskian constructivism emphasizes education for social transformation and reflects a theory of human development that situates the individual within a socio-cultural context. Individual development derives from social interactions within which cultural meanings are shared by the group and eventually internalized by the individual *(Richardson, 1997).* Individuals construct knowledge in transaction with the environment, and in the process both the individual and the environment are changed. The subject of study is the dialectical relationship between the individual and the social and cultural milieu.

Schools are the socio-cultural settings where teaching and learning take place and where "cultural tools" such as reading, writing, mathematics, and certain modes of discourse are utilized *(Richardson, 1997).* This approach assumes that theory and practice do not develop in a vacuum; they are shaped by dominant cultural assumptions *(Martin, 1994).* Both formal knowledge, the subject of instruction, and the manner of its presentation are influenced by the historical and cultural environment that generated them. To accomplish the goals of social transformation and reconstruction, the context of education must be deconstructed, and the cultural assumptions, power relationships, and historical influences that undergird it must be exposed, critiqued, and, when necessary, altered. Variants of social constructivism include situated constructivism, social re-constructivism, socio-cultural constructivism, socio-historical constructivism, and emancipatory constructivism.

Characteristics of Constructivist Classroom

Teaching learning process is not only an arrangement of teaching strategies but setting of situations and environment in which learning process is recognised and supported. For creating such situation and environment, a constructivist classroom has certain characteristics as discussed below :

1. Interactive Teaching-Learning: Learning takes place within a net of social relationships as teachers and pupils interact both formally and informally. Teacher creates interactive situations for understanding students' concepts and then refines or revises those concepts by asking questions, posing contradictions, engaging them in inquiries and / or encouraging research *(Prabha, 2010).* There is no domination of teacher and learning takes place in a collaborative environment and experiences. Collaborative teaching, group discussion, group work and assignment and project work are some of the essential elements of an interactive classroom. Teacher makes all possible efforts to make her classroom interactive. This interaction is multidirectional. Therefore, a variety of group activities with minimal teacher input are encouraged to promote communication among students and to facilitate the individual student's self-discovery of the subject matter.

2. Use of Students' Prior Knowledge: Awareness and acknowledgement of students' prior knowledge are essential for teaching learning process in a constructivist classroom. Teacher needs to provide an encouraging environment in which students are comfortable with what is not yet known to them and feel at ease to share their ideas with their peers and teacher. It facilitates students to construct and reconstruct their knowledge relating it with their previous knowledge.

3. Child-Centred Classroom :
Constructivist classroom places a child in the centre position of the classroom. Ideas initiated by students are accepted and encouraged. Students' opinions are valued. NCF-2005 establishes the need to recognize the child as a natural learner, and knowledge as the outcome of the child's own activity. Students' experiences, their voices and their active participation are valued. Students are not ridiculed or rebuked for asking questions. They are allowed to ask questions, make mistakes and to correct those mistakes. They learn from the positive experiences of social set up of the classroom. Focus is given to what students are learning rather than what the teacher is teaching. They are involved in all the activities of classroom and at all stages of teaching learning processes. Lindfors (1984) advises that how we teach should originate from how students learn.

4.Democratic Classroom Management:
Democratic environment of the classroom facilitates constructive learning. Such environment emphasises shared responsibility in learning and decision-making. Students are directly involved in all the activities of the classroom. Teacher in a constructivist classroom designs and manages her activities in such a way that students are eager and ready to exchange their ideas. They are not afraid of being ridiculed. Teacher encourages his / her students to ask and share the thought processes going on in their mind. He / she assures to his / her students that no question is silly one. Relationship among students and teacher is also democratic and responsive. It stimulates interest in the subject matter and develops a sense of self-achievement in students. Rules are made flexible and teacher's focus is on students learning rather than on his / her own performance (Prabha, 2010).

5. Empowering Students : Empowering students to learn themselves is basic in constructivist philosophy. Students are given a lot of choices in their activities, curriculum and behaviour, but within certain parameters. In such a classroom control comes from involving the students in responsibilities and not from imposing strict rules. Thus the teacher can focus on students learning.

6. Assessment is Interwoven with Teaching Learning Process : In traditional classroom, teachers assess students by paper-pencil test, grading assignments, worksheets and rating students' work as right and wrong answers. In contrast, in a constructivist classroom assessment of students learning is done in the context of daily teaching. It is continuous and comprehensive. NCF-2005 suggests that maintaining a daily diary based on observation helps in continuous and comprehensive evaluation. Assessment is not considered as separate and patchwork, but interwoven in teaching learning process of a constructivist classroom. Not only scholastic but also co-scholastic areas of students' learning are also assessed.

Teacher's Role
A basic premise of constructivism is that individuals live in their own world of personal and subjective experiences and build new knowledge on the basis of their previous experiences, rather than new knowledge being imposed from outside. The role of teacher, therefore, undergoes a major transformation from the imparter of knowledge to facilitator of conditions, which will help learner in the process of knowledge construction. This changing concept of knowledge, learner, and teacher has been presented in Table 1.
In a traditional classroom teacher transmits knowledge, students passively listen while their minds may be daydreaming. In a constructivist classroom teacher transacts the knowledge, students are actively involved

Table 1 : Changing Epistemology of Learning

	Traditional (Behaviourist)	Constructivist
Learning	Learning is a change in behaviour brought out through selective reinforcement of response. It is a product and external entity.	Learning is a process of subjective construction of knowledge based on personal experience of learner.
Knowledge	Passed on, transmitted, reproducible, and linear	Reciprocally developed co-constructed, builds on prior-knowledge, spiral.
Pedagogy	• Teacher centred • Evaluation & assessment of set knowledge • Practising, listening, reproducing • All students do the same tasks	• Learner centred cooperative and experiential • Doing, stating, theorising • Range of possible responses • Tasks vary among students
Motivation	• Extrinsic, grade focus	• Intrinsic, Learning focus
Teacher	• Imparter of knowledge • Asks questions • Explains concepts • Superior to learners	• Facilitator, guide • Raises questions • Facilitates students theorising • A learner among learners
Learners	• are objects that learn • Passive listeners • Rarely ask questions beyond seeking clarification of instructions	• Co-inquires • Active partners in learning • Raise questions

Source : Cited from Pandey (2007), p. 24

Table 2 : School Environment of Traditional &Constructivist Classrooms

Traditional Classrooms	Constructivist Classroom
Curriculum is presented part to whole, with emphasis on basic skills.	Curriculum is presented whole to part with emphasis on big concepts
Strict adherence to fixed curriculum is highly valued	Pursuit of student questioning is highly valued
Curricular activities rely heavily on textbooks and workbooks	Curricular activities rely heavily on primary sources of data and manipulative materials.
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
Teacher seeks the correct answer to validate student learning	Teachers seek the student's point of view in order to understand student's present conceptions for use in subsequent lessons
Assessment of student learning is viewed as separate from teaching and occurs almost entirely through testing	Assessment of student is interwoven with teaching and occurs through teacher observations of students at work and through student exhibitions and portfolios
Students primarily work alone	Students primarily work in group

Source : Cited from Brooks and Brooks, 1993, p. 17.

and their minds construct the knowledge. Constructivism sees learning as a dynamic and social process in which learners actively construct meaning from their experiences in connection with their prior understandings and the social setting *(Driver, Asoko, Leach et al. 1994)*. The Table–2 summarizes the differences in school environment between traditional classrooms and constructivist classrooms. 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.

One of the major characteristics of the constructivist classroom is the student-centered learning environment; thus, the cognitive demands placed on individual learners in a constructivist learning environment are higher than in content rich classroom setting *(Goldberg, 2002)*. The teacher's role is shifted from that of an "information provider, sequencer of information, and test creator" to a "facilitator, guide, scaffolder, and problemtask presenter" *(Nicaise & Barnes, 1996)*. In the constructivist classroom, the teacher's role is to prompt and facilitate discussion. Thus, the teacher's main focus should be on guiding students by asking questions that will lead them to develop their own conclusions on the subject. *David Jonassen* identified three major roles for facilitators to support students in constructivist learning environments : Modeling, Coaching and Scaffolding.

Suggestions for teacher in a constructivist classroom are :

- Encourage and accept student autonomy and initiative.
- Try to use raw data and primary sources, in addition to manipulative, interactive, and physical materials.
- When assigning tasks to the students, use cognitive terminology such as "classify", "analyze", "predict", and "create".
- Build off and use student responses when making "on-the-spot" decisions about teacher behaviors, instructional strategies, activities, and content to be taught.
- Search out students' understanding and prior experiences about a concept before teaching it to them.
- Encourage communication between the teacher and the students and also between the students.
- Provide enough time for students to construct their own meaning when learning something new.

Conclusion

Constructivism in education emerged after the behaviourist movement as a welcome and refreshing view of learning that centres on the active learner within the teaching-learning process. In constructivism, development of understanding requires the learner actively engage in meaning making. In contrast to Behaviourism, constructivists argue that "Knowledge is not passively received but built up by the cognizing subject". Thus, constructivists shift the focus from knowledge as a product to knowing as a process. In the Constructivist classroom, learning take place through a variety of group activities among students or through dialogues with peers or teachers. Learning is a process of subjective construction of new knowledge based on prior knowledge and experience of the learner. Teachers are aware of the role of prior knowledge in students' learning, recognising that students bring with them a rich array of prior experiences, knowledge and beliefs that they use in constructing new understandings.

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Sub Theme - 1
Constructivist Pedagogy & Learning

Constructivist Approach in Pedagogical Practices

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Abstract

A revolution in whole teaching learning process including the curriculum, role of teachers, methods of teaching and evaluation patterns is needed to improve the quality of education. According to Constructivist learning theory all knowledge is constructed from a base of prior knowledge. Children learn best when they are allowed to construct a personal understanding based on experiencing things and reflecting on those experiences. The classroom organization suggested by this approach differs in many respects from that of the traditional approach. The present paper discusses the conceptual underpinnings of constructivist learning theory along with the characteristics of constructivist classroom. The role of teacher, methods of teaching and evaluation patterns in a constructivist classroom along with the constructive curriculum is also discussed here.

Introduction

Education should be child directed as the learner has an active role in interpreting the learning process. High drop-out rates, low skill and knowledge levels among many students, low levels of student engagement in school work and poor international comparisons suggest that the current educational paradigm is weak or inappropriate. Educators must understand that changes in students' outcomes must be supported by parallel changes in curriculum and instruction. However, it is apparent that many of today's teachers are caught in the midst of a change for which they may not have been professionally prepared. In the present classroom role of the student is to memorize information, conduct well regulated experiments, perform mathematical calculations using a specific algorithm and is then tested on his ability to repeat these tasks or remember specific facts. Additionally, the conventional (lecture) teaching method of teacher as sole information-giver to passive students appears outdated. In a study carried out by (Colburn, 2000) on undergraduates in a large lecture hall setting, it was found that only 20% of the students retained what the instructor discussed after the lecture. 65% students were busy in taking notes to internalize the information. Also, after a lecture has passed eight minutes, only 15% of the students were paying attention. such a degradation of our education system cause psychologists with their understanding of human learning process to invent an important branch of

cognitive learning theory - learning theory of constructivism.

Constructivist theory provides a framework through which the emergent ideas about teaching, learning and assessment can be unified (Young and Collin, 2003). Constructivism is not accepting what you are told but your prior knowledge about what you are taught and your perceptions about it has given due importance. Active involvement of students is emphasized in constructivism, hence knowledge gained lasts long in their memory.

Constructivism : A Conceptual Framework

Constructivism has its roots in philosophy and has been applied to sociology and anthropology, as well as cognitive psychology and education, so it is a growing concept in different disciplines. Constructivism is a psychological theory of knowledge which argues that humans construct knowledge and meaning from their experiences. It is a set of beliefs about knowledge that begins with the assumption that reality exists but cannot be known as a set of truth *(Tobin et al.,1993)*.

Immanuel Kant elaborated that human beings are not passive recipients of information. Learners actively take knowledge, connect it to previously assimilated knowledge and make it theirs by constructing their own interpretation *(Cheek, 1992)*.

A. E. Woolfolk divides the constructivism theory into three groups:

1. Individual constructivism theory,
2. Social constructivism theory of Vygotsky,
3. Sociology constructivism theory.

Characteristics of Constructivist Classroom

According to *Audrey Gray*, the characteristics of a constructivist classroom are as follows:

In a constructivist classroom-

- The learners are actively involved.
- The environment is democratic.
- The activities are interactive and student-centred.
- The teacher facilitates a process of learning in which students are encouraged to be responsible and autonomous.

Constructivist Teacher

Based on the assumed reality constructivist teachers need to adapt their teaching style, approach, and content to the specific developmental stage of the child. The role of the teacher is to organize information around conceptual clusters of problems, questions and discrepant situations in order to engage the student's interest. Ideas should be presented holistically as broad concepts and then broken down into parts.

Cognitive theorists believe that teacher should play the role of a facilitator and friend of learner as described below:

1. To assist the students in developing new insights and connecting them with their previous learning.
2. To provide students the required environment to actively construct meaning.
3. To give Students a prior understandings and thoughts about a topic or concept before instruction. It exerts a tremendous influence on what they learn during instruction.
4. To generate a change in the learner's cognitive structure or way of viewing and organizing the world.
5. To co-operate with students is an important source of motivation and support for them.

Constructivist Curriculum

The present curriculum fails to encourage students to work together, to share ideas and information freely with each other, or to use modern instruments to extend their intellectual capabilities *(Olarewaju, 1987)*. One proposed solution to the

mentioned problem is to prepare students to become good adaptive learners. That is, students should be able to apply what they learnt in school to the challenging and unpredictable situations that they might encounter in the course of their work lives. Obviously, the traditional teacher as information giver and textbook guided classroom has failed to bring about the desired outcome of producing thinking students *(Young and Collin, 2003)*. National Curriculum Framework (NCF 2005) emphasizes constructivism and recommends that curriculum should help learners to become constructor of knowledge and emphasizes active role of teachers in relation to the process of knowledge construction.They are the subset of school education and social interactions. Several authors have cited importance of constructivist approaches that engage students on interdisciplinary exploration, collaborative activity and field based opportunities for experiential learning. By adopting the constructivist approach focus of the classroom will change from teacher dominated to student dominated. Focusing on a more educational description of construc-tivism, meaning is intimately connected with experience *(Mahoney, 2004)*. It means curriculum should provide experience based learning material and less importance to theoretical work should be given.

Constructivist Teaching Methods

Behaviourism and Constructivism are two predominant theories in Education for effective classroom teaching. But the researches conducted in these areas showed that there is obvious shift to constructivist way of teaching. Also to grow professionally towards constructivist practices there is a need of paradigm shift from Behaviorism to Constructivism in Teacher Education Programmes.

Conventional (lecture) method of teaching is the process of transmission of knowledge from teacher to student (*Rhodes and Bellamy, 1999).*

Constructivist teaching concept holds the opinion that teaching should take students' existing experimental knowledge as a growing point of new knowledge and then guide them to make new experimental knowledge from existing experimental knowledge. Since learning occurs under a certain situation or in some social cultural context with the help of others, that is, through interpersonal collaboration activities. So to achieve the meaning of construction process, constructivist learning theory thinks that "situation", "cooperation", "session" and "meaning construction" are the four key elements of the learning environment.

Constructivists Evaluation

Constructivists view assessment as a process that involves both the instructor and the student. Educators who prefer to use constructivist methods and principles in evaluating student work have several different avenues to choose that can help to enhance the learning experience of students *(Holt & Willard-Holt, 2000).*

Similarities between constructivist and traditional methods of assessment do exist. Even though constructivists continue to research and experiment with more interactive, experience based assessments, the more traditional methods still prevail and are being used in classrooms as the predominant means of assessment.

Constructivists do not see assessment as an ending activity, but rather an ongoing process that helps the student continue to learn. Many constructivists encourage self-reflection as a means of assessment, or encourage students to exchange evaluations of each other's work (NCREL, 1993).

In assessing, a constructivist's goal is to

help the learner acquire knowledge, not make the learning process laborious and undesirable. Therefore, it is important to have a non-critical attitude as one evaluates in a constructivist format.

Tools and Methods Used in Constructivist Assessment

When constructivists assess students, they prefer to use following methods:

1. To Engage in dialogue with the learner.
2. Take an opportunity to observe a student as he or she develops knowledge.
3. Verbal discussions such as interviews, debates, knowledge telling, co-investigations, or dramatizations should be preferred.
4. Physical Assessment of the whole child is also important. When observed, a constructivist instructor will note physical stance and expression.
5. KWL Charts, Mind mapping, portfolios, checklists, investigative projects, paper and pencil tests, and performance tasks are also often used to evaluate work in a constructivist frame.

Conclusion

It is believed as true that 'teaching methods that enable children to organize learning at their own Pace, manage problem solving processes and learn from interaction with other students, generate encouraging results from social and educational standpoints'. Also learning environment of a constructivist classroom is generally marked by the absence of fear, feeling of being secure, equality and justice, thus everyone feel valued. A good evaluation system should be an integral part of the learning process. It should be beneficial for all the students, teachers and the society. There is a growing need to understand philosophy, pedagogy and teacher practices in order to implement the constructivist evaluation process.

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<u>**Sub Theme - 1**</u>
<u>**Constructivist Pedagogy & Learning**</u>

Practicing Constructivism in the Era of Neo-Liberalism: Challenges for Evolving a Critical Pedagogy

Dr. Kamaljeet Singh *

Abstract

Constructivism is an epistemological view of knowledge acquisition emphasizing the active role of the learners in the construction of knowledge and interpretation of reality. The emergence of new sociology of education and postmodernism has provided scope for constructivist approach to gain ground in the field of education. In India, the National Curriculum Framework (2005) has introduced the constructivist approach for the first time as the very basis of curriculum formulation. But the neoliberal agenda in education advancing the instrumental and behaviouristic conception of education is posing a serious challenge for practicing constructivism and evolving a critical pedagogy.

Introduction

The modern formal education has been generally organised on the basis of objectivist or positivist view of knowledge. According to this view, objects have intrinsic meaning and knowledge is a reflection of a correspondence to reality. In this tradition, knowledge being a reflection of the ontological reality should represent a real world that is thought of as existing, separate and independent of the knower, and this knowledge should be considered true only if it correctly reflects that independent world *(Jha, 2009:)*. Similarly, positivism views knowledge and educational categories consensually, as if they were objective, 'out there' and existed in an unsituated, context-free, manner *(Sarup, 1978)*. Regarding knowledge the positivist approach believes that no conscious or unconscious choices are involved in acquiring knowledge. Whatever is given it is accepted without questioning by the students (ibid:).

This view of learning and knowledge assumes that knowledge can be imparted from teacher to learner through instruction, lecture and practice. Teaching and research driven by this philosophy discourage different views and understandings, disregarding different contexts, and experiences of the individuals, and regard individuals as passive recipients of knowledge (ibid.). Such approach to knowledge thus provides the necessary theoretical basis for behaviourist school of learning, which has dominated the educational scenario till date.

In contrast, the phenomenological approach rejects positivism and

objectivist epistemology. According to this approach, it is not the ontological structures of objects, but the meaning of our experiences which constitute reality (ibid.). Knowledge is not absolute and 'given', but is relative and 'produced' by men (ibid.). This relativist view of knowledge states that knowledge should not be regarded as a body of knowledge, but as a human activity. If learning is really to take place then it can't be context free. It will be related to the life and surroundings of the learner. The learning process becomes independent from knowledge centred teaching methods and it would be composed of less information but a variety of ways of learning *(Kale, 2001).*

This phenomenological approach to knowledge brings into limelight constructivism as an alternative paradigm of learning.

Constructivism: The Defining Paradigms

Constructivism is an epistemological view of knowledge acquisition emphasizing knowledge construction rather than knowledge transmission *(Jha, 2009).* Constructivism's central idea is that human knowledge 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 (ibid). The constructivists argue that knowledge does not have an objective or absolute value. Rather, the learner while interacting with his environment constructs and interprets knowledge based on his experiences and perceptions. This construction of new knowledge is mediated through the previous knowledge of the learner. Therefore, constructivism implies that learners are encouraged to construct

their own knowledge, instead of copying it from an authority, be it a book or a teacher, in realistic situations instead of decontexualised, formal situations such as propagated in traditional textbooks and together with others instead of on their own *(Kanselaar et al., 2001*). Experience is the central point around which learning and knowledge are generally interpreted in constructivism. It is a belief that one constructs knowledge from one's experience, mental structures and beliefs that are used to interpret objects and events (ibid). Thus, constructivism is a philosophy based on the premise that by reflecting on our experiences, we construct our knowledge of the world surrounding us.

The Constructivist perspectives are rooted in the psychological works of *Jean Piaget, Lev Vygotsky*, and *Jerome Bruner* and in the philosophical work of *John Dewey*. In fact, there is no single constructivist theory of learning, rather multiple perspectives and approaches of constructivism are there. Two prominent perspectives of constructivism have been psychological constructivism and social constructivism. The psychological or cognitive constructivism, based on the ideas of Piaget visualises knowledge acquisition as a process of continuous self-construction by the child. It is not a process of imparting information for child's understanding and use rather it is a process under which the child constructs his/her own knowledge through experiences. According to *Piaget*, child's individual action is the starting point of his or her intellectual development. While interacting with his/her surrounding environment he/she begins to form mental constructs about the world. These mental constructs or cognitive structures called schemas by Piaget constitute the knowledge of the individual child. Thus, *Piaget's* psychological constructivist perspective

is less concerned with "correct" representations and more interested in meaning as constructed by the individual (Woolfolk, 2011: 358). Rather than knowing an objective reality, individuals only construct a version of it for themselves (Jha, 2009:46).

On the other hand, the social constructivism having its origin in the work of Lev Vygotsky emphasises the significance of social interactions and of the cultural context in understanding and explaining the process of learning. Vygotsky believed that social interaction, cultural tools and activity shape individual development and learning (Woolfolk, 2011: 358). For Vygotsky, the cognitive development of children is not an individualised process rather is a result of a dialectical process, where the child learns through the shared problem-solving experiences with someone else (Jha, 2009:59). The social context, where different people interact with the child from his/her birth onwards thus forms the very basis of his/her cognitive development. Because, it is this social context which provides the child with the cognitive tools like language needed for his/her intellectual development. Therefore, Vygotsky considered an individual's cognitive system to be a direct result of and inseparable from social life (Vygotsky, as quoted in ibid.).

However, despite its varied versions, constructivism in general represents a philosophical position that promulgates that reality is a mental construction based one's experiences in a particular cultural context. In the field of education, constructivism thus acknowledges the active role of the learner in the construction of knowledge and interpretation of reality. Constructivism also suggests that our constructions and views of the world are not stable, but are in continuous change as we build on past experiences. This change signifies learning and supports the understanding that as human beings we are always construing and learning, and we are never inert (Kelly, as quoted in ibid.: 5). Thus, instead of talking about knowledge as such constructivism offers an explanation of the nature of knowing and how human beings learn.

Scope for Constructivism in Education

In 1970s, with the publication of the works of *Michael Apple, Michael Young, Pierre Bourdieu, Basil Bernstein, Samuel Bowles* and *Herbert Gintis*, new sociological insights were developed in educational studies, which came to be known as the 'new sociology of education'. These thinkers highlighted the absurdity of argument regarding the neutrality of the education system in general and especially of school curriculum. The curriculum, these thinkers argued, had to be understood in terms of questions of power, politics, and ideology, both within and beyond schools *(Young, 2008:2)*. Pierre Bourdieu puts forward the argument that education system is generally biased in the favour of the dominant class which is in possession of requisite cultural capital necessary for becoming academically successful. In this way the education system reproduces the existing domination in the society. Similarly, Bernstein with his work on 'invisible pedagogy' highlights that how through an implicit controlling mechanism in schools, the capitalist societies exercise control over the students and thus perpetuate domination.

NCF(2005) & Constructivism

The National Curriculum Framework (2005) has uniqueness of its own as with it constructivism for the first time came to be the very basis of curriculum formulation in India. The NCF document views child-centred pedagogy as its basic premise, meaning thereby giving primacy to children's experiences, their voices,

and their active participation *(NCERT, 2005)*. The document realizes that our school pedagogic practices, learning tasks, and the text we create for learners tend to focus on the socialisation of children and on the 'receptive features of children's learning (ibid.). Therefore, it argues that learning at school cannot become a joyful experience unless we change our perception of the child as a receiver of knowledge and move beyond the convention of using textbooks as the basis of examination (ibid.). It contends that learning for the sake of being examined in a mechanical manner takes away the joy of being young, and delinks school knowledge from everyday experience (ibid.)

While defining learning in constructivist terms the document states: Learning is active and social in its character (ibid). Learning is a process of the 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 (ibid.). The children are thus viewed as creators of knowledge rather than passive recipient of knowledge.

Further, the NCF document asserts that the greatest national challenge for education is to strengthen our participatory democracy and the values enshrined in the Constitution (ibid.:9), therefore the aims of education have to be located in social values cherished by our democratic society. The first is a commitment to democracy and the values of equality, justice, freedom, concern for others' well-being, secularism, respect for human dignity and rights. Education should aim to build a commitment to these values, which are based on reason and understanding. The curriculum, therefore, should provide adequate experience and space for dialogue and discourse in the school to build such a commitment in children (ibid).

Furthermore, the NCF document envisages the role of education as an instrument of social transformation and of developing an egalitarian social order. It affirms the vision of Mahatma Gandhi who had visualized education as a means of awakening the nation's conscience to injustice, violence and inequality entrenched in the social order (ibid). The document visualizes that a critical function of education for equality is to enable all learners to claim their rights as well as to contribute to society and polity (ibid). It therefore emphasises that the concept of critical pedagogy has to be practiced in all dimensions of education, including school education (ibid).

Thus, the National Curriculum Framework (2005), while instituting constructivism as the underlying approach of the curriculum framework, envisages the evolution of a critical pedagogy in order to enable the students to develop a comprehensive and democratic worldview and way of life.

Neoliberal Agenda in Education: Challenges for Practising Constructivism

Parallel to the introduction of constructivist paradigm in the National Curriculum Framework, the intensification of neoliberal agenda in education especially at elementary education level has resulted in such pedagogical situations, which are quite contrary to those required under constructivist approach. In the neoliberal educational policy discourse education is being viewed and defined more in terms of the needs of the emerging economy. The school education in the global discourse of Education for All (EFA) is viewed more in terms of skills to be acquired by masses, which are considered as prerequisite for the smooth functioning of the emerging economy. The setting up of Minimum Levels of Learning by the National Policy on Education (1986)

gained further credence in the subsequent policy documents in the era of neoliberal globalisation.

Therefore, the policy documents in the era of neoliberalism have recommended setting up of learning outcomes beforehand those are to be realized through educational programmes. The declaration of World Conference on Education for All held at Jomtien states: "Whether or not expanded educational opportunities will translate into meaningful development-for an individual or for society-depends ultimately on whether people actually learn as a result of those opportunities i.e. whether they incorporate useful knowledge, reasoning ability, skills and values. The focus of basic education must, therefore, be on actual learning acquisition and outcome, rather than exclusively upon enrolment, continued participation in organized programmes and completion of certification requirements.....It is therefore, necessary to define acceptable levels of learning acquisition for educational programmes and to improve and apply systems of assessing learning achievements *(UNESCO,1990).* Such definition of role of education in terms of acquisition of pre-decided outcomes leads to its reduction to mere literacy, numeracy, life skills and behaviorism.

On the other hand, the conception of quality of education is now-a-days also being reduced to merely achieving these learning outcomes. Far from showing concern for any essential attributes of education, much of the current usage of the term 'quality' focuses on the relatively more instrumentalist features of education. Whereas one might expect 'quality' to refer to a comprehensive or holistic view of education, contemporary debates on quality often stick to the limited view of learning which became synonymous with behaviouristic educational theory and pedagogy.

According to this theory and the pedagogic advice it offers, learning is something that can be planned, predicted and accurately measured once it has occurred. Evidently, quality related debates around the world, and not just in the developing countries, tend to attach great significance to large-scale testing which, in turn, encourages teaching for predictable outcomes *(Kumar, 2010).*

With regard to the instrumental paradigm gaining ground in educational policy discourse, eminent educationist Prof. Anil Sadgopal comments: The goal of education excludes building a democratic, egalitarian, just, secular and enlightened society. Instead, education has become an instrument for only improving productivity, promoting consumerism and establishing market control over knowledge and the public mind such that every human being becomes a 'useful' resource for the global capital *(Sadgopal, 2010).*

Such an instrumental and behaviouristic conception of education is posing a serious challenge for evolving a critical pedagogy based on a constructivist paradigm. Evolving such pedagogy is of utmost significance in the face of predominance of the neoliberal model of development characterised by the exacerbating socio-economic inequalities, which are posing serious challenges for the working of our democratic society. Our education system must develop a critical thinking about the working of neoliberal global capitalistic system and its impact on social, economic, political and cultural aspects of our society. If something is education, it must enable the learner to arrive at how cultural and economic forces and schools perpetuate the operation of 'people and create, recreate, and legitimate an unequal, unjust and undemocratic society' *(Heilman, quoted in Hussein, 2006).*

Conclusion

Constructivism is an epistemological view of knowledge acquisition emphasizing the active role of the learner in the construction of knowledge and interpretation of reality. This learning approach also has the potential to rein in the operation of power and ideology in the field of education. The National Curriculum Framework (2005) has introduced the constructivist approach as the very basis of curriculum formulation in India. But, with the intensification of neoliberal agenda in education, an instrumental and behaviouristic conception of education is now predominating especially in our school education. Such a conception of education reduces educational practice only to ensure the achievement of pre-determined learning outcomes, thus restricting the active role of learner in pedagogical situations. This situation is posing a serious challenge for practising constructivism and evolving a critical pedagogy. Evolving a critical pedagogy is of utmost necessity for critical understanding of the working of neoliberal order which is resulting in exacerbation of socio-economic inequalities in our society. Such a pedagogy would also engender a hope for orienting our education system towards a humane and sustainable society.

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Sub Theme - 1
Constructivist Pedagogy & Learning

Innovative Teaching for Effective Learning

Dr. Happy, P. V. *

Abstract

The common image of a teacher standing in front of a class, providing information to students sitting passively at their desk is simply archaic, according to contemporary scientific views of the learning process. The research on learning has shown that people construct new knowledge and understandings based on what they already know and believe. It is not sufficient for academics to be experts in their disciplinary area. The new curriculum, which is followed in developed countries and some of the states of our country, has constructivism as a major theoretical backing. It is constructivism that initiated learner-centered approach in education

Introduction

Many of today's schools still operate as they did at the beginning of last century. They are not encouraging deep learning and skills that underline innovative activity.

For both the individual and society, successful management of learning is essential. Individuals who become self-directed learners are able to acquire expert knowledge in various fields, to change careers and to endow their lives with creativity and variety. Developing these capacities is not only important for a successful economy, but also for effective community and social engagement, participatory democracy and for living meaningful lives.

How can individuals be helped to achieve their fullest potential? How can today's schools be transformed so as to create environments that result in the types of teaching and learning that makes individuals lifelong learners and prepares them for the 21st century?

We need to change and improve teaching so that there are better learning outcomes and those different skills sets are fostered simultaneously pedagogical innovations are absolutely necessary. Pedagogical innovation is only one dimension of a broader innovation ecosystem in education. Innovation and improvement in pedagogy is the cornerstone of better learning outcomes.

Learning to see deeper truths

A father once took his six-year old son for an evening walk. On the way it started raining heavily. The father and the son took shelter under a huge banyan tree. In order not to waste their time, the father decided to teach his son the four directions East, West, North and South. The son learnt this quickly and in the meanwhile the rain stopped and they returned back home. The father very

proudly told his wife that he had taught his son about the four directions of the compass. The happy mother then asked the son to point towards east. The boy promptly replied: "let us go back to the banyan tree."

Here lies the question, what is education? Is it merely obtaining university degree or is it something more?

The common image of a teacher standing in front of a class, providing information to students sitting passively at their desk is simply archaic, according to contemporary scientific views of the learning process. But what exactly do we know? While traditional education has emphasised memorization and the mastery of text, research on learning has shown that people construct new knowledge and understandings based on what they already know and believe. The importance of allowing students to take control of their own learning and, thereby, become active learners who are able to understand complex subject matter, is another major finding of the learning sciences. This can be achieved by taking meta-cognitive as well as motivational and affective factors in learning into account. In general, learning must be seen as a social, cultural, intrapersonal and, most of all, active process. While there is no universal best teaching practice, general principles of teaching and learning – that can enhance our understanding of the teaching-learning process –unquestionably exist.

It is not sufficient for academics to be experts in their disciplinary area; they also need to know how best to teach that discipline. They need to have an understanding of learning theories, and to know how to apply these theories to their practice. They need to appreciate what teaching and learning approaches work best for different students in different situations.

Western countries have already modified their school curriculum, according to the learner centered approach, which is highly influenced by the constructivist view of learning. In many states of India, the teaching is still dominated by the teacher in the class, and it is less learner-centered. In the present education system, verbalism dominates all activities. Words, which are found remote or unrelated by the learner, cannot initiate learning. The teacher-centered education system, lack of basic amenities and the overcrowded classrooms resulted in the failure of achieving many planned objectives. Hence, we are also making continuous efforts to modify and revitalize the school education. The new curriculum, which is followed in developed countries and some of the States of our country, has constructivism as a major theoretical backing. It is constructivism that initiated learner-centered approach in education

Principles of constructivism

1. Learning is an active process in which the learner uses sensory input and constructs meaning out of it. The more traditional formulation of this idea involves the terminology of the active learner (Dewey's term) stressing that the learner needs to do something; that learning is not the passive acceptance of knowledge which exists "out there" but that learning involves the learner s engaging with the world.

2. People learn to learn as they learn: learning consists both of constructing meaning and constructing systems of meaning. For example, if we learn the chronology of dates of a series of historical events, we are simultaneously learning the meaning of a chronology. Each meaning we construct makes us better able to give meaning to other sensations which can fit a similar pattern.

3. The crucial action of constructing meaning is mental: it happens in the

mind. Physical actions, hands-on experience may be necessary for learning, especially for children, but it is not sufficient; we need to provide activities which engage the mind as well as the hands. (*Dewey* called this reflective activity.)

4. Learning involves language: the language we use influences learning. On the empirical level. Researchers have noted that people talk to themselves as they learn. On a more general level. there is a collection of arguments, presented most forcefully by *Vygotsky*, that language and learning are inextricably intertwined. This point was clearly emphasized in *Elaine Gurain's* reference to the need to honor native language in developing North American exhibits. The desire to have material and programs in their own language was an important request by many members of various Native American communities.

5. Learning is a social activity: our learning is intimately associated with our connection with other human beings, our teachers, our peers, our family as well as casual acquaintances, including the people before us or next to us at the exhibit. We are more likely to be successful in our efforts to educate if we recognize this principle rather than try to avoid it. Much of traditional education, as Dewey pointed out, is directed towards isolating the learner from all social interaction, and towards seeing education as a one-on-one relationship between the learner and the objective material to be learned. In contrast, progressive education (to continue to use Dewey's formulation) recognizes the social aspect of learning and uses conversation, interaction with others, and the application of knowledge as an integral aspect of learning.

6. Learning is contextual: we do not learn isolated facts and theories in some abstract ethereal land of the mind separate from the rest of our lives: we learn in relationship to what else we know, what we believe, our prejudices and our fears. On reflection, it becomes clear that this point is actually a corollary of the idea that learning is active and social. We cannot divorce our learning from our lives.

7. One needs knowledge to learn: it is not possible to assimilate new knowledge without having some structure developed from previous knowledge to build on. The more we know, the more we can learn. Therefore any effort to teach must be connected to the state of the learner must provide a path into the subject for the learner based on that learner's previous knowledge.

8. It takes time to learn: learning is not instantaneous. For significant learning we need to revisit ideas, ponder them try them out, play with them and use them. This cannot happen in the 5-10 minutes usually spent in a gallery .If you reflect on anything you have learned, you soon realize that it is the product of repeated exposure and thought. Even, or especially, moments of profound insight, can be traced back to longer periods of preparation.

9. Motivation is a key component in learning. Not only is it the case that motivation helps learning, it is essential for learning. This idea of motivation as described here is broadly conceived to include an understanding of ways in which the knowledge can be used. Unless we know "the reasons why", we may not be very involved in using the knowledge that may be instilled in us. Even by the most severe and direct teaching.

Conclusion

Constructivist view of learning focus on how individuals construct their own cognitive structures as they interpret

their experiences in particular learning situations. Constructivist approaches emphasizes making students aware of their own role in constructing knowledge. The assumptions we make, our beliefs, and our experiences shape what each of us comes to 'know' about the world. Different assumptions and different experiences lead to different knowledge. If students are aware of the influence that shape their thinking, they will be more able to choose, develop, and defend positions in a self –critical way while respecting the positions of others.

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<u>**Sub Theme - 1**</u>
<u>**Constructivist Pedagogy & Learning**</u>

Constructive Teaching Strategies and Evaluation Methods

Dr. Meena Manral *

Abstract

Constructivism is a theory of learning which emphasises in discovering and creating of knowledge. With the help of constructive teaching strategies, a teacher can enhance problem solving and creative thinking abilities with in students. Theory of constructivism helps a teacher in evaluation processes also. Formative assessment methods can be applied assess the overall performance of students in class room situations and out of class rooms.

Introduction:

There are many learning theories that help the teachers in planning, organizing, evaluating teaching-learning process. The theory of Constructivism gives teachers another perspective to rethink how students learn and to focus on process and provide ways of documenting change and transformation. It also reminds teachers to look for different ways to engage individual students, to develop conductive environment for exploration, prepare for coherent sets of problems and challenges that focus the model building effort, elicit and communicate student perceptions and interpretations. Constructivism is one of the learning theory by which, learning is an active process in which learner constructs new ideas or concept's based upon their current/past knowledge, social instructions and motivation effect. Constructivism is not a new phenomenon in the field of teaching and learning. It

played effective role in education and literature for many decades.

Meaning and History of Constructivism: According to Lisa *Firtscher (2009), "*Constructivism is a type of learning theory that explains human learning as an active attempt to construct meaning in the world around us. Constructivists believe that learning is more active and self-directed. Constructivism divides learning into two types: accommodation and assimilation. The focus is on the individual's desire and ability to learn, and the teacher is merely there to help guide self-directed learning." In the field of education constructivism is applied as learning theory, epistemology and pedagogy of learning. The term constructivism refers the idea that learners construct knowledge themselves. From the perspective of constructivism, learners construct knowledge based on what they already know and make connections between

new information and old information. Students' prior ideas, experiences, and knowledge interact with new experiences and their interpretations of the environment around them.

Some philosophers, such as *Socrates*, focused on helping students construct meanings on their own rather than having authority figures transmit information to them. *Immanuel Kant (1724–1804)* built upon this by recognizing that the way learners perceive stimuli from their environment shapes their understanding of the world. In the early 20th century, *John Dewey (1859– 1952)* proposed that education should work with students' current understanding, taking into account their prior ideas and interests. Later, *Jean Piaget (1896–1980)* defined accommodation and assimilation as ways for new knowledge to build upon previous knowledge. The ideas of *Lev Vygotsky (1896–1934)* also influenced constructivism. He helped increase awareness of the interactions between the individual, interpersonal, and cultural historical factors that affect learning. The constructivist learning is based on students' active participation in problem-solving and critical thinking regarding a learning activity which they find relevant and engaging. They are "constructing" their own knowledge by testing ideas and approaches based on their prior knowledge and experience, applying these to a new situation, and integrating the new knowledge gained with pre-existing intellectual constructs. In the field of education some of the main constructivists thinkers are, *John Dewey (1859-1952), Maria Montessiri (1870-1952), David A. Kalb (1939), Wladyshaw Strzeminske (1893-1952), Heinz Von Foerster (1911-2002), George Kelly (1905-1967), Herbert Simon (1916-2001), Paul Watzlawick (1921-2007), Ernst Von Glaserfeld (1917-2010), Edgar Morin (1921) and Humberto Maturana (1928).* In

the field of education there are two main types of constructivism –

1. Cognitive constructivism which is about how the individual learner understand things, in terms of developmental stages and teaching styles and

2. Social constructivism which emphases how meanings and understandings grow out of social encounters.

Principals of constructivism:

According to *Jonassen, (1994)* the main principals of constructivism are –

1. constructivist learning environments provide multiple representations of reality.

2. these represent the complexity of the real world.

3. knowledge construction is emphasized over knowledge reproduction.

4. authentic tasks are emphasized in meaningful context.

5. real world settings or case-based learning is provided.

6. thoughtful reflection on experience is encouraged.

7. enable context and content dependent knowledge construction.

8. support collaboration and social negotiation among learners.

9. discovery learning.

10. collaborative activity.

11. integration and activation of prior knowledge.

12. opportunities for hand-on activities.

Teacher's role to enhance constructive approach among the students:

Teacher has significance role in teaching-learning process. To enhance construc-tive approach among student a teacher can focus on making connections between facts and fostering new understanding in students. Teachers tailor their teaching strategies to student responses and encourage students to analyze, interpret, and predict information. Teachers also rely heavily on open-ended questions and promote

extensive dialogue among students. To give students an opportunity to be involved in creating knowledge, the learner should be involved not in activities in which the goal is to memorize facts but in problem-solving activities. For instructional design geared toward radical constructivism, students should be provided with personal autonomy in which individual work is a part of the instructional framework. Furthermore, to actively engage students, "the teacher's role should be to challenge the learner's thinking-not to dictate or attempt to proceduralize that thinking"*(Savery & Duffy).*

Teaching strategies for enhancing constructive approach:

Every child has constructive ability in more or less quantity. A teacher can play significant role in enhancing this ability of the students. As a guide and facilitator the teacher can help to enhance the constructive ability of the students. Teaching strategies can help the teachers for achieving this goal are as below –

1- Discovery learning:

It is an instructional method in which students are free to work in a learning environment with little or no guidance. For example, discovery learning is the method of instruction when students are given a math problem and asked to come up with a solution on their own, when students are given a scientific problem and allowed to conduct experiments, or when students are allowed to learn how a computer program works by typing commands and seeing what happens on a computer screen. The early 21st-century interest in discovery learning has its roots in *Jerome Bruner's (1961)* eloquent call for discovery methods of instruction and is echoed in *Seymour Papert's (1980).*

 2- Case based learning:

Cases describe an interesting story that will generate alternative perspectives from learners. Cases should provoke alternative ideas and require decision making *(Herreid, 2008).* There are a variety of methods for using cases in the context of instruction. Collaborative discussions among students about the case are common. Students are expected to bring their knowledge and perspectives to the consideration of the case, engage in argumentation about the interpretation of the case with their peers, and deepen their understandings of the issues at hand. In doing so, students use their prior experiences and knowledge to construct new knowledge and understandings.

3- Inquiry based learning:

Constructivist teaching practice, particularly inquiry-based learning, seeks to mediate the learning process and make this kind of cognition an object of classroom instruction. Through inquiry learning, students play the role of scientists, a role that is familiar to researchers, as it is modeled on the authentic inquiry activities of professional scientists. Their tasks include formulating questions, designing informative investigations, analyzing patterns, drawing inferences, accessing evidence in responding to questions, formulating explanations from evidence, connecting explanations to knowledge, and communicating and justifying claims and explanations. The focus on inquiry learning originated with the work of *Jean Piaget (1896–1980)* on the development of adolescent reasoning skills, particularly his focus on the discontinuous, or abrupt, transition from concrete to formal operational thought during adolescence.

4- Project based learning: project-based learning was the idea of "whole-hearted purposeful activity proceeding in a social environment." Thus, many elements of project-based approaches of the twenty-first century are present in this early conception. A goal of using projects is to

provide opportunities for students to become engaged in their own learning as they create meaningful artifacts. These may include reports, physical models, computer models, exhibits, Web sites and other concrete products that provide opportunities for students to demonstrate their understanding. Project-based learning (PBL) is a constructivist approach to learning because students are involved in constructing deep understanding as they engage with the ideas needed for their projects.

5- Problem based learning:

Problem Based Learning was designed with five instructional goals (Barrows, 1985): to help students (1) construct flexible knowledge, (2) develop effective problem-solving skills, (3) develop self-directed learning skills, (4) become effective collaborators, and (5) become motivated to learn. Major factors in the effectiveness of PBL are having good problems that allow for extended engagement, a student-centered tutorial process, and a facilitator to help guide the learning process.

Constructive evaluation methods:

Evaluation or assessment is a well planned process by which we evaluate the achievement of teaching-learning objectives. Assessment tools are needed to guide students and teachers in setting appropriate learning goals. To assess the student's over all performance teacher use summative and formative tools. To assess the constructive learning constructivism emphasis some innovative assessment methods like -

1. Anecdotal record:

Anecdotal record provides general information about student learning styles, attitude and behavior and help to a teacher for ongoing assessment.

2. Celebration of learning:

Celebration of learning organizes a demonstration where students have the opportunity to share their expertise in several subject areas with other students, teachers and parents.

3. Exit cards:

Exit cards is an easy 5 minute activity to check student knowledge before, during and after a lesson or complete unit of study. Students respond to 3 questions posed by the teacher. Teachers can quickly read the responses and plan necessary instruction.

4. Graphic organizers:

Also known as mind maps, are instructional tools used to illustrate prior knowledge.

5. Oral presentation:

Student may share their knowledge verbally or oral presentation using multimedia.

6. Peer Assessment:

In this assessment pattern one learner, group of learners or class give written or verbal feedback of learner. For this they can use check list, rubrics or written response to peer work.

7.Portfolios:

A portfolio is a representative collection of an individual student's work. A student portfolio is generally composed of best work to date and a few "works in progress" that demonstrate the process. Students show their knowledge, skills and abilities in a variety of different ways that are not dependent upon traditional media such as exams and essays.

8. Project-Based Learning:

Instructional strategy that challenges students to discover answers to their questions through real-world investigation. These are in-depth learning opportunities that motivate students and integrate many curriculum objectives.

9. Rubrics:

A rubric is "a road map, telling students and teachers where to begin, where they're going, and how to get there." *Dr.*

Kay Burke. Rubrics are scoring guides or sets of expectations used to assess student level of understanding and allow students to know the expectations and what they need to do in order to be learning at a higher level.

10. **Simulation:**

The use of role playing by the actors during the operation of a comparatively complex symbolic model of an actual of hypothetical social process; usually includes gaming and may be all-man, man-computer, or all-computer operations.[14]

Conclusion:

Constructivism believes in invention, construction and generation of the knowledge. Constructivism emphasis that every child has his/her own style of learning. By the help of constructive teaching methods, such as, discovery learning, case based learning, inquiry based learning, project based learning, problem based learning etc, can enhance creativity, problem solving and critical thinking ability of the students. Constructive teaching methods help students in acquire knowledge in self pace of learning. By the help of peer assessment, anecdotal record, continuous and comprehensive assessment etc teacher can assess the overall performance of the students and can give them feed-back. So constructivism based teaching and evaluation pattern can change whole process of learning and can develop critical thinking, problem solving and knowledge discovering abilities of the students.

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Constructivism: A Learner – Centered Education

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Abstract

Constructivism is a new approach in education that claims human beings are better able to understand the information that they have constructed by themselves. Constructivism as learning theory has emerged as one of the child-centered approaches. It is mainly attributed to the work of Jean Piaget. Constructivism is about how people learn and construct their own understanding and knowledge through experiencing thinks and reflecting on those experiences. This article gives a brief outline of Constructivism.

Introduction-

Schools are expected to transmit knowledge to the younger generation. The traditional classrooms sometimes resemble a one-person show with a captive but often uninvolved audience. Classes are usually dominated by the teacher at the centre. To improvise the instruction, various strategies like discovery, joyful and recently experiential learning were introduced. Hence it requires a shift from teacher centered to learning-centered education for which one proposed solution is Constructivism. Constructivism is not a new concept, it has been around since the turn of the century and was supported by: *John Dewey* an American psychologist. *Jean Piaget*, who based his view of psychological development of children such that a child constructs understanding through many channels: such as reading, listening, exploring and experiencing his or her environment. *Lev Vygotsky*, a Russian psychologist and philosopher and was associated with the social constructivist theory. He believed that the influence of cultural and social contexts play an important part in learning and supports a discovery model of learning.

Constructivism is a child-centered approach, rather than curriculum based. It focuses on knowledge construction, not knowledge reproduction. It is a belief that one constructs knowledge from one's own experiences. Everyone's view of the external world differs from others because of their unique set of experiences. The ideas and interests of children drive the learning process and the teachers the facilitators.

Definition-

A learning theory that claims individuals actively construct new knowledge from their experiences rather than acquiring

knowledge from outside to within the learner. Knowledge is individually constructed through interactions with the environment and others (cognitive) and is co-constructed through interactions with others (social).

Jonassen (1994) proposed that there are eight characteristics that differentiate constructivist learning environments:

1. Constructivist learning environments provide multiple representations of reality.
2. Multiple representations avoid oversimplification and represent the complexity of the real world.
3. Constructivist learning environments emphasize knowledge construction inserted of knowledge reproduction.
4. Constructivist learning environments emphasize authentic tasks in a meaningful context rather than abstract instruction out of context.
5. Constructivist learning environments provide learning environments such as real-world settings or case-based learning instead of predetermined sequences of instruction.
6. Constructivist learning environments encourage thoughtful reflection on experience.
7. Constructivist learning environments" Senable context- and content-dependent knowledge construction."
8. Constructivist learning environments support "collaborative construction of knowledge through social negotiation, not competition among learners for recognition."

Roles of the Teacher

The role of the teacher in construstivist teaching methods is,watching, listening, asking questions and having the ability to observe and listen to one's students and their experiences in the classroom contributes to his other ability to use a constructivist approach. A constructivist approach contributes to one's ability to observe and listen in the classroom.

Advantages -

Each person in the world builds their own knowledge. Focuses on student-centered learning Teacher guides students in building their own understanding and knowledge. Students actively engaged in their learning process.

Disadvantages -

Lack of teacher preparation for constructivist classrooms Difficult to break the cycle of those who have been taught in a classroom where they were expected to solely absorb information.

Limitation-

- It is almost impossible to create highly detailed lesson plans because so much variation is possible.
- Teaching from a constructivist perspective is more time consuming and places higher demands on learners as compared to a typical lecture format.
- Recognize that students construct their own interpretations of things regardless of whether you teach from a constructivist perspective.
- Constructivism is not the only orientation to learning that you will ever need.

Conclusion-

Constructivism is an idea that not every teacher will use, but they should at least consider it. The idea of building knowledge off prior knowledge is a technique that if done properly, can enhance the learning of the students dramatically while at the same time making it more interesting due to the fact the teacher does not have to keep repeating the same information over and over.

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<u>**Sub Theme - 2**</u>
<u>**Constructivism Application**</u>

Problem-Based Learning as a Constructivist Method of Teaching

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Abstract

Problem based learning (PBL) is an innovative learner-oriented instructional strategy. It draws on constructivist and social constructivist principles of learning. PBL is an instructional method in which students work in collaborative groups to identify what they need to learn in order to solve a problem, engage in self-directed learning, apply their new knowledge to the problem, and reflect on what they learned and the effectiveness of the strategies employed (Hmelo, 2004). PBL is an imperative part of an various disciplines viz. sciences, medicine, engineering, law, business, educational administration, teacher education and architecture (Savery & Duffy, 1996). A selected review of literature is presented in the present paper, discussion and conclusions are also presented.

Introduction

Problem based learning (PBL) is an innovative learner-oriented instructional strategy. It draws on constructivist and social constructivist principles of learning, advocating student centered engagement with course materials and content as well as student interaction with peers as central to the process associated with learning. PBL is an approach that empowers learners to conduct research, integrate theory and practice and apply knowledge and skills to develop a viable solution to a defined problem *(Savery, 2006)*. Problem based learning is focused, experientially based learning organized around the investigation and resolution of messy, real- world problems *(Torp & Sage, 2002)* which includes the following characteristics *(Murray & Slee, 2000)*,

- actively engaging the students to take responsibility for solving the problem with support from a tutor or instructor
- organizing the curriculum around the challenging, open- ended problems to facilitate students' learning, and
- creating a learning environment to guide student inquiry at a deeper level of understanding.

Hence PBL is an instructional method in which students work in collaborative groups to identify what they need to learn in order to solve a problem, engage in self-directed learning, apply their new knowledge to the problem, and reflect on what they learned and the effectiveness of the strategies employed *(Hmelo, 2004)*. PBL is an imperative part of an array of disciplines viz. sciences, medicine, engineering, law, business, educational administration, teacher education and

architecture *(Savery & Duffy, 1996).*

Definitions and Characteristics of Problem-Based Learning

PBL is based on constructivist theory and carry with them expectations of:

- anchoring all learning activities to a larger task or platform;
- supporting the learner in developing ownership for the overall problem or task;
- engaging in authentic tasks;
- designing problems or tasks that reflect the complexity of the teaching environments;
- giving the learner ownership of the process used to develop a solution;
- designing the learning environment to support and challenge the learner's thinking;
- encouraging the testing of ideas against alternative views and alternative contexts; and
- providing opportunities and support for reflection on both the content learned and the learning process (*Savery & Duffy, 1996).*

Boud and Feletti (1997) provided a list of the practices considered characteristic of the philosophy, strategies, and tactics of problem-based learning. *Duch, Groh,* and *Allen (2001)* described the methods used in PBL and the specific skills developed, including the ability to think critically, analyze and solve complex, real-world problems, to find, evaluate, and use appropriate learning resources; to work cooperatively, to demonstrate effective communication skills, and to use content knowledge and intellectual skills to become continual learners.

Torp and *Sage (2002)* described students as engaged problem solvers, seeking to identify the root problem and the conditions needed for a good solution and in the process becoming self-directed learners. *Savery (2006)* enlisted following characteristics and henceforth the definitions of PBL viz.

1. ***Students must have the responsibility for their own learning***- PBL is a learner-centered approach—students engage with the problem with whatever their current knowledge/experience affords. Learner motivation increases when responsibility for the solution to the problem and the process rests with the learner. Individuals accept responsibility for seeking relevant information and bringing that back to the group to help inform the development of a viable solution.

2. **The problem simulations used in problem-based learning must be ill-structured and allow for free inquiry**- Problems in the real world are ill-structured. A critical skill developed through PBL is the ability to identify the problem and set parameters on the development of a solution. When a problem is well-structured learners are less motivated and less invested in the development of the solution.

3. ***Learning should be integrated from a wide range of disciplines or subjects***- *Barrows (1996)* elucidated that during self-directed learning, students should be able to access, study and integrate information from all the disciplines that might be related to understanding and resolving a particular problem-just as people in the real world must recall and apply information integrated from diverse sources in their work. The rapid expansion of information has encouraged a cross-fertilization of ideas and led to the development of new disciplines.

4. ***Collaboration is essential***- In the world after school most learners will find themselves in jobs where they need to share information and work productively with others. PBL provides a format for the development of these essential skills. During a PBL session the tutor will ask questions of any and

all members to ensure that information has been shared between members in relation to the group's problem.

5. ***What students learn during their self-directed learning must be applied back to the problem with reanalysis and resolution*** - The point of self-directed research is for individuals to collect information that will inform the group's decision-making process in relation to the problem. It is essential that each individual share coherently what he or she has learned and how that information might impact on developing a solution to the problem.

6. ***A closing analysis of what has been learned from work with the problem and a discussion of what concepts and principles have been learned are essential*** - Given that PBL is a very engaging, motivating and involving form of experiential learning, learners are often very close to the immediate details of the problem and the proposed solution. Barrows (1988) examined that learners examine all facets of the PBL process to better understand what they know, what they learned, and how they performed.

7. ***Self and peer assessment should be carried out at the completion of each problem and at the end of every curricular unit*** - These assessment activities related to the PBL process are closely related to the previous essential characteristic of reflection on knowledge gains. The significance of this activity is to reinforce the self-reflective nature of learning and sharpen a range of metacognitive processing skills.

8. ***Student examinations must measure student progress towards the goals of problem-based learning*** - The goals of PBL are both knowledge-based and process-based. Students need to be assessed on both dimensions at regular intervals to ensure that they are benefiting as intended from the PBL approach. Students are responsible for the content in the curriculum that they have "covered" through engagement with problems. They need to be able to recognize and articulate what they know and what they have learned.

9. ***Problem-based learning must be the pedagogical base in the curriculum and not part of a didactic curriculum.***
Thus PBL can be defined as a process in which

- the role of the tutor is of a facilitator of learning,
- the responsibilities of the learners are to become self-directed and self regulated in their learning, and
- the essential elements in the design of ill-structured instructional problems serves as the driving force for inquiry.

Impact of Problem-Based Learning on Teaching Learning Process

Studies by *Coles (1985), Dods (1997)* and *Newble* and *Clarke (1986)* revealed that PBL promotes more in-depth understanding of content than traditional methods. A meta-analysis of 20 years of PBL evaluation studies was conducted by *Albanese* and *Mitchell (1993)*, and also by *Vernon* and *Blake (1993)*, and it was concluded that a problem-based approach to instruction was equal to traditional approaches in terms of conventional tests of knowledge (i.e., scores on medical board examinations), and that students who studied using PBL exhibited better clinical problem-solving skills.

A smaller study of graduates of a physical therapy program that utilized PBL *(Denton, Adams, Blatt, & Lorish, 2000)* showed that graduates of the program performed equally well with PBL or traditional approaches but students reported a preference for the problem-centered approach. Anecdotal reports from PBL practitioners suggest that

students are more engaged in learning the expected content (*Torp & Sage, 2002).* Basile et al (2003) explored problem-based learning as a dimension that adds context and framework to coaching and reflection. The process for problem-based learning is described as a healthy environment for reflection, discussion and problem solving. The results illustrated how teacher candidates move from micro-reflection to self-reflection to macroreflection as they engage in a year-long teacher education program in a professional development school. Implications from the study suggested that problem-based learning is a valid process for the enculturation of teacher candidates to schools and to the profession of teaching.

Hmelo- Silver (2004) enunciated that Problem-based learning is an instructional method in which students learn through facilitated problem solving. In PBL, student learning centers on a complex problem that does not have a single correct answer. Students work in collaborative groups to identify what they need to learn in order to solve a problem. They engage in self-directed learning and then apply their new knowledge to the problem and reflect on what they learned and the effectiveness of the strategies employed. The goals of PBL included helping students develop flexible knowledge, effective problem-solving skills, effective collaboration skills, and intrinsic motivation.

Cindy et al. (2007) used two cases using advocacy as a teaching strategy and learning outcome and PBL as a guide for task structure were described in terms of course design, student learning, and revisions. It was observed that the problem-based learning approach helped to increase students' empowerment and beliefs that they can make a difference in people's lives by using their professional activities and therefore, combining PBL and advocacy was shown to be a successful approach in fostering an appreciation within the students for their personal power.

Kaur (2010) introduced PBL as an alternative pupil-oriented method to the mainstream teacher-oriented method in the subject of 'Teaching of Science' in initial teacher training programme. The topic 'Microteaching Skills' was developed into two case studies to acquaint the prospective teachers with the real problems of the teaching- learning world. It was examined that PBL approach helped students in connecting the topic in their practicum experience.

Polyzois et al. (2010) conducted a review to classify and interpret the available evidence and extract relevant conclusions. In addition, it was intended to propose recommendations regarding the relative benefits of PBL compared with conventional teaching. The literature was searched using PubMed, ERIC and PsycLIT. At the level of RCTs and comparative studies (whole curricula), no clear difference was observed between PBL and conventional teaching. Paradoxically, it was only comparative studies of single PBL intervention in a traditional curriculum that yielded results that were consistently in favour of PBL. However researchers pointed out some limitations of PBL. Because the focus of this pedagogy is primarily on learning to learn and less on mastery of a particular body of knowledge, traditional methods of course assessment such as examinations may not be very effective *(Major, 1999).* Further a report on a systematic review and meta-analysis on the effectiveness of PBL used in higher education programs for health professionals *(Newman, 2003)* stated that "existing overviews of the field do not provide high quality evidence with which to provide robust answers to questions about the effectiveness of PBL".

Discussion

These studies show that it is time to think out of the box on how we assess the effectiveness of PBL and how we think about its outcomes. Allowing students to engage in these kinds of measures can allow us to assess important learning by examining and judging the students actual or simulated performance on significant tasks (Worthen, 1993). While each particular PBL instructional environment is unique, and therefore merits its own unique assessment strategy, several alternative assessment techniques seem particularly appropriate for the PBL learning environment (Major, 2001) viz. Outside Evaluation by Experts, Content Analysis of Projects, Focus Groups, Peer Evaluations, Journals or Activity Logs and Personal Reflections. These techniques focus on the contextual nature of PBL, requiring the students to produce an authentic product that is related to the problem and to make judgments about their performances.

Conclusion

From the selected review of literature it is observed that PBL serves as an alternative method of learning which is based on formulation of authentic problems for the learners, encourage their critical and logical reasoning. It provides opportunities for content mastery, self reflection, ownership value and self-directed learning. PBL is based on constructivist principles and proves to be a paradigm shift from traditional to contemporary learning proves.

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Sub Theme - 2
Constructivism Application

Constructivism and Formative Assessment: An Overview

Rima Dutta *

Abstract

The child constructs knowledge from environment, from his experiences and interactions with others. Constructivism holds the view that every child actively participates in learning and constructs his/her own piece of knowledge. It is always based on his/her previous knowledge. In a formal setting of education if measures are taken to conform that knowledge should be constructed by the learner through active participation in teaching learning process then question arises about the role of the evaluation. What would be the contribution of evaluation in constructing knowledge? Can it be used effectively to create new knowledge? What would be its type then? All these concerns need to be addressed effectively for a well build curriculum.

Introduction :

The child constructs knowledge from environment, from his experiences and interactions with others. Constructivism holds the view that every child actively participates in learning and constructs his/her own piece of knowledge. It is always based on his/her previous knowledge. A child may relate new knowledge with previous knowledge in various amazing and peculiar ways. Every child comes from different environment and background so their previous experiences also differ from each other. In teaching learning process the teacher not only has to have a good knowledge of the previous knowledge but s/he should optimally use it for the construction of the new and valid knowledge. In our day to day interactions in the classrooms we come across many such situations.

Constructivism :

Constructivism is an idea in which knowledge is regarded as a byproduct of human construction. An earliest votary of constructivism an Italian philosopher *Giambattista Vico* had said "The known is the made". Constructivism has its roots in various disciplines like philosophy, psychology, sociology, education, cognitive science and cybernetics.

Constructivism is centered on the idea that human knowledge and learning is actively constructed by the learner, not passively received from the environment. Knowledge is always someone's knowledge. It is created or constructed by the experiencing individual. It is not impersonal or absolute. They create knowledge on the bedrock of their prior knowledge. Learners in a classroom have their individual experiences and a

cognitive structure, which are built on those prior experiences.

The main function of the knowledge constructs is to organize the ongoing experiences of the learner and not mirror reality. The learner tends to reformulate his/her existing structures/constructs by connecting them to the new experiences of the world.

Knowledge involves mental constructs that are constructed from past experience. Whether these constructs/structures are valid, truthful or incomplete is not important. The truth content of this knowledge is insignificant. If the knowledge is the made, there is no singular, universal absolute knowledge; if reality is pluralistic, then it is meaningless to search for or debate about what the truth is. The truthfulness of a statement has to be judged vis-à-vis the point of reference on which it is based.

The two main ideas of constructivism are:-

- The learner is not a passive entity but an active cognizing subject and knowledge cannot be transmitted from one learner to another. Learners have to construct knowledge themselves.

- The function of cognition is not the discovery/representation of the world but adaptation. That is to say that cognition performs the function of organizing the learner's experiences of the world. What is of significance is that the learner constructs a viable explanation of his/her experiences. The goal of cognition is thus not the representation of an objective independent reality but our own attempt to understand and organize it. In order to do so we create a version of it by our own selves. This is the process of construction of knowledge.

Formative Assessment

Formative assessment is a tool used by the teacher to continuously monitor student's progress in a non- threatening, supportive environment. It instead of measuring knowledge helps in formation of the knowledge. When evaluation is subsumed into teaching-learning, it will lead to diagnosis, remediation and enhancement of learning. It is an integral part of the instructional process, underpinning the importance of student involvement. It involves students being an essential part of assessment from designing criteria to assessing self or peers. It follows from this that when incorporated into classroom practice; assessment tends to lose its individual identity, getting subsumed into the instructional process. It is also important because it not only measures the progress and achievement of the learner but also the effectiveness of the teaching materials and methods used for transactions. If used effectively it can improve student performance tremendously while raising the self esteem of the child and reducing the work load of the teacher.

Features of Formative Assessment

- Is diagnostic and remedial
- Makes the provision for effective feedback
- Provides the platform for the active involvement of students in their own learning
- Enables teachers to adjust teaching to take into account the results of assessment
- Recognizes the profound influence assessment has on the motivation and self-esteem of students, both of which are crucial influences on learning
- Recognizes the need for students to be able to assess themselves and understand how to improve
- Builds on student's prior knowledge and experience in designing what is taught
- Incorporates varied learning styles into deciding how and what to teach
- Encourages students to understand the criteria that will be used to judge their work

- Offers an opportunity to students to improve their work after feedback
- Helps students to support their peers, and expect to be supported by them
- Formative assessment is thus carried out during a course of instruction for providing continuous feedback to both the teachers and learners for taking decisions regarding appropriate modifications in the transactional procedures and learning activities
- The most important aspect to be kept in mind is that these tasks are meant to be integrated with the teaching-learning process, i.e., while teaching unit/lesson (and not after). Also the follow up in terms of providing further help to clear doubts, removes problems faced by the learners and modifications in teaching methods and strategies has to be given utmost importance

After considering the features of formative assessment it can be said that if any evaluation suits constructivism it is formative assessment. Formative assessment helps in creating the proper environment for knowledge construction. In it the students work in collaboration and help each other in a project or group activity. The feeling of collaboration takes place instead of the feeling of competition.

Formative Assessment: - The Tool of Evaluation in Constructivism

Knowledge construction the learner is at the center of every activity. It's the learner who is constructing his/her own piece of knowledge. Although this knowledge has to be valid and authentic but the nature of this knowledge is subjective. Individual differences of the learners have to be considered and should be given proper importance. As the individuals vary largely from each other it is obvious that their capacity to construct knowledge also varies. Some students are very good at language while some others are good at computation. Even in language some are very good listeners while some others have a marvelous capacity of creative writing. As they vary distinctly from each other objective evaluation cannot cater all their needs. To meet all their needs the evaluation system also has to be subjective which means that the teacher has to design different evaluation pattern for the learners. It not only measures their achievements and progress in learning but also gives a feedback to the teacher regarding his/her teaching learning materials and strategies. It also gives a clear idea of the difficulties and problems faced by the learner in particular areas.

In formative assessment the teacher is free to give various projects to the learners according to their needs and capability. The students are encouraged to work in groups so that they can counterbalance their deficiencies and can learn from each other. Teacher can apply various strategies for various students and can monitor their progress. The slow learners are encouraged if they successfully complete the assignments given to them. At the same time gifted are also motivated as they are able to move according to their own speed. Even by self evaluation and peer evaluation the learners are able to monitor their own progress. Learning disabilities are detected timely and both the teacher and the learner are able to work on it. Formative assessment also helps in the process of knowledge construction as it is done simultaneously with the dealing of the topic. Teacher digs into the prior knowledge of the learner and thus takes it to the forefront so that the learner is able to connect the new knowledge with the previous one. So it can be said that formative assessment is the essential tool for evaluation in constructivism.

Limitations of Constructivism

Summative assessment is conducted at the completion of any particular content or after a certain time it is obvious that it fails to contribute in the construction of

knowledge and even it cannot address the individual needs of the student. It cannot evaluate the construction of knowledge properly. It is objective in nature and each student is measured on the same standards so the subjective aspect of knowledge is ignored. It is also true that without summative assessment a huge number of students are difficult to measure on the account of their achievement. It is also important that formal system of education serves as a base for different selections units to select proper employees for them and formative assessment cannot serve this purpose.

Conclusion

Constructivism says that the child should have the freedom to construct his/her knowledge. Knowledge is subjective so the question of its being true or false is useless. The plurality of truth says that there are various versions of truth and it depends on the individual that what is truth according to him. It depends on the perception of the individual that what s/he considers important for him. And what is important for one may not be important for another. Hence what is truth and knowledge for one may not be the same for the other. But knowledge should be valid and authentic and it should help the individual in performing his/her day to day activities then it will consider as true knowledge.

In formal setup of education we see that assessment is an integral part of curriculum and it cannot be separated. So in a constructive approach we have to see that assessment will also act as a tool of knowledge construction. To address this issue we should adopt formative assessment and help the learner to construct his/her knowledge along with monitoring his/her progress and eradicating difficulties.

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<u>**Sub Theme - 2**</u>
<u>**Constructivism Application**</u>

Attitude of Secondary School Teachers towards Teaching through Constructivist Approach

Pranab Barman * & Dr. Dibyendu Bhattacharyya *

Abstract

It is an attitudinal study on 120 secondary school teachers taken from Bengali Medium Secondary Schools in the district of Burdwan,West Bengal towards constructivist teaching approach. The Purposive sampling technique has been used for the selection of sample. The investigators developed a tool themselves to measure attitude towards constructivist teaching approach of teachers at secondary level. For the analysis of data 't' test has been used in the present study. The overall results indicate that the secondary school teachers possess favourable attitude towards constructivist teaching approach. There is no significant difference in the attitude of secondary school teachers towards constructivist teaching approach in relation to gender, locality and stream (i.e. Arts and Science).

Introduction:

Learning without meaningful understanding is valueless in our life. That's why teachers should always teach students by using a fruitful teaching method so that students can learn meaningfully and apply their learned experiences in their daily life.

Constructivist teaching method is such a method which draws on students' existing knowledge, beliefs, and skills. With a constructivist approach, students synthesize new understanding from prior learning and new information. In constructivist teaching, a teacher sets up problems and monitor students' exploration, guides students inquiry, and promotes new patterns of thinking.

Constructivist teaching asks students to work with their own data and learn to direct their own explorations. Ultimately, students begin to think of learning as accumulated, evolving knowledge.

Constructivist teaching poses a question to the students, who then work together in small groups to discover one or more solutions *(Yager, 1991)*. Students play an active role in carrying out experiments and reaching their own conclusions. Teachers assist the students in developing new insights and connecting them with previous knowledge, but leave the discovery and discussion to the student groups *(VAST, 1998)*. Students are able to develop their own understanding of the subject matter

based on previous knowledge, and can correct any misconceptions they have.

Important aspects of Constructivism:
In the Constructivist 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. This theory suggests that people learn through an interaction between thinking and experience. It also emphasizes that learning is a result of sequential development of more complex cognitive structures. This theory places the learner in a very active and independent role. There is considerable emphasis on learning concepts and skills though their interaction with the topics of their own choice. Great emphasis is placed on direct experience in constructivist learning.

Role of a teacher in Constructivist Classroom:
In the constructivist classroom, the teacher's role is to prompt and facilitate discussion. Thus, the teacher's main focus should be on guiding students by asking questions that will lead them to develop their own conclusions on the subject. *David Jonassen* identified three major roles for facilitators to support students in constructivist learning environments: Modelling; Coaching and Scaffolding.

Objectives of the Study:
The researcher has conducted his study on the basis of the following objectives:
1. To study the attitude of secondary school teachers towards constructivist teaching approach.
2. To study the difference in mean scores of attitude towards constructivist teaching approach among secondary school teachers on the basis of Gender, Locality and subject wise attitude of teachers.

Research Question
Whether there exists favourable attitude towards constructivist teaching approach among secondary school teachers ?

Hypotheses of the Study:
The following hypotheses have been constructed to achieve the objectives of the study:

$H_{o.1}$. There exists no significant difference in the mean scores of attitude of secondary school teachers towards constructivist teaching approach in relation to gender.

$H_{o.2}$. There exists no significant difference in the mean scores of attitude of secondary school teachers towards constructivist teaching approach in relation to their locality.

$H_{o.3}$. There exists no significant difference in the mean scores of attitude of secondary school teachers of Arts and Science stream towards constructivist teaching approach.

$H_{o.4}$. There exists no significant difference in the mean scores of attitude between Arts Male Teachers and Arts Female Teachers towards constructivist teaching approach.

$H_{o.5}$. There exists no significant difference in the mean scores of attitude between Science Male Teachers and Science Female Teachers towards constructivist teaching approach.

Methodology of the Study
Method:
In the present study Descriptive Survey Method was employed to find out the attitude of secondary school teachers towards constructivist teaching approach by using following statistical techniques: Mean, S.D., followed by t-test.

Sample:
A sample of 120 teachers from selected five secondary schools situated in the district of Burdwan have been considered as the sample for the present study. Purposive sampling technique is used for the selection of sample and data has been collected on the basis of gender, locality and subject wise attitude of teachers.

Tools Used:

The following tool was used for the collection of data in the present study: 'Constructivist Teaching Attitude Scale' developed by the investigator.

Results and Discussion:

Table-1.

Shows the Frequency Distribution and Percentage of Attitude Score of Total Teachers.

Class Interval of Attitude Scores	Frequency	% of the Teachers
65-71	1	0.83
72-78	8	6.66
79-85	22	18.33
86-92	36	30.00
93-99	37	30.83
100-106	16	13.33
Total	**120**	

Fig.1

Graphical Representation of Frequency Distribution and Percentage of Attitude Scores of Teachers
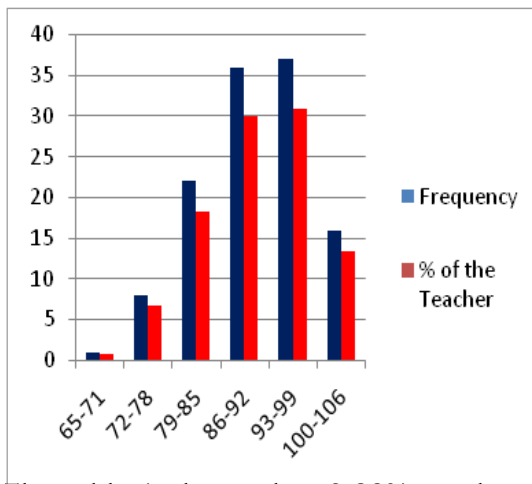
The table-1 shows that 0.83% teachers responded between the score 65-71. Similarly 6.66% teachers responded between the score 72-78, 18.33% teachers responded between the score 79-85, 30% teachers responded between the score 86-92, 30.83% teachers responded between the score 93-99 and 13.33% teachers responded between the score 100-106. It shows that most of the teachers have favourable attitude towards Constructivist Teaching Approach at secondary level.

$H_{o.1}$. There exists no significant difference in the mean scores of attitude of secondary school teachers towards constructivist teaching approach in relation to gender.

Table - 2:

Shows the attitude of Male and Female Teachers towards Constructivist Teaching Approach.

Sex	No. of Teach.	Mean	Sd.	t-value	Level of Signi.
Male	60	91.1	7.97	0.38	NS
Female	60	90.56	7.28		

From the table -2, it is observed that the calculated 't' value ('t' = 0.38) is less than the table value (1.98 at 0.05 level of significance).

So, it is not significant and it indicates that male and female teachers have similar attitude towards constructivist teaching approach at secondary level. Hence the null hypothesis is accepted.

$H_{o.2}$. There exists no significant difference in the mean scores of attitude of secondary school teachers towards constructivist teaching approach in relation to their locality.

Table - 3:

Shows the attitude of Urban and Rural Teachers towards Constructivist Teaching Approach.

Locality	No. of Teach.	Mean	Sd.	t-value	Level of Signi.
Urban	70	89.88	6.94	1.62	NS
Rural	50	92.16	8.07		

From the table -3, it is observed that the calculated 't' value ('t' = 1.62) is less than the table value (1.98 at 0.05 level of significance). So, it is not significant and it indicates that urban and rural teachers have similar attitude towards constructivist teaching approach at secondary level.

Hence the null hypothesis is accepted.

$H_{o.3}$. There exists no significant difference in the mean scores of attitude of secondary school teachers of Arts and Science stream towards constructivist teaching approach.

Table - 4:
Shows the attitude of Arts Teachers and Science Teachers towards Constructivist Teaching Approach.

Strea-ms	No.of Teach.	Mean	Sd.	t - value	Level of Signi.
Arts	60	90	7.9	1.22	NS
Sci.	60	91.66	7.03		

From the table -4, it is observed that the calculated 't' value ('t' = 1.22) is less than the table value (1.98 at 0.05 level of significance). So, it is not significant and it indicates that teachers of Arts and Science streams have similar attitude towards constructivist teaching approach at secondary level. Hence the null hypothesis is accepted.

$H_{o.4}$. There exists no significant difference in the mean scores of attitude between Arts Male Teachers and Arts Female Teachers towards constructivist teaching approach.

Table - 5:
Shows the attitude of Arts Male Teachers and Arts Female Teachers towards Constructivist Teaching Approach.

Arts	No. of Teach.	Mean	Sd.	t-value	Level of Signi.
Male	25	90.8	7.75	0.67	NS
Fem-ale	35	89.42	7.93		

From the table -5, it is observed that the calculated 't' value ('t' = 0.67) is less than the table value (1.98 at 0.05 level of significance). So, it is not significant and it indicates that Arts male teachers and Arts female teachers have similar attitude towards constructivist teaching approach at secondary level. Hence the null hypothesis is accepted.

$H_{o.5}$. There exists no significant difference in the mean scores of attitude between Science Male Teachers and Science Female Teachers towards constructivist teaching approach.

Table - 6:
Shows the attitude of Male and Female Arts Teachers towards Constructivist Teaching Approach.

Sci.	No. of Teach.	Mean	Sd.	t-value	Level of Signi.
Male	35	91.74	7.28	0.09	NS
Fem-ale	25	91.56	6.67		

From the table -6, it is observed that the calculated 't' value ('t' = 0.09) is less than the table value (1.98 at 0.05 level of significance). So, it is not significant and it indicates that Science male teachers and Science female teachers have similar attitude towards constructivist teaching approach at secondary level. Hence the null hypothesis is accepted.

Major Findings of the Study:
1. The secondary school teachers possess favourable attitude towards teaching through Constructivist Approach.
2. The secondary school teachers do not differ significantly in their attitude towards Constructivist Teaching Approach in relation to gender.
3. The secondary school teachers do not differ significantly in their attitude towards Constructivist Teaching Approach in relation to their locality.
4. The secondary school teachers of Arts and Science streams do not differ significantly in their attitude towards Constructivist Teaching Approach.
5. The Male and Female teachers of Arts stream do not differ significantly in their attitude towards Constructivist Teaching Approach.
6. The Male and Female teachers of Science stream do not differ significantly in their attitude towards Constructivist Teaching Approach.

Conclusion

The secondary school teachers have favourable attitude towards Constructivist Teaching Approach.

There is no significant difference in the mean scores of attitude of secondary school teachers towards Constructivist Teaching Approach in relation to gender, locality and streams.

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Sub Theme - 3
Cooperative Learning

Cooperative Learning as a Constructivist Teaching-Learning Strategy

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Abstract

This paper presents the function of Cooperative Learning as pioneering constructivist pedagogy in educational practice which could encourage students' creativity, interest, problem solving, critical thinking and meaningful learning and promotes responsibility. Our formal education system assumes true reality can be determined by "a large accumulation of facts" and teachers play a central role as a transmitter of objective truths and information to the students where they play as passive listeners in the process of learning. In order to eradicate such problems in our formal education system various revolutionary teaching learning methods and approaches are initiated and implemented in our present education system Construtivism is one of them.

Introduction:

The constructivist movement has grown throughout the world in academic parlance essentially from the dissatisfaction with traditional educational methods. Our formal education assumes true reality can be determined by "a large accumulation of facts" *(Kelly, 1970)* and has relied on the *objectivist view of knowledge* in which learning presumes that knowledge can be imparted from teacher to learner through instruction, lecture and practice. In our traditional education system teachers play a central role as a transmitter of objective truths and information to the students and mere controller of students in classroom where the students play as passive listeners in the process of learning. There was insufficient interaction between students and teachers in classrooms where more emphasis has been given on theory without any practical and real life time situations. Observing this *Gulati (2004)* has rightly stated that learning in objectivist context places emphasis on teacher control and learner compliance. In order to eradicate such problems in our formal education system various revolutionary teaching learning methods and approaches are initiated and implemented in our present education system. Among the various methods in educational practice *Cooperative learning* is the pioneering *constructivist pedagogy* which encourages students' creativity, interest, problem solving, critical thinking and meaningful learning and promotes responsibility.

Constructivism

Constructivism is the theory of how the

learner constructs knowledge from experience, which is unique to each individual. It is a view of learning based on the belief that knowledge is not a thing that can be simply given by the teacher at the front of the room to students in their desks. Rather, knowledge is constructed by learners through an active, mental process of development; learners are the builders and creators of meaning and knowledge.

"Constructivism" refers to the process by which human beings actively make sense out of the world around them to understand *(Wiske, 1998). Fosnot (1989)* defines constructivism by reference to four principles: learning, in an important way, depends on what we already know; new ideas occur as we adapt and change our old ideas; learning involves inventing ideas rather than mechanically accumulating facts; meaningful learning occurs through rethinking old ideas and coming to new conclusions about new ideas which conflict with our old ideas.

Constructivist Classroom

Constructivism is a more overarching theory, one that can incorporate a number of teaching practices, such as cooperative, collaborative and inquiry based learning. In the classroom, the constructivist view of learning can be point towards a number of different teaching practices. In the most general sense, it usually means encouraging students to use active techniques (experiments, real world problem solving) to create more knowledge and then to reflect on how their understanding is changing. In constructivist classroom, the focus tends to shift from the teachers to the students. The classroom is no longer a place where the teacher (expert) pours knowledge into passive students but students are urged to be actively involved in their own process of learning. The teacher provides students with experiences that allow them to hypothesize, predict, manipulate objects, pose questions, research, investigate, imagine, invent and also the teacher functions more as a facilitator who coaches, mediates, prompts and helps students develop and assess their understanding of learning.

Constructivism in Teaching and Learning

In the present era there is a vast change in the educational curricula and teaching methods. Constructivist approach has recently been applied to teaching and learning in the classroom with the belief that better learning occurs when knowledge is the result of situated construction of knowledge *(Wilson, 1996).* One component of the current redevelopment of all subject area curricula is the change in focus of instruction from the transmission curriculum to a transactional curriculum. In a traditional curriculum, a teacher transmits information to students who passively listen and acquire facts. In a transactional curriculum, students are actively involved in their learning to reach new understandings. *Von Glasersfeld (1995)* argues from the constructivist perspective that, learning is not a stimulus-response phenomenon. It requires self- regulation and the building of conceptual structures through reflection and abstraction. In this paradigm, learning emphasizes the process and of constructing meaningful representations of making sense of one's experiential world. Based on the constructivism approach the following *principles of learning* are derived.

- Learning as an active process in which the learner uses sensory input and constructs meaning of it.
- Individuals learn to learn as they learn and the key component of learning is motivation.
- Physical actions and hands on experiences are necessary for learning

especially for children.

- Learning involves language which influences learning and also language and learning are inextricably intertwined.
- Learning is social activity and learning is associated with one's connection with teachers, peers, parents as well as casual acquaintances.
- It is not possible to absorb new knowledge without having some structure developed from previous knowledge to build on.
- Learning is not instantaneous. It takes time to learn.

Constructivist teaching fosters critical thinking and creates active and motivated learners. Many educationists stated that learning in all subject areas involves inventing and constructing new ideas. They suggest that constructivist theory be incorporated into the curriculum, and advocate that teachers create environments in which children can construct their own understandings. *Fosnot (1989)* recommended that, a constructivist approach be used to create learners who are autonomous, inquisitive thinkers who question, investigate, and reason. A constructivist approach frees teachers to make decisions that will enhance and enrich students' development" in these areas. Based on constructivist approach teachers in a constructivist classroom must be in a position to:

- Influence or create motivating conditions for students.
- Take responsibility for creating problem situations.
- Foster acquisition and retrieval of prior knowledge.
- Create a social environment that emphasizes that attitude of learning to learn.
- Provide complex learning environments that incorporate authentic activity.
- Provide for social negotiation as an integral part of learning.

- Emphasize student centered instruction.

Cooperative Learning

Cooperative Learning is an approach to organizing classroom activities into academic and social learning experiences. It differs from group work, and it has been described as "structuring positive interdependence." Students must work in groups to complete tasks collectively toward academic goals. Unlike individual learning, which can be competitive in nature, students learning cooperatively capitalize on one another's resources and skills (asking one another for information, evaluating one another's ideas, monitoring one another's work, etc.). Furthermore, the teacher's role changes from giving information to facilitating students' learning. Everyone succeeds when the group succeeds. *Ross and Smyth (1995)* describe successful cooperative learning tasks as intellectually demanding, creative, open-ended, and involve higher order thinking tasks.

Cooperative Learning Strategy

Cooperative learning is an increasingly popular instructional strategy. In recent decades, theorists have extended the traditional focus on individual learning to address cooperative, collaborative and social dimensions of learning which focused on students learning than on teachers teaching. The goal of constructivist cooperative learning environment is to engage learners in active (manipulative), constructive, intentional, cooperative (collaborative and conversational) and reflective learning activities *Chen (1996). Hilke (1990)* defines "Cooperative learning is an organizational structure in which a group of students pursue academic goals through collaborative efforts. Students work together in small groups, draw on each other's strengths, and assist each other in completing a task." *Johnson and Johnson (1991)* stated that "Cooperative

learning is the instructional use of small groups so that students work together to maximize their own and each other's learning."

Cooperative learning refers to a variety of methods for organizing classroom instruction so that students work and learn in small groups. Cooperative learning is instruction that involves students working in teams to accomplish a common goal, under conditions that include the following elements

- **Positive interdependence**. Team members are obliged to rely on one another to achieve the goal. If any team members fail to do their part, everyone suffers consequences.

- **Individual accountability**. All students in a group are held accountable for doing their share of the work and for mastery of all of the material to be learned.

- **Face-to-face promotive interaction**. Although some of the group work may be done individually, some must be done interactively, with group members providing one another with feedback, challenging reasoning and conclusions, and perhaps most importantly, teaching and encouraging one another.

- **Appropriate use of collaborative skills**. Students are encouraged and helped to develop and practice trust-building, leadership, decision-making, communication, and conflict management skills.

- **Group processing**. Team members set group goals, periodically assess what they are doing well as a team, and identify changes they will make to function more effectively in the future.

Cooperative learning is an approach to learning and teaching which offers the opportunity for regular and rigorously designed group work, where students are very clear about the learning intentions and success criteria and are encouraged to work collaboratively while still encouraging individual accountability. In this learning strategy students are actively involved in making meaning, processing and relating information to their own experience through dialogue and collaboration.

Cooperative Learning Techniques

There are a great number of cooperative learning techniques available. Some cooperative learning techniques utilize student pairing, while others utilize small groups of four or five students. A well known cooperative learning techniques are Think Pair Share, Jigsaw, Jigsaw II , Reverse Jigsaw and Reciprocal Teaching technique. *(Schul, 2011)*

i. Think Pair Share - Think-Pair-Share technique is developed by *Frank T. Lyman (1981)* which allows for students to contemplate a posed question or problem silently. The student may write down thoughts or simply just brainstorm in his or her head. When prompted, the student pairs up with a peer and discuss his or her idea(s) and then listen to the ideas of his or her partner. Following pair dialogue, the teacher solicits responses from the whole group.

ii. Jigsaw - In this technique students are considered as members of two groups: home group and expert group. In the heterogeneous home group, students are each assigned a different topic. Once a topic has been identified, students leave the home group and group with the other students with their assigned topic. In the new group, students learn the material together before returning to their home group. Once back in their home group, each student is accountable for teaching his or her assigned topic.

iii. Jigsaw II - Jigsaw II is *Robert Slavin's (1980)* variation of Jigsaw in which members of the home group are assigned the same material, but focus on separate portions of the material.

Each member must become an "expert" on his or her assigned portion and teach the other members of the home group.

iv. Reverse Jigsaw - This variation was created by *Timothy Hedeen (2003)* which differs from the original Jigsaw during the teaching portion of the activity. In the Reverse Jigsaw technique, students in the expert groups teach the whole class rather than return to their home groups to teach the content.

v. Reciprocal Teaching - It is a cooperative technique developed by *Brown and Paliscar (1982)* that allows for student pairs to participate in a dialogue about text. Partners take turns reading and asking questions of each other, receiving immediate feedback. Such a model allows for students to use important met cognitive techniques such as clarifying, questioning, predicting, and summarizing. It embraces the idea that students can effectively learn from each other.

Benefits of Cooperative Learning

Cooperative learning is not simply a synonym for students working in groups. A learning exercise only qualifies as cooperative learning to the extent that the five listed elements are present. From looking at these five essential attributes of cooperative learning, it is evident that they illustrate the outworking of numerous values among the students. Interdependence focuses on a concern for others; Accountability is a demonstration of our responsibility for each other's welfare; Collaboration gives the ability to work closely with others, seeing their point of view; Listening, encouraging and trusting are essential elements if affirmation and support, which help, comprise faith and Face to face interaction promotes the type of closeness required for formation of caring community.

Cooperative learning provides an approach to teaching which is conductive to the development of the skills and social interaction which increases pupil attainment. There are three major benefits to cooperative learning: higher achievement and greater productivity, more positive relationship and greater psychological health, social competence and self esteem. It can have many different kinds of positive impacts on student learning and which help students develop conflict resolution skills and commitment to democratic values. Other benefits include better attitudes toward school, learning, and classmates; improved ability to collaborate; better psychological health, including increased self esteem; and increased awareness of multicultural and diversity issues.

The following are the main benefits identified by the extensive studies *(Johnson, Johnson, & Holubec, 1988).*

- Higher achievement and increased retention.
- Greater use of higher level reasoning strategies and increased critical reasoning competencies.
- Greater ability to view situations from others' perspectives.
- More positive attitudes toward subject areas, learning, and school.
- Higher achievement and greater intrinsic motivation.
- More positive attitudes toward teachers, principals and other school Personnel.
- High self-esteem based on basic self-acceptance.
- Less disruptive and more on-task behavior.
- Greater collaborative skills and attitudes necessary for working effectively with others.

Conclusion:

As a result Cooperative Learning as a constructivist strategy appear to promise positive effects for students, as reflected in increased academic achievement and improved social attitudes and behavior. Although cooperative learning activities may require more teacher preparation of

group material and monitoring of group activities, the rewards and benefits for both the teacher and students go a long way. They appear likely to positively influence a school's academic and social climates as well as enhance students' creativity, interest, problem solving, and critical thinking. It encourages active and meaningful learning and promotes responsibility; because of constructivist teaching is beneficial in achieving desirable educational goals for students and for teachers to grow professionally towards a constructivist practice.

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Sub Theme - 3
Cooperative Learning

Effect of Computer-Supported Cooperative Learning on Achievement of Secondary School Students in Biology

Ms. Beena *

Abstract

Constructivism as a description of human cognition is often associated with pedagogic approaches that promote learning by doing. Constructivism is a learning strategy that draws on students' existing knowledge, beliefs, and skills. With a constructivist approach, students synthesize new understanding from previous knowledge. Cooperative learning is a teaching strategy that encourages student success by alleviating overt competition and substituting group encouragement. Computer-supported cooperative learning (CSCL) helps in achievement of higher scores of Biology subject at higher secondary level. The sample consisted of 19 students of higher secondary school of Meerut District, which had been selected by purposive Sampling technique. The data was collected with the help of pre test and post test after teaching through computer supported co operative method.

Introduction

Constructivism is an educational philosophy which holds that learners ultimately construct their own knowledge that then resides within them, so that each person's knowledge is as unique as they are. Among its key precepts are:

- situated or anchored learning, which presumes that most learning is context-dependent, so that cognitive experiences situated in authentic activities such as project-based learning;

- cognitive apprenticeships, or case-based learning environments result in richer and more meaningful learning experiences;

- social negotiation of knowledge, a process by which learners form and test their constructs in a dialogue with other individuals and with the larger society. Collaboration as a principal focus of learning activities so that negotiation and testing of knowledge can occur.

Constructivist learning is based on students' active participation in problem-solving and critical thinking regarding a learning activity which they find relevant and engaging. They are "constructing" their own knowledge by testing ideas and approaches based on their prior knowledge and experience, applying these to a new situation, and integrating the new knowledge gained with pre-existing intellectual constructs.

The 5 E's is an instructional model based on the constructivist approach to learning, which says that learners build or construct new ideas on top of their old

ideas. The 5 E's can be used with students of all ages, including adults. Each of the 5 E's describes a phase of learning, and each phase begins with the letter "E": Engage, Explore, Explain, Elaborate, and Evaluate. The 5 E's allows students and teachers to experience common activities, to use and build on prior knowledge and experience, to construct meaning, and to continually assess their understanding of a concept.

Characteristics of Constructivist Teaching

One of the primary goals of using constructivist teaching is that students learn how to learn by giving them the training to take initiative for their own learning experiences.

According to Audrey Gray, the characteristics of a constructivist classroom are as follows:

- the learners are actively involved
- the environment is democratic
- the activities are interactive and student-centered
- the teacher facilitates a process of learning in which students are encouraged to be responsible and autonomous.

Transition towards Constructivism: according to Constructivism approach the teachers are learning facilitators and instructors.

Relevance: Constructivism is one of the hot topics in educational philosophy right now. It potentially has profound implications for how current 'traditional' instruction is structured, since it fits with several highly touted educational trends, for example:

- the transition of the teacher's role from "sage on the stage" (fount/transmitter of knowledge) to "guide on the side" (facilitator, coach);
- teaching "higher order" skills such as problem-solving, reasoning, and reflection.

- enabling learners to learn how to learn;
- more open-ended evaluation of learning outcomes;
- and, of course, cooperative and collaborative learning skills.

Cooperative Learning

Cooperative learning refers to an instruction method in which students in small groups of two to five help one another learn and work cooperatively to achieve a common academic goal. Cooperative learning is a teaching strategy that encourages student success by alleviating overt competition and substituting group encouragement. Cooperation involves people working together to achieve common goals. Davidson distinguishes cooperative learning from traditional group work in that most models conform to the following principles:

Children work and learn together in small (2-5 members) groups.

- Their task is carefully designed to be suitable for group work.
- There is positive interdependence - cooperation is necessary for children to succeed.
- Children are individually accountable for learning and participation.
- Attention and class times are given to cooperative skill building.
- The role of the teacher changes from being the "sage on the stage" to the "guide on the side"

Importance of Cooperative Learning

Research has shown that cooperative learning techniques:

- promote student learning and academic achievement
- increase student retention
- enhance student satisfaction with their learning experience
- help students develop skills in oral communication
- develop students' social skills

• promote student self-esteem

• help to promote positive race relations

Computer supported cooperative learning (CSCL)

The technology itself is not transformative; it's the school, the pedagogy, which is transformative. CSCL is a computer application that stimulate learning and thinking in group of students. CSCL improves instruction for students because students receive immediate feedback and do not continue to practice the wrong skills and computer capture the students' attention because the programes are interactive and engage the students' spirit of competitiveness to increase their scores. It helps students with developing ideas, organizing, outlining and brainstorming. Templates provide a framework and reduce the physical effort spent on writing so that students can pay attention to organization and contents.

Information and communication technology has brought new possibilities in to the classroom. Information and communication technology exemplified by the internet and interactive multimedia and obviously of great significance for teachers and students. It needs to be effectively integrated in to the formal classroom and learning condition. The introduction of technology in the education field has made the process of learning and knowledge sharing an interactive and for filled activities. The computer offers an interactive audio visual media. Power point presentation and animation software can be used to render information to the students in an interactive manner. The visual effects provided by the animation and presentation. Software serves as visual aids to the teachers. Overhead projectors and screens facilitate a simultaneous viewing of information by a large number of students. There audio visual teaching aids have brought about marked improvement in students attention and attentiveness.

Objectives

To study the effect of computer supported cooperative learning on the achievement of biology subject for higher secondary class.

Hypotheses

1. There will be no significant difference in the mean scores of achievements of students with individualistic method.

2. There will be no significant difference in the mean scores of achievements of students with cooperative method.

3. There will be no significant difference between the achievements of students with individualistic and cooperative methods.

Population and Sample

All the students studying in higher secondary classes of government senior secondary schools of Meerut district constitute the population of the study. A group of 19 students' taken, purposive sampling technique is used.

Tools and techniques used for data collection

As per objective and hypotheses of the present study, the researcher has constructed the following tools:-

1. Computer supported lessons (self constructed)

2. Pre test and post test (self constructed)

Description of tools

To develop Computer supported lessons for higher secondary class, which are interactively chosen.

The ten concepts were chosen by researcher while giving consideration.

a. Concept which had not been taught in the class.

b. The concepts on which effectively computer programe, can be made those concept were taken.

c. Concept developed on the basis of theme given in the text book

Name of topics included were, 1. Plant physiology 2. Overview of respiratory

system 3. Overview of digestive system 4. Overview of circulatory system 5. Overview of excretory system 6. Endocrine glands 7. Exocrine glands 8. Replication 9. Translation and 10. Transcription.

Pre and Post Tests

Self made pre and post tests based on selected units of content in science subject for higher secondary class were administered. They are based on the syllabus of higher secondary class biology group of U.P. Board. Test based on different type of questions. There are 2 sections in some and four in others - fill in the blanks, right and wrong, matching and multiple choice questions etc.

Statistical techniques used:

Keeping in the mind the objective and research methodology used in this study, for better analysis statistics like mean and t-value has been used to test the significance of the difference between means of two groups.

Table -1

Comparison of the scores of pre test and post test of students in relation to individualistic method

Group	N	M	S.D.	t-value	S/NS
Pre test	19	12.44	2.6	.0003	NS
post test individual	19	16.31	3.3		

Table 1 shows that means score of pre test and Individual post test in relation to individualistic method is 12.44 and 16.31 with S.D. 2.589 and 3.300 respectively. The t-value testing the significance of mean difference between two groups was calculated as 0.0003, which is not significant at 0.05 level. The conclusion is that the students' achievement is equal after individualistic method.

Table 2 shows that mean score of pre test and cooperative post test in relation to cooperative method is 12.44 and 20.68

with S.D. 2.6 and 1.6 respectively. The t-value testing the significance of mean difference between two groups was calculated as 9.33, which is significant at 0.05 level. The conclusion is that the students achievement is differ after CSCL method.

Table -2

Comparison of the scores of pre test and post test of students in relation to cooperative method.

Group	N	M	S.D.	t-value	S/NS
Pre test	19	12.44	2.6	9.33	S
post test individual	19	20.68	1.6		

Table -3

Comparison of the scores of individualistic method and cooperative methods.

Group	N	M	S.D.	t-value	S/NS
Pre test	19	16.31	3.3	2.03	NS
post test individual	19	20.68	1.6		

Table 3 shows that mean score individualistic method and cooperative method is 16.31 and 20.68 with S.D. 3.3 and 1.6 respectively. The t-value testing the significance of mean difference between two groups was calculated as 2.03, which is not significant at 0.05 level. The conclusion is that the students achievement is not differ after individualistic and CSCL method.

Findings of the study

1. The cooperative method is more effective method for learning as compare to individualistic method.

2. There was no significant difference in the mean scores of pre and post tests of students with individualistic method.

3. There was a significant difference in the mean scores of pre and post tests of students with cooperative method.

4. There was no significant difference between the achievements of students with individualistic method and cooperative method.

Conclusion

Computer supported cooperative learning (CSCL) method stimulate teaching learning process and facilitate easy and effective learning as compare to individual and traditional learning method. Computer and the internet technology have revolutionized the field of education and give its maximum impact on teaching learning process in group study as it increase the feeling of competitiveness and interest among students. Computer technology is used to add a fun element to education and it goes without saying that the technology has endowed education with interactivity.

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Sub Theme - 4
Practicing Constructivism

Effect of Constructivism-Based Teaching Strategy on Academic Performance of Students in Chemistry at Secondary Level

Dr. Satvinderpal Kaur *

Abstract

Present paper is based on an investigation aimed at to study the effect of constructivist-based teaching strategy on academic performance of students in Chemistry at secondary level. The study is experimental in nature and has been conducted on 60 students of 10+1 class. The sample was divided into two equated groups, group 1 was instructed with traditional (lecture) method and group 2 was exposed with the constructivist- based strategy. Achievement test was constructed and used as pre and post test as a criterion for academic performance. The index of effectiveness of constructivist-based teaching strategy was taken from the achievement scores of pre and post test and t- test was used to find the significance of the difference in scores. The results reveal that group 2 students instructed with constructivist based strategy showed significantly better performance in the form of achievement scores on. It is suggested that along with other methods of teaching, constructivist- based approach should be applied to enhance the academic performance of the students in chemistry at secondary level.

Introduction

It has been remained as a question before the educationists that which learning activities contribute to the learning of scientific concepts with understanding and to transfer that learning to daily life situations. Answer to this question is of paramount importance to the designing and use of innovative learning environment of science education in school setting. Traditional classroom experience predominating organized on the basis of behaviouristic approach, emphasized rote learning and essentially a one-way process in which learners are the passive recipients. In this type of instructions, the learners are developed more to get good grades rather than an evolving and rational human being with scientific attitude. Moreover, the out of school knowledge and previous experiences are not well integrated in this strategy.

Contrast to this approach, science teaching is now finding a base on constructivist, cognitive and social learning theories which consider human being as an active constructor of knowledge based on his/her prior knowledge rather than being a passive recipient. This approach is called a constructivist approach of teaching. Constructivism asserts that learning can take place only when the learner relates the new information to his already existing knowledge and perceive learning

as a product of self organization and reorganization of existing ideas.

Constructivism advocates that knowledge cannot be transmitted to the learner's mind from a textbook or by the teacher. Instead, students construct their knowledge by making links between their ideas and new concepts through experiences they acquire in school or daily life *(Mohan 1998)*. Constructivism works with the assumption that students come into classroom with their own experiences and a cognitive structure based on previous experiences. These preconceived structures may be valid, invalid or incomplete. Memorized facts or information that has not been connected with the learner's prior experiences are quickly forgotten. In short, learner must actively construct new information in to his/her existing mental framework for meaningful learning to occur *(Mahoney 2004)*.

The core view of constructivists on learning science suggests that students construct their knowledge strongly influenced by social environments. They learn science through a process of constructing, interpreting and modifying their own representations of reality based on their experiences. Therefore, constructivists acknowledge social dimension of learning such as the classroom and community whereby students make meaning of the world through both personal and social processes *(Driver et. al., 1994)*.

The role of teacher in teaching through constructivist strategy is to organize information around conceptual clusters of problems, questions and discrepant situations in order to engage the student's interest. Ideas are presented as broad concepts and by broken down into parts. The activities are student-centered and students are encouraged for discussions, to ask questions, carry out their own experiments, make their own analogies and come to their own conclusions. Teaching science focuses on providing students with opportunities in which they have cognitive conflict and they develop different structures based on their experience. It is accepted that students develop some ideas about natural events before coming to the classroom. Often these ideas are different from scientific explanations and interact with scientific knowledge presented in the class. Consequently, unintended learning outcomes come out. Therefore, prime aim of science education is to make students to acquire scientific knowledge meaningfully.

Certain topics in Chemistry like Atomic Structure and Chemical Bonding are basic concepts in which students experience difficulty in understanding. Since these topics are abstract in nature, and cannot be applied to everyday life directly, most of the students are not able to comprehend because they cannot relate the microscopic to macroscopic world. Also, the understanding of these topics requires base of topics from Physics such as energy and force in which students usually have misconceptions in understanding. In order to comprehend the nature of chemical reactions and some physical properties such as boiling point, melting point etc., and students should understand atomic structure and chemical bonding at mastery level of learning. Empirical research studies conducted in this field showed that type of instruction affected students' attitudes toward science as a school subject *(Parker, 2000, Chang, 2000)*.

Niaz (1995) studied on dialectic constructivist framework based on cognitive conflict for science students reported that students exposed to cognitive conflict method were more successful than students studied traditionally. *Carey et al. (1989)* concluded that after the constructivist methodology,

students saw scientific inquiry as a process guided by questions and ideas. From the review of the studies related in this area, it is observed that a few studies have been conducted to study the effect of constructivist approach in performance of students in the subject of chemistry and this makes the present study vital in essence.

Objective

The present study has been conducted based on following objective:

1. To study the effect of constructivist-based teaching strategy on academic performance of students in Chemistry at secondary level.

Hypothesis

1. There will be no significant difference in the academic performance of the students instructed with constructivist based strategy and traditional method of teaching.

Methodology and Procedure

(a) Design of the study: The basic design of this study is experimental. 60 students of 10+1 class were selected for a sample and sample was divided into two groups namely group 1 and group 2. Two topics of chemistry i.e. Atomic Structure and Chemical Bonding were taught to Group 1 with the conventional method of teaching and group 2 with the constructivist model of instructions for the period of 15 days.

(b) Procedure in framing the equated groups: The sample of 60 students was divided into two equated groups of 30 students in each. Both the groups were equated as nearly as possible in terms of their prior knowledge about the topics to be taught. With the pre test conducted to get idea about the previous knowledge an achievement test was conducted. Students having similar range of scores were divided equally and randomly in both the groups. To find out whether there was any significant difference between the two groups t-test was applied. The difference was not significant. Hence an attempt was made to increase the internal validity of the results and it was assured that both the groups were equivalent to each other before beginning of the experiment.

(c) Construction of Tools: Achievement tests were constructed with a set of thirty five multiple choice test items on topics covered i.e. Atomic Structure and Chemical Bonding. Experts of the field were consulted and as per the opinion of the experts test items were formulated. The agreement of the views expressed by the experts after the logical evaluation of the test items was taken as the index of the validity of the tool. The reliability was established by the split half method and the reliability coefficient was found to be 0.84, which depicted the reliability of the tool. Both the tests constructed on Atomic Structure and Chemical Bonding were administered just after instructions in each topic. The same tests were used as pre test and post test to evaluate the students' performance.

An instructional package with the use of constructivist instruction and instructional package with the use of conventional (lecture) method were prepared. The groups equated by the above said procedure were taken for the study under experimental design. The pre test was administered to both the groups. The test instrument covered the afore mentioned topics which were taught during the study. At the end of each instruction, the achievement test was applied as a post test. Mean and standard deviation of achievement scores on both the groups for the topics taught with conventional method and constructivist strategy were calculated separately for pre and post test. 't' -test was applied and the results are presented in the form of tables for discussion.

Results and Discussion

Means and standard deviations for each

group with respect to pre and post test scores are presented in the form of tables. As indicated in table 1, in the pre test the achievement scores are almost equal for both the group 1 and 2 students with mean scores 15.1 and 16.1 respectively for both the groups. The t- value is 0.88, which shows no significant difference. Hence before the treatment, students of both the groups have almost the same level of knowledge about the topic I. After the treatment, group 2 students exposed to constructivist instructions in topic I has mean achievement score 29.4 (SD= 1.4) and the group 1 taught with traditional method of instructions keeps mean achievement scores 19.3 and (SD =4.8). The value of t is calculated as 3.01 which show significant difference at 0.01 level of confidence.

Further, table 2 reveals the statistical scores on academic performance obtained by group 1 and group 2 students in the pre and post-test on topic II. The mean

Table-1

Scores Obtained by Group 1 and Group 2 in the Pre and post- test on Topic-1

Method	N	Mean	S.D.	t-value	S/NS
Tra.(Pre)	30	15.1	4.5	0.88	NS
Con(Pre)	30	16.1	4.1		
Tra.(Post)	30	19.3	4.8	3.01	0.01
Con(Post)	30	29.4	1.4		Sig.

Table-2

Scores Obtained by Group 1 and Group 2 in the Pre and post- test on Topic-2

Method	N	Mean	S.D.	t-value	S/NS
Tra(Pre)	30	18.2	5.8	0.43	NS
Con(Pre)	30	17.9	6.1		
Tra(Post)	30	18.8	4.02	3.28	0.01
Con(Post)	30	28.9	1.51		

achievement scores of group 1 and group 2 in the pre test are 18.2 and 17.9 and value of SDs as 5.8 and 6.1 respectively for both the groups. The t-value is 0.43 shows no significant difference between the group 1 and 2 in the pre test of topic II. It means students of both the groups have the same entry level before the treatment. The mean and sd. scores of the groups with constructivist based strategy are 18.8 and 4.02 and for the traditional (lecture) group, the mean achievement score is 28.9 with sd. 1.51. The t-value is 3.28 is significant at 0.01 level of confidence.

Results

1. Students performed significantly better in the academic performance when used construcivism based teaching method than the traditional method at post test level for the topic Atomic Structure.

2. Students performed significantly better in the academic performance when used construcivism based teaching method than the traditional method at post test level for the topic Chemical Bonding.

Conclusion

It is concluded in unequivocal terms that if constructivist approach of teaching and learning is applied in the secondary classes for teaching of Chemistry, there would be improvement in the students' performance and conceptual clarity of the topics taught. Constructivist approaches are student centered in which teachers use subject matter for interactive engagement with students. Classroom climate encourages discussions and negotiation of ideas. Also, it is observed from the study that students develop positive attitude, enthusiasm and interest in the subject with the constructivist pedagogy, which in itself has long impending impact to formulate the base for the Chemistry at tertiary level also. The subjects like Chemistry in which

most of the topics are based upon the imagination and students develop their own misconceptions about them. Hence clarity at the concept level requires some innovative strategies like constructivism. Also constructivist methods of teaching develop scientific attitude, rationality and cognitive skills among the students. Teachers should incorporate constructivist based teaching strategy into other methods of teaching.

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An Innovative Inquiry-based Approach for Science-Teaching with reference Constructivism

Dr. Shazli Hasan Khan *

Abstract

Constructivism is a theory of Knowledge and philosophy of learning. Its proponents include Piaget, Vygotsky and Von Glasersfeld etc.. The constructivist philosophy has been adopted in teaching of science by many enthusiastic pedagogues and teachers in many countries. A Constructivist pedagogy consists of several teaching strategies with added responsibility to create a conducive classroom environment. Research has established that constructive methods of science teaching have been much more successful than the traditional methods. In the present research paper the author has identified some of the important reasons for the implementation of constructivist strategy.

Introduction

Constructivism is a theory of knowledge, i.e.; epistemology and a theory of learning. It is not any particular pedagogy. Constructivists believe that human beings are active information receivers. They use their existing experience to construct understanding that makes sense to them. Humans assimilate and accommodate new knowledge and build their own understanding. Thus, knowledge is the result of individual construction of reality. In its essence, constructivism asserts that there is no essential truth, and no objective reality. Knowledge is viewed as personal and subjective. Reality resides in the mind of each person. Learning takes place when individuals make use of their existing knowledge and experience. Thus, multiple interpretations of events are possible, and multiple answers to a question are source of creativity in learners.

The importance and role of language was recognized early by the constructivists. Language is not only a tool to promote the construction of knowledge, but in fact all "human thought is trapped by the language in which it is encased" *(Mathews, 2000)*. Ideas are not only "communicated" through language, ideas are also "constructed" in the medium of language. Through language learners become aware of their own thoughts which facilitate as well as define understanding. Knowledge is not passively received but actively built up by the learner. Each person builds for himself an individual perspective of reality.

It is held by constructivists that learners

need time to reflect on their experiences in relation to what they already know. After some time, they reach consensus about what specific experience means to them.

Constructivism is an epistemological view of learning rather than teaching. Students' previous knowledge and their active participation in problem solving and critical thinking all play a crucial part in the construction of knowledge. One of the most important goals of constructivism is to develop students' critical thinking skills, which are possible only in a conducive learning environment in the classroom. The teacher may improve the day's lesson or change the sequence of activities, depending on the needs of the students or due to any other unexpected development. Such flexibility is said to be a valuable quality of a positive learning environment. The following are some of the important features of a constructivist learning environment:

1. Learners should be challenged by ideas and problems that generate inner cognitive conflicts.
2. Learners are encouraged for active participation in the classroom activities and raise questions.
3. Learning environment should encourage students to enter into dialogue with the teacher as well as with their peers.
4. Students should be given sufficient time for reflection, for constructing relationship and for discussion.

Objectives of the Present Study

The following are the major objectives of the present study:

1. To explain the Constructivist Philosophy and to know its major exponents.
2. To identify important features of Constructivist philosophy having relevance in Science classrooms, and to know the related pedagogies which can be usefully applied in Science teaching.
3. To study how far constructivist strategies have been successfully employed in schools, both in India and abroad, and why it has had only a limited success everywhere, especially in developing countries.
4. To present a few suggestions to improve the chances of success for a constructivist science classroom, including better training of teachers and more financial and moral support from the administration and government.

Methodology of the Present Study

This research is a descriptive study of constructivist philosophy and its implementation in academics. Keeping in view of availability of the resources and the feasibility of the present research study, the author conducted his research studies on the basis of secondary sources of data. Secondary data has been collected from several books, research articles published in standard and prestigious Journals etc. The author has included the thoughts and views of various important philosophers in the field.

Constructivism in a Science Classroom

There is no single Constructivist strategy for instruction in the class. Different pedagogies and researches have highlighted various elements in varying degrees for the benefit of classroom instructors. Even so, there are several common themes which can be described here. Education is a student-centred process and the teacher is only a facilitator. Learning depends on shared experience with peers and teachers. Collaboration and cooperation is a major teaching method. Students actively explore and use hands-on experience. The constructivist views knowledge as being constructed in a social context. It is an active social process. Learners cannot construct understanding alone; they do it collaboratively, through interactions. Learning is an active

process; hence the learner should be encouraged for guesswork and intuitive learning.

"Thinking" effectively, with focus on the problem at hand, is an important aspect of Constructivist learning. "Understanding" becomes clear and strong if the learner "thinks" over the issue at hand and if he can monitor his own thinking. "Thinking" is also called "self-reflection". It helps in self-questioning and self-reviewing. It is called "metacognition" or a purposeful thoughtfulness. A motivated and thinking learner tries to check his errors and tries to find why he failed in his earlier attempt. Such a learner's knowledge would be deep and durable. As Yager says, "One only knows something if one can explain it" *(Yager, 1999)*. On the other hand, a novice leaner does not check for quality in his work and thus he fails to make amends to his earlier errors.

Teacher's role in a Constructivist Science classroom

A teacher is not an authority buta facilitator or guide. He helps the learners to create proper environment in the class so that the students are motivated, challenged and think deeply to arrive at his own conclusion.

As a facilitator, the teacher has to support the learners in becoming effective thinkers. Students are to be encouraged to arrive at their own version of truth and then compare it with that of the instructor as well as with that of their fellow learners. Teachers have only to observe in the beginning of a session and assess the progress. They should pose questions to create right environment. They should intervene if any "conflict" arises or if the process of learning is going astray.

An important task for a constructivist Science teacher is to create a "learning environment" which facilitates students thinking and motivate them to explore. An authentic leaning environment is obtained if real-life complexities and real-world situation is simulated. A Science teacher creates congenial learning environment when learning goals are negotiated through consensus and dialogue with students.

Direct instruction is not appropriate. Learning should take place by "active involvement" of the students, by "doing", by generating their own ideas. In a well planned classroom environment, students learn how to learn. Learning is like a spiral. Students reflect on their past experience and integrate new experience. Teachers can use various strategies to promote and strengthen students' capacity to think and to "think about their thinking". *Eggen, P & Kauchak, D, (2007)* have suggested the following strategies for the purpose:

i. Teachers should pose some provocative questions to students and also encourage them to frame their own questions on the problem at hand.

ii. KWL Strategy: Teachers should teach the students to be aware of (a) what they already Know, (b) what they Want to learn, and (c) What they have eventually Learnt.

iii. PQ4R strategy: PQ4R is an acronym for Preview, Questions, Read, Reflect, Recite and Review.

The steps are described below:

Preview: The learner surveys the material.

Question: Students ask questions on the available material.

Read: Students read the material to ask questions.

Reflect: The learners think about the material, relating it to the things they already know.

Recite: The students practice remembering.

Review: The students review the material and ask questions.

iv) Ideal strategy:

IDEAL is an acronym for Identify, Define, Explore, Act and Look. To facilitate

Fig. 1:
PQ4R Strategy

effective thinking, the teacher can teach each of these metacognitive skills to students. Identify potential difficulties, and define these problems. Then, students explore to find solution. Finally, they have to look and note which actions lead to solutions.

Assessment and Examination in a Constructivist Science Classroom

The traditional system of evaluation and examination has more or less remained unchanged in schools. The summative approach – an examination at the end of school year—promotes accumulation of knowledge. Most of the students cram their notes and resort to rote learning. Such a procedure sends a very wrong message to the students—that learning means simply reproduce lessons without understanding it.

In a constructivist set up, the traditional assessment system will defeat the very purpose of teaching. Learning means "understanding" and which implies that one is able to explain what one knows. In a constructivist approach, assessment is interwoven with teaching. Students' activities, their work and portfolios, are all taken into account. It is their understanding and "knowledge" that is assessed.

Though judgments are involved in a constructivist classroom, but these are given to community authority and negotiation rather than to the individual teacher. In addition, assessments are made using multiple authentic measures, such as observations, dialogue journals, field notes, and portfolios, as well as test scores. These authentic assessments encourage students to participate in lifelike problem-situations, which are therefore long remembered. The real purpose of assessment should be to assist the teacher in determining how well the student is mastering the concepts. Hence students' performance should be monitored continually while the lesson is taught.

Constructivist view of Science Teaching

The Constructivist strategy is not a single strategy but a collection of instructional strategies like problem solving, project method, inquiry method etc. Science educators take more interest in social aspect of science. Teachers who follow a constructivist approach in teaching of science have tried to create links between the students' prior knowledge and the new information they would get. In many cases learners have successfully made modifications in the face of new evidences. Though knowledge is individually constructed but one must think both about the learning problem as

well as of learners' experience and previous knowledge.

Conclusion

To conclude, it can be said that Constructivist pedagogy is a very effective means of science teaching. However, the success of this pedagogy presupposes that the teachers should not only be well trained in a constructivist approach, but they should also be dedicated enough to follow its requirements patiently. This strategy is time consuming and requires lot of patience on the part of teachers and administrators. The teachers should also be trained in the use of relevant technologies. This all implies massive support from administration and the government.

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<u>**Sub Theme - 4**</u>
<u>**Practicing Constructivism**</u>

CONSTRUCTIVISM : Examining its Applications in Science Education

Rakshinder Kaur *

Abstract

Constructivism is a philosophy of learning and knowledge based on the premise that by reflecting on our experiences we can construct our own understanding of the world we live in. It is qualitatively different from the traditional behaviourist theory of learning and knowledge acquisition. This constructivist paradigm of viewing knowledge had an impact on a number of national curricular documents and national educational statements. In this context National Curriculum Framework also focused on constructivism and child centred education in India. Constructivism in science teaching has both potentialities and challenges. But still different teaching strategies of constructivism are finding a place in science education and have created a rupture in the traditional didactic methods of teaching where child is just a passive listener.

Introduction

Education is the process of acquiring knowledge and information and how one acquires and perceives that information and knowledge are the pertinent questions of education. In the post-industrial society, information and knowledge have become key resources in the same way that labour and capital were central resources of industrial societies. Since then the concept of knowledge has undergone profound changes and has been at the centre of major controversies so much so that it will not be incorrect to speak of a deepening sense of crisis in the modern knowledge system.

Indian education system is one of the oldest systems and lot of criticisms is labelled against our education system, because it has traditionally relied on the objectivist view of knowledge too much.

This view of learning and knowledge assumes that knowledge can be imparted from teacher to learner through instruction, lecture and practice. Teaching driven by this philosophy discourages different views and understandings, disregarding different contexts and experiences of individuals, and regard individuals as passive recipients of knowledge. In recent times, educators and institutional discourses have begun to challenge the objectivist view, with an increasing appreciation of different ways of knowing the world. Thus, constructivist influence has extended beyond the research and scholarly community and it has had an impact on a number of national curricular documents and national educational statements. In this context, National Curriculum Framework (NCF2005)

focused on constructivism and child centered education in India.

Constructivism

The word constructivism is derived from Latin word *construcre* – meaning to arrange or to give structure. Constructivism is an epistemology, a learning or meaning-making theory that offers an explanation of the nature of knowledge and how human beings learn. It maintains that individuals create or construct their own new understandings or knowledge through the interaction of what they already know and believe and the ideas, events, and activities with which they come into contact. Here knowledge is acquired through involvement with content instead of imitation or repetition.

In comparing constructivism to both behaviourism and cognitivism, Cooper summarizes: "The constructivist.... sees reality as determined by the experiences of the knower. The move from behaviourism through cognitivism to constructivism represents shifts in emphasis away from an external view to an internal view. To the behaviourist, the internal processing is of no interest; to the cognitivist, an internal processing is only of importance to the extent to which it explains how external reality is understood. In contrast, the constructivist views the mind as a builder of symbols-the tools used to represent the knower's reality. Constructivist view reality as personally constructed, and state that personal experiences determine reality not the other way round" *(Cooper 1993, cited in Jha,2009:12).*

According to constructivism, knowledge is relativistic (nothing is absolute, but varies according to time and space) and fallibilist (nothing can be taken for granted).On the basis of above discussion some of the guiding principles of constructivism are:

- Learning is a search for meaning.
- Meaning is contextualized and rooted in experience.
- The purpose of learning is for an individual to construct his or her own meaning not just memorize the "right" answers.
- Learning should be situated in realistic settings; testing should be integrated with the task and not a separate activity.

NCF (2005) in the chapter 'Learning and Knowledge' established the need of constructivist perspective in learning. It stated that 'child - centered' pedagogy should be followed means giving primacy to children's experiences, their voices and their active participation and knowledge will be the outcome of the child's own activity (NCF, 2005:13). Learning is a collaborative process and each learner individually and socially constructs meaning as he/she learns. Constructing meaning is learning (Ibid.:17).

Constructivism in Education

The constructivist movement has grown essentially from dissatisfaction with educational methods where rote memorization, regurgitation of facts and division of knowledge into different subjects, led to a situation where learners were not necessarily able to apply what they have learned in real life *(Dixon-Kraus, 1996 cited in Jha, 2009:16).* Constructivism thus goes beyond the study of how the brain stores and retrieves information to examine the ways in which learners make meaning from experience. This new learning theory has spawned a changing view on learning and instruction and is of paramount underst- anding in designing the curriculum. Constructivism is not another epistemology, or a way of knowing rather it is said to be post-epistemological. It cannot replace objectivism. Rather, constructivism is a way of thinking about knowing, a referent for building models of teaching, learning and curriculum.

Thus, constructivism in education means that teachers should embrace a holistic way of thinking about the nature of learning, quite apart from the methodology of direct instruction and should give those experiences to the children which are challenging and allow independent thinking, and multiple ways of being solved.

Constructivism in Science Education

Constructivist learning is recognized as a valuable technique to increase the depth of understanding of scientific ideas with students building their own knowledge through inquiry based exercises. Scott (1987) defines a constructivist in science as one who "perceives students as active learners who come to science lessons already holding ideas about natural phenomena, which they use to make sense of everyday experiences....Such a process is one in which learners actively make sense of the world by constructing meaning" (cited in Jha, 2009:418). No doubt constructivist pedagogy is valuable in science and should be encouraged, but a question arises how efficacious is constructivist pedagogy in teaching scientific concepts at different levels of schooling.

Critiques of constructivism have made an unsheathing attack and said that unrealistic claims have been made by the advocates of constructivism. One prominent constructivist, Richard White, has said, "Although the research on alternative conceptions has sparked interest in content, it has not yielded clear advice about how to teach different topics. Given the necessity for any science programme to teach the content of science this is a serious failure" (cited in Matthews, 2000).

The difficulty for constructivism which is posed by teaching the content of science is a fundamental theoretical problem, not merely a practical one. If knowledge cannot be imparted, and knowledge must be a matter of personal construction based on one's experience, then how can children gain knowledge of complex conceptual schemes that have taken the best minds hundreds of years to build? *(Saxena, 2006: 56).*

Many science educators are interested in finding out how, on constructivist principles, one teaches a body of scientific knowledge that is in large part abstract (depending on notions such as velocity, acceleration, force, gene), that is removed from experience (propositions about atomic structure, cellular processes, astronomic events), that has no connection with prior conceptions (ideas of viruses, antibodies, molten core, evolution, electromagnetic radiation), and that is alien to common-sense, and in conflict with everyday experience, expectations and concepts? Teaching a body of knowledge involves not just teaching the concepts, but also the method, and something of the methodology or theory of method. How all of this is to be taught, without teachers actually conveying something to pupils, is a moot point (Mathews, 2000).

But on the other hand constructivism has given some applicable and child centered strategies which can be applied in teaching not all the content of science but many of the topics can be taught by applying them. These are:

- *Project Based Learning:* Project Based Learning is a strategy that challenges students to discover answers to their questions through real world investigations. Research projects can be given where students do research on a particular topic and present the findings to the class.
- *Problem Based Learning:* It is a student-centered pedagogy in which students learn about a subject in the context of complex, multifaceted, and realistic problems. The goals of PBL are

to help the students develop flexible knowledge, effective problem solving skills, self-directed learning, effective collaboration skills and intrinsic motivation. Working in groups, students identify what they already know, what they need to know, and how and where to access new information that may lead to resolution of the problem. The role of the instructor is that of facilitator of learning who provides appropriate scaffolding and support of the process, modelling of the process, and monitoring the learning.

- *Inquiry Training*: The philosophy of inquiry based learning finds its antecedents in the work of Piaget, Dewey, Vygotsky and Freire among others. There are four levels of inquiry-based learning in science education: confirmation inquiry, structured inquiry, guided inquiry and open inquiry. With confirmation inquiry, students are provided with the question and procedure (method), and the results are known in advance.

In structured inquiry, the question and procedure are still provided by the teacher; however, students generate an explanation supported by the evidence they have collected. In guided inquiry, the teacher provides students with only the research question, and students design the procedure (method) to test their question and the resulting explanations.

At the fourth and highest level of inquiry, open inquiry, students have the purest opportunities to act like scientists, deriving questions, designing and carrying out investigations, and communicating their results.

- *Group Discussion* is a strategy where students are divided into groups. Open ended questions can be asked where students are given time to discuss, share ideas and express their opinion.
- *Cooperative Learning* can be practiced

in classrooms which gives learners opportunity to construct knowledge, problem solving and develop social and personal skill. It is a successful teaching strategy in which small teams, each with students of different levels of ability, use a variety of learning activities to improve their understanding of a subject.

- *Concept Mapping:* A concept map is a diagram showing relationships among concepts. It is a graphical tool for organizing and representing knowledge. It can be used to generate ideas, illustrate the relationship between different components to integrate new knowledge and old knowledge.
- *Experimentation:* Here students individually or in groups perform experiments and than discuss the results in the classroom.
- *Field Trips:* This strategy is very useful in the teaching of biology. Field trips help to put concepts and ideas discussed in class in a real world context. Field trips should be followed by class discussions.

The Position Paper on Science of NCF (2005) also gave some strategies to stimulate creativity and inventiveness in Science. It stated: Introduce a paradigm shift in science curriculum at all stages. Emphasize exploration, inventiveness and creativity through activities, experiments, technological modules, contextualized as far as possible. *(NCERT, 2005: 31).*

Constructivist Assessment

Assessment and evaluation of constructivist learning is also different than that of traditional methods. In traditional methods there is focus on the reproduction of the content, but in constructivism students' ability to organize, structure and use information in context to solve complex problems is important. So, constructivist teachers must embrace alternative assessment

strategies in order to truly understand what students are thinking and to identify the steps they have taken to construct meaning out of their learning experiences. Alternative assessment strategies include observation, interviews, concept mapping, open-ended problems, drawings, performance based assessment, self assessment etc. Therefore, formative assessment is more valuable to the learner in the constructivist paradigm *(Dwivedi, 2010:17).*

Conclusion

Constructivism has changed the way of attaining the knowledge. Now knowledge is not regarded as a product which can be transmitted by the teachers rather it is now well established that knowledge is an idiosyncratic, dynamic construction of human beings. No doubt, constructivism cannot be used in teaching all the topics of sciences. It has its own limitations .But still there is much that is laudable, insightful, and progressive about constructivist theory and practice. It is far superior to the wooden and limiting behaviourist theory. In Indian context it is for the first time that curriculum is framed on these lines for school students and it has created a rupture in the traditional didactic methods of teaching where child is just a passive listener. Padma M. Sarangapani has rightly remarked, "The cognitive revolution has barely begun in Indian education and the concepts and theories of 'constructivism' are essential for this. At long last through the NCF 2005 modern psychology of learning is being read and debated in a wider arena of non-specialists who contribute to the educational discourse and action in India" *(Sarangapani, 2007: 241).*

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Constructivism: A Student-Centred Approach in Teaching Social Science

Sandeep Kumar *

Abstract

The teaching of social science has not been very effective partly due to the way it is transacted within the classroom. The class room process in social science is dominated by teacher talk and note dictation which forces the creation of a passive classroom atmosphere and students uncritically accept the information and knowledge posed on to them. Therefore, it is necessary to revitalize social science teaching, to help the learner to acquire knowledge and skills in an interactive environment, which can make learning of social science an enjoyable experience for students.

Introduction

Education is a process which empowers the body, mind and spirit of the person so that one becomes a productive and responsible member of the family and society. The function of education is thus to equip each individual with the skills and competencies for a successful living. It serves as instrument for the economic and social development of a country. The goal of education is the fullest realization of the possibilities of the individual not only for his personal welfare but for participation and contribution in a changing society. One of the important goals of school education is to help pupils to understand the world in which they live so they become responsible citizens and this becomes the fundamental purpose of social science teaching in school education. It is crucial therefore for teachers to not only set in place the knowledge foundations for continued studies in social science but also develop sense of interest towards social science and requisite skills among the students. But today in social science teaching what we do today is only transfer the knowledge of social science from one brain to another and therefore students of social science should be provided such learning environment where they acquire knowledge and skills in an interactive way.

Social Science Teaching and Today's Classroom

The social studies content requires the educator to have an academic background. The subject areas commonly associated with social studies are mainly from history, geography, political science and economics. This diverse subject matter places a social studies teacher in a position where they must be well trained in a variety of disciplines. Currently, in many classrooms, social

studies is taught through teacher-centered activities. This involves techniques like memorization of facts, lectures and a heavy reliance on textbooks *(Rice & Wilson, 1999).*

Banarjee (2007), tried to track down the evolution, popularity and utility of Geography as a school subject in Indian Schools has further stated that the teachers, in most cases, refrained from explaining the concept part or the diagrams. A common practice in teaching was to switch over to the descriptive part and complete the syllabus. Practical skill development was largely out of reach. This practice over the years has created a kind of fear among pupils about geography, maps and map reading.

Khasnavis (2000) also observed the same situation and stated that at present in most of the schools in India, emphasis is placed on memorization. The schools programme is dominated social science teaching in school education. It is crucial therefore for teachers to not only set in place the knowledge foundations for continued studies in social science but also develop sense of interest towards social science and requisite skills among the students.

Almost same situation has been observed in Economics teaching in the Schools of Chhattisgarh where normally the lectures in economics are done by one-way communication, lecture is delivered and it is understood that student understands the topic. No attempt is generally made to get the feedback from the students on his comprehension. No discussions take place in the class room due to the reasons mentioned above and moreover no practical problems are given to student to make him understand the subject. Example quoting is normally missing in the lecture; therefore, students get disinterested in the subject. *(Swarna, 2010).*

A similar condition in Andhra Pradesh schools has been found by *Nageshwar (2011).* According to him Social Science teaching in Schools of Andhra Pradesh is dull, passive, teacher and text book oriented in the state. It is fostering rote learning with little or no scope for constructivism. Local specificity and relevance to real life is also missing.

From the above discussions it can be seen that the present position of social science teaching is ill planned and at a lower level in Indian Schools, which demand a shift.

Social Science and Constructivism

Social science is the study of society and its chief aim is to help pupils to understand the world in which they live, so they become responsible citizens. According to Education Commission (1964-66), "Social Studies help the students to acquire knowledge of their environment, an understanding of human relationships and certain attitudes and values, which are vital for intelligent participation in the community, the state, the nation and the world".

According to *National Curriculum for Elementary and Secondary Education (1988)* "Social Science is perhaps the singular curricular area which can prove to be the most effective tool for providing education in the context of all the core components indicated in NPE 1986.

The present scenario of teaching reveals that the classroom process in social science is dominated by teacher talk and note dictation which forces the creation of a passive classroom atmosphere and student uncritically accept the information and knowledge passed to them. So the teaching in schools runs with parrot like repetition of facts and principles, which has very less applicability in their future life.

Survey conducted by Wipro along with the educational initiative in 5 metro cities on 142 schools over 32000 students revealed that the students were not able to answer

questions dealing with understanding and application level. The study was conducted on IV, VI and VIII standard students. *(Source: Gujarat Samachar dated 11.11.09).*

Studies on teaching of social science at primary and secondary schools reveal that it is dull, passive and textbook oriented and which demand a shift from transactional nature of teaching from student centered teaching.

Constructivism is an epistemology, learning or meaning making theory based on thought process involved in learning. Constructivism views learning as a process in which the learner actively constructs or builds new ideas on concepts based upon current and past knowledge. It has its root from philosophy and psychology and also applied to education. The work of Piaget, Dewey, Bruner, Vygotsky provides historical precedents for constructivist learning theory.

The learning process in constructivism is supported by two broad principles: first, knowledge is not passively received, but actively constructed by the learner and second, learners generate understanding when they relate prior knowledge to present experiences (Wheately, 1991).

In a constructivist classroom the teacher's role is mainly to guide, facilitate, focus, suggest and evaluate the learning process in order to encourage the students to construct knowledge.

The teacher is also a co-explorer, who encourages learners to question, explain, challenge, discuss, evaluate and formulate their own ideas, opinions, solutions and conclusions. Teachers also function as initiators of activities that evoke students' interest and lead to new constructions instead of telling them what to know about specific content areas (Hannafin & Land, 1997). Moreover, in constructivist terminology, *encouraging* rather than *teaching* is used more frequently because the individual development cannot be forced *(Selley, 1999).* So it can be stated that in constructivist classrooms the emphasis is on knowledge construction, not reproduction, the composition of information rather than the imposition of knowledge; multiple outlooks rather than multiple workbooks.

Above approach has also been supported by *National Curriculum Framework for School Education (NCFSE), 2005* and emphasized that child should be a constructor of knowledge rather than mere reservoir of knowledge, further it suggests that students of social sciences should be provided such learning environment where they acquire knowledge and skills in an interactive way. The teaching of social science must adopt methods that promote creativity, aesthetics and critical perspectives and enable children to draw relationships between past and present and to understand changes taking place in the society.

Instructional Strategy Based on Constructivism to Teach Social Science

Many committees and commissions have recommended for improving the quality of social science education by moving away from behaviourist approach of teaching to constructivist approach of teaching. The learning cycle idea of 5 E Models can be traced back in 1960. The model is grounded in constructivism. The learning cycle used in this development follows *Bybee's (1997)* five steps of Engagement, Exploration, Explanation, Elaboration, and Evaluation.

Engage:

The first phase engages students in the learning task. The students mentally focus on an object, problem, situation, or event. The role of the teacher is to present the situation and identify the instructional task. The teacher also sets the rules and procedures for establishing

the task. Successful engagement results in students being puzzled by and actively motivated in, the learning activity. Here, the word "activity" refers to both mental and physical activity.

Explore:

Once the activities have engaged the students, the students have a psychological need for time to explore the ideas. Exploration activities are designed so that the students in the class have common, concrete experiences upon which they continue formulating concepts, processes and skills. The aim of exploration activities is to establish experiences that teachers and students can use later to formally introduce and discuss concepts, processes, or skills. The teacher's role in the exploration phase is that of facilitator or coach.If called upon, the teacher may coach or guide students as they begin reconstructing their explanations.

Explain:

The word "explanation" means the act or process in which concepts, processes, or skills become plain, comprehensible, and clear. Explanations are ways of ordering the exploratory experiences. The key to this phase is to present concepts, processes, or skills briefly, simply, clearly,

and directly and to move on to the next phase. Teachers have a variety of techniques and strategies at their disposal to elicit and develop student explanations. In the end, students should be able to explain exploratory experiences and experiences that have engaged them by using common terms. Students will not immediately express and apply the explanations-learning takes time.

Elaborate:

Once the students have an explanation and terms for their learning tasks, it is important to involve the students in further experiences that extend, or elaborate, the concepts, processes, or skills.

This phase facilitates the transfer of concepts to closely related but new situations. In some cases, students may still have misconceptions, or they may only understand a concept in terms of the exploratory experience. Elaboration activities provide further time and experiences that contribute to learning.

This phase is also an opportunity to involve students in new situations and problems that require the transfer of identical or similar explanations. Generalization of concepts, processes, and skills is the primary goal.

Evaluation:

This is the important opportunity for students to use the skills they have acquired and evaluate their understanding. In addition, the students should receive feedback on the adequacy of their explanations. Informal evaluation can occur at the beginning and throughout the 5E sequence. The teacher can complete a formal evaluation after the elaboration phase. As a practical educational matter, teachers must assess educational outcomes. This is the phase in which teachers administer assessments to determine each student's level of understanding.
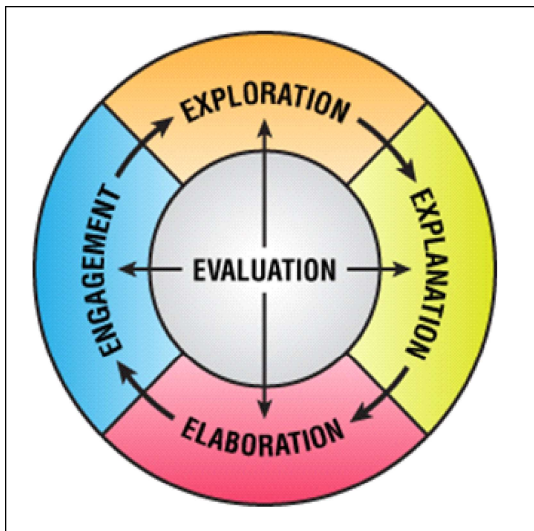
Illustration of Constructivist Approach:
RUBBER (PRODUCTION AND DISTRIBUTION)

Engage: Teacher will introduce the topic by showing a number of rubber products (sports balls, gaskets, rubber gloves, etc) and ask students to call out other rubber-based items as they think of them. The teacher will compile this list on the board at the front of the room. Teacher will then pre-assess what the students know about rubber and from where it comes.	**Assessment:** Teacher will use guided questioning to determine what information the students possess on this topic.
Explore: Working in pairs, students will be assigned a country from the list above to search online or through other sources provided by the teacher and/or library. Students will be assisted in their search by adhering to a guided worksheet that will ask them to look up and provide specific information about their topic. It must be stressed that the worksheet is merely a tool to assist in research. It should only be viewed as contributing to part of the research. (For example, the worksheet does not ask for any pictures, references, country flag, map, or many descriptors of culture, yet students should be encouraged to include such things on their poster.) The goal for each student pair is to gather and absorb wide-ranging information that will give them a broad scope of knowledge about the social, political and economic makeup of their assigned country.	**Assessment:** Students will turn in their search worksheets at the end of the project, along with their posters. However, during the Exploration stage the teacher will only monitor student to ensure that students are properly pacing themselves.
Explain: Here students will be asked to perform two specific tasks. The first is to take the information they gathered in the research stage and display it on a poster board using a variety of media (printed word, images). Each student pair will create a poster that demonstrates a strong foundational understanding of the cultural background of their assigned country. The second task each student pair must perform is to present their poster to the class. This presentation must cover the specified criteria of the assignment and will serve as an opportunity for students to demonstrate their knowledge of the topic.	**Assessment:** Teacher will assess both the poster and the presentation. The students must understand that both are contributing to their score on the project.
Elaborate: Teacher will engage the students in a discussion after the presentations have been completed. Through guided questioning, the students must make observations and must compare and contrast the different areas that produce rubber. They will be reminded of their earlier discussion and the list that was created at the beginning of the lesson. Students will have an opportunity to identify how their knowledge of the topic has changed their perceptions and may now, with more guided questioning by the teacher, alter	**Assessment:** Students must write a journal entry reflecting on this experience. They are expected to discuss their perceptions and level of knowledge that existed before

their original list of information about rubber-producing countries. At the conclusion of the class, the teacher will show a video about natural rubber production.	beginning this activity and must describe briefly what they learned and explain how their perceptions changed through the course of the project.
Evaluation: At every stage the teacher evaluates the students learning and provides feedback. Evaluation itself is an indirect feedback to the teacher regarding the entire process.	**Assessment:** Summative evaluation can be done to test the students improvement and educational outcomes.

Conclusion

When the educational philosophy of constructivism is applied to a classroom environment, it impacts every facet of the class. The author feels that if teaching of social science will be done by using 5 E cycle model than the students will understand and comprehend the concepts and able to apply in the day to day life situations. Constructivism affects the way a classroom is managed and the role teacher plays in its operation. Other methods which are based on constructivist philosophies can also be used to teach social science as a student-centered approach so that the aims and objectives of social science teaching and respective skills can be developed among the students and the quality of social science teaching can also be improved.

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Sub Theme - 4
Practicing Constructivism

Critical Inquiry Pedagogy in Social Science Classrooms

Dr. Beena K. *

Abstract

Critical pedagogy as a field of study and a set of practices emerged during the 1970s. It is an attempt to transform education and pedagogy as part of the project of radical democracy, aiming to encourage the development of a more democratic culture and active citizenry. Critical pedagogy actually questions the reproduction of knowledge and it believes that students can generate knowledge on their own. Students are made able to critically examine the society in which they are growing up and to criticize the kind of enterprise, the value system which they are imbibing. It is only through education that we develop the capacity to critically analyze the situation and take appropriate decisions. It is in this context critical pedagogy becomes very crucial.

Introduction :

Critical Pedagogy is based upon the philosophy of *John Dewey*. *Dewey* supported a type of education that would create a society that was more mindful of issues of social justice and equity. He called for teachers to use the classroom to build a socialist society and for teachers to become leaders, not just in their schools or local communities, but also as an effective, powerful political force.

Critical pedagogy has its roots in the critical theory of the Frankfurt school, whose influence is evident in the emancipatory works of Paulo Freire, the most renowned critical educator. For Freire, laboratory education focuses on the development of critical consciou- sness, which enables learners to recognize connections between their individual problems and experiences and the social context in which they are embedded.

Critical inquiry pedagogy is a constructivist approach to knowledge formation that critiques traditional knowledge constructs and includes essential elements of critical theory and other progressive educational theories. Critical inquiry pedagogy seeks to expose students to debates on issues of social justice. According to *Fecho (2000)*, critical inquiry pedagogy facilitates environ- ments, where students can come to their own conclusions about other current status and future direction of democracy. Critical pedagogy is an approach in planning teaching-learning experiences. Its framework helps the learners to relate the underlying social issues of the content to their day-to-day life to make choices in varied situations, and to develop the ability for good decision making. Critical pedagogy is only a programme of action. It is not a theory.

It means the development of capability of critically assimilating knowledge and skill in whatever form it is provided to him or her. It means a level of self reflexivity, that is understanding oneself and reflexively changes oneself.

It means critically assimilating the social conditions in which he or she grows up as well as the reasons for the development of such conditions. Critically evaluating the targets set before him and using his her own options to accept or reject those targets and finally examining one's own future including the social future and ability to pose it oneself clearly and social transformation. Critical pedagogy, therefore, doesn't reject any knowledge system. Rather, it enhances the capacity of the students to transform it, if necessary.

Students are critical observers of their own conditions and needs, and should be participants in discussions and problems solving related to their present and future opportunities. Hence learners need to be convinced that their perceptions and experiences are important. They must be always encouraged to develop the mental skills so as to think and reason independently and have the intellectual honesty and courage to dissent.

A critical frame work helps children to see social issues from different perspectives and understand how much issues are connected to their lives. For eg. Understanding of democracy as a way of life can be chartered through a path where children reflect on how they regard others (eg. Friends, neighbours, the opposite sex, elders etc.) and how they cultivate the ability to make decisions. Likewise, issues related to human rights, caste, religions and gender can be critically reflected on by children in order to see how these issues are connected to their every day experiences, and also how different forms of inequalities become

compounded and are perpetuated. Critical pedagogy facilitates collective decision making through open discussion and by encouraging and recognizing multiple views.

Critical pedagogy is particularly concerned with reconfiguring the traditional student/teacher relationship, where the teacher is the active agent the one who knows, and the students are the passive recipients of the teacher's knowledge. Instead, the classroom is envisioned as a site where new knowledge grounded in the experiences of students and teachers alike, is produced through meaningful dialogue.

Application of the principles of critical Pedagogy in classroom

In order to foster a more critical citizenry and facilitate the construction of more socially and politically active students, social studies teachers are obligated to integrate discussions of these issues into the classroom. The following practices are recommended for the implementation of critical pedagogy in social studies classroom.

1. Facilitate constructivist approaches to knowledge construction

Instead of teaching progressive ideas to students from a bully pulpit, social studies teachers should create an environment, where these ideas are constructed and developed by the students themselves through critical inquiry of established knowledge.

2. Facilitate safe and co-participatory learning environments:

Social studies teachers should create reciprocal co-participatory learning environments and encourages to construct their own knowledge, social identities and philosophies within them. This can be facilitated through peer teaching and the fostering of a safe learning environment for students. A social studies teacher needs to create

an environment where students feel comfortable to express personal beliefs and safely interrogate status quo knowledge. Such a reconceptualization requires new patterns of teaching and learning that involve deliberate power sharing on the part of teachers with students through non hierarchical classroom discourse.

3. Embrace democratic citizenship education:

Schools are appropriate places for democratic education because they possess essential aspects of a democratic society. Social studies teachers should introduce students to models of citizenship and democracy that transcend passive or participatory models. Social studies teachers should embrace democratic citizenship education models that promote social cooperation and democratic participation. Through the implementation of critical inquiry pedagogies, social studies educators can begin to rectify the failing of traditional pedagogies and foster political and social activism among students.

4. Dialog towards the development of a critical social consciousness

Social studies teachers move towards more egalitarian and equitable construction of democracy and away from inequitable and Eurocentric paradigms.

5. Supplement text books with more balanced educational resources

In order to foster critical discourse of societal and historical realities in social studies classrooms, teachers need to include non-traditional sources that contain revisionist historical analysis in social studies curriculum.

Conclusion :

Social Studies teacher should keep in mind that many of the topics, issues, and problems studied in the social studies may be of a controversial nature. Every effort should be made to develop the scientific approach to problem-solving of various issues. They should not avoid material likely to feed to controversial issues. Critical pedagogy provides an opportunity to reflect critically on issues in terms of their political, social, economic and moral aspects. It entails the acceptance of multiple view on social issues and a commitment to democratic forms of interaction. In short, social studies teachers should facilitate student knowledge construction through critical inquiry pedagogy. Students of all social, racial, gender, and cultural backgrounds need and deserve a curriculum that cultivates the construction of democratic ideas of equity and social justice.

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<u>**Sub Theme - 4**</u>
<u>**Practicing Constructivism**</u>

Constructivist Lesson Planning: Theory and Practice

Dr. A. Ramakrishna * & Ms. Sonia Sawhney **

Abstract

This research article aims at developing a constructivist lesson plan in biology for high school students. Though the teachers are familiar with the concept of constructivism, they face difficulty in organizing a class. This is probably due to the reasons such as extensive preparation, availability of resources – infrastructure and instructional and above all professional excellence involved in conducting a constructivist lesson in classroom. Authors through this study explore the ways and means of organizing a constructivist lesson and illustrate a lesson in action which was held during the student teacher's internship.

Introduction

Learning is not complete unless it is beneficial to the learners in their daily life. Lesson planning in the B.Ed. course is based on Herbartian Approach developed many decades ago. Till today, we are following this approach for lesson planning. Now, when our country has come up with reforms in Education (School & Higher levels), it is apt to take a cue from the latest Educational policies in vogue so as to keep our citizenry abreast and empower them to meet the demands of the society.

Developments in Constructivism

The concept of constructivism has its roots in Socratic Dialogue. Then, Jean Piaget and John Dewey's contribution led to the evolution of constructivism. Lev Vygotsky introduced social aspect of learning while Jerome Bruner initiated curriculum change based on the notion that learning is active, social processes in which students construct new ideas or concepts based on their current knowledge. Constructivist environments (using ICT) were dramatically changed with the groundbreaking work of Seymour Papert.

Today, Constructivist approach is widely discussed and used in may of the schools. National Council for Teacher Education (NCTE) and National Council for Educational Research & Training (NCERT) in their documents for curriculum revision emphasized the construction of knowledge. This is possible when a teacher uses constructive lesson planning.

Simple put, constructivist learning is based on students' active participation in problem-solving and critical thinking regarding a learning activity which they find relevant and engaging. The emphasis is on integrating already existing approaches with alternatives presented

by other team members, research sources or current experience. Here, pre-existing views and approaches regarding a concept is balanced with new ones through trial and error thereby constructing a new level of understanding. A teacher in the true sense is a facilitator and coach while also being a co-learner who guides students while stimulating and provoking their critical thinking. To do this a constructivist teacher uses the following techniques in the teaching process –

- *Inquiry*: Prompt students to formulate their own questions;
- *Multiple Intelligences*: Allow multiple interpretations and expressions of learning;
- *Collaborative learning*: Encourage group work and the use of peers as resources.

Constructivist Learning Design

The above mentioned techniques require a constructivist learning design which emphasizes six important elements of teaching and learning process. These are:

1. *Developing a situation*: Teacher has to develop a situation for the students related to the learning process.
2. *Grouping*: It involves grouping of students and learning materials
3. *Bridging*: This is done to developing a bridge between what the students already know and what they are expected to learn.
4. *Questioning*: Herein the teacher anticipates questions to and from the students. For this the class needs to be prepared accordingly.
5. *Exhibiting*: It includes encouraging students to exhibit a record of their thinking by sharing their knowledge in the class.
6. *Reflecting*: Here the teacher has to solicit the student's reflections on their learning.

A teacher's decision regarding the kind of approach to be used for planning their lessons depends on factors such as the type of content; availability of resources; teaching; presentation and communication skills of teachers; constraint of time and so on.

Objective

The main objective of this research article is to develop a constructivist lesson plan in Biology for high school students.

Methodology

One of the students constructed the following lesson plan under first author's guidance and taught in the school during internship.

The first few aspects such as Preliminaries, Objectives and Specifications, and Teaching Learning Points are similar to a Traditional Herbartian Lesson plan. Preliminaries include the details of the name of the student teacher, name of the school, date, period, duration, subject, unit, topic, teaching aids and references. The objectives and specifications area deals with the purposes of teaching learning in terms of cognitive, affective and psychomotor domains with the specific aspects of behavioural outcomes. Then, teaching learning points discuss the content given as concepts.

The steps of the constructivist lesson plan are:

1. *Engagement:* The main emphasis here is to stimulate curiosity and activate previous knowledge of the students. Questions are raised wherein students are motivated to discover more about the concept.
2. *Exploration:* Here the students actively explore the concept through hands-on-activity. This allows the students to share ideas about the concept.
3. *Explanation:* New scientific terms are explained during the discussion. The most important step wherein the explanations based on observations enable them to construct new understanding and have a clear focus for additional learning.

4. *Elaboration:* During interaction, students are encouraged to apply, extend and enhance the new concept and other related terms. This provides additional active learning opportunities and to conform to mental constructs which expands their understating.

5. *Evaluation*: Here the students' progress reflects their understanding of the concept. This also enables the teacher to know the additional experiences required for the student to construct knowledge as well as to refine understanding of the concept.

Conducting a constructivist lesson in the classroom

The classroom is organised with five tables and six chairs per table for students to begin the first activity of 'engagement'. Or else the conventional classroom be organised so as to arrange / seat six or seven students facing each other. They are given specimens of plants and models of animals. Five minutes are allocated for the students to understand the concept "Economic Importance of Plants and Animals". Later, the lesson proceeds as given in the next page.

Discussion

Feedback regarding the effectiveness of constructive lesson planning was obtained from IX class students and the pre-service teacher who had practiced the above lesson. Students felt very happy and showed keen interest towards the topic. As the way of teaching was different from traditional Herbartian lesson plan, they were more interested and enthusiastic to know more about the subject. Through this innovative type of teaching a teacher while providing knowledge about the subject can simultaneously relate the knowledge to its utility in daily life. A teacher can develop moral values among the students. A teacher can exhibit inherent talents through this type of constructive lesson plan. The benefits of constructivism are:

1. Students learn more and enjoy the activities.
2. It concentrates on learning how to think and understand.
3. Learning in these situations is transferable.
4. It gives students ownership of what they learn, since learning is based on students' questions and explorations, and often students have a hand in designing the assessments.
5. Students in constructivist classrooms learn to question things and to apply their natural curiosity to the world.
6. It promotes social and communication skills by creating a classroom environment that emphasizes collaboration and exchange of ideas. Critics of constructivism raise the question of its applicability to disadvantaged children, who lack resources of the elitist group, as they only benefit from explicit instruction. Further, a few students' voices or interpretations dominate the group's conclusions in social constructivism producing a 'tyranny of the majority'. A study reported that students in these classrooms lag behind those of traditional type in basic skills.

Conclusion

Any theory would have merits and demerits, advantages and disadvantages, certain limitations. In case of constructivist lesson planning, the teacher needs to decide what content and skills can be taught through conventional and what content and skills through constructivist mode. As the benefits of using constructivist classroom learning design outweigh that of traditional type, teachers have to prefer constructivist mode of teaching provided the students are motivated, availability of infrastructure and text material and so on. Above all, the most important is the aptitude or inclination of teachers to excel in professionalism.

CONSTRUCTIVIST LESSON-PLAN

Steps	Teacher's activity	
1. Engagement	Teacher keeps cereals, pulses, oil seeds, sugars, spices, drugs, fibres, coir, timber, resins, gums, fruits, vegetables, dyes, meat, skin and fur, eggs, wax, silk, honey and lac on the table. 1.Name the living resources of nature. 2. What type of resources are these plants and animals?They can be produced as quickly as it is used – when you cut few branches / pluck few leaves / flowers of a plant. 3. What do you call plants present in a region? 4. Similarly, name the animals present in a region?	
2. Exploration	Teacher allows the students to feel the things provided on the table. 1.How are plants useful to us?Gum is the solid form of the liquid oozed out from gum plants. 2. How are animals useful to humans?Lac is obtained from lac insects.	
3. Explanation	Teacher asks the students to see what's in their lunch box. 1.Your lunch box has rice and red gram. 2. How do we obtain rice, rye, green gram, black gram, beans, etc? 3. How are these prepared by plants? 4. Since the plants prepare their own food, what do we call them? 5. How are animals helpful to us?	
4. Elaboration	1.What are the uses of wood? 2.How do you obtain wood? Teacher displays a chart showing different types of wood: 3.Name some trees which provide hard & strong timber . 4.What is the use of sandal wood? 5. What is this? 6. How do you obtain coir? 7. Which plants yield coir? 8.How is cotton different from coir? 9.Name a few fibre yielding plants.	

CONSTRUCTIVIST LESSON-PLAN

	Pupils' activity	Tea./Lear.Resources
	Students are curious to know about these things as is reflected on their facial expressions / murmurs / taking to each other themselves. 1. Plants and animals 2. Renewable resources. Why are they called renewable? 3.Flora 4.Fauna.	
	Students take things on the table into their hands and explore their familiarity. 1.Plants provide us cereals, pulses, oil seeds, sugars, spices, drugs, fibres, coir, timber, resins, gums, fruits, vegetables, dyes, etc. Is the gum in this bottle, a plant product? 2.Animals give meat, skin and fur, eggs, wax, silk, honey, lac, etc. How is lac obtained?	
	One student opens a lunch box and asks 1.What kind of pulse is this food made of? 2.We obtain rice, rye, green gram, black gram, and beans from plants. 3.They are prepared through Photosynthesis with the help of solar energy in the presence of carbon dioxide and chlorophyll. 4.Primary producers. 5.We obtain meat, milk, skin and fur from animals. One student shows curd rice that he brought for lunch.	Samples of rice, rye, green/black gram, beans, ground nut, mustard, sugar, pepper, cloves, cinnamon, etc. Models of Sheep, buffalo, hen.
	1.Wood is used for construction of buildings, boats, furniture, toys & sports goods, packing. Tables, chairs and board are made of wood. 2.As plants become old, cells in stems are strengthened by secondary growth deposits. Students identify different types of wood: 3.Teak, sal, neem, deodar, dalbergia, pine. 4.Making perfumes & talcum powder. 5.Coir. 6.Long thread like material taken from bark, stem, leaves and fruits. 7.Coconut, palm, date plants. 8.Cotton is called fibre & it is more flexible & soft than coir. 9.Cotton and jute.	A piece of wood. chart - different types of wood A piece of sandal wood. A bunch of coir. A boll of cotton.

Steps	Teacher's activity	
	10.What are the uses of fibres and coir?	
	11.Identify these specimens.	
	12.What are the uses of tulasi and neem leaves?	
	13.What are the uses of skin and fur?	
	14.Which other products are obtained from animals? 15.Name the oil obtained from animals.	
	16.What types of human activities endanger the plant & animal species?	
	17.Which methods are adopted for preservation of flora & fauna?	
5. Evaluation	1.What have you learnt from this lesson?	
	2.Can you show me what you have learnt through charts, collections or drawings?	
	3.What do you understand about plants & animals?	

Summary of the Lesson

Plants and animals present in a region are called flora and fauna. Plants are called primary producers. They give several products like cereals, pulses, oil seeds, sugars, spices, drugs, fibres, coir, timber, resins, gums, fruits, vegetables, dyes and so on. Animals provide meat, skin and fur. These are renewable resources and are to be used judiciously.

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Pupils' activity	**Tea./Lear.Resources**
10.Coir is used to prepare ropes, mats and stuffing material in pillows, mattresses and sofas and seats while fibre is used for making garments, paper & cardboard. 11.Tulasi and neem. We have these in our school garden and at home. 12.They are used in medicines. My mother gives me to chew tulasi leaves for stopping cough. 13.Skin is used to prepare leather which in turn used for making garments, footwear, belts & toys. Hair is used for making wool & brushes. 14.Oils, wax, silk, honey and lac. 15. Cod liver oil. I took cod liver oil when I was very young to grow taller. 16.Deforestation, overgrazing, conversion of forest land to agricultural land & agricultural land to house or industrial plots, indiscriminate killing of animals for their products & pollution. 17.Afforestation, preventing overgrazing, proper land management and so on.	Tulasi and neem leaves
1.One student says that plants and animals are important in our daily life. Another student replies that what we eat, wear is all got from flora and fauna. Third student says we should use all these resources judiciously. 2.One student says – I will collect these and other plants from my home and bring to the class tomorrow.Another student says – I will draw these animals on the chart.Yet another student says – I will bring cloth, honey, a wooden toy, an egg and milk. 3.Plants & animals are renewable resources and are to be used judiciously and carefully. If proper care is not taken, these may disappear totally from earth's surface.	

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<u>**Sub Theme - 4**</u>
<u>**Practicing Constructivism**</u>

Teaching of History through Constructivism

Ajit Kumar Bohet *

═══════════════╣ *Abstract* ╠═══════════════

History as a field of study is a very lively discipline. It is full of imagination, creativity, as well as controversy. History is a bridge connecting the past with the present and pointing the road to the future. But, the methods which are used to teach this lively subject are not capable enough to create an interest for the subject among the students. Constructivism is a way through which the subject can be really fruitful for the students. Present article focuses on the constructivism as a learning theory for teaching the subject like "HISTORY". How constructivism can be used in the history class? How can it be benefitted for the students?

Introduction:

History is that, which happened in the past and it is the intellectual reconstruction of these happenings at a subsequent time *(John Dewey, 1990).* Past influences our present in many ways. In fact, our present is the sum total of achievements, aspirations, and frustrations, that our forefathers experienced in the by-gone ages. *E. H. Carr (2008)* explained that "history is a continuous process of interaction between the historian and his facts, unending dialogue between the present and the past." The importance of history is in its capacity to help one to draw conclusions from the past events. It sheds the light of the past upon the present. History enables one to grasp one's relationship with in one's past. That's why History is a major subject taught at school. We can't neglect the study of history because it enables students to settle themselves in time and place and it makes them acquire knowledge in humanity. It builds a critical mind to students and helps them to understand the world in a meaningful context. History gives the opportunity to understand the world and society; it helps pupils to understand why and how the world that surrounds us has changed because the past causes the present and so, the future.

The importance of history is in its capacity to help one to draw conclusions from the past events. The value of history, in fact, is looked upon from diverse perspectives. *Report of National Advisory Committee, 1993 (Yashpal Committee)* found that the aim of teaching history is defeated in schools because children are not enabled to relate to their own heritage as history is presented in the form of packed boxes

of information which has no scope for critical thinking. The study of History should enable the children to form an overall picture of the 'whole' of India and enable the students to analyze, understand, and reflect on the problems and priorities of socio-economic development *Kothari commission (1964-66)* desired to use history to promote critical thinking, national integration as well as moral and spiritual values. The Commission emphasized that there would be no contradiction between the general educational task history shares with other fields of study and the special one assigned to it. But when we come to the question of teaching History in schools, we have to see that the eagerness of men to learn about his past should be so channelized that helps the child in many other ways. It is not to overemphasize the importance of history when we say that history teaching is capable of adding many more feathers to the overall personality of a student: History should be taught with the intent of enabling student better understand their own world and their own identities came into being shaped by a rich and varied past. History helps to discover processes of change and continuity in their world and to compare ways in which power and control were, and are exercised.*"(NCF 2005)*

Burston and Green (1962) said that "the problem for historians and the history teacher is how to demonstrate the relevance of history to the present in a sufficiently convincing manner to gain the interest of the students". This is as true today as it was in 1962. One must look for opportunities to relate the past to the present and the future so that students can 'see the point' of learning about the past. In the present educational scenario the whole system is emphasizing on memorizing knowledge. Rote learning is the order of the day, then how can history

teaching be untouched. During the teaching learning process in history memorizing historical facts, dates, and causes of events is emphasized so much that this is all that we perceive as history teaching. Nobody cares of what and how much has been understood by the students and as a result history becomes boring, uninteresting, and a burden for students. Students are consequently not able to relate historical knowledge with their lives and their own experiences. Using constructivism while teaching history can be very helpful in this context as this learning theory gives ample space to the students to construct their own knowledge.

Constructivism

Constructivism is a theory which regards learning as an active process in which learners construct and internalize new concepts, ideas, and knowledge based on their own present and past knowledge and experiences.

- It says that people construct their own understanding and knowledge of the world, through experiencing things and reflecting on those experiences. Knowledge is constructed rather than received.
- Constructivism is a view that emphasizes the active role of the learner (who understands and makes sense of information).
- It is basically a theory based on observation and scientific study about how people learn.
- When learners encounter something new, they have to reconcile it with our previous ideas and experiences to make the concept relevant.

Teaching-Learning process:

John Dewey (1956) believed education must engage with and expand experience; those methods used to educate must provide for exploration, thinking, and reflection; and that interaction with the environment is necessary for learning.

Dewey advocates the learning process of experiential learning through real life experience to construct and conditionalize knowledge, which is consistent with the Constructivists.

- 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.
- 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.
- Learning is contextual. One do not learn isolated facts and theories in some abstracts airy land of mind separate from rest of our lives, learner learn in relationship to what else he/she know, what he/she believe, his/her prejudices and fears.
- People learn to learn as they learn. Each meaning the learner construct makes his/her better able to give meaning to other sensations which can fit into similar pattern.

Teaching of History through Constructivism

Constructivism is a broad theory with a variety of perspectives. However the basic tenet of constructivism is that learning is an active process where the learner constructs knowledge rather than acquiring it. The emergence of an inquiry-based approach to history education along with the new opportunities made possible by advances in technology, have made constructivist approaches quite applicable in today's history classroom. There is a growing emphasis in history education on students being able to construct and analyze historical knowledge. Some of the ways through which constructivism can be made applied to the history classroom, are as follows:

- Students learn from experience from the constructivist view, a main function of the teacher is to shape those experiences. For example, sending students to an archive for an hour might not be the most productive way for them to learn how to construct an historical knowledge. While students learn from experience from the constructivist view, a main function of the teacher is to shape those experiences.
- Modeling how to construct an historical knowledge is also an important role of the history teacher. While an inquiry approach to history education is on the upswing, many students have been taught to simply recall facts. Students should inquire about the past, but history teachers still need to provide background materials for students.
- Problem-Solving is an important skill to develop at school level as it is needed and used everywhere in our life. Constructivist methods focus on developing this skill in the students to help them become better learners. History is a subject which can provide students with this opportunity as students have to critically examine each fact and information and then draw conclusions which are relevant. History develops the skill of selecting relevant fact to support their argument or to solve the problem.
- By directing the students to history that is more relevant to them (modern history) the lesson will be learnt without any undue friction. One constructivist technique is to have the students write their own narrative history in addition to those written by others. By incorporating their lives as examples, then important incidents events (for example Indian Freedom struggle) of the historical past should be easier understood by the students.

- Teacher can present lots of information and facts in front of the learners and asked them to think critically and draw conclusions or classify the information. In order to make the process of learning participative, debate and discussion should be used rather than imparting the information.These types of activities definitely help learners to think and argue themselves to defend their place. It will provide them with an opportunity to think about the facts. For e.g. a field visit to National museum can be planned to discuss about Harappa Civilization instead of showing pictures of the materials of that time. This will provide firsthand experience to learners as they can observe themselves and draw conclusions.

- Visiting to the various historical monuments is more fruitful for learners instead of sitting in the classroom and studying about it. Students of elementary school are taught about the architectural designs of the monuments, pictures are drawn on the blackboard, but all these things are waste of time as it will not capture student's interest. They can be given an opportunity to physically go and observe the architectural designs so that they can create meaning themselves and curiously find out the answers of all the queries. It will also provide them a chance to think how these designs are created? Can there be any another way of designing these monuments? Why are these monuments still relevant for all of us? Learners can explore answers to these types of questions themselves if they are provided the opportunity and it will surely create an interest for the subject.

- History is a subject which cannot be experimented again and again to provide students with the firsthand experience so it is very necessary to draw relation between the lives of the learners and the content. Local and oral history should be incorporated in the curriculum so that children are able to relate with it and it can only be done if constructivist pedagogy is being used as it stressed on the connections of content with the previous background of the students.

- Collaborative learning is the right hand of constructivist paradigm and historical knowledge is constructed through collaborative learning as learners argue with in themselves and try to find out the correct and relevant facts which are related to their lives.

Thus, there are lots of ways through which constructivism can be applied to the history classroom.

Conclusion:

The theory of constructivism is not a prescription for how to teach, but rather provides a useful way for teachers to think about their practice because it is the teaching practices which do not let the students think themselves and find out the answer to the queries. History is a major subject at school level but the teaching methods which are used to teach the subject make it uninteresting and irrelevant for the students. The main problem is not history itself but the way history is taught. The study of history can be fun by using the local community resources like monuments and museums. The classroom interaction will be enhanced and communications will be widened for the purpose of visualization, observation, and critical thinking of the students. This will enable them to create knowledge on their own so as not to feel that history is an unpleasant subject.

Constructivism can solve these issues as it will handle history according to the cognitive level, interest, and pace of the students. Learning in the constructivist history classroom is based on the prior knowledge of the students. Historical facts create disequilibrium in the

student's mind and this state of mind motivates the learner to explore an answer. Students explore and reflect themselves and thus learning is long lasting. Constructivism provides students to observe and inquire the firsthand information and then an opportunity to reflect upon it. This paradigm definitely creates an interest among the students for the subject. So, it can be concluded that applying constructivism in the history classroom is not difficult but it strongly requires motivation from the teacher to change his teaching methods as well as to think differently from the learner's point of view.

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<u>**Sub Theme - 4**</u>
<u>**Practicing Constructivism**</u>

Constructivist Learning Approach for Enhancing Academic Achievement of Seventh Class Students in Science

Dr. S. Pany * & Ms. Gayatri

Abstract

The present study has been conducted to assess the effectiveness of Constructivist Learning Approach in enhancing Academic Achievement of Seventh Class Students. For this purpose non equivalent control group design of quasi experimental research was followed. A sample of 80 students consisting experimental and control groups each of 40 was taken for the study. From the analysis of the obtained data it is concluded that the constructivist learning approach has significant impact on the academic achievement of the learners and the traditional method of teaching has no significant impact on the academic achievement of the learners.

Introduction

Teaching is no more concerned with the mere process of imparting knowledge rather it is the process of generation of knowledge through the active interaction of children among themselves and the teacher as a facilitator. The traditional model of teaching based on objectivist paradigm has been shifted towards constructivist paradigm with the assumption that knowledge is subjective and children construct knowledge themselves in a free and fearless environment.

The pioneers in the field of constructivism like *Piaget, Vygotsky* and *Novak* have propounded different theories on constructivism. According to *Piaget* children construct knowledge individually, *Vygotsky* believes that children construct knowledge through social interaction and according to *Novak* children construct knowledge through classroom interaction. Analysis of all these viewpoints reveal that knowledge construction is beyond from imposition of pre fixed ideas rather it is the free interplay of ideas and feelings about concepts. Constructivism is not a way of teaching rather it is a theory of learning based on the proposition that the children learn actively by means of creating, interpreting and reorganizing knowledge in a collective way. Here interaction among the children is the main focus. The teachers have to provide a very authentic learning situation where the children can be involved in inquiry activities, problem solving discussions with peers and discovery etc. Now in our country teachers are focusing on it since it has been highlighted by national Council of Educational Research and Training (NCERT) in its National Curriculum Framework (NCF) in terms of a paradigm shift from rote memory to Learning by

understanding. Very few research evidences are there with regard to the application of constructivist learning approach in Indian classroom set up. *Padmanabhan* and *Rao (2011)* in their study reported the positive impact of constructivist approach in enhancing the problem solving ability of class 7th students in science and *Nayak (2012)* conducted a study on effectiveness of Constructivist Approach on Learning process, Learning Achievement in Mathematics and Creativity of Primary School children in which the investigator reported the effectiveness of constructivist approach in enhancing the academic achievement of children in mathematics. But this area need a very urgent attention of all because it can go a long way in proving real education to the children and we can regain the fame that our Indian brains are superior to others.

Objectives

The objectives of the present study are as follows;

1. To study the impact of teaching of science through constructivist learning approach on academic achievement of the seventh class students.
2. To study the impact of teaching of science through traditional method of teaching on academic achievement of the seventh class students.

Hypotheses

The study proceeded with the following hypotheses;

H_1 There exists significant difference on the impact of teaching of science through constructivist learning approach on academic achievement of seventh class learners.

H_2 There exists significant difference on the impact of teaching of science through traditional method of teaching and academic achievement of seventh class learners.

The Research Design

The design of the study was non-equivalent control group design of the quasi-experimental type. This design has been employed to study the impact of teaching of science through constructivist learning approach on academic achievement of seventh class learners of district Mandi, Himachal Pradesh.
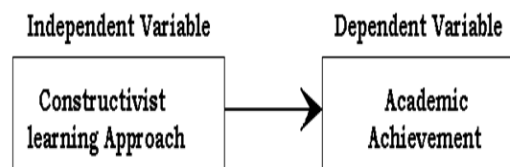
The Sample

Out of 140 secondary school of Mandi district the investigator purposively selected ten secondary schools those were more or less apparent in nature with regard to their nature of management, infrastructure, teacher strength, student strength, year of establishment and student result etc. Out of these ten apparently equivalent schools the investigator randomly (by lottery method) selected two schools for the purpose of experimentation.

As such the seventh class learners of the Government Secondary School, *Kanaid* were taken as the subjects of the experimental group and seventh class learners of Government secondary School, *Chambi* were taken as subjects of control group.

The number of subjects of the experimental group and control group was 40 and 40 respectively.

The Tools

In the present study the investigator used parallel forms of self made achievement test in the subject of science.

The two parallel forms of the achievement test were directed to experts checking and confirmation for getting their approval regarding its authenticity and classroom applicability. Each parallel forms of self developed achievement tests constitute three parts covering a variety of items.

The Treatment

Both of experimental group and control group were pre-tested and the treatment is given to experiment group. The students of Government Secondary School, Kanaid i.e. the experimental group were taught by the investigator through constructivist leaning approach. The treatment of teaching through the respective approaches, to both the experimental group and control groups were conducted by the investigator and the regular subject teacher of the controlled school respectively. The investigator herself did not taught the subjects of the control group in order to avoid the carry over effect. The investigator supervised the teaching of the regular teacher. The details of pre and post tests to both the experimental and control groups are discussed in succeeding section.

Procedure of Data Collection

Governement High School, Chambi was taken as the control group for present investigation. All the 40 students of class seventh of this school constituted the sample of control group. The achievement Test was administered to control group to assess their status just at the beginning of the experiment. On the same day in the afternoon session same achievement test was administered to 40 students of Government Secondary School Kanaid taken as experimental group. After the conduction of pre-test, from the next day, control group was taught through old traditional method of teaching by their regular classroom teacher. As per the request of investigator the regular class teacher prepared lesson plans on five chapters for implementation. These lesson plans were verified by investigator prior to implementation. From the same day 40 students of the Experimental group were taught by investigator through constructivist learning approach. One period of school

Table 1

Design of the teaching programme on the science subject and testing to both the experimental and control groups

Pre test	Content	Post test
Achievement test in Science (Developed by the investigator)	1. Heat 2. Fibre to Fabric 3. Physical and Chemical changes 4. Soil 5. Electric Current and its effects 6.Water : A precious Resource 7.Animal Respiration 8.Plant Respiration 9.Living and Non-Living beings 10.Magnet	Achievem-ent test in science (Developed by the investig-ator)
Part I – Multiple choice Type of questions.		Part I - Multiple Type choice of questions.
Part II – Open ended question.		Part II – Open ended question.
Part III – Concept Mapping based questions.		Part III – Concept Mapping based questions.

time table was devoted to teach each topic. As such, as a whole eighteen teaching days were spent to teach all the topics under the respective five chapters. At the end of teaching the post-test was administered to both groups. A minimum gap of 4 weeks was maintained between the successive administration of pre-test and post-test.

Statistical Techniques Employed

The collected data were analyzed with regard to finding out the initial difference if any between the pre-test scores of both the groups on each dependent variable. In order to test the normality of distribution of the data at the pre-test level the descriptive measures of statistics like Mean, Median, Mode, Skewness,

Kurtosis were applied and to test the impact of the independent variables the inferential statistical measure 't' test technique has been used.

Analysis and Interpretation

A. ***Analysis of pre-test scores on academic achievement of both the control and experimental groups***

The Table-2 shows the descriptive measures of the pre-test scores of the subjects of control and experimental groups indicate that the values of mean, median and mode of both the groups are very close to each other indicating the scores to have been distributed almost normally. Moreover, the obtained values of skewness and kurtosis in case of the control group being -1.75 and 0.278 respectively are very close to such values needed in case of a normal distribution of scores, that is, 0 and 0.263 respectively. Therefore, the investigator can safely conclude that the groups are more or less equivalent in nature and the construct value is approximately normally distributed in the sample.

On the other hand the pre-test scores of the experimental group on academic achievement show the values of mean, median and mode to be 44.1, 44.5 and 45.3 respectively. Such values indicate that though both the mean and median values appear to be almost very close to each other but the value mode seems to deviate slightly. However, the skewness and kurtosis values of the distribution being -1.15 and 0.274 respectively appear to be very close to the corresponding values as required in case of a normal distribution.

From the forgoing discussion it may be concluded that the pre-test scores on academic achievement of the control and experimental groups are almost normally distributed. Hence, the statistical technique of 't' test may be applied to study the significance of difference between the means of the control and experimental groups. The results of the pre-test scores concerning the difference in the academic achievement of the subjects of control and experimental groups obtained through t test are presented in table-3. An analysis of the data reveals the t value of 0.04. In the present case the obtained 't' value being 0.04 is found not significant at 0.05 level.

Table-3

Significance of mean differences of pre-test academic achievement scores of both control and experimental groups

Groups Tests	N	Mean	SD	df	t
Control Pre	40	43.95	13.57	79	.04
Experi. Pre	40	44.1	13.70		

Therefore, it may be interpreted that the initial mean differences that exist between the control and experimental groups with regard to academic achievement is not significant. As such, both the groups may be considered to have almost equal level of academic achievement. In other words, both the groups may be considered to be equivalent so far as their academic achievement is considered.

B. **Impact of constructivist learning approach on academic achievement of experimental group**

The following table shows difference of mean scores, standard deviation and 't'

Table- 2

Descriptive measures of the pre-test scores on academic achievement of both the control and experimental groups.

Groups	N	Mean	Median	Mode	SD	Skewness	Kurtosis
Control	40	43.95	44.5	45.6	13.57	-1.75	0.278
Experimental	40	44.1	44.5	45.3	13.70	-1.15	0.274

value of experimental group at pre-test and post-test level.

Table-4

Significance of difference of mean scores on academic achievement of experimental group at pre-test and post-test level

Tests	N	Mean	SD	df	t
Pre	40	44.1	13.7	39	2.36*
Post	40	50.85	11.89		

* Significant at 0.05 level

From the above table 't' value for the pre-test and post-test of experimental group was found to be 2.36 which is more than table value of 't' i.e. 2.02 at 0.05 level of significance for df 39. Thus the obtained value of 't' is significant at 0.05 level of confidence. Thus it shows that learning with the help of constructivist approach has positive impact upon academic achievement and as such the hypothesis i.e. *"There exists significant difference on the impact of teaching of science through constructivist learning approach on academic achievement of seventh class learners"* is accepted.

C. **Impact of traditional approach of teaching on academic achievement of control group**

The following table shows difference of mean scores, standard deviation and 't' value of control group at pre-test and post-test level.

Table-5

Significance of difference of mean scores on academic achievement of control group at pre and post-test level

Tests	N	Mean	SD	df	t
Pre	40	43.95	13.57	39	0.15
Post	40	44.4	13.11		NS

From the above table 't' value for the pre-test and post-test of control group was found to be 0.15 which is less than table value of 't' i.e. 2.02 at 0.05 level of significance for df 39. Thus the obtained value of 't' is not significant. It shows that teaching through traditional approach does not put any impact on the academic achievement of control group that means the hypothesis i.e. *"There exists significant difference on the impact of teaching of science through traditional method of teaching on academic achievement of seventh class learners"* is rejected.

D. **Comparative Impact of Constructivist Learning Approach and Traditional Approach on Academic Achievement**

The following section deals with the comparative impact of constructivist learning approach and traditional approach of teaching on dependent variable academic achievement. As such the scores obtained in case of the post test of both the control and experimental group have been presented in the following table-6

It is evident from the above table that the obtained 't' value is 2.31which is more than the table value of 't' i.e. 2.02 at 0.05 level of confidence for df 39.

Table-6

Significance of mean differences of post-test academic achievement scores of both control and experime. groups

Groups Tests	N	Mean	SD	df	t
Control Post	40	44.4	13.44	79	2.31
Experi. Post	40	50.85	11.89		

Thus, the obtained 't' value is significant at 0.05 level of confidence. This indicates that the traditional and constructivist learning approach has significant impact on the academic achievement of the students of both experimental and control group.

Major Findings of the Study

From the analysis of the obtained data we can conclude that;

i. The constructivist learning approach has significant impact on the academic achievement of the learners.

ii. The traditional method of teaching has no significant impact on the academic achievement of the learners.

Conclusion

It can be concluded that constructivist learning is more effective for he development of academic achievement than traditional lecturing methods. It also shows that constructivist learning approach is one of the potent ways of imparting science education and communicating science and technological advancements in the integrated and holistic manner.

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<u>**Sub Theme - 4**</u>
<u>**Practicing Constructivism**</u>

Teaching Economics through Constructivist Approach

Dr. Kartar Singh *

Abstract

Constructivism is based on the idea that learner constructs knowledge on the basis of his/her previous knowledge in real world. Constructivism is basically a theory of learning which is based on the principle that knowledge cannot be supplied but it is generated in the mind of learners on a given environment. It recognizes that the role of a teacher in the constructivist classroom is as a guide, facilitator, supervisor, motivator, manager etc. Learners need autonomy in the teaching-learning process in the classroom. The constructivist approach (Problem Solving) is used to teach a topic of economics; price rise. It is the need of present time to ensure quality in education.

Constructivism

The basic idea of constructivism is that the learner constructs knowledge; the teacher cannot supply it. Constructivism is one of the theories of learning based on the idea that knowledge is constructed by the learners based on their life experiences. Learners are considered to be actively seeking meaning from the various situations based on their potential and perceptions. Driver and Easley (1978) states that interventions provided in the classroom can help children to construct their own concepts. They believed that learners construct knowledge on the basis of their prior knowledge and personal experience. The National Curriculum Framework (2005) also recognizes that. "In the constructivist perspective, learning is a process of the 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." It is clear that constructivism is the need of present time to ensure quality in education.

Principles of Teaching through Constructivist Approach

Constructivist teaching is based on constructivist learning theory. Constructivist approach to learning is the contribution of the Gestalt psychologists and other cognitive and social psychologists like Piaget, Vygotsky, and Bruner etc. It believes that learners construct their own knowledge on the basis of their prior knowledge and interaction with the environment all alone or in a group quite independently or assisted or guided by their teachers, elders and knowledgeable peers for

attaining the desired learning outcomes in a given teaching-learning situation. The constructivist paradigm as advocated by Piaget and Bruner stresses that whatever gets in to the mind has to be constructed by the learner through knowledge discovery. This approach holds the view that learning is an active process in which learners construct new ideas or concepts based upon their current or past knowledge. Following are considered as principles of teaching-learning through constructivist approach:

• Learning should take place in authentic and real world environment.
• Learning should involve social negotiation and meditation.
• Content and skills should be made relevant to the learner.
• Content and skill should be understood within the framework of the learner's prior knowledge.
• Students should be assessed formatively, serving to inform future learning experiences.
• Students should be encouraged to become self-regulatory, self-mediated, and self-aware.
• Teachers serve primarily as guides and facilitators of learning, not instructors.

Characteristics of Constructivist Teaching

One of the primary goals of using constructivist teaching is that students learn how to learn by giving them the training to take initiative for their own learning experiences. The main Characteristics of constructivism are:

• Learners are actively involved in teaching-learning process.
• Classroom environment is democratic.
• Activities are interactive and learner-centered.

Teaching-Learning Environment of Constructivist Classroom

A constructivist classroom obviously operate in the backdrop of constructivist learning environments and key principles of constructivism. In the constructivist classroom, the focus tends to shift from the teacher to the students. The constructivist teacher sets up problems and monitors student exploration, guides the direction of student enquiry, and promotes new patterns of thinking. Brooks and Brooks (1993) states that a constructivist classroom should bear the following characteristics:

• Student's autonomy and initiative are accepted and encouraged.
• The teacher asks open-ended questions and allows wait time for responses.
• Higher-level thinking is encouraged.
• Students are engaged in dialogue with the teacher and with each other.
• Students are engaged in experiences that challenge hypotheses and encouraged discussion.

The constructivist learning is the present need. We need our pupils to become active and independent learners and discover of the knowledge instead of remaining passive listeners in the classroom. Constructivists suggest that learning is more effective when a student is actively engaged in the learning process rather than attempting to receive knowledge passively.

Constructivism theory differs from traditional approaches of teaching and learning in the classroom, the constructivist view of learning can point towards a number of different teaching and learning practices.

Various Constructivist Approaches of Teaching and Learning

There are many approaches which can be used as a constructivist approach some of them are:

• Concept Mapping
• Problem Solving
• Investigatory Approach
• Social inquiry Approach.

Before teachers apply above mentioned approaches in the classroom, they must ensure that these should not be grafted

on traditional methods of teaching; these need a change in the culture – a set of norms, attitudes, beliefs and practices that constitute constructivist culture.

An Illustration from Economics
1. Introduction.
Economics deals economic activities of mankind in ordinary business of life. It is the study of consumer behavior at micro level and national income and expenditure at macro level. The scope and importance of economics has been increasing day by day. Everyone is involved in economic transactions in his/her life. This subject is offered as a separate subject at senior secondary level and one of the subjects of social science at secondary level in many parts of the country. There are some challenges which our Indian Economy has been facing today like Poverty, unemployment, self-reliance, price rise etc. The problem of price rise is selected here to teach through constructivist approach. The topic is relevant for class XI th and at secondary level also.

2. Topic: Price Rise (Inflation).
3 Behavioral Objectives.
After teaching through constructivist approach pupils will be able to:
- State the meaning by price rise.
- List the factors responsible for price rise of essential commodities in an economy.
- Distinguish between demand pull and cost push factors.
- Explain the impact of price rise on Production of goods, employment and final consumers.
- Give short term and long term suggestions to overcome on problem of price rise.

4. Constructivist Approach:
Problem Solving.
According to Daughtrey (1974) "The problem approach attempts to examine all elements of a problem with a view towards finding the alternatives available, a workable solution". According to Callahan and Clark (1977) "The problem solving activity is one that requires thought and a search for solution which may be a generalization or a conclusion". It is clear from these two definitions that problem solving approach is that approach which solves of a problem after examining its elements systematically. This involves following six main steps:
- Identification and selection of a problematic topic.
- Formulation of objectives.
- Divide the class into different groups and assign them work with materials.
- Invite group leader from each group for presentation.
- Review of responses with teachers and students feedback.
- Generalizations.

5. Procedure.
After selecting the problem of price rise and formulation of objectives, you may follow the following steps:
5.1 Step-1. Divide students into five groups comprising 6 students in each group.
- **Group-1.** Assign the work of meaning by price rise. The focus should be on a continuous rise in the prices of essential commodities with a decrease in value of money and decrease in purchasing power of consumers.
- **Group-2.** Assign the work searching factors responsible for price rise. The focus should be on increase in money supply, low rate of interest, low cash reserve ratio, low bank rate, increase in cost of production, low supply of goods, hoardings etc.
- **Group-3.** Assign the work of identifying impact of price rise on supply of goods, employment and consumers. The focus should be on to produce more of goods, employ more labors and adverse impact on consumers.
- **Group-4.** Assign the work of exploring

short term measures to control price rise situation. The focus should be on equitable distribution of goods and actively control on black marketing and hoardings, increase in cash reserve ratio, increase in bank rate, increase in rate of interest etc.

- **Group-5.** Assign the work of exploring long term measures to control price rise situation. The focus should be on change in scale of production.

5.2 Step-2. Give 10 to 15 minutes to each group to complete the assigned work. Teacher may supervise the process of each group work and may encourage them for discussions along with his guidelines.

5.3. Step-3. Invite group leader from each group for presentation. The students of other groups may ask questions on their doubts and give some valuable feedback.

5.4 Step-4. Review the presentation of each group along with feedback and draw generalizations.

6. Conclusion. After the exercise the students will have known meaning of price rise, factors responsible for price rise, impact of price rise and measures to control the situation of price rise in economy. They will be more interactive to each other and more responsive towards the teacher. They would also like to study more of topics through constructivist approach.

Role of Teacher under Teaching through Constructivist Approach

Constructivist teachers pose questions and problems, and then guide students to help them find their own answers. Constructivist teachers encourage students to constantly assess how the activity is helping them gain understanding. One of the main roles of the teacher is to encourage learning and reflection process. Moreover, the role of teacher under constructivist teaching is observed as facilitator, supervisor, manager etc.

Role of Pupils

Students' role in the constructivist teaching-learning process changes from knowledge acquisition to knowledge construction. Student asks questions from teacher and other students' ideas, gives predictions about phenomenon, suggests activities to solve problems and discusses results. The student verifies and validates his/her own ideas. Constructivism allows academic freedom to students, encourages co-operative learning and sharing of thought among peers. They should be well behaved, obedient and regular towards their study.

Merits Constructivist Approach

- Achievement level of learners increase through constructivist teaching.
- Retention level of learners is high through constructivist teaching.
- Constructivism promotes social and communication skills by creating a classroom environment that emphasizes collaboration and exchange of ideas.
- Children learn more, and enjoy learning more when they are actively involved, rather than passive listeners.
- Education works best when it concentrates on thinking and understanding, rather than on rote memorization. Constructivism concentrates on learning how to think and understand.
- Constructivist teaching-learning develop ability in among learners to come up on solution of a problem with general consensus.
- Constructivism gives students ownership of what they learn, since learning is based on students' questions and explorations, and often the students have a hand in designing the assessments as well. Constructivist assessment engages the students' initiatives and personal contributions in physical models and presentations. 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.

- By grounding learning activities in an authentic, real-world context, constructivism stimulates and engages students. Students in constructivist classrooms learn to question things and to apply their natural curiosity to the world.
- Prompt students to formulate their own questions.
- Allow multiple interpretations and expressions of learning.
- Encourage group work and the use of peers as resources.

Limitations of Teaching through Constructivist Approach

- It needs skilled teachers to act as guide students on every aspects of learning experience.
- It needs co-operation of fellow teachers towards use of this approach.
- It needs positive and adaptive attitude of school principals towards use of this approach.

- It needs learner centered curriculum and classroom settings.

Summary

Accepting learner as constructor of knowledge and an active participant in the process of learning are the bases of constructivist teaching and learning. Constructivism is based on a type of learning in which the learner constructs knowledge. The teacher is seen as a facilitator of learning, where learners are permitted to move around freely, use of time is flexible rather than structured. In a constructivist classroom, the teacher assumes the role of a facilitator and guide. Students take the responsibility of their own learning. They question, state problems, design projects and discuss their results with others. Students construct knowledge and do not receive knowledge as passive learners. The use of constructivist teaching-learning depends on co-operation of fellow teachers and administrators of school system.

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Miscellaneous

E-Learning : Concept, Meaning and Scope

Dr. Vidya S. Bharambe *

Abstract

E-learning focuses on self-learning through electronic devices. It is an advanced concept which will provide students the appropriate support and atmosphere for self learning achieving maximum knowledge. E-learning takes place as a result of experiences and interaction in an internet environment. E-learning involves greater variety of equipment than online training or education. E-learning permits the delivery of knowledge and information to learners at an accelerated pace opening new vistas of knowledge transfer. Distance education provided the base of e-learning development. The major advantage is consistency that e-learning provides, e-learning is self paced and learning is done at the learners pace. The content can be re-repeated until it is understood by trainees.

Introduction

E-Learning focuses on self learning through electronics devices. It is an advanced concept which will provide students the support and atmosphere for self learning achieving maximum knowledge. For this, CD materials are to be provided properly. The CD for self learning should be made attaining quality and taking the individual difference into consideration also there is an important aspect attached to this that is advanced and complete facility for reference and resources viz. the facilities virtual library should be provided along with this CAL, CAI, CAT, Tele Conferencing and Video Conferencing technique should be utilized properly. Distant learning can form chat-groups and connect them for discussing by doing this the traditional method for providing knowledge, information which has many limitations will be illuminated and teacher training will be able to get latest and complete information, according to the capacity of teacher trainee.

E-Learning

It is a type of learning which takes place as a result of experiences and interaction in an environment. It is not restricted to a regular school day and can take place in a variety of location including home, school and community location. Example: library and cafe etc.

The delivery of learning, training and educational programmes by electronic means is E-Learning. E-learning involves the use of computer or electronic device such as mobile phone, in some way to provide training, educational or learning material.

E-Learning can involve a great variety of

equipments than on line training or education, for as the name implies, online, involves using the internet or an intranet, CD-Rom and DVD can be used to provide learning material.

Distance education provided the base of E-Learning development. E-Learning can overcome the limitations viz., timing, attendance and travelling difficulties.

State of E-Learning

E-Learning permits the delivery of knowledge and information or learns at an accelerated pace, opening new Vistas of knowledge transfer. Early adopters are companies that have tried to supplement face to face meeting demonstration, training classes and lectures with this technology. The adoption of E-Learning in all spheres-corporate, school, universities, etc. is low at present. The Indian market is not substantial when compared to international market.

E-Learning in India has been most successful in corporate segment where it is seen as a means of achieving business goals and motivating employers.

Although e-learning has potential in India, adoption has been slow and will need a major marketing and awareness efforts – Megha Banduni.

Changing Role of Teachers and the Classroom Environment with the Advent of E-Learning

Many words have been written about the internet and the possibilities for its use in e-education but little has been researched about how teachers effectively modify their practice to work in the new environment. It is just because, teachers in schools have teacher education qualification, which did not prepare them to be e-teachers. Being able to teach

Comparison of Conventional Learning and E-Learning

Conventional Learning	E-Learning
Students attend a school in their local community or attend a boarding or correspondence school.	Students participate from variety of location and may attend multiple learning institution or their local schools.
Classes are scheduled according to school hours and timetables.	Students may determine the school times when they access e-learning opportunities.
Students are directed to work individually or in groups.	Students can choose to work individually or collaboratively with people who may or may not be in regular classes.
Classes are synchronous and teachers and students interact in real time.	Classes may be synchronous o r asynchronous.
Students are generally enrolled with one school.	Students may take classes from more than one school.
Learning objectives are set by the teachers and institution.	Student may set their own objective and explore their own learning needs and agendas.
Teachers work in one school.	E-teachers can work more than one school.

confidently in one environment is not a precursor to success as an e-teacher in very different environment. The e-teacher, who is surrounded by rapidly changing e-environment and technology must at times feel like they are trying to change type on a moving vehicle. When exploring the challenge and changing role for e-teachers it is a little like encouraging them to be information and environment architect. The environment they create may well be totally being aligned with the work of regular classroom so that e-learning become an integral part of it. Alternatively it may be virtual classroom where the students only visit electronically.

E-Learning and it's Impact on Teachers.

The network environment of this new internet, connected world has expanded the opportunities for teaching and learning in ways that we are only beginning to understand what makes the implementation of e-teaching so challenging that we are asking teachers of the dot.com as to teach in way in which they have never be taught when they were at school. They will work in an environment in which they have never been learners and may have few first hand experiences.

Advantages of E-Learning

'Nothing can replace classroom traditional teaching, but e-learning complements the process and can help reach out the masses' *Gautam Goradia, Managing Director of remit tag Software Company.*

The biggest advantage of e-learning lies in teacher's ability to cover distances for an organization that is spread across multiple locations. Traditional training becomes a constraint as all the trainees need to come to classroom to get trained. The major advantage is consistency that e-learning provides, e-learning is self paced, and learning is done at the learners pace. The content can be re-

repeated until it is understood by the trainees. It can be made compelling and interesting with multimedia, and the trainee can be given multiple learning paths depending on his or her needs.

1. Electronic learning:-
• changes the way of imparting and receiving education.
• it eliminates barriers of time and distance.
• information through internet is easily available.
• accountable and reliable.

Today more than 70 million students are educated through internet.

2.It helps:-
• in increasing knowledge of the content.
• delivery of knowledge in multiple formats.
• management of learning experiences and network community of learner's and experts.

3.E-learning provides for:-
• faster learning.
• Re-search study, find that learning occurs 50% faster on-line than classroom.
• cost of education is 40 to 60% lower.
• any combination of subjects of learner's choice is possible.
• eliminates needless repetition of programmes and subjects content and organizational learning gaps.
• contents can be captured by using Slides, Audio, Video and CD's.

4.The systems of e-learning also can be worked out for
• Workshops, Seminars, Testing the capacity of learner, interaction with the teachers and group discussion.

Importance of E-Learning

The importance of e-learning can't be ignored as across the world, students have saved time, money and managed to get easy accessibility of the knowledge, irrespective of their place. E-learning solutions in business have improved their profitability. Students need not to spend

on travelling accommodation, food and high fees for tutor's.

With easy access, e-learning programmes have become more complex. New trends like the expansions of application are developed by constant training. Blended e-learning is also become the latest trend. To facilitate such programmes some companies are providing e-learning solutions. They have developed custom-made integrated e-learning content solutions in many languages and multi interactive forms of learning solutions.

Trends in E-Learning

It is clear that e-learning is a self learning with electronic devices, stimulation, gaming and interactivity are some of the trends which are popular in e-learning. These trends enrich e learning. Research shows that understanding and retention of students improves when they learn by experience technologies such as collaboration, interacting modeling, stimulations, virtual reality interfaces and gaming. It will help student to enrich their knowledge and develop life skills.

Conclusion

Aforesaid discussion clears that e-learning is an advanced concept. It focuses on self learning through electronic devices. It provides support and atmosphere for self learning achieving maximum knowledge. Its importance cannot be ignored. It saves time, money and students manage to get easy accessibility of e-learning solutions irrespective of their place. It changes the way of imparting and receiving education. So now it's the time we should accept e-learning and provide such facilities to our young ones.

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Miscellaneous

Impact of Music-Fused Teaching on the Performance in Mathematics of Students at College Level

Kirupa Kani, J. * & Dr. William Dharma Raja, B. *

Abstract

Music is a magical medium. It can impart a sense of stability, order, predictability, safety and creates a mentally stimulating environment for learning. If teachers can create an emotional connection between students and curriculum, the battle is almost won. Having this as the base, the investigators attempted to study the difference, between the conventional method of teaching and music fused teaching in terms of the learning objectives 'knowledge' and 'understanding' of college students in Mathematics. The study revealed that in the post test, although the two groups did not significantly differ but significant difference was found in the delayed post-test between the two groups in terms of the learning objective 'understanding'.

Introduction :

Music is intermingled as a magical medium in every aspect of life. It is a powerful aid to cure diseases, keep up mental health, motivates students for learning tasks and many more. If students actively involved in construction of knowledge through multisensory experiences, the learning environment will become more positive *(Sandra, 1997).* Music can impart a sense of stability, order, predictability, safety and creates a mentally stimulating environment for learning. It can create an atmosphere that encourages emotional well-being within a positive learning environment *(Campell, 1997).* Students can learn and recall better when the physiological states are matched. If students learn a material with a particular music at the background, they will also do better during test.

Staying focused for long period of time while sitting and studying or writing can be deadly. If background music is used, it will help the mind and body to be in an alternative state *(Brewer, 2004).* Music at the background can make the classroom soothing and calming, stimulating and engaging. It improves spatial-temporal reasoning, a neurological process needed to understand Mathematics *(Willingham, 2007).* Teachers know that if they can create an emotional connection between students and curriculum, the battle is almost won. Music and learning mathematics is a perfect match in this context.

The resume of reviewed researches reveals that although the findings of some studies *(Hoffman, 1995, Crosswhite, 1997, Kluball, 2001)* were not favour of music fused teaching, but in majority,

instrumental music has significant impact with reading *(Trent, 1997; Cardarelli, 2004; Eaton, 2007)*, language development *(Trent, 1997)*, and academic achievement in English and Mathematics performance *(Trent, 1997, Hallam, 2000, Whitehead, 2002, Vardareli, 2004, McLellend, 2005)*.

Significance of the Study

The teachers have to set their mind to innovative practices for the cause of making their wards to be good learners. Music can create an atmosphere that encourages emotional well-being within a positive learning environment. Having this as base, the investigators believed that music fused teaching of Mathematics will enhance learning. The investigators have chosen the piano music pieces to play in the classroom as they have minimum knowledge in playing and understanding piano with the belief that the attempt would be helpful to bring a pleasant situation in the higher education classroom.

Objective

The objective of the present study is:

i) To study the effect of musically fused teaching method over the traditional teaching method with respect to the performance of students in mathematics.

Hypotheses

i) There will be no significant difference between the control and experimental groups in the post-test with regard to the performance of students in mathematics.

ii) There will be no significant difference between the control and experimental groups in the delayed post-test with regard to the performance of students in mathematics.

Design of the Study

In this study, the post-test only equivalent group design was followed *(Best & Kahn, 2006)*. The control group and the experimental group were given conventional teaching and piano music intervened teaching of Mathematics. The treatment lasted for 15 days and both the groups were taught by the same teacher. Post-test is conducted on the very next day of the last class of the treatment and delayed post-test is conducted after 15 days from the post test.

Selection of Sample

In this study, the population is the under graduate first year college students studying Mathematics as major subject in the college affiliated to Manonmaniam Sundaranar University, Tirunelveli. Twenty two first year B.Sc. Mathematics students of Rani Anna Government College for women, Tirunelveli were selected for the study. They were equally assigned to control and experimental groups by intelligence test scores.

Tools Used

The tools used in this study were Achievement Test in Mathematics (ATM) and Ahuja's Intelligence Test. Achievement Test in Mathematics (ATM) was developed by the investigators. ATM is an objective type test with 24 questions covering the topic selected for the experiment.

Data Analysis

Arithmetic mean, SD and t-test for small sample independent variables were employed for data analysis.

Table 1

Significance of difference in Performance in Mathematics in the post-test between the control and experimental groups

Cate. gory	Group	N	Mean	SD	t-Value	Sig
Know. ledge	Cont.	11	53.5	20.9	0.638	NS
	Expt.	11	58.6	15.8		
Unders tanding	Cont.	11	64.2	7.9	1.066	NS
	Expt.	11	67.7	7.2		
Total	Cont.	11	60.7	7.1	1.135	NS
	Expt.	11	64.4	7.9		

Table 2
Significance of difference in Performance in Mathematics in the delayed post-test between the control and experimental groups

Learn. Obje.	Group	N	Mean	SD	t-Value	Sig
Know-ledge	Cont.	11	53.6	10.9	1.52	NS
	Expt.	11	60.6	12.5		
Unders tanding	Cont.	11	54.5	14.8	2.41	NS
	Expt.	11	69.9	15.0		
Total	Cont.	11	54.2	10.2	2.1	NS
	Expt.	11	66.9	9.9		

S- Significant NS-not significant

Findings

1. There is no significant difference in performance in Mathematics in the post-test between the control group and experimental groups.

2. There is no significant difference in the performance in Mathematics in the post-test in terms of the learning objective – 'knowledge' between the control group and experimental groups.

3. There is no significant difference in performance in Mathematics in the post-test in terms of the learning objective – 'understanding' between the control group and experimental groups.

4. There is significant difference in performance in Mathematics in the delayed post-test between the control group and experimental groups.

5. There is no significant difference in performance in Mathematics in the delayed post-test in terms of the learning objective –'knowledge' between the control group and experimental groups.

6. There is significant difference in performance in Mathematics in the delayed post-test in terms of the learning objective –'understanding' between the control group and experimental groups.

Educational Implications

From the present study, it is revealed that music influences learning and it acts as a memory aid for learning. So music fused teaching can be implemented in the tertiary level classroom.

The teaching faculties may read literature on 'importance on music in learning' government may also provide training for teachers to implement music in the classroom as teaching tool. Educational planners may have forums to fuse music in teaching the subjects at college level administrators can be supportive for implementing music fused teaching in schools and colleges.

Music departments can make attempts in finding the impact of instrumental music on the performance of students at college level. The educational institutions may consider music to be played in the classroom at least on an experimental basis to find out the performance of students in learning and retaining capacity.

The students who feel bored during the conventional method of teaching may be benefited by the novel attempt of music-fused teaching. School students can also implement music in the classroom for betterment of teaching and learning process. There is plenty of literature to support the music fused Mathematics teaching. So Mathematics teachers can use instrumental music so that it creates interest towards Mathematic among pupils. Music fused teaching may be implemented in the classroom for the learning of all the subjects at school level and college level.

Since music acts as a memory aid, parents may encourage their wards to learn by listening to music. Music makes an environment which is conducive for learning. So students may use instrumental music in the background while studying at home.

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Hindi Section

निर्मितवादी अधिगम पद्धतियाँ एवं उनकी प्रासंगिकता

डॉ. राकेश कटारा *   एवं ध्रुव कुमार मित्तल **

सारांश

बालक जिस प्रकार से अनुभव लेता है, जिस समाज व संस्कृति में रहता है, और जिस तरीके से अर्थ ढूँढता है, वैसा ही वह ज्ञान निर्मित करता है। शिक्षक, विद्यार्थियों के मध्य ज्ञान की साझेदारियों के अवसर विकसित करके ज्ञान के निर्माण में मदद कर सकता है। इसके लिए विद्यार्थी में प्रत्यक्षीकरण करने की क्षमता विकसित करने की विधियाँ शिक्षक को तलाशनी चाहिए। ज्ञानेन्द्रियाँ जितनी स्वस्थ होंगी तथा पूर्वाग्रहों से मुक्त होंगी बालक उतना ही स्पष्ट प्रत्यक्षीकरण करेगा और यह प्रत्यक्षीकरण बालक के मस्तिष्क में ज्ञान का निर्माण करने में मददगार होगा। सीखना संदर्भों से जुड़ी हुई प्रक्रिया है। विद्यार्थियों द्वारा दिए गए उत्तरों की शिक्षकों को कभी उपेक्षा नहीं करनी चाहिए बल्कि उसे पारस्परिक सद्भावनापूर्ण विचार—विमर्श द्वारा संशोधित और परिमार्जित करवाया जाना चाहिए। शैशवावस्था में जो शिशु जितनी अधिक क्रियाएँ करते है, वस्तुओं के, पदार्थों के, घटनाओं के प्रत्यक्ष सम्पर्क में आते हैं वे उतने ही अधिक अनुभवों को प्राप्त करते हुए भविष्य में निर्मित किए जाने वाले सम्प्रत्ययों के लिए पूर्व ज्ञान प्राप्त कर रहे होते हैं।

प्रस्तावना :—

गेस्टाल्ट अधिगम उपागम के विभिन्न क्षेत्र एवं संरचनावाद की विमा से संयुक्त होकर संज्ञानात्मक परिदृश्य का विकास होता है, जो इस तथ्य पर केन्द्रित है कि हम दुनिया को कैसे जानते हैं? संज्ञान (Cognition) ज्ञान होने की प्रक्रिया होता है, इसके अन्तर्गत चिन्तन, समझ, प्रत्यक्षीकरण, स्मरण करना, समस्या समाधान की योग्यता तथा अन्य अनेक मानसिक प्रक्रियाएँ आती हैं, जिससे हमारा दुनिया का ज्ञान विकसित होता है, हम दुनिया को जान सकते हैं। यह हमें इस लायक बनाता है कि हम वातावरण के साथ विशिष्ट तरीके से समायोजित रह सके। कई संज्ञानात्मक मनोवैज्ञानिक मनुष्य मस्तिष्क को कम्प्यूटर तकनीक की तरह एक सूचना प्रक्रमण तंत्र के रूप में देखते हैं अर्थात् हमारा मस्तिष्क वह कम्प्यूटर होता है, जो विभिन्न ज्ञान के स्रोतों से विविध सूचनाओं को ज्ञानेन्द्रियों के माध्यम से प्राप्त करता है, उसका प्रत्यक्षीकरण करता है, संश्लेषण—विश्लेषण युक्त प्रक्रमण करता है, संशोधन या परिवर्तन अथवा रूपान्तरण करता है, ज्ञान को आंकड़ों के रूप में संचित करता है तथा आवश्यकता पड़ने पर स्मृति में संचित ज्ञान की पुनःप्राप्ति करता है।

आधुनिक संज्ञानात्मक मनोवैज्ञानिक मानव को उनके सामाजिक एवं भौतिक वातावरण के अन्वेषणों के द्वारा अपने मन की सक्रिय रचना करने वाले के रूप में देखता है इस विचारधारा को निर्मितवाद (Constructivism) स्वीकार किया गया है। बाल विकास के विषय में *जीन पियाजे* का सिद्धान्त निर्मिति परक सिद्धान्त भी कहा जाता है। रूस के मनोवैज्ञानिक *व्यगाट्स्की (Vygotasky)* ने कहा कि मनुष्य मस्तिष्क का विकास सामाजिक एवं सांस्कृतिक प्रक्रियाओं के माध्यम से होता है। जहाँ

पियाजे मानते हैं कि बच्चे अपने मन का निर्माण सक्रिय रूप से करते है वहीं *व्यगाट्स्की* (Vygotasky) का मानना है कि मन एक संयुक्त सांस्कृतिक निर्मिति है तथा वयस्कों एवं बच्चों की अन्तःक्रिया के परिणामस्वरूप उद्भूत होती है।

सदियों से मनुष्य यह जानने का प्रयास कर रहा है कि–"मानव किस तरीके से सीखता है और उसके अधिगम को किस प्रकार प्रभावी बनाया जा सकता है।" संज्ञानात्मक अधिगम क्षेत्र, तंत्रिका विज्ञान क्षेत्र तथा शिक्षण अधिगम क्षेत्र में हुए विभिन्न अनुसंधानों के प्रभाव से अधिगम प्रक्रिया परम्परागत परिभाषाओं के परिधान से निकलकर उस नूतन प्रविधि में प्रवेश पा चुकी है जहाँ ज्ञान को लेना और देना इतना महत्वपूर्ण नहीं माना जाता है, जितना कि ज्ञान को निर्माणात्मक प्रविधि के रूप में माना जाता है। ज्ञान अनुभव, अभ्यास और प्रयास के द्वारा अधिगमकर्ता को स्वयं अर्जित करना होता है।

परम्परागत एवं निर्मितवादी पद्धति :–

परम्परागत रूप में यह माना गया है कि गुरू का वाक्य ब्रह्म वाक्य होता है और विद्यार्थी को बिना किसी हस्तक्षेप के उसे मान लेना चाहिए। लेकिन निर्मितवादी विचारधारा गुरू के ब्रह्म वाक्य को बिना तर्क, बिना संश्लेषण–विश्लेषण, बिना विचार–विमर्श और बिना किसी प्रमाण के मानने के लिए विद्यार्थी को बाध्य नहीं करती है। क्योंकि अन्धानुकरण, रटन्त अथवा अविवेक द्वारा अर्जित ज्ञान अधिगमकर्त्ता में समस्या–समाधान की योग्यता, निर्णय लेने की योग्यता, सृजनात्मकता तथा रचनात्मक चिन्तन का विकास नहीं कर सकता है।

हम जिस विश्व में रहते हैं उसके अनुभवों पर चिन्तन djd¼ghml dk vockk fufeZ djrsgaA *महात्मा गौतम बुद्ध* ने भी अपने दर्शन में निर्मितवादी विचारधारा का जयघोष करते हुए स्पष्ट कहा है कि–"अप्प दीपो भवः" अर्थात् अपने अनुभवों से ज्ञान की स्वयं निर्मिति करते हुए प्रकाशित रहो। वास्तव में अनुभवों के अभाव में कोरा हस्तान्तरित ज्ञान अंधकार के समान ही होता है। अतः निर्मितवाद, अधिगम का दर्शन है।

निर्मितवाद एक सतत् सम्प्रत्यात्मक वह प्रविधि है जिसे विद्यार्थियों को स्वयं के प्रयासों, कार्यों, पूर्व अनुभवों एवं विविध प्रक्रियाओं के माध्यम से सम्पन्न करना होता है और विद्यार्थी अपने संवेदनात्मक ज्ञान को प्रत्यक्षीकृत ज्ञान में, प्रत्यक्षीकृत ज्ञान को सम्प्रत्यात्मक ज्ञान में निर्मित

करने की पद्धति को अपनाते हुए जिस ज्ञान को प्राप्त करता है वह उसके दीर्घकाल तक दृढ़ रहने वाला ज्ञान उपलब्ध करवाता है। फलतः कहा जा सकता है कि निर्मितवाद ज्ञान का ही एक अति प्राचीन उस ज्ञान का सिद्धान्त है जो नवीन सन्दर्भों के अनुसार व्यक्ति अपने विवेक से जाग्रत करता है। आधुनिक शिक्षण पद्धतियों में निर्मितवादी समन्वय कक्षा–कक्ष शिक्षण में शिक्षक के रूप में हमें निम्नलिखित पद्धतियाँ अपनानी चाहिए–

* कक्षा–कक्ष का वातावरण वैचारिक सम्प्रेषण और पारस्परिक अन्तर्सम्बन्धों का निर्माण करने वाला हो।

* निर्मितवादी अधिगम प्रक्रिया सक्रियतायुक्त होती है, अतः कक्षा शिक्षण अधिगम की विभिन्न विधि, प्रविधि आदि सक्रियता पर आधारित हों जैसे–प्रोजेक्ट कार्य, प्रायोगिक कार्य, अन्वेषण कार्य, खोज कार्य आदि।

* विद्यार्थी, अपने मस्तिष्क में जिस भी संप्रत्यय का जो भी अर्थ निर्मित करता है, उसकी विषय प्रासंगिकता की उपेक्षा करते हुए भी शिक्षक को अधिगमकर्ता द्वारा निर्मित अर्थ की अभिव्यक्ति को यथोचित अवसर प्रदान करना चाहिए।

* ज्ञान के विभिन्न उद्दीपकों एवं स्रोतों को प्राप्त करने का एकमात्र संसाधन अधिगमकर्ता की ज्ञानेन्द्रियाँ होती हैं। अतः शिक्षक को कक्षा में ऐसी गतिविधियाँ, खेलकूद एवं पहेलीनुमा कार्य करवाने चाहिए जो कि ज्ञानेन्द्रियों को सक्रिय एवं स्वस्थ रखने के साथ–साथ उनका सही उपयोग करना भी सिखाएँ।

* निर्मितवादी अधिगम प्रक्रिया विद्यार्थियों की पारस्परिक क्रियाओं, सहभागिता, सामाजिक सन्दर्भों एवं सहयोगात्मक अधिगम की पद्धतियों का भी समर्थन करती है। अतः कक्षा शिक्षण में विद्यार्थियों के मध्य कुछ इस प्रकार की समस्याएँ दी जाएँ जिसमें विद्यार्थी छोटे–छोटे समूहों में परस्पर अन्तःक्रियाएँ करते हुए सहयोग व प्रभाव के आधार पर अपने द्वारा निर्मित ज्ञान को प्रबलता से अभिव्यक्त कर पाएँ। इसमें शिक्षक उनके द्वारा निर्मित ज्ञान का स्पष्टीकरण एवं सरलीकरण करे। साथ ही शिक्षक उस ज्ञान क्षेत्र की भावी संभावनाओं के सृजन हेतु अधिगमकर्ता से विचार विमर्श भी करे।

* वास्तव में अधिगम कोई तात्कालिक घटना नहीं हैं, ज्ञान की निर्मिति में पर्याप्त समय की आवश्यकता

रहती है अतः निर्मितवादी पद्धतियों में विद्यार्थियों को धैर्यपूर्वक सतत् कार्य करने का प्रशिक्षण एवं अभ्यास का अवसर उपलब्ध करवाया जाना चाहिए।

* ज्ञान की निर्मिति में पूर्वज्ञान तथा पूर्व अनुभवों का महत्वपूर्ण योगदान होता है। अतः शैशवावस्था से ही शिशुओं को विभिन्न वस्तुओं के आन्तरिक प्रतिनिधित्व का स्वरूप या स्कीमा (Schema) विकसित करने का अवसर दिया जाना चाहिए।

* भाषा विषयों तथा कला विषयों में विद्यार्थियों को अपनी कल्पना को उड़ान देने के असीमित और मुक्त अवसर उपलब्ध करवाने चाहिए।

* ज्ञान की निर्मिति लोकतांत्रिक मूल्यों की शिक्षा के अभाव में अधूरापन लिए हुए होती है, इस कारण अधिगमकर्ता के परिवार, विद्यालय एवं कक्षा—कक्ष में प्रजातांत्रिक वातावरण का निर्माण करना चाहिए जिसमें अधिगमकर्ता को अभिव्यक्ति की स्वतंत्रता प्राप्त हो।

* निर्मितवादी अधिगम प्रक्रिया में कोई भी सम्पूर्ण नहीं होता है, इस कारण शिक्षक को अपने विद्यार्थियों के साथ एक शिक्षक के रूप में नहीं बल्कि एक वरिष्ठ छात्र की भूमिका में अपने उत्तरदायित्वों का निर्वहन करना चाहिए।

* बूझो जो जानें, वर्ग पहेलियाँ, अन्त्याक्षरी, अमीर खुसरों की लोक पहेलियाँ, कबीर की उलट बाँसियाँ आदि ऐसे कई पक्ष हैं जो भाषा क्षेत्र में ज्ञान की निर्मिति की महत्वपूर्ण पद्धतियाँ हैं। इनका मुख्य उद्देश्य विद्यार्थी के विचारों को चिन्तन के विविध क्षेत्रों में सक्रिय करते हुए अपसारी एवं अभिसारी चिंतन की शैलियों का अभ्यास करवाना होना चाहिए।

* निर्मितवादी अधिगम पद्धतियों में शिक्षक को यह ईमानदारी से स्वीकार करना चाहिए कि प्रत्येक विद्यार्थी अपने परिवेश से प्राप्त अनुभव के आधार पर, वातावरण और पारस्परिक क्रिया द्वारा मानसिक प्रतिरूप बनाते हैं, ये ही प्रतिरूप उसकी ज्ञान निर्मिति का साधन हैं। ज्ञान का निर्माण अनुभवों से होता है अतः सामाजिक परिप्रेक्ष्य में विद्यार्थियों को अनुभव प्रदान करने की सूचना तकनीक आधारित पद्धतियों का भी चयन करना चाहिए।

* निर्मितवादी अधिगम पद्धतियाँ व्याख्यान में नहीं बल्कि संवाद व परिचर्चाओं में विश्वास करती है।

* निर्मितवादी पद्धतियाँ प्रतिशत, श्रेणी या कक्षा में स्थान के लिए ज्ञान नहीं देती है बल्कि वे अधिगमकर्ता को अवबोध एवं समस्याओं का समाधान करने की विधाएँ बताती हैं।

* निर्मितवादी पद्धतियाँ ज्ञान को परीक्षाओं के सापेक्ष नहीं देखती बल्कि वे ज्ञान की निर्मिति को सामान्यीकरण व सरलीकरणयुक्त पद्धतियों के सापेक्ष देखती हैं।

* निर्मितवादी पद्धतियाँ समावेशी शिक्षा की पद्धतियों का आश्रय लिया करती है।

* शैक्षिक भ्रमण या पर्यटन विद्यार्थियों के ज्ञान निर्माण में एक महत्वपूर्ण एवं उपयोगी पद्धति होती है।

* भारतीय मनीषी महात्मा गांधी, अरविन्द, विवेकानन्द आदि ने ज्ञान की निर्मिति को उसी रूप में स्वीकार किया है जिस रूप में *फ्रोबेल, मोन्टेन्सरी* तथा *किलपैट्रिक* ने किया है, ज्ञान निर्मिति की वह विधि क्रियात्मक विधि भी कहलाती है। जिसमें तत्परता एवं जागरूकता अधिक महत्वपूर्ण होती है इसमें तीन प्रकार की क्रियाएँ महत्वपूर्ण होती हैं—

I.   ज्ञान प्राप्त करने वाली क्रियाएँ।

II.   ज्ञान व्यक्त करने वाली क्रियाएँ।

III.   अनुभव प्राप्त करने वाली क्रियाएँ।

* प्रत्येक विद्यार्थी व्यक्तिगत विभिन्नता लिए हुए होता है, फलस्वरूप विद्यार्थियों की गतिविधियाँ उनकी रचनाएँ और ज्ञान निर्मिति से प्राप्त अर्थों में भी विविधताएँ हो सकती है। अतः निर्मितवादी शिक्षक को विद्यार्थियों के मध्य अनावश्यक तुलनाएँ एवं प्रतिस्पर्धाएँ आयोजित नहीं करनी चाहिए।

* निर्मितवादी अधिगम प्रक्रिया में बालकेन्द्रित, स्वाभाविक क्रिया आधारित तथा स्वतः अनुभव के आधार पर ज्ञान प्राप्ति के अवसर उपलब्ध करवाने वाली विधियाँ अपनानी चाहिए।

* निर्मितवादी विधियाँ विद्यार्थियों को अवलोकन, संग्रहण, भ्रमण तथा परीक्षण के लिए भी प्रोत्साहित करती हैं।

उपसंहार :—

उक्त सभी सन्दर्भों पर चिन्तन करने से ज्ञात होता है कि वर्तमान सदी में परम्परागत प्रतिमानों को परिमार्जित करना होगा। शिक्षक को शिक्षण अधिगम पद्धतियों में निर्मितवादी पद्धतियों के अनुसार परिवर्तन करना चाहिए। सक्रियता, सामाजिकता, सन्दर्भों, सम्प्रेषण एवं सहयोगात्मक

सम्प्रत्ययों के अभाव में अधिगमकर्ता के अनुभव सार्थक नहीं हो सकते हैं, और ज्ञान की निर्मिति कभी निरर्थक नहीं होती, फलस्वरूप हमें मुक्त मन एवं हृदय से निर्मितवादी पद्धतियों को अपनी वर्तमान शिक्षण व्यवस्था में बिना पूर्वाग्रह के समुचित एवं सम्मानजनक स्थान देने का प्रयास करना चाहिए।

संदर्भ ग्रंथ सूची

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Hindi Section

वैदिक गणित विधि व परंपरागत गणित शिक्षण विधि का 9वीं कक्षा के विद्यार्थियों की गणित में उपलब्धि के परिप्रेक्ष्य में तुलनात्मक अध्ययन

*डॉ. अर्चना दुबे *   एवं   आरती शाक्य ***

सारांश

प्रस्तुत शोध के अंतर्गत 9 वीं कक्षा के विद्यार्थियों की वैदिक गणित विधि व परंपरागत गणित शिक्षण विधि में उपलब्धि के परिप्रेक्ष्य में तुलनात्मक अध्ययन किया गया। शोध के लिए महू शहर के विद्यालयों में अध्ययनरत 9वीं कक्षा के 50विद्यार्थियों को न्यादर्श के रूप में लिया गया था। शोध के लिए पूर्व परीक्षण पश्च परीक्षण नियंत्रित समूह प्राकल्प का प्रयोग किया गया जिसमें प्रयोगात्मक समूह को वैदिक गणित विधि से तथा नियंत्रित समूह को परम्परागत विधि से 20 दिनों तक प्रतिदिन 45 मिनट की अवधि तक पढ़ाया गया। प्रदत्तों के संकलन के लिए शोधकर्ती द्वारा स्वनिर्मित उपलब्धि परीक्षण का उपयोग किया गया था। प्राप्त प्रदत्तों के विश्लेषण के लिए t- test का प्रयोग किया गया। परिणामों से प्रदर्शित हुआ कि वैदिक गणित विधि, परम्परागत गणित शिक्षण विधि से सार्थक रूप से प्रभावी पायी गयी।

प्रस्तावना

गणित मानव मस्तिष्क की खोज है। यह एक ऐसा साधन है जिसके माध्यम से छात्र युक्ति युक्त ढंग से चिंतन, बोध, तर्क, वितर्क, विश्लेषण एवं स्पष्टीकरण करने की योग्यता अर्जित करता है। एक विशिष्ट विषय होने के अतिरिक्त गणित को ऐसे किसी भी विषय का सहवर्ती माना जाता है जिनमें विश्लेषण व तर्क शक्ति की आवश्यकता है।

वेद का अर्थ

'वेद' शब्द की व्युत्पत्ति से जो अर्थ निकलता है, उसका तात्पर्य है कि वेदों में मानव समाज के लिए आवश्यक न केवल आध्यात्मिक वरन् इहलौकिक, सांसारिक या व्यावहारिक सम्पूर्ण ज्ञान होता है, और सारी मानव जाति के विकास की जितनी भी दिशाएँ संभव हैं, उनके सर्वांगीण, सम्पूर्ण तथा अधिकतम सफलता के लिए आवश्यक ज्ञान होता है। उनमें निहित ज्ञान पर किसी भी विषय में किसी भी दिशा में सीमा बांधने वाला विश्लेषण या बंधन नहीं हो सकता। भारतीय संस्कृति में चार वेद हैं और उनके चार उपवेद हैं तथा छह वेदांग हैं। ये सभी मिलकर उस दिव्य ज्ञान का अभाज्य संग्रह बनाते हैं।

वेद	उपवेद
ऋग्वेद	आयुर्वेद
सामवेद	गांधर्ववेद
यजुर्वेद	धनुर्वेद
अथर्ववेद	स्थापत्यवेद

वैदिक गणित के मुख्य गुण

1. सूत्र गणित की सभी शाखाओं के सभी अध्यायों के सभी विभागों पर लागू होते हैं।

2. सूत्र सहज ही समझ में आ जाते हैं, उनका अनुप्रयोग सरल है, वे सहज ही याद हो जाते हैं तथा सारी प्रक्रिया 'मौखिक' है।

3. कई पैड़ियों की प्रक्रिया वाले जटिल प्रश्नों को हल करने में आधुनिक पाश्चात्य विधि (प्रचलित) की अपेक्षा

वैदिक विधि से एक तिहाई, चौथाई, दसवाँ तथा उससे भी कम समय लगता है।

औचित्य

वाघ (1991) ने भिन्न संख्या में सुधारात्मक कथन के रूप में कक्षा 8वीं के विद्यार्थियों के लिए Multimedia Instructional System का विकास किया तथा पाया कि छात्र भिन्न संख्या तथा उसकी क्रियाओं, तिर्यकगुणा, जोड़–घटाना, गुणा, भाग में सामान्य तौर पर गलतियाँ करते है तथा MMI विधि परम्परागत विधि से अधिक समझ पैदा करती है।

भागवत (1992) में गणित में बहुदिश उत्पादन प्रकार की समस्याओं के लिए पुंज का निर्माण किया तथा पुंज के प्रयोग से पाया कि लड़कों तथा लड़कियों के बहुदिश चिंतन के विकास में सार्थक सहायता मिली। विद्यालयीन छात्रों का इस की सहायता से सृजनात्मक विकास हुआ।

दत्त (1990) ने गणित शिक्षण के लिए दृश्य –श्रव्य सामग्री का निर्माण किया तथा शोध द्वारा पाया कि दृश्य–श्रव्य सामग्री के माध्यम से रेखा गणित संबंधी संकल्पना में विद्यार्थियों में रूचि पाई गई और स्पष्टता तथा धारण करने की शक्ति का विकास होता है।

राव (1983) ने गणित में अभिक्रमित अधिगम और परम्परागत विधि का तुलनात्मक अध्ययन किया तथा पाया कि–अभिक्रमित अधिगम विधि का माध्य उपलब्धि फलांक परम्परागत विधि के माध्य उपलब्धि फलांक की तुलना में सार्थक रूप से अधिक है।

मिश्रा (1991) ने The Mathematics Education पत्रिका में प्रकाशित लेख में वैदिक गणित का त्रिकोणमितीय उपयोग बताया गया है। त्रिकोणमिति में *आर्यभट्ट, गोविन्द स्वामी, आर्यभट्ट प्रथम* इत्यादि गणितज्ञों द्वारा प्रतिपादित सिद्धांतों तथा सूत्रों को बताया गया है।

लाल द्वारा (1982) (1983) (1985) में प्राचीन गणित जैन गणित पर The MathematicsEducation पत्रिका में अनेक लेख प्रकाशित किए गये जिसमें प्राचीन वेदों तथा उपवेदों में गणित के विभिन्न विषयों पर लिखे श्लोकों को विस्तार से समझाया गया तथा वर्तमान में उसकी उपयोगिता बताई गई है।

कोल्हे (2004) ने वैदिक गणित विधि व परम्परागत गणित शिक्षण विधि का तुलनात्मक अध्ययन 9 वीं कक्षा के छात्रों की गणित में उपलब्धि व प्रतिक्रियाओं के परिप्रेक्ष्य में अध्ययन किया। कोल्हे ने पाया कि वैदिक गणित विधि विद्यार्थियों की गणित में उपलब्धि के संदर्भ में परम्परागत गणित शिक्षण विधि से प्रभावी पायी गई। वैदिक गणित विधि के प्रति प्रायोगिक समूह के छात्रों की प्रतिक्रिया सकारात्मक पाई गई।

प्रायः देखा गया है कि परम्परागत शिक्षण विधि से विद्यार्थी कक्षा में नीरस रहता है। शिक्षक कक्षा में एक ही विधि का उपयोग करता है। गणित को रूचि कर बनाने के लिए यू.सी. मास, गणित में प्रयोग तथा वैदिक गणित का उपयोग करना चाहिए। वैदिक गणित से विद्यार्थी प्रतियोगी परीक्षाओं में कम समय में गणित के प्रश्नों को हल कर सकते हैं।

वर्तमान समय प्रतियोगिता तथा परिवर्तन का समय है जिसमें व्यक्ति अपनी स्थिति को बनाए रखने के लिए सदैव प्रयत्नशील रहता है। छात्र शिक्षण क्षेत्र में भी अपनी श्रेणी बनाए रखने के लिए अथक प्रयास करते हैं। विभिन्न विषयों में अधिक अंक प्राप्त करने के लिए छात्र अलग–अलग प्रकार की विधियों से अध्ययन करता है। गणित जैसा कठिन विषय जिसमें छात्र मात्र उत्तीर्ण होने की उम्मीद करते हैं व ऐसी विधि चाहते हैं जो सरल हो जिसकी सहायता से प्रश्न कम सोपानों में हल हो जाए।

प्राप्त शोधों से ज्ञात होता है कि वर्तमान गणित शिक्षण में अभिक्रमित अधिगम सामग्री, संगणक कार्यक्रम, कम्प्यूटर सहायक अनुदेशन दृश्य–श्रव्य सामग्री, अभिक्रमित पाठ्यपुस्तक तथा खेल इत्यादि विधियों का प्रयोग किया जा रहा है। खेल विधि का गणित शिक्षण में प्रयोग मात्र प्राथमिक स्तर तक ही किया जा सकता है। उच्च कक्षा के लिए इस विधि का प्रयोग नहीं कर सकते। अभिक्रमित अधिगम सामग्री तथा संगणक कार्यक्रम, कम्प्यूटर सहायक अनुदेशन, दृश्य–श्रव्य सामग्री अभिक्रमित पाठ्यपुस्तक की विधियाँ कुछ विशेष विद्यालयों तक ही सीमित हैं। इनका प्रयोग करना सामान्य विद्यालयों के लिए संभव नहीं है तथा प्रत्येक छात्र तक इसका लाभ पहुंचाना संभव नहीं है। वैदिक गणित प्राचीन वेदों से बनाए 16 सूत्रों पर आधारित हैं। गणित की पत्रिका The Mathematics Education में प्रकाशित लेखों से ज्ञात होता है कि वैदिक गणित, गणित की सभी शाखाओं में उपयोगी है।

ज्ञात शोधों से पता चलता है कि वैदिक गणित विधि से संबंधित कुछ ही सूत्रों को लेकर शोध कार्य किया गया

है। प्रस्तुत शोध कार्य में अन्य नये सूत्रों को भी शामिल किया गया है। प्रस्तुत शोध वैदिक गणित विधि की प्रभाविता का पता लगाने से संबंधित है। इस शोध के द्वारा यह जानने का प्रयत्न किया गया है कि क्या वैदिक गणित शिक्षण विधि परम्परागत गणित शिक्षण विधि से तुलनात्मक रूप से प्रभावी है।

उद्देश्य

वैदिक गणित विधि एवंपरम्परागत गणित शिक्षण विधि से प्राप्त उपलब्धि के माध्य फलांकों का तुलनात्मक अध्ययन करना।

परिकल्पना

1. वैदिक गणित विधि एवंपरम्परागत गणित शिक्षण विधि से प्राप्त उपलब्धि के माध्य फलांकों में कोई सार्थक अन्तर नहीं होगा।

न्यादर्श

प्रस्तुत शोध कार्य के लिए यशवंत पब्लिक हायर सेकेण्ड्री विद्यालय महू के 9 वीं कक्षा के दो वर्गों को लिया गया जिसमें छात्रों की कुल संख्या 50 थी। विद्यार्थियों को दो समूहों में यादृच्छिक विधि से विभाजित किया गया। प्रथम समूह में 25 विद्यार्थी व द्वितीय समूह में 25 विद्यार्थी थे। प्रथम समूह को प्रायोगिक समूह व द्वितीय समूह को नियंत्रित समूह नाम दिया गया। उपरोक्त सभी विद्यार्थी माध्यमिक शिक्षा मण्डल भोपाल के नियमित तथा हिन्दी माध्यम के विद्यार्थी थे जिनकी उम्र 15—16 वर्ष के मध्य थी।

उपकरणःउपलब्धि परीक्षण

शोध कार्य में चरों के मापन के लिए शोधकर्त्री द्वारा स्वतः उपलब्धि परीक्षण का निर्माण किया गया। उपलब्धि परीक्षण में कुल 15 प्रश्न थे। प्रत्येक प्रश्न के सही उत्तर पर 5 अंक तथा गलत उत्तर पर शून्य अंक प्रदान किए गए। उपलब्धि परीक्षण में वर्ग, घन, गुणनखण्ड, भाग तथा समीकरण ज्ञात करने की विधियों पर प्रश्नों का निर्माण किया गया। उपलब्धि परीक्षण के प्रश्नों के लिए कुल अंक 75 रखे गये थे। प्रश्नों को हल करने के लिए 35 मिनट की समय सीमा निर्धारित की गयी थी। वैदिक गणित पढ़ाने के लिये चयनित प्रकरण निम्नलिखित हैंः—

1. वर्ग ज्ञात करने की विधियाँ

　　अ. एकाधिकेन पूर्वेण
　　ब. एकन्यूनेन पूर्वेण

स. यावदूनं तावदूनीकृत्य वर्ग च योजयेत्

2. घन ज्ञात करने की विधियाँ

　　अ. वैकल्पिक विधि
　　ब. निखिलम् सूत्र विधि

3. गुणनखण्ड ज्ञात करने की विधियाँ

　　अ. समूहन विधि
　　ब. आद्येन—अन्त्यम् अन्त्येन विधि
　　स. उर्ध्वतिर्यक विधि

4. भाग विधि

　　अ. परावर्त्य विधि

5.समीकरण हल करने की विधि

　　अ. परावर्त्य विधि द्वारा युगपत सरल समीकरण

प्रदत्त संकलन की विधि

प्रदत्त संकलन हेतु कक्षा 9 वीं की गणित की पाठ्यपुस्तक के वर्ग, घन, गुणनखण्ड, भाग तथा समीकरण प्रकरणों का चयन किया गया। वर्ग ज्ञात करने की विधियों में एकाधिकेन पूर्वेण, एकन्यूनेन पूर्वेण, यावदूनं तावदूनीकृत्य वर्ग च योजयेत्। घन ज्ञात करने की विधियों में वैकल्पिक विधि, निखिलम् सूत्र। गुणनखण्ड ज्ञात करने की विधियों में समूहन विधि, आद्येन—अन्त्यम् अन्त्येन विधि, उर्ध्वतिर्यक विधि। भाग ज्ञात करने की विधि में परावर्त्य विधि तथा समीकरण हल करने में परावर्त्य नियम द्वारा युगपत सरल समीकरण विधि का उपयोग किया गया। प्रदत्त का संकलन सउद्देश्य न्यादर्श विधि द्वारा चयनित विद्यालय में किया गया।

सर्वप्रथम दोनों समूहों पर शोधकर्त्री द्वारा निर्मित उपलब्धि परीक्षण (पूर्व परीक्षण) प्रशासित किया गया। इसके बाद प्रायोगिक समूह को वैदिक गणित विधि से 20 दिन तक 40 मिनट प्रति कालांश तथा नियंत्रित समूह को परम्परागत विधि से 20 दिन तक 40 मिनट प्रति कालांश प्रतिदिन पढ़ाया गया। 20दिन के पश्चात् दोनों समूहों को पश्च उपलब्धि परीक्षण प्रशासित किया गया।

परिणाम, विवेचना एवं चर्चा

प्रस्तुत शोध अध्ययन से संबंधित प्रदत्तों का विश्लेषण t-test द्वारा किया गया।

इसके परिणाम सारणी क्रमांक 1 में प्रस्तुत किए गए हैं।

सारणी क्रमांक 1

प्रायोगिक एवं नियंत्रित समूह का उपलब्धि के आधार पर माध्य, मानक विचलन व t- मान

समूह t -मान	संख्या	माध्य		मानक
			विचलन	
प्रायो. समूह	25	48.8	10.4	3.384**
नियं. समूह	25	38.2	11.5	

**0.01 स्तर पर सार्थक है।

सारणी क्रमांक 1 से यह स्पष्ट होता है कि t-मान 3.384 है जो कि 0.01 स्तर पर सार्थक है, जबकि df=48 है। इसका अर्थ है, कि प्रायोगिक समूह एवं नियंत्रित समूह के छात्रों के माध्य उपलब्धि फलाकों मे सार्थक अंतर है। अतः उपरोक्त आधार पर शून्य परिकल्पना **"वैदिक गणित विधि एवं परम्परागत गणित शिक्षण विधि से प्राप्त उपलब्धि के माध्य फलांकों में कोई सार्थक अन्तर नहीं होगा "** निरस्त की जाती है। दोनों समूहों के माध्यों का अवलोकन करने से भी यह स्पष्ट है कि प्रायोगिक समूह के छात्रों के माध्य उपलब्धि फलांक 48.8 है जो कि नियंत्रित समूह के छात्रों के माध्य उपलब्धि फलांको 38.2 से सार्थक रूप से उच्च है।

परिणाम

वैदिक गणित शिक्षण विधि, परम्परागत गणित शिक्षण विधि से सार्थक रूप से प्रभावी पायी गयी।

परिणामों की विवेचना

शोध से प्राप्त परिणामों से यह निष्कर्ष निकलता है कि वैदिक गणित शिक्षण विधि, परंपरागत गणित शिक्षण विधि से प्रभावी है। वैदिक गणित शिक्षण विधि के प्रभावी होने के निम्न कारण हो सकते हैं —

- वैदिक गणित शिक्षण विधि, परंपरागत गणित शिक्षण विधि से रूचिकर होने के कारण, छात्रों को अच्छी लगी। वैदिक गणित शिक्षण विधि, परंपरागत गणित शिक्षण विधि की तुलना मे सीखने मे सरल है।
- वैदिक गणित शिक्षण विधि में प्रश्नों को हल करने की विधियाँ सूत्र बध्द हैं, जिसके कारण इन विधियों को याद रख पाना आसान है।
- वैदिक गणित विधि से सवालों को हल करने के लिए परंपरागत गणित शिक्षण विधि की तुलना में कम सोपानों का प्रयोग किया जाता है, जिससे सवालों के उत्तर कम समय मे तथा आसानी से प्राप्त हो जाते हैं व सोपानों को याद रखना सरल रहता है।
- एक ही प्रकार के सवालों को हल करने के लिए अनेक सूत्रों का प्रयोग किया जा सकता है।
- इस विधि से सवालों का उत्तर जल्दी प्राप्त होता है, तो छात्रों को उत्तर प्राप्ति से आत्म संतुष्टि की अनुभूति हुई होगी।
- आत्म संतुष्टि के कारण छात्र इस विधि से अधिक सवालों को हल करने के लिए प्रेरित हुए होंगे।
- इस विधि के द्वारा छात्र सवालों को मौखिक रूप से भी हल कर सकते हैं।

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