pISSN 2320-9305
eISSN 2347-5706
Available at: http://cjoe.naspublishers.com

CONFLUX

JOURNAL OF EDUCATION

VOLUME2, ISSUE 12, MAY 2015

A PEER REVIEWED INTERNATIONAL JOURNAL

RE-CONFIGURING THE DYNAMICS OF THE TEACHING AND LEARNING PROCESS THROUGH INTEGRATION OF CONSTRUCTIVIST BASED APPROACH IN CLASSROOMS OF TWENTY FIRST CENTURY

Dr. Shazli Hasan Khan[1]

Abstract

It is now being exceedingly realized that constructivist approach is the most important and remarkable approach in the current scenario of teaching-learning. It is a theory of learning and not a theory of teaching or pedagogy. Constructivism is a theory of Knowledge, a philosophy of learning. Basically, in this scenario of teaching-learning, learners are the constructers of knowledge and teachers will be the facilitators. Its proponents include Piaget, Vygotsky and later-day philosopher Von Glasersfeld. The constructivist philosophy has been adopted in teaching of science by many enthusiastic pedagogues and teachers in many countries. A Constructivist pedagogy does not consists of a single teaching strategy. Instead, it has several features that should be attended to simultaneously in a classroom. It has been asserted that for a successful constructivist strategy, the teaching has only to be student-centered and the teacher be a mere facilitator, but the teacher has also the added responsibility of creating 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 most important reasons for lack of success of constructivist strategy. The teachers are not properly trained in constructivist strategy and also constructivist approach entails huge sums of money in training & technology. The author in the present paper focuses upon the role of constructivist approach in education, meaning of constructivist approach, significance of constructivist approach in the field of education and the challenges in the implementation of this approach in education in today's global scenario.

Keywords: *Constructivism, Collaborative learning, Reflective Learning, Science education.*

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 an event 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*

[1] Senior Assistant Professor,Dept. of Education & Training,MANUU, Hyderabad.

the language in which it is encased" (Mathews, 2000)[10]. 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 is possible only in a conducive learning environment in the class. The teacher may have to improvise 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 STUDY

1. To explain the constructivist philosophy and to know its major exponents.
2. To identify important features of constructivist philosophy, this has some relevance in Science classrooms.
3. To explore 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 study holistically about the teachers' role in a constructivist classroom.
5. To study various prevailing challenges in the implementation of constructivism in India.
6. To study various educational implications of the theory of constructivism.

METHODOLOGY

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.

VIEWS OF EARLY CONSTRUCTIVIST PHILOSOPHERS

In recent years, with the coming of Piaget, Vygotsky and Ernst Von Glaserfeld (1990)[17] on the horizon, the constructivist theory has widespread high popularity and influence among the teachers and students. A brief introduction to their philosophies is as follows:

a) Jean Piaget (1896-1980)

Piaget's constructivist theory is based on analogies with biological evolution and adaptation. He believed that the child's own actions in this world were important for cognitive development. The social context was important in this development process. Cognitive structures build up from simple initial processes in conjunction with personal action and experience. The development is a form of adaptation to the environment. Later, Piaget tended to shift from the isolation of individual to a more social learning process.

b) Lev Vygotsky (1896-1934)

He believed that the developmental process was governed by the learning process. Pedagogy creates learning processes that lead to development. He distinguished between actual (development) and potential (learning) levels of development. Actual level is achieved independently, potential levels is obtained by the guidance of an adult.

In Vygotosky's (1986)[15] scheme, in the process of constructing knowledge, the learner is not only active internally but also in a social context with the learning material. Here comes the use of "*cognitive conflict*". If the designed activities lead students to a framework which differs from correct scientific concepts, this creates "*cognitive conflict*". This '*conflict*' should be neither too easy nor too difficult. That is, the '*conflict*' should neither be beyond their capabilities nor should be too easy. It should be within Vygotsky's "*Zone of Proximal Development*". When a child cannot accomplish a task alone and can find a peer who possesses a slightly higher cognitive level, one within the child's "*Zone of Proximal Development*", the child can complete the task with that person's assistance. In Piagetian cognitive constructivism the emphasis is on the individual constructing knowledge through a cognitive process of analyzing and interpreting. In Vygotskian social constructivism, emphasis is on the social interactions with the teacher and peers.

c) Ernst Von Glasersfeld (1917-2010)

Von Glasersfeld is known for his "*Radical Constructivist*" philosophy. According to Von Glasersfeld, '*knowledge is not passively received but built up by the cognizing subject'*. He calls his theory as "*Theory of Knowing*" rather then a "*Theory of Knowledge*". Von Glasersfeld underscores the importance of active learning. Knowledge is entirely constructed out of social relations. Knowledge needs to be relevant and related to the person's interest. The teacher can create environment so that students can act upon the basis of their ideas and discover which of their ideas lead to '*friction*' and need revision.

Glasersfeld is a radical constructivist. He asserts that '*internalization*' is a pre-requisite condition for learning. "*The responsibility of learning resides increasingly with the learner*" (Glasersfeld, 1989)[17]. Learners construct their own understanding. Glasersfeld also believes that sustaining motivation to learn is strongly dependent on the learner's confidence in his potential for learning. This feeling of confidence in his own competence is derived from his first hand experience with problems.

CONSTRUCTIVIST APPROACH IN A 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*". An expert learner thinks about his own thinking. 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)[19]. 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.

Constructivism is a movement that combines cognition from a developmental perspective with other important issues, such as motivation, self-directed learning, and a focus on the social context of learning. Actually, there are two main aspects of constructivism. First learning is a process of knowledge construction instead of absorption. We construct knowledge based on our own perceptions and conceptions of our worlds; therefore, each of us constructs a different meaning or concept. Learning, in constructivists' view, requires the building of conceptual structures through reflection and abstraction. Since each leaner has to construct his or her knowledge, concepts cannot be transmitted from teacher to learner by means of words. Learning occurs only when the learners are actively involved in the construction and organization of concepts. Second knowledge is highly related to the environment in which the learner experiences and constructs knowledge. In other words, understanding is mixed by experience. Therefore, constructivists emphasize cognitive experience in authentic activities. The context need not be real world of work, however, to be authentic; rather, learning activities should employ the type of tasks that are the ordinary practices of the culture. The second main aspect of constructivism is similar to situated learning. Situated learning takes the theory of social and ecological interaction as its basis and emphasizes the information structures in the

context of people's interactions; therefore, situated learning emphasizes context and environment. One of the recommendations of constructivism is to engage students in building objects. This is a promising approach to assist learners in constructing theoretical constructs because it creates the means of objectifying constructs that is, building physical displays that allow explicit representation of key theoretical constructs.

Constructivists approach focuses on ideas, as the evidence of knowledge only occurs within humans who construct their own reality; measurement can occur through estimation with observation and dialogue. It aims at a rich learning environment-that is-learning environment that can be tailored to meet the need of the learners. Constructivist learning environment covers negotiation, task analysis, developing multiple perspectives, based on three common elements as context, collaboration and construction. Constructivism relies on the concept of a learner-centred learning environment, this concept is used to describe curricula and instructional settings in which learners' learning activities are focused upon; the role of learners is thereby considered an active role.

SIGNIFICANCE OF CONSTRUCTIVIST APPROACH IN EDUCATION

Educational curricula and teaching methods are changing. One component of the current redevelopment of all subject areas 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 listens and acquires facts. In a transactional curriculum, students are actively engaged in their learning so as to reach new understandings. Constructivist teaching fosters critical thinking and creates active and motivated learners. Learning in all subject areas involves inventing and constructing new ideas. Constructivist teaching fosters critical thinking and creates active and motivated learners. Learning in all subject areas involves inventing and constructing new ideas. Constructivist theory should be incorporated into the curriculum, and advocate that teachers create environments in which children can construct their own understandings. Constructivist approach must be used to create learners who are autonomous, inquisitive thinkers, who question, investigate, and reason. A constructivist approach gives freedom to teachers to make decisions that will enhance and enrich students' development in these areas. Jonassen (1999)[5] gives an account of the fact that many educators and cognitive psychologists have applied constructivism to the development of learning environments. From these applications, he has isolated a number of design principles: create real-world environments that employ the context in which learning is relevant; focus on realistic approaches to solve real-world problems; the instructor is a coach and analyzer of the strategies used to solve these problems; stress conceptual interrelatedness, providing multiple representations or perspectives on the content; instructional goals and objectives should be negotiated and not imposed; evaluation should serve as a self-analysis tool; provide tools and environments that help learners to interpret the multiple perspectives of the world; learning should be internally controlled and mediated by the learner.

Jonassen (1999)[5] summarizes what he refers to as "*the implications of constructivism for instructional design*". The following principles illustrate how knowledge construction can be facilitated:

- Provide multiple representation of reality;

- Represent the natural complexity of the real world;
- Focus on knowledge construction, no reproduction;
- Present authentic tasks (contextualizing rather than abstracting instruction):
- Provide real-world, case-based learning environments, rather than pre-determined instructional sequences;
- Foster reflective practice;
- Enable context and content dependent knowledge construction;
- Support collaborative construction of knowledge through social negotiation.

Major Features of Constructivist Learning and Teaching

Constructivism is a meta-concept. It is not just another way of knowing, but a way of thinking about knowing. It is a theory of communication and suggests that each listener or reader will potentially use the content and process of the communication in different ways. Situated cognition, anchored instruction, apprenticeship learning, problem-based learning, generative learning, constructionism, exploratory learning: these approaches to learning are grounded in and derived from constructivist epistemology. The researchers and theorists whose perspectives are listed below suggest links between constructivist theory and practice. They provide the beginnings of an orienting framework for a constructivist approach to design, teaching or learning.

Wilson and Cole (1991)[18] provide a description of cognitive teaching models which "*embody*" constructivist concepts. Form these descriptions, we can isolate some concepts central to constructivist design, teaching and learning:

- Embed learning in a rich authentic problem-solving environment;
- Provide for authentic versus academic contexts for learning;
- Provide for learner control;
- Use errors as a mechanism to provide feedback on learners' understanding.

Ernest Von Glasersfeld (1996)[16] in his description of the many schools of thought of constructivism suggest the following implications of constructivism which derive from both the radical and social perspectives:

- Sensitivity towards and attentiveness to the learner's previous constructions;
- Diagnostic teaching attempting to remedy learner errors and misconceptions;
- Attention to meta-cognition an strategic self-regulation by learner;
- The use of multiple representations of mathematical concepts;
- Awareness of the importance of goals for the learner, and the dichotomy between learner and teacher goals;

- Awareness of the importance of social contexts, such as the difference between folk or street mathematics.

Honebein (1996)[4] describe seven goals for the design of constructivist learning environments:

- Provide experience with the knowledge construction process;
- Provide experience in and appreciation for multiple perspectives;
- Embed learning in realistic and relevant contexts;
- Encourage ownership and voice in the learning process;
- Embed learning in social experience;
- Encourage the use of multiple modes of representation;
- Encourage self-awareness in the knowledge construction process.

SOCIAL CONSTRUCTIVISM

The Major proponent of social constructivism is Vygotsky. According to him, four principles always apply:

1. Learning and development is a social, collaborative activity;
2. The zone of proximal development can serve as a guide for curricular and lesson planning;
3. Classroom activity should be reality-based and applicable to the real world;
4. Learning extends to the home and other out-of-school environment and activities and all learning situations should be related.

Major Elements of this Social Constructivism are as following:

Social interaction plays a fundamental role in the process of cognitive development. In contrast to Jean Piaget's understanding of child development (in which development necessarily precedes learning), Vygotsky felt that social learning precedes development. He states: "*Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological) and then inside the child (intrapsychological)*" (Vygotsky, 1978)[14].

The More Knowledgeable Other (MKO): The MKO refers to anyone who has a better understanding or higher ability level than the learner, with respect to a particular task, process, or concept. The MKO is normally thought of as being a teacher, coach, or older adult, but the MKO could also be peers, a younger person, or even computers.

The Zone of Proximal Development (ZPD): The ZPD is the distance between a student's ability to perform a task under adult guidance and/or with peer collaboration and the student's ability to solve the problem independently,. According to Vygotsky, learning occurred in this zone.

Vygotsky theory promotes learning contexts in which students play an active role in learning. He also focused on the connections between people and the socio-cultural context in which they act

and interact in shared experiences. According to Vygotsky humans used tools that develop form a culture, such as speech and writing, to mediate their social environments. Initially children develop these tools to serve solely as social functions, ways to communicate needs. He believed that the internalization of these tools led to higher thinking skills.

An important concept for social constructivists is that of scaffolding which is a process of guiding the learner from what is presently '*known to*' what is '*to be known*'. According to Vygotsky (1978)[14], students' problem-solving skills fall into three categories:

- Skills which the student cannot perform.
- Skills which the student may be able to perform.
- Skills that the students can perform with help.

Scaffolding allows students to perform tasks that would normally be slightly beyond their ability without the assistance and guidance from the teacher. Appropriate teacher support can allow students to function at the cutting edge of their individual development. Scaffolding is therefore, and important characteristic of constructivist learning and teaching.

Multiple perspectives, authentic activities, real-world environments these are just some of the themes that are frequently associated with constructivist learning and teaching. In brief the summary of major characteristics of constructivist learning and teaching are as following:

- Multiple perspectives and representation of concepts and content are presented and encouraged;
- Goals and objectives are derived by the student or in negotiation with the teacher or system;
- Teacher serve as the role of guide, mentor, coach, tutor and a facilitator;
- Activities, opportunities, tools and environments are provided to encouraged meta- cognition, self-analysis, regulation, reflection and awareness;
- The student plays a central role in mediating and controlling learning;
- Learning situations, environments, skills, content and tasks are relevant, realistic, authentic and represent the natural complexities of the real world;
- Primary sources of data are used in order to ensure authenticity and real-world complexity;
- Knowledge construction and not reproduction is emphasized;
- This construction takes place in individual contexts and through social negotiation, collaboration and experience;
- The learners' previous knowledge constructions, beliefs and attitudes are considered in the knowledge construction process;
- Problem-solving, higher order thinking skills and deep understanding are emphasized;
- Errors provide the opportunity for insight into students' previous knowledge construction;

- Exploration is a favoured approach in order to encourage students to seek knowledge independently and to manage the pursuit of their goals;
- Learners are provided with the opportunity for apprenticeship learning in which there is an increasing complexity of tasks, skills and knowledge acquisition;
- Knowledge complexity is reflected in an emphasis on conceptual interrelatedness and interdisciplinary learning;
- Collaborative and cooperative learning are favoured in order to expose the learner to alternative viewpoints;
- Scaffolding is facilitated to help students perform just beyond the limits of their ability;
- Assessment is authentic and interwoven with teaching.

CONSTRUCTIVISM AND SCIENCE TEACHING

The rapid and technology and the increasing demands for more and more scientists to meet ever-arousing domains of science-based activities have accelerated the need for expanding scientific approach in the teaching-learning process in general and science in particular. Science as a subject plays a unique role in promoting thinking ability through the process skills. Science process skills emphasize on hypothesizing, manipulating the physical world and reasoning from data. Science process skills can be defined as a set of broadly transferable abilities, appropriate to many science disciplines and reflective behavior of scientists.

Science is a dynamic, expanding body of knowledge, covering ever-new domains of experience. Science should always be interesting to the learner. It becomes interesting only when it includes the participation of students. Conventional teaching methods which are profoundly behaviorist emphasize on the product aspect of Science where the child is a passive recipient of knowledge. It is argued that the responsibility of learning should reside increasingly with the learner. Constructivism views learning as an active process where learners should learn to discover principles, concepts and facts for themselves. It is important to note that constructivism itself does not suggest any particular pedagogy. In fact, constructivism describes how learning should happen.

The various policy initiatives in science place emphasis on, "*learners to relate and understand their surrounding environment*" (NCERT, 2000). The research efforts to translate these policies into practice have resulted in development of an instructional program for teachers and pupils. The instructional program developed to understand the process skills were based on linear model or process skills were assumed to be arranged in a linear fashion, which develops in isolation, independent of content and context. Haden (1993) criticizes the linear model of instruction and proposed alternative model based on constructivist approach.

Teacher's Role in a Constructivist classroom

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

As a facilitator, the teacher has to support the learners in becoming effective thinkers. The facilitator and the learners both learn from each other. Students should 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 learning 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 experiences and integrate new experiences.

Teachers can use various strategies to promote and strengthen students' capacity to think and to "*Think about their Thinking*". Eggen, P and 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.

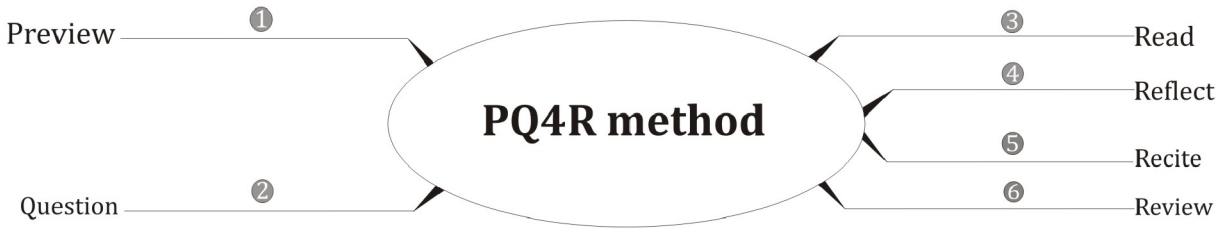

Figure 1. PQ4R Strategy

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 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 in a Constructivist Classroom

Assessment becomes an integral part of every step in this learning design. Teachers design the situation based on their assessment of students' learning approaches, interests and needs. Teachers design a process for groupings based on their assessment of materials available and desired mixture of students. Teacher design a simple assessment of what students already know as a bridge to what they want students to learn. Teachers design questions to assess student understanding of the concepts, skills or attitudes they are trying to learn. Teachers arrange an exhibit for students to record what they thought and submit it to others for assessment. Teachers arrange for reflections about what students' have learned and their internal process of representations as a context for self-assessment of individual learning.

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 and memorization. Such a procedure sends a very wrong message to the students---which 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.

Challenges in Implementation of Constructivism

The major challenge Constructivism presents to teacher and teacher educators is the task of translating a learning theory into a theory of teaching (Mackinnon & Scarff Seatter, 1997)[8], which in turn raises questions about what teachers need to know and be able to do. For teacher educators, among other tasks, this involves balancing the need to acknowledge the different discipline-specific requirements of teaching with the need to model constructivist methods in teacher education courses and practicum. Richardson (1997)[12] also notes the limits of a perspective on teaching that values students' understanding at the expense of right answers. Student knowledge becomes idiosyncratic; thirty different students may arrive at thirty different understandings or interpretations of a concept, all of which are not appropriate.

Several authors cite the importance of teacher educators' modeling constructivist approaches that engage students in interdisciplinary exploration, collaborative activity, and field-based opportunities for experiential learning, reflection and self-examination (Kaufman, 1996; Kroll and LaBosky, 1996)[6], if future teachers are to be able employ these strategies in schools. To derive culturally relevant and socially just pedagogy and practice from constructivist epistemologies, Martin (1994)[9] and Vadeboncoeur (1997)[13] urge teacher educators to deconstruct and scrutinize cultural assumptions that underlie various interpretations of constructivism to expose how social beliefs have influenced the development of theory and practice. Without such scrutiny, societal inequities and historical forms of oppression may perpetuate in constructivist classrooms.

A final challenge faced by educators is the pitfall, regarding constructivism as the only viable theoretical framework for teaching and learning. It is the only way of thinking about how knowledge and understanding are formed, but it is not the only way. Nor are the various interpretations about constructivism necessarily incompatible with one another (Mackinnon and Scarff-Seatter, 1997)[8]. Prospective teachers should be exposed to varying perspectives and given opportunities to develop the discretion needed to implement their choices.

EDUCATIONAL IMPLICATIONS

Constructivism challenges some basic understanding of content knowledge. At the same time, research supporting constructivist approaches brings insights to teacher education practice that makes for more powerful teaching and student understanding of content. An understanding of the nature of pedagogical content knowledge leads to teacher educators to help students integrate their experiences in content courses with their experiences in teacher education courses. Examples in teacher education programmes reinforce these understandings. These examples should share an understanding that content and process are inseparable.

In constructivism teacher education programmes link method courses with content with a sole objective of helping prospective teacher educators to think in different ways about the content. Constructivist approach is based on the fact that the students here are actively engaged in situations that involve collaboratively considering their own explanations for phenomena, resolutions to problems, or formulation of questions. Students are asked to actively construct their own knowledge by making meaning out of the situation by themselves with support and guidance from their teachers. Teachers organize the situation and then provide encouragement and questions to groups of students who are trying to construct and to display their own explanations. For example, composition teachers

might ask to construct the simplest sentences and compare structures, literature teachers might ask students to explain the motives of a character, social studies teachers might ask students to assumes the roles of adversaries in a meeting, science teachers might demonstrate a phenomenon and ask students to explain what was observed, math teachers might ask students to find examples of sloping lines in the world around them and then introduce grids to determine equations, language teachers might engage students in conversational immersion without resorting to English translations, art teachers might ask students to transform clay with their hands without looking at it, music teachers might ask students to identify rhythms in a piece of music using their own annotations. The constructivist approach can be adapted to any subject area or curriculum by involving students as active participants in making meaning instead of passive recipients of information given to them by the teacher. This approach can be incorporated into 45 or 50 minute class periods to teach a particular concept, skill or attitude.

When the constructivist approach is applied in teacher education, then efforts are made to increase collaboration with art and science faculty towards creating a seamless teacher education program. The model of constructivist program lead out students to understand content deeply and to view content and process as inseparable aspects of knowledge construction-approaches that enable them to gain reliable perspectives and abilities so as to have a greater and in-depth understanding of content. Powerful teacher educators should help students at all levels of schooling for better appreciations of the world around them. A constructivist approach shows that content and process are not dichotomous. As more teachers come to understanding, many more students will benefit. Constructivist learning implies an initial concern with '*what knowledge is*' and '*how knowledge is actively constructed by the learner'*. Advocates of constructivism agree that acquiring knowledge or knowing is an active process of constructing understanding rather than the passive receipt of information.

Summary of a Constructivist view of Teaching and Learning

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.

In science teaching, students should be provoked into intuitive guessing through good questions. They should be given sufficient time to reflect. The students' learning would be more lasting if they understand the structure of their subject. Specific examples should be used, i.e. inductive method. The students must understand the structure of a subject, and learn through discovery learning. Constructivism has placed practical work at the heart of learning process. Worksheets are designed to provoke students into thinking and reflection. Teaching science, thus, becomes an active, social process of making sense of experiences. A topic is introduced in the classroom with a short lecture and text book readings. Then the teacher asks the students what interested them in that topic

and encourages them to pursue and test their ideas. Students usually divide themselves into groups and search and formulate questions. 'This method has been adopted by many teachers' of high school classes in USA, and the students were found to have a deep understanding of their topics'. (Lorsbach & Tobin, 2007)[7]. The students, therefore, should be provided opportunity to use their prior knowledge and senses in making connections to the new concepts. Science is not the search for truth. It is a process by which we make sense of our world. Constructivist learning encourages students to develop their higher order thinking skills and has been found more durable.

CONCLUSION

In many countries, like USA, Italy, Turkey, Nigeria and many other countries efforts have been made to adopt constructivist philosophy, especially in the teaching of science classes. It has been noted that these practices were made in primary and secondary schools. Obviously, constructivist theory relates more to growing children and not much to the higher learning stage. Mathews (2000)[9], says that there are limitations in applying constructivist principles to science education, because many scientific concepts such as atomic structure, electro-magnetic radiation, have no connection with prior conceptions. Then there may be some students who have not developed the schemata enough to understand the information provided by the teacher

Teachers generally offer resistance to adopting constructivist position. The reason is simple. Firstly constructivist strategy is time consuming. Students have to be given ample time for "*reflecting*", group discussion and so on. Teachers are generally worried about covering the syllabus within a limited time. This time factor has placed great practical constraints on the implementation of constructivist learning. In most private and government schools, many students come from a very poor background. They are slow and have little motivation or interest in learning. In fact they do not possess the minimum level of readiness that leads to learning.

Secondly teachers are not trained in constructivist methodology. Generally teachers are averse to creating learning environments as it entails "*waste*" of time. Pre-service teacher training should include constructivist methods. Technology has a definite role to play in a constructivist classroom. It has been found that online animations, virtual labs, computer software, Interactive White Board (IWBs) and sensors have increased test scores significantly. Most of the schools in India lack access to technology. Unless the government helps in a massive way, most of the schools and school teachers in India are not likely to change their ways.In order to create constructivist setting for the learners, the pre-service and in-service teachers should be trained in constructivist setting. It has been found that the prospective teachers trained in a constructivist setting are able to be effective constructivist teachers (Hassard, 1999)[3].

Constructivist scholars view learning as an active process where learners should learn to discover principles, concepts and facts for themselves. Activities may help students in accomplishing them. Through activities students are expected to develop skills. The classroom interactions must be flexible to include students' questions and problems arising out of their personal experiences. The role of the teacher is to engage children in exploratory and hands-on activities to enable them to acquire skills. Children should be encouraged to express their ideas and interact with their peers. The teacher's first effort should be to establish good two-way communication with the children. The teacher would

be required to provide an environment that is conducive to learning. Thus, meaningful; learning happens through constructivist approach. The increased focus on use of constructivist instructional models as an agent of reform in education, especially in science education, has resulted in a great deal of research. The application of constructivist theory to science education would result in the development of deeper understanding of science as a subject. It is contended that constructivist theory supported by brain research necessitates radical changes in the design and implementation of science education curricula.

Constructivism calls for a paradigm shift from teacher-centered construction to student-centered teaching. In the constructivist classroom, the role of the teacher shifts from transmitter of knowledge to that of a facilitator, investigator, manager and explorer of knowledge, as a result role of students' changes from 'knowledge acquisition' to 'knowledge construction'. In a constructivist classroom, student design experiments, test hypotheses, draw conclusions and compare findings and results with those of others. Constructivism allows academic freedom to students and encourages cooperative learning and sharing of thought among students and peers. We may say that both teachers and students in a constructivist class have the challenge of managing such a decentralized environment.

To conclude, it can be said that constructivist pedagogy is a very effective means of teaching, especially 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.

REFERENCES

1. Dewey, J (1916). Democracy and Education. New York: the Macmillan Company.
2. Gabric, K. et al. (2006). Scientists in their own classroom: the use of type II technology in the science classroom. *Computers in the schools*. 22(34).
3. Hassard, J (1999). Students' experience in constructivist learning environments: An Inquiry into teems…….a science teacher education program. Paper presented at the 6th

1. *Nordic Research Conference on Science Education*. Joensuu, Finland. Retrieved on December 9, 2011, from http://www.gsu.edu. webfs01 /mst/ mstjr/ public_ htm/ teemsfinland.html.
4. Honebein, P.C. (1996). Seven Goals for the Design of Constructivist Learning Environments. New Jersey: Educational Technology Publications, 11-24.
5. Jonassen, D., Peck, K.L., Wilson, B.G. (1999). Learning with Technology: A Constructivist perspective. New Jersey; Prentice Hall.
6. Kaufman, D. (1996). Constructivist-based Experiential learning in Teacher Education. Action in Teacher Education 18 (2), 404-9. EJ 536845.
7. Lorsbach, A and Tobin, K. (2012). "Constructivism as a referent for Science Teaching". Printed in *National Association for Research in Science Teaching* (NARST).

8. Mackinnon, A., & Scarff-Seatter, C (1997). Constructivism: Contradictions and Confusion in Teacher Education. In V. Richardson (Ed), Constructivist Teacher Education: Building New Understandings (pp. 38-55). Washington, DC: Falmer Press.

9. Martin, R.J. (1994). Multicultural Social Deconstructionist Education: Design for Diversity in Teacher Education. Teacher Education Quarterly 21 (3), 77-89. EJ 492 141.

10. Mathews, M.R. (2000). Editorial of the Monographic issue on Constructivism, Epistemology and the Learning of Science' *Science & Education*, 9 (3).

11. Oldfather, P., Bonds, S., and Bray, T. (1994). Drawing the Circle: Collaborative Mind Mapping as a Process for developing a Constructivist Teacher Education Program. *Teacher Education Quarterly* 21 (3), 5-13. EJ 492 137.

12. Richrdsson, V (1997). Constructivist Teaching and Teacher Education: Theory and Practice. In V. Richardson (Ed), Constructivist Teacher Education: Building New Understandings (pp 3-14). Washington, DC: Falmer Press.

13. Vadebocoeur, J (1997). Child Development and the Purpose of Education: A Historical Context for Constructivism in Teacher Education. In V. Richardson (Ed), Constructivist Teacher Education: Building New Understandings (pp 3-14). Washington, DC: Falmer Press.

14. Vygotsky, L.S. (1978). *Mind in Society: The Development if Higher Psychological Processes.* Cambridge, MA: Harvard University press.

15. Vygotsky, L.S. (1986). Thought and Language. Cambridge. Massachusetts. MIT Press.

16. Von Glasersfeld, E (1996). Aspects of Constructivism. In C.T. Fosnot (Ed), *Constructivism: Theory, Perspectives, and Practice*. New York., N.Y. Teachers College Press, Columbia University.

17. Von Glaser feld, E (1990). Constructivism in education. In A Lewy (Ed). The International Encyclopedia of curriculum. Oxford Pergamon London: Falmer Press.

18. Wilson, B.G., & Cole, P. (19910. A Review of Cognitive Teaching Model. New York: Scholastic press

19. Yager, R. (1999). The Constructivist Learning model, towards real reform in Science education. *The Science Teacher*. 58(60, 52-57.

VISIT: http://cjoe.naspublishers.com

NAS
PUBLISHERS

Perinthattiri P.O., Cheloor, Malappuram Dt., Kerala, India, Pin - 676 507
Ph: 09745073615, 08907162762
Email: naspublishers@gmail.com, web: www.naspublishers.com

/9745073615 /NasPublishers