CHAPTER – I

INTRODUCTION

Chapter - I

INTRODUCTION

The progress and prosperity of any nation depends upon the quality of it's citizens. The critical measure of the quality of it's citizens is the quality education provided to them. Education, it is rightly said, is the key to national property and welfare.

Education is the purposeful and continuous process. The root, Latin word of Education is educere means 'to draw out from within'. What we draw out from within is knowledge which is already present in one's mid. Through the medium of education we just give the form of expression to that knowledge.

This age is identified by knowledge. Every human being is in pursuit of knowledge in each field. Why man is differ from all animals? Because he has the gift of intellect. Man can think and then decide which knowledge is useful for me and which is not. Education helps him for this.

Today's education is highly influenced by the immense growth in information, communication and technology. New knowledge is generated within a seconds. Speed and quality of knowledge both has been increased. It turns the whole society as learning society.

Keeping this in mind International Commission on Education known as Delores Commission put from the first pillar of education that is 'Learning to know.'

Today's teaching-learning process is not a one-way communication. But student-centered approach is there which makes the teaching-learning lively in the classroom.

Constructivism is one reason behind this change. This new trend in education makes the teaching-learning interesting more rigorous and enjoying process.

1.1 Constructivism :

Constructivism is a theory of knowledge which argues that humans generate knowledge and meaning from their experiences. Knowledge is not attained but constructed (Von Glasersfeld, 1989). This statement came from a new challenge to the concept of traditional knowledge. The process of teaching is based on objectivist view of knowledge. This view is based on the assumption that knowledge is objective universal and complete and it can be imported by those who have it to those who do not have it.

Today, as we focus our attention on giving quality education to millions of children in our schools, we find a paradigm shift taking place in the basic process of education from 'teaching to learn' to 'helping to know'. Now, we have not only realized the limits in objectivist learning but started looking for better ways of pursuing learning through effective ways of teaching. If knowledge is not to be seen as a commodity to be acquired through transmission / deposit, but as a subjective experience then learning is required to take place within the individual. Learners create their own knowledge in the process of understanding during their encounter with reality involving objects, persons and events.

Construction is basically a theory used to explain now people know what they know. 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 basic characteristics of constructivism are as follows.

- Learning is not a passive receptive process but is instead an active meaning-making process required to solve meaningful problems.
- Now learning depends on learner's previous knowledge, which may sometimes interfere with the understanding of new information.
- Learning implies the reorganization of prior conceptual schemes.
- Learning is facilitated by social interaction.
- Meaningful learning occurs within authentic learning tasks.

The meaning of constructivism varies according to one's perspective and position. Within educational contexts there are philosophical meanings of constructivism, as well as, personal constructivism as described by Piaget (1967), Social Constructivism outlined by Vygtosky(1978),radical constructivism advocated by Von Glasersfeld (1995), Constructivist epistemologies, and educational constructvism (Mathews, 1998)

"Constructivism is not a theory about teaching it is a theory about knowledge and learning the theory defines knowledge as temporary developmental, socially and culturally medicated, and thus, non-objective." (Brooks and Brooks, 1993, p. vil.)

"(K)nowledge, no matter how it be defined, is in the heads of persons, and that the thinking subject has no alternative but to construct what he or she knows on the basis of his or her own experience."

(Von Glasersfeld, 1995).

"The doctrine itself holds that language users must individually construct the meaning of words, phrases sentences and texts." (Suchting, 1998, p. 61-62; Von Glasersfeld, 1989, p. 132).

'To construct this verb comes from 'Con struere', a Latin word which means to construct, 'Knowledge means a specific type of structure done by an individual.'

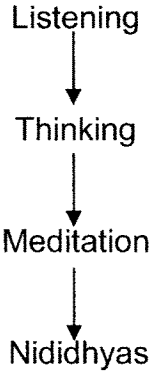
(Giambattisa Vico-1668-1744)

1.2Historical Background of Constructivism :

1.2.1Ancient Indian Philosophy and Constructivism :

Constructivist approach is originated in 18th Century. But its is not new to Indians while teaching learning process in ancient times was based on this philosophy. In ancient times, Vedic, Jain, Buddha Philosophies had a view that knowledge is within the person.

In Vedic era students live with guru in Gurukul for 12 years. Through out this period they learn a lot. Direct experiences, probing inferences were the ways of gaining knowledge. The process of knowledge acquisition is as follows,



(Flow Chart No.1.1)

The process of knowledge acquisition

For above processes questioning, debates, seminars, sharing of views, discussions etc. methods were used.

Jainism also stated 'Anekantavad' which says that knowledge is not complete as a whole. But when we accept the opinions of every individual and when we connect them we go nearer to the knowledge. For this purpose dialogue, discussion, questioning methods were used. Here we find social constructivism. We can acquire knowledge by sharing of ideas and thoughts.

Buddhism gives stress on the power of meditation because it believes in the scientific attitude towards knowledge acquisition. Concentration power was important. The philosophy believed that knowledge is within the person.

1.2.2Proponents of Constructivism :

Socrates :

The concept of constructivism has roots in classical antiquity, going back to Socrates' dialogues with his followers, in which he asked directed questions that led his students to realize for themselves the weaknesses in their thinking. The Socratic dialogue is still an important tool in the way constructivism educators assess their students' learning and plan new learning experiences. Socrates believed that learning was an inner experience and that why we learned was more important than what was learned.

Giambattista Vica :

Giambattista Vico published a treatise on the construction of knowledge in 1710. This treatise illuminated (rather than invented) the idea that knowledge is something that is constructed by the knower. Vico's concepts deal mostly with the relationship between truth, knowledge and the origins of language and the desire of the human mind to create knowledge.

John Dewey :

According to Dewey (1859-1952), knowledge and ideas entrge only from a situation in which learners have to draw out experiences that have meaning and importance to them. Dewey argued that human thought is practical problem solving, which proceeds by testing rival hypotheses. These problem solving experiences occur in a social context, such as a classroom, where students join together in manipulating materials and observing outcomes. He wrote, "If you have doubts about how learning happens, engage in sustained inquiry study, ponder, consider alternative possibilities and arrive at your belief grounded in evidence." Inquiry is a key part of constructivist learning.

Jean Piaget :

The psychological roots of constructivism began with the developmental work of Piaget who proposed four stages in human development; the sensor motor stage, the proportional stage, the concrete operational stage and the formal operational stage. For Piaget the development of human intellect proceeds through adaptation and assimilation. Furthermore, Piaget's constructivist stances are seen in his belief that our understandings of reality are constantly being revised and re-constructed

through time and with respect to exposure to new experiences, "what remains is construction as such, and one sees no ground why it should be unreasonable to think it is ultimate nature of reality to be in continual construction instead of consisting of an accumulation of ready-made structures." (Piaget, 1970 pp.57-58)

Lev Vygotsky :

The Russian psychologist Lev Vygotsky's (1896-1934) relevance to constructivism derives from his theories about language, thought, and their mediation by society. Vygotsky held the position that the child gradually internalizes external and social activities, including communication, with more competent others. In his experiments, Vygotsky studied the difference between the child's reasoning when working independently versus reasoning when working with a more competent person. He devised the notion of the zone of proximal development to reflect, the potential of this difference. Vygotskys believed that learning is social in nature. It involves interaction between learner and teacher and also amongst learners. Vygotsky's findings suggested that learning environments should involve guided interactions that permit children to reflect on inconsistency and to change their conceptions through communication.

Von Glasersfeld :

Von Glasersfeld (1917), the prominent social constructivist in his epistemological question stated that :

- Knowledge is not about an observer independent world.
- Knowledge is created by an individual in a historical and cultural context.
- Knowledge refers to individual experience rather than to the world.

Constructivist theory stated two main principles that knowledge is not passively received but is actively build up and the functions of the cognition is adoptive and serves the organization of the experiential world.

Jerome Bruner (1966) :

Bruner (1966) on the theory of cognitive development and discovery learning stated that children are more likely to remember concepts if they discover then on their own. He defines that a learner is capable of learning any subject so long as instruction is organized appropriately. In his theory of learning he emphasizes the role of language and culture in the development and construction of thoughts and knowledge.

David Asubel :

Asubel in his book 'The psychological of meaningful verbal learning (1963) proposed the Advance organizer mode. Advance Organiser is an introductory material at a higher level of abstraction generally and inclusiveness than the learning material presented before the actual learning task. Its purpose is to explain, integrate and interrelate the material in the learning task with previously learned material also to help the learner discriminate the new material from the previously learned material.

Driver, Posner, Novak :

Driver (1978) was of the view that interventions provided in the classroom can help children to construct their own concepts. Posner (1982) formulated the theory of conceptual change and indicated the conditions required for it to occur. Novak (1993) proposed a model of learning known as human constructivism. Human constructivists assert that the cognitive processes resulting in creative or research work of a scientist are essentially the same as those of a fresh learner in constructing new knowledge.

In Indian and Western philosophy we find the roots of construction. Learner's conceptual schemes progressively reconstructed so that they are in keeping with a continually wider range of experiences and ideas and it become an active process.

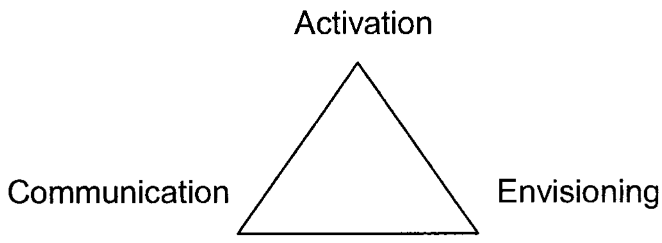
1.3Process of Knowledge Construction :

Piaget believed that learning is strongly influenced by the learners developmental stages. In the process of assimilation and accommodation learner always relates new knowledge to the older one. When this new knowledge relates or same to the older one the assimilation takes place and when new knowledge differs from older one learner just add on and process of accommodation takes place.

Vygotsky believed that learning is social in nature. Learning involves interaction between the learner and teacher, and also among learners. Learner shares his knowledge, ideas with those of others and develop new understanding.

Contemporary constructivists like Diver, Posner, Novak and Osborne assume that learner's conceptual schemes progressively reconstructed so that they are in keeping with a continually wider range of experiences and ideas and it become an active process.

The process of knowledge construction is active changing and continuous. This process involves 3 main factors such as –



Activation :

Knowledge is in build in each mind. But it is in a hidden form. In first stage expression of this hidden knowledge in front of others is very essential. This process of expression called activation.

Communication :

The knowledge constructed in one one's mind it should convey to others and this is expected at this stage. Each learner has a different and unique idea so here, interactions between learners are very important to generate new knowledge, to verify conclusions, to express opinions. Communication should be a continuous process. Intellectual competency of learners, healthy interactions, democratic atmosphere and work culture influences this process.

Envisioning :

After the interactions, learner's old knowledge reconstructed and turns into new knowledge. It is his responsibility that to check the changes takes place in old knowledge. One must be flexible enough to change himself and never to stick the old knowledge. Then only envisioning will take place.

According to above three factors each student must be involved in the process of constructing knowledge if we want to make education a dynamic process. So far that reason environment in the classroom must be changed according to the knowledge construction.

1.4Learning environment for knowledge construction :

Constructivist philosophy believes that knowledge is constructed by the learner i.e. new experiences are accommodated or assimilated in the light of his or her own culture, background and embedded worldview.So according to the constructivist view, the process of knowledge construction and the constructor of the knowledge both are important. The constructor constructs knowledge himself/herself. The learner is at the center of this process and the teacher facilitates and directs the process of learning in which students are

engaged in different tasks. They are encouraged by the teacher and the environment is democratic and interactive.

Characteristics of the Learning Environment for knowledge construction:

1) Every learner is encouraged to use prior experiences to form and reform interpretations. Teacher's construction of knowledge is not imposed on the students.i.e.the environment is democratic.
2) The environment is student centered. Though there are individual differences, each student is treated and respected as a constructor of knowledge.
3) The environment is free from direct instructions of the teacher and it is not monotonous in nature. According to the need and nature of the content students are involved in activities, experiences, experiments, small group interactions etc. So the environment and the process changes according to the change in content.
4) Restricted time table and compartments of syllabus have no place in this type of environment. Time table should be flexible and adequate time for knowledge construction should be given to the students.
5) Teacher creates an environment by providing some resources. Active interactions with the resources and learning material leads to the construction of knowledge of the students.
6) Teacher involves the students in mental tasks which includes analysis, synthesis and evaluation. And then creates a cognitive space thoughtfully to promote thinking of the student. By asking higher order questions and encouraging students to form questions, hypothesise, teacher lets the students to search and research the answers on their own which creates a thinking community.
7) According to Andry Gray(1997), In the traditional classroom, a barrier between the student and the teacher exists through power and practice. But in a constructivist classroom the teacher and the students share responsibilities and decision making and demonstrate mutual respect.
8) According to Cook (1992) in a constructivist classroom the teacher must offer options and choice to the students in their work. Instead of the common practice of telling what to do, teacher engages the students, trust them and invites them to participate.

9) Though the process of knowledge construction is student centered, teacher plays a vital role. Creating a cognitive and physical space for knowledge construction is a difficult and challenging task.

Table No.1.1

Role of a teacher in the creation of constructivist learning environment :

Teacher's Role	Teacher's Activity
Philosopher	Frames aims and objectives according to the constructivism.
Critical Thinker	1. Analyses the content, situation and students ability. 2. Makes healthy environment to construct knowledge.
Decision Maker	1. Decides which proponent of constructivism he should follow. 2. The Decides strategies, resources proves useful for knowledge construction.
Facilitator	1. Provides resources and study material to the students. 2. Gives them ample opportunity to handle the things on their own.
Manager	1. Manages class and situations by giving proper instructions to the students. 2. Manages time and engaged entry student in the environment.
Guide	1. Give active guidance to each learner. 2. Observer each one personally and guides wherever necessary.
Counselor	1. Keeps various options in front of the learner to solve problem.

	2. Motivates him to choose the correct one.
Researcher	1. Observers each student in the environment. 2. Takes hard efforts to keep everyone engaged in the class. 3. Analysis reasons behind aloofness of any student if it is there. 4. Searches everyone for a novel, creative environment for knowledge construction in the classroom.
Evaluator	1. Observes everyone in the class. 2. Maintains a cumulative record of each student. 3. Gives feedback immediately to everyone. 4. Makes the process of evaluation speedy accurate and prompt.

With the Classroom environment, student's thinking ability is also important. Teachers have to use various techniques to keep mental process of student's active and stable at the same time. Following are the various teaching techniques to keep students mental process engaged in the classroom atmosphere.

1. Questioning Technique
2. Role playing
3. Inquiry Training
4. Puzzles
5. Problem Solving
6. Projects

1.5Questioning :

Questioning is the key aspect of the teaching learning process. Questioning is the most powerful skill which help teachers obtain knowledge deepen understanding refine skills, reflect on instructional practices and learn how to successfully communicate with students. Question in the classroom can be defined as,

"Any statement intended to evoke a verbal response."

Questioning helps teacher to draw pupils into the learning process as well as checking an acquisition of knowledge.

Yoram Harpar and Adam Lefstein with twelve Israeli schools created communities of thinking to explore how a pedagogy based on questioning can transform teaching and learning.

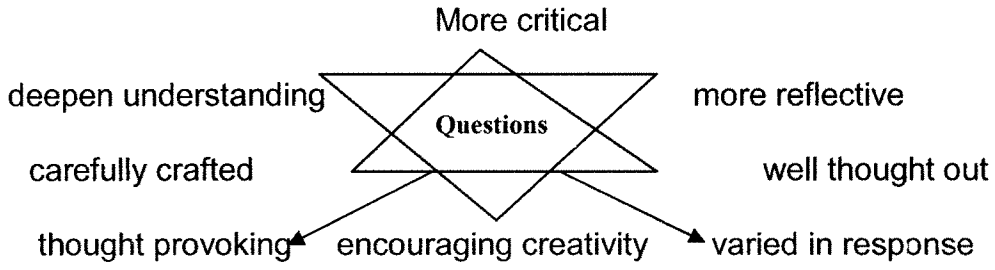
In this research they explain the nature of questioning as follows :

1. Questioning is a creative activity.
2. Questioning helps to elaborate previous knowledge.
3. Questioning gives birth to motivation.
4. Questioning fashions the answer.

Characteristics of questions for knowledge construction :

Questions of various types plays a vital role in the knowledge construction.

Following diagram gives us the characteristics of those questions which are essential for knowledge construction.



Knowledge construction is not a one second process instead it gives more stress on time to think over question and then giving response. So teacher must also give students time to think before answering.

According to research by Morgan and Saxton (1991), wait time or think time after posing questions yields significant results.

i) More participants volunteer answers.
ii) Participants provide longer answers.
iii) Participants responses are more creative, evaluative and analytical.
iv) Participant generate more follow-up questions.

In the knowledge construction, questions must never be the result of thinking what type of question should I ask? instead of that it should be the result of thinking what do I need the question to do?

Types of Questions :

We find the enormous variety in types of questions. Questions can be classified in various ways and they are as follows :

a) Bloom and Turney's types of questions:

i)Remembering

(Recall of factual information.)

ii) Understanding

(Showing understanding of the information recalled.)

iii) Applying

(Consideration of practical relevance of information.)

iv)Analyzing

(Ability to investigate elements of the information.)

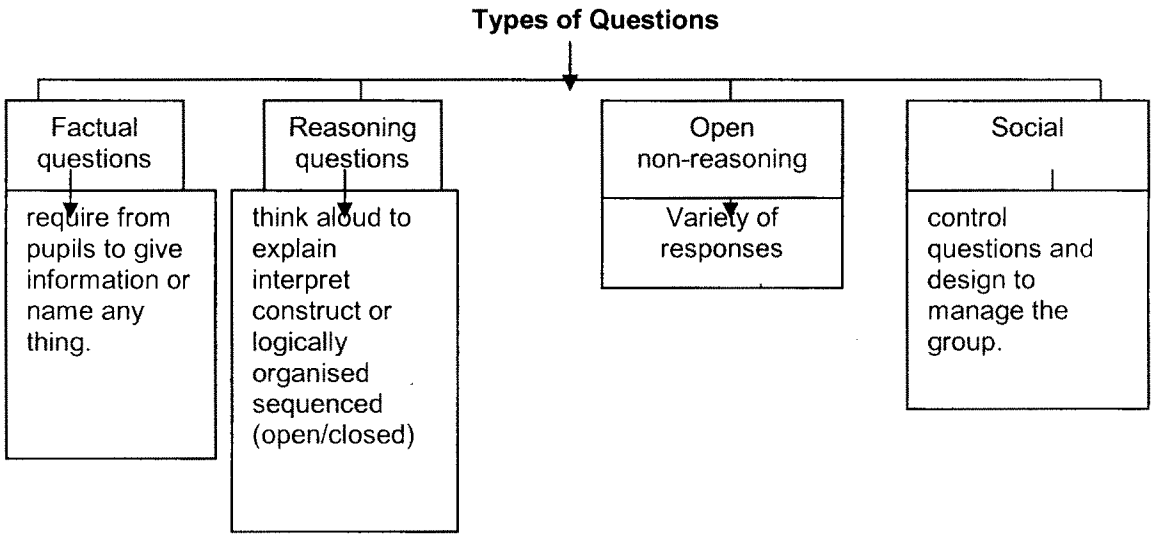
vi) Evaluating

(Ability to make judgments about the nature of information.)

vii)Creating

(Ability to think in a novel way creatively)

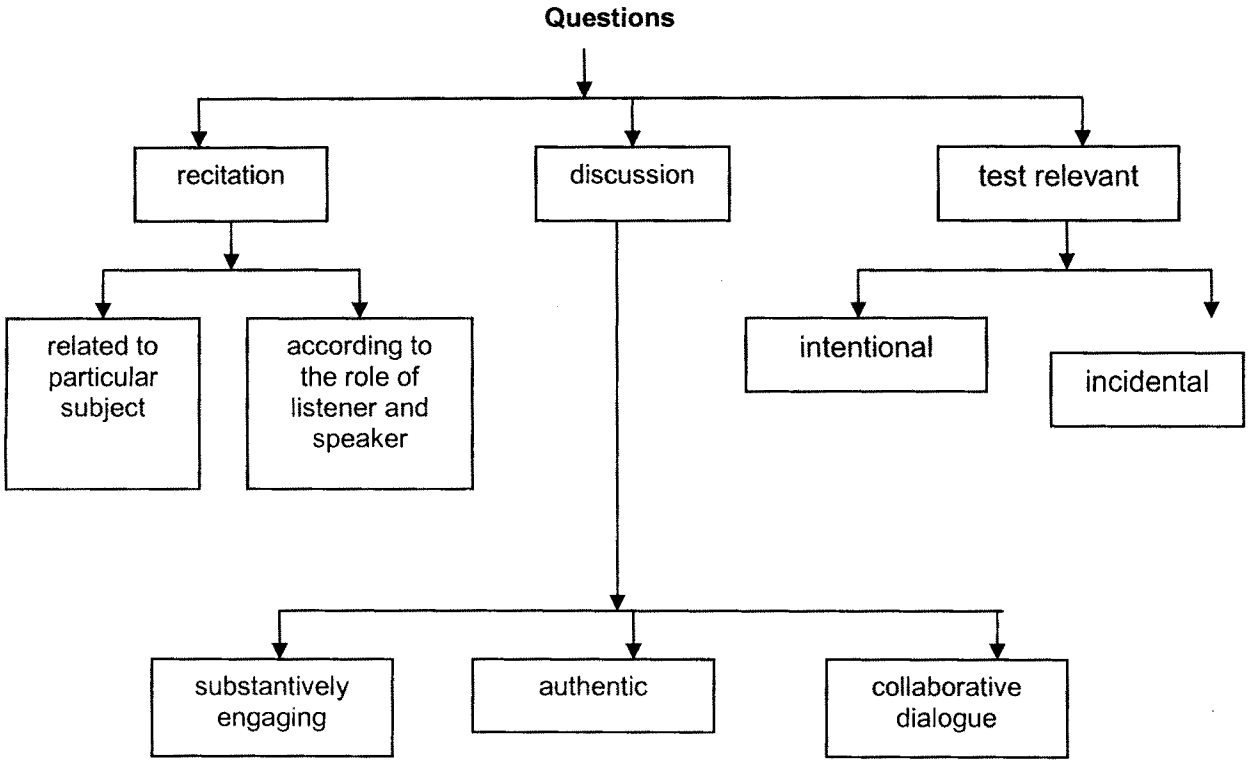
b) Barne's Model (Types of Questions) :



Flow Chart No.1.2

Types of questions by Barne

c) Gall and Artero Boname give following types of questions.



Flow Chart No.1.3

Types of questions by Gall and Artero

d) Yoram Harper and Adam Lefstein explains the types of questions in 3 stages.

i) The fertile question stage :

In this stage, teacher pose a fertile question which has following six types.

- An open question
- An undermining question
- Rich question
- Connected question
- Charged question
- Practical question

ii) The Research stage :

In this stage learner pose hypotheses, gather information, interprete data and draw conclusions in accordance with the scientific procedures customary in the discipline being studied.

iii) The concluding performance stage :

Each research team presents its conclusions in a performance.

Questions necessary for knowledge construction :

a) From the Bloom and Turney's types of questions :

Last four levels of Bloom's taxonomy.

iii) Application

iv) Analysis

v) Synthesis

vi) Evaluation

requires higher level thinking ability which prepares student's mind to construct knowledge, as they are useful for divergent thinking.

Questions asked to fulfill these four objectives are necessary for knowledge construction.

b) From the Barne's Model :

In this model, last three types of questions.

ii) Reasoning Questions

iii) Open / Non-reasoning questions

iv) Social questions.

proves helpful for students reflective thinking ability. While answering to these type of questions pupil has to think deeply to give the variety of responses which are logically sequenced and sign of best knowledge construction.

c) From the Gall and Artero-Boname's types of questions :

In this classification, second type of questions,

ii) Discussion proves helpful for the construction of knowledge.

d) From the Yoram Harper and Adam Lefstein's types of questions :

All the three stages.

i) The fertile question stage.

ii) The research stage.

iii) The concluding performance stage

Questions arised in these stages contributes a lot in the construction of knowledge.

Points arising from researches done in foreign countries over classroom questioning.

i) Improving questioning was one of the keys to raising attainment identified by Black and William.

ii) Teachers ask between 300-400 questions each day (Leven and Long, 1981) though many of these are procedural.

iii) Most teacher's questions are lower-order. Increasing higher-order questions to around 50% of the total can raise attainment and improve pupil attitudes.

Most teacher's questions are answered in less than a second often by the teacher him or herself. Increasing wait time to 3 seconds for lower order questions and 10 seconds for higher order ones improves the number and quality of answers

To make the process of education dynamic and totally changed our government has to change the entire policy of education. The one step to that direction is National curriculum Framework, 2005. Our National Curriculum Framework, 2005 is designed on the basis of constructivism.

1.6National Curriculum Framework, 2005 :

In the National Curriculum Framework, 2005 stress is on giving the knowledge which is enriched in it to the student but this knowledge is not a outside entity but it is present within a student. For this teacher's role is important here as a facilitator which develops his student into an active listener. The guiding principles of National Curriculum Framework are as follows:

1. To relate the knowledge with outside world.
2. Free the education from rote learning.
3. Use the education not as the textbook. (Entered but for the overall development of child.)
4. Make the examination more flexible and integrated with classroom life.

Classroom teaching should be according to these principles. Students must be engaged all the time in activities, observations, reflective thinking, analyzing, evaluating at the same time with the content in textbook. Local knowledge and experiences of children should be the part of teaching methods.

Educational sources also should be restructured as follows:

1. Textbooks should be centered at concepts which demands group work and reflective thinking, projects, questions and practice.

2. Teacher handbooks and workbooks depending on new approaches and thoughts.
3. Use of information, communication technology and multimedia as sources for two way interaction instead of one way acquisition.
4. Perfect library.

For the language education, National Curriculum Framework states following points:

1. Mothertongue is the best medium of education for schools.
2. If the regional language is differs from mothertongue first two years of education must be in mothertongue.
3. At primary level, regional language should be the compulsory subject.
4. Multilingualism should be used as best resource to develop new methods of teaching language.

Objectives of first language acquisition according to National Curriculum Framework are as follows –

1. To develop four basic skills that is listening speaking, reading and writing up to the higher level competencies in communication and understanding.
2. To develop the reflective understanding among students.
3. To spend more time for developing awareness about expanding interesting and challenging world.
4. To motivate students for creative expression.
5. To motivate students to read books in different languages as the resource for their textbook content.
6. To motivate students to participate in co-curricular activities to develop their sensitivity for others.

In this way National Curriculum Framework, 2005 gives stress on engaging students in different activities to propose their own knowledge in front of others.

To follow the National Curriculum Framework, 2005 thoroughly a paradigm shift in education is necessary and it will happen only after following various teaching techniques.

Questioning technique helps to engage students in teaching-learning environment. It also helps to develop higher order thinking ability of students. Questions help students to be active in the class both mentally and physically.

Present study throws light on the role of questions for knowledge construction among VIII standard students with reference to the subject English.

1.7About the Research :

Statement of Problem :

Use of questions for knowledge construction among viii standard students with reference to the subject English – a critical study.

Definition of terms and phrases:

1. Use of questions

Operational Definition

"For the purpose of this study, 'use of questions' means ' different types of questions' asked by the teacher for construction of knowledge by students."

2.Types of questions

Conceptual Definition

"Two types of questions according to the Bloom's taxonomy of objectives are as follows –

Higher level questions:

Creating type

Evaluating type

Analyzing type

Applying type

Understanding type

Low level questions:

Remembering type

Bloom (1956)

3.CONSTRUCTION OF KNOWLEDGE

Conceptual Definition

"Construction of knowledge is a individualized process which takes place in human brain, joins new knowledge to the previous experiences in the form of assimilation and accommodation continuously."

Jean Piaget. (1973)

"Construction of knowledge is a changing process because individual experiences are influenced by one's social and cultural background."

Vygotsky.

Operational Definition

"Here, construction of knowledge means that knowledge which is basec on higher level objectives, content, literary genres and generated by students of VIII standard in English language by questions asked during classroom teaching."

4.VIII STANDARD

Nominal Definition

"VIII class of pupils in a school."

International Dictionary of Education

Operational Definition

"Here, VIII standard means the class of higherer primary stage in 5+3+2 course structure or pattern provide by NCERT."

5.STUDENT

Nominal Definition

"Person enrolled in a school or college or university to follow a particular course of studies."

International Dictionary of Education

Operational Definition

"Here, student means person enrolled in a VIII class in a school."

6.SUBJECT ENGLISH

Operational Definition

"Here, English is one of the subjects taught to the VIII standard in English medium schools.

Objectives of the Study

1) To find out the objectives of teaching English as the first language for VIII standard according to the National Curriculum Framework, 2005.
2) To find out the higher level objectives of teaching English as the first language for VIII standard according to the National Curriculum Framework, 2005.
3) To find out the higher level objectives framed by Maharashtra State Bureau of Textbook production and Curriculum Research of Teaching English as the first language for VIII standard.

4) To find out the contents which fulfill the higher level objectives of teaching English as the first language for VIII standard.
5) To determine constructions of knowledge depending on the contents which fulfill the higher level objectives.
6) To determine the types of questions necessary for the creation of above construction of knowledge.
7) To find out the questions asked by teachers during classroom teaching with reference to the selected content.
8) To compare the questions asked by English teachers in classroom teaching and the expected questions for the construction of knowledge.
9) To make appropriate suggestions and recommendations for the creation of expected construction of knowledge in English language.

Assumptions :

1) There are various types of objectives in the curriculum of English as a first language.
2) To fulfill higher level objectives various questions are asked.
3) Various types of questions are necessary to construct knowledge.

Significance of the study :

A study of the use of questions for the construction of knowledge is very significant because the results of this research will be useful for the subject teachers, students, teacher – educators, student teachers. The suggestions and recommendations will be useful for the curriculum designers.

Scope of the study :

Results of this study are applicable only to the VIII standard students of English medium schools in Kolhapur city, English teachers, curriculum designers, teacher educators, student teachers.

Limitations of the Study :

1. Present study is limited only for the VIII standard students studying in English medium schools.
2. Present study is limited only for the English schools in Kolhapur city.
3. Present study is limited only for the subject English.
4. Present study is limited only for the English textbooks prepared by Maharashtra State Bureau of Textbook Production and Research.

5. Present study is limited only for the questioning technique used by concerned teachers during classroom teaching.
6. Present study is limited only for the teachers teaching subject English in English Medium Schools for VIII standard.

Scheme of Chapterization :

Chapter I INTRODUCTION:

It deals with a background of problem, definition of the terms and phrases, objectives, assumptions, significance, scope and limitations of the study.

Chapter 2 REVIEW OF RELATED LITERATURE AND RESEARCH :

It deals with the review of literature and research which is directly and indirectly related to the present study.

Chapter 3 METHODOLOGY OF STUDY : A PLAN AND PROCEDURE :

It deals with the plan and procedure of the study. It contains research design, types and methods of research, sample design and size and nature of sample. Tool for the data collection, procedure for data collection and scheme for data analysis.

Chapter 4 ANALYSIS, INTERPRETATION OF DATA AND RESULTS:

It deals with the tabulation of data and qualitative analysis and interpretation of the collected data and results of the study.

Chapter 5 SUMMARY AND CONCLUSIONS:

It deals with the summary and conclusion, educational implications and suggestions for further research.

Lastly the reference and appendices are given to complete the body of the thesis.

REFERENCES

APPENDICES