THEORETICAL FRAMEWORK

2.0 Constructivism in education

The new paradigm, “constructivism,” is a psychological philosophical perspective contending that individuals form or construct much of what they learn and understand (Shunk, 1996). It is a descriptive theory that highlights the way people learn or develop rather than the way they should learn (Richardson, 1997). The roots of constructivism can be traced from Kant through Dewey, Vygotsky and Piaget, who investigated the ways that people construct meaning from the information they receive and how they integrate this information with their existing cognitive structures. Like Dewey, the constructivists have reframed the goal of education from dispensing knowledge to creating social environments that help students construct their own knowledge (Brown, Collins, & Duguid, 1989). Piaget proposed that cognitive change and learning take place when a learner’s way of thinking, or scheme, leads to perturbation instead of producing what the learner expects. This perturbation (puzzlement) then leads to accommodation (cognitive change) and a new sense of equilibrium.

The other theoretical perspectives on how students learn from interacting with others is based on the social constructivist view of Vygotsky (1978). According to this perspective, children’s mental functioning develops first at the interpersonal level where they learn to internalize and transform the content of interpersonal interactions with others, to the intra-personal level where it becomes part of their repertoire of new understanding and skills. In essence, children learn by interacting with adults or more capable peers who scaffold or mediate learning so that they are able to complete tasks they could not do alone.

Definitions of constructivism vary according to the various questions being debated within the constructivist movement. The most basic arena for debate is represented by a continuum from viewing learning as an act of individual construction to seeing learning as socially constructed. This continuum is anchored on one end by a position known as radical or psychological constructivism, which describes the construction of knowledge as a process that takes place in the mind of the individual. The other end of the continuum is occupied by a position known as social
CHAPTER II

constructionism or the socio cultural position that sees "mind" as almost totally embedded in the social practices of the culture.

Based on the idea that learners construct their learning to previous learning, Limón (2001) states that research on conceptual change explored students’ prior conceptions overall about scientific phenomena and instructional strategies were developed to promote conceptual change.

2.1 Conceptual change

In the constructivist perspective, conceptual knowledge includes both what students learn and how it is organized into broader principles (Grotzer, 2002; J. D. Novak, 2002). Yet, contributors to the constructivist literature do not always make it clear what level of change they are targeting when they address issues of conceptual change. Building on the work of Ausabel (1963) and Gowin (1981), J. D. Novak (2002) defined a concept "as perceived regularities in events or objects, or records of events or objects designated by a label (usually a word)" (p. 550). Concepts are organized into constructs, deep principles, and theories that describe their relationships and how these relationships explain how, when, and why events occur.

When teachers help students attach useful labels and signs to regularities and patterns of events, they scaffold students' conceptual development. Because concepts are embedded in larger cognitive systems, their meaning is affected by their placement in these systems and their connections to other concepts and principles and the non reflective web of experience. The different names given to cognitive structures (e.g., schema, mental models) try to capture this broader level of meaning connected to conceptual knowledge.

When constructivists describe the process for helping students develop useful concepts, they assume that students are changing concepts rather than acquiring new ones. Much of the concern of educators interested in conceptual change has focused on misconceptions that prevent students from adopting concepts and principles that will more accurately explain the events they experience (Novak, 2002). To design effective learning experiences, it is important to understand that learning involves replacing an existing concept (or more likely a misconception) with a new concept or larger cognitive structure. Seeing learning as replacing an existing concept directs us to start the learning process by trying to understand the students' existing everyday
theories and help students become more aware of their own theories. If students share a misconception (if it is common knowledge), it is even more difficult to dislodge the misconception and replace it with a useful concept. Adding this step to the beginning of the teaching process increases our awareness of the common misconceptions and difficult concepts in our disciplines. The constructivist perspective challenges teachers to discover what concepts students find most difficult to understand and to identify the most common misconceptions students hold about the phenomena their discipline is organized to understand. It is important for teachers to find ways to involve at least a subset of their students in conversations that reveal their conceptual understanding of the subject matter.

2.2 Guiding principles for constructivist classrooms
In a constructivist classroom, the teacher searches for students’ understandings of concepts, and then structures opportunities for students to refine or revise these understandings by posing contradictions, presenting new information, asking questions, encouraging research, and/or engaging students in inquiries designed to challenge current concepts. The following five overarching principles are evident in constructivist classrooms.

2.2.1 Teachers pose problems of emerging relevance
Constructivist teachers by acknowledging the central role of the learner, structure their classroom experiences (subject areas) that foster the creation of personal meaning.

2.2.2 Teachers build lessons around primary concepts and “big” ideas
Structuring curriculum around primary concepts is a critical dimension of constructivist pedagogy. When designing curriculum, constructivist teachers organize information around conceptual clusters of problems, questions, and discrepant situations because students are most engaged when problems and ideas are presented holistically rather than in separate, isolated parts.

2.2.3 Teachers seek and value their students’ points of view
Seeking to understand students’ points of view is essential to constructivist education. The more we study the learning process, the more we understand how fundamental this principle is. Students’ points of view are windows into their reasoning.
Awareness of students’ points of view helps teachers challenge students, making school experiences both contextual and meaningful. Each student’s point of view is an instructional entry point that sits at the gateway of personalized education.

2.2.4 Classroom activities challenge students’ suppositions
Learning is enhanced when the curriculum’s cognitive, social, and emotional demands are accessible to the student. Therefore, some sort of relationship must exist between the demands of the curriculum and the suppositions that each student brings to a curricular task. If suppositions are not explicitly addressed, most students will find lessons bereft of meaning, regardless of how charismatic the teacher or attractive the materials might be.

2.2.5 Teachers assess student learning in the context of daily teaching
Constructivist teachers don’t view assessment of student learning as separate and distinct from the classroom’s normal activities but, rather, embed assessment directly into these recurrent activities.

2.3 Becoming constructivist teachers: descriptors
2.3.1 Constructivist teachers encourage and accept student autonomy and initiative
Autonomy and initiative prompt students’ pursuit of connections among ideas and concepts. Students who frame questions and issues and then go about answering and analyzing them take responsibility for their own learning and become problem solvers and, perhaps more importantly, problem finders. These students—in pursuit of new understandings—are led by their own ideas and informed by the ideas of others. These students ask for, if not demand, the freedom to play with ideas, explore issues, and encounter new information.

2.3.2 Constructivist teachers use raw data and primary sources, along with manipulative, interactive, and physical materials
The constructivist approach to teaching presents these abstractions (concepts, theorems, algorithms, laws and guidelines) through real-world possibilities to students, then helps the students generate the abstractions that bind these phenomena together. When teachers present to students the unusual and the commonplace and ask
students to describe the difference, they encourage students to analyze, synthesize, and evaluate. Learning becomes the result of research related to real problems.

2.3.3 When framing tasks, constructivist teachers use cognitive terminology such as “classify,” “analyze,” “predict,” and “create.”

Framing tasks around cognitive activities such as analysis, interpretation, and prediction—and explicitly using those terms with students—fosters the construction of new understandings.

2.3.4 Constructivist teachers allow student responses to drive lessons, shift instructional strategies, and alter content.

As educators, we have each experienced moments of excitement in the classroom, moments when the students’ enthusiasm, interest, prior knowledge, and motivation have intersected in ways that made a particular lesson transcendental and enabled us to think with pride about that lesson for weeks. We recall the gleam in our students’ eyes, their excitement about the tasks and discussions, and their extraordinary ability to attend to the task for long periods of time and with great commitment. If we were fortunate, we encountered a handful of these experiences each year, and wondered why they did not occur more frequently.

The students’ thinking drove these experiments, and the teacher’s mediation framed the processes that followed. The curriculum content—exploration of the scientific method—was addressed faithfully in a different manner for each student.

2.3.5 Constructivist teachers inquire about students’ understandings of concepts before sharing their own understandings of those concepts.

It’s hard for many teachers to withhold their theories and ideas. First, teachers do often have a “correct answer” that they want to share with students. Second, students themselves are often impatient. Some students don’t want to “waste their time” developing theories and exploring ideas if the teacher already knows that they are “on the wrong track.” So teachers sometimes feel great pressure from students to offer the “right” answer. Third, some teachers adhere to the old saw about knowledge being power. Teachers struggling for control of their classes may use their knowledge as a behavior management device: when they share their ideas, the students are likely to be quiet and more attentive. And fourth, time is a serious consideration in many
classrooms. The curriculum must be covered, and teachers’ theories and ideas typically bring closure to discussions and move the class on to the next topic. Constructivist teachers, the caveats presented in the preceding paragraph notwithstanding, withhold their notions and encourage students to develop their own thoughts.

2.3.6 **Constructivist teachers encourage students to engage in dialogue, both with the teacher and with one another.**

One very powerful way students come to change or reinforce conceptions is through social discourse. Having an opportunity to present one’s own ideas, as well as being permitted to hear and reflect on the ideas of others, is an empowering experience. The benefit of discourse with others, particularly with peers, facilitates the meaning-making process.

2.3.7 **Constructivist teachers encourage student inquiry by asking thoughtful, open-ended questions and encouraging students to ask questions of each other.**

If we want students to value inquiry, we, as educators, must also value it.

2.3.8 **Constructivist teachers seek elaboration of students’ initial responses.**

Students’ first thoughts about issues are not necessarily their final thoughts nor their best.

2.3.9 **Constructivist teachers engage students in experiences that might engender contradictions to their initial hypotheses and then encourage discussion.**

Cognitive growth occurs when an individual revisits and reformulates a current perspective. Therefore, constructivist teachers engage students in experiences that might engender contradictions to students’ current hypotheses. They then encourage discussions of hypotheses and perspectives. Contradictions are constructed by learners. Teachers cannot know what will be perceived as a contradiction by students; this is an internal process.

But teachers can and must challenge students’ present conceptions, knowing that the challenge only exists if the students *perceive* a contradiction. Teachers must, therefore, use information about the students’ present conceptions, or points of view, to help them understand which notions students may accept or reject as contradictory.
Students of all ages develop and refine ideas about phenomena and then tenaciously hold onto these ideas as eternal truths. Through experiences that might engender contradictions, the frameworks for these notions weaken, causing students to rethink their perspectives and form new understandings. Through elaboration, students often reconceptualize and assess their own errors.

2.3.10 Constructivist teachers allow wait time after posing questions.
In every classroom, there are students who, for a variety of reasons, are not prepared to respond to questions or other stimuli immediately. They process the world in different ways. Another reason students need wait time is that, as we have discussed, the questions posed by teachers are not always the questions heard by the students. Teachers take sensitive leadership over the orchestration of classroom dialogue and provide opportunities for all students to participate in different ways while encouraging students’ intellectual autonomy with regard to concept formation.

2.3.11 Constructivist teachers provide time for students to construct relationships and create metaphors.
Metaphors help people to understand complex issues in a holistic way and to tinker mentally with the parts of the whole to determine whether the metaphor works. And all of this takes time.

2.3.12 Constructivist teachers nurture students’ natural curiosity through frequent use of the learning cycle model.
First, the teacher provides an open-ended opportunity for students to interact with purposefully selected materials. The primary goal of this initial lesson is for students to generate questions and hypotheses from working with the materials. This step has historically been called “discovery.” Next, the teacher provides the “concept introduction” lessons aimed at focusing the students’ questions, providing related new vocabulary, framing with students their proposed laboratory experiences, and so forth. The third step, “concept application,” completes the cycle after one or more iterations of the discovery-concept introduction sequence. During concept application, students work on new problems with the potential for evoking a fresh look at the concepts previously studied. These 12 descriptors highlight teacher practices that help students search for their own understandings rather than follow other people’s logic. The
descriptors can serve as guides that may help other educators forge personal interpretations of what it means to become a constructivist teacher (Brooks & Brooks, 1999).

2.4 Constructivism: implication to teacher education
The key implication of the constructivist paradigm for teacher education is that student teachers should have time and encouragement to reflect on what they are learning. Because of the short duration of pre-service programs there is a tendency to think we must “give them the theory” while we have the chance, leaving them to work out the implications as they teach. This is an unfortunate approach, however, not only because it models transmission pedagogy but because it gives the students inadequate opportunity to assess and adapt theory (Fosnot, 1989; Tom, 1997; Wideen & Lemma, 1999). Fosnot (1996) maintains that, to achieve a constructivist teacher education program, field experiences must take place in settings that are conducive to experimentation and in which curriculum is approached “in an integrated, learner-centered fashion with emphasis on learner investigation, reflection, and discourse”.

2.5 Common methods and strategies used in constructivistic approach
The common methods and strategies used in constructivistic approach are:

2.5.1 Cooperative Learning
Johnson, Johnson, and Holubec (1993) define CL as “the instructional use of small groups so that students work together to maximize their own and each other’s learning”

2.5.2 Collaborative learning
Collaborative learning is an approach to teaching that is built on philosophical positions like Dewey's, Vygotsky's, and Habermas', which assert that knowledge is socially constructed within a community of learners. If knowledge is socially constructed in learning communities, an important feature of any method of teaching within this framework is to promote meaningful dialogue among students.

2.5.3 The unification of Collaborative and cooperative learning
While comparing collaborative and cooperative learning Panitz (2009) in his ebook cites Ken Bruffee identification of two causes for the differences between the two
approaches. He states: "First, collaborative and cooperative learning were developed originally for educating people of different ages, experience and levels of mastery of the craft of interdependence. Second, when using one method or the other method, teachers tend to make different assumptions about the nature and authority of knowledge." (p12) The age or education levels as a distinction have become blurred over time as practitioners at all levels mix the two approaches. However, what determines which approach is used does depend upon the sophistication level of the students involved, with collaborative requiring more advanced student preparation working in groups.

In the collaborative model groups would assume almost total responsibility for answering the question. The students determine if they had enough information to answer the question. If not they identify other sources, such as journals, books, videos, and internet. The work of obtaining the extra source material would be distributed among the group members by the group members. The final product is determined by each group, after consultation with the teacher. The means of assessment of the group’s performance would also be negotiated by each group with the teacher.

In the cooperative model the teacher maintains complete control of the class, even though the students work in groups to accomplish a goal of a course. The teacher provides additional articles for the students to read and analyze, beyond the text, and then asks the students to work in groups to answer the question. He/she might require a specific product such as a term paper or report, class presentations, and an exam at the end of the topic. The students do the work necessary to consider the material being covered but the teacher maintains control of the process at each stage. In general with cooperative learning’s origins in a concern that competition can impede learning, collaborative learning began with a concern that the hierarchical authority structure of traditional classrooms can impede learning.

For the present study collaborative learning is used for student teachers and cooperative learning is used for learners in this school.

In the present study Co-operative/Collaborative problem-solving discussion is directed towards the exploration of a particular topic or the resolution of a problem. A problem-solving discussion consists of one or more meetings between a small group /
whole class of students who communicate with each other, often face-to-face, in order to achieve one or more goals such as increased understanding, the coordination of an activity, or the solution of a shared problem (Galanes & Adams, 2007).

### 2.5.4 Problem based learning

Problem-Based Learning (PBL), as a general model, was developed in medical education in the early 1970's and since that time it has been refined and implemented in medical schools and it has been adopted in other subject areas (Savery & Duffy, 1995). Henk (2000) in his article states that, PBL stresses the use of real - life problems as a stimulus for learning. In PBL, students work in small groups on these problems, and, in the course of discussing them, formulate goals for self-directed learning. The learning resulting from these activities is constructive and contextually meaningful. Students using PBL build teamwork skills as they learn from each other and work together to solve the problem. For this reason, PBL is ideal for classes with a range of academic abilities. Students in each group can work on different aspects of the problem. Similarly, students from diverse backgrounds will see different aspects of the problem and have varying ideas that could lead to solutions. The PBL process generally includes four main steps: (1) introducing the problem, (2) exploring what students do and do not know about the problem, (3) generating possible solutions to the problem, and (4) considering the consequences of each solution and selecting the most viable solution. The structure of PBL process followed in the present study is given Table 2.1.

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<tr>
<th>Facts</th>
<th>Need to Know</th>
<th>Learning Issues</th>
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<table>
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<tr>
<th>Possible Solutions</th>
<th>New Learning Issues</th>
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<th>Defendable Solution(s)</th>
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The student proceed with itemise all the facts they have been given in the problem. This helps them begin to identify what they know. Then the students need to make a Need to know list. Here they list all the information they would like to have to
better understand the problem and their role in resolving the problem. From the Need to Know list, students should begin to derive a Learning Issues list, comprised of the things they need to look up, research, or explore in order to move forward with problem resolution. Then they work out plan of action and exploration and students should list down their possible solutions. This list will have ideas about how to resolve the problem and require the development of a New Learning Issues list. This new list is used to gather additional information that will allow the students to rule in or rule out the possible solutions they created which will be written in defendable solution(s) (Lambros, 2004).

2.5.5 Inquiry learning

Inquiry learning implements a constructivist approach so that students interact with the content by asking questions to increase understanding and comprehension and at the same time construct their own knowledge. In inquiry, the teacher poses question and then allows time for the students to consider possible solutions, plan an investigation, and go about solving the question posed to them. It helps students focus on the development of key skills such as hypothesis development, planning procedure for activities, data collection, data analysis, and drawing conclusions. In the classroom, inquiry-oriented learning can take many forms. As the teacher, one can help scaffold and build upon the inquiry process by assisting and encouraging students to ask questions related to the topic being investigated. Students then have the responsibility to identify and define their own individual procedures for answering these questions to make the content personal and meaningful to them.

Inquiry learning focuses on teacher asking questions on a consistent basis to ensure that the students understand the material during a class discussion. In a constructivist classroom the students need to be actively involved. The teacher may initiate by asking questions and the students will also ask questions by working with their classmates to explore and discover possible answers. Within this structure of learning, students bring their unique knowledge, understanding, and skills to the learning community. The focus is on the student, with an emphasis placed on active engagement in the learning process to develop and build on student understanding. Through questioning and discovering information, the student learns the material. The
teacher sets up the activity and facilitates the process (Figure 2.1) to ensure students are on task and learning what is intended.

![Inquiry Process Diagram](image)

**Figure 2.1: Inquiry process**

The process begins with questioning and moves through discovery, exploration, and presentation of findings. Throughout this dynamic process, questions are introduced, hypotheses are tested, and new questions are formed and reformed. Central to this inquiry process is reflection and feedback from the teacher and classmates to ensure that understanding and learning are occurring (Coffman, 2009).

### 2.5.6 Field visit

A field visit enables the learners to experience materials and phenomena in their true and natural relationships. They can observe real conditions and gather actual data. Studies have shown that more education can be acquired in a pleasant outdoor environment than in the classroom. It provides an opportunity for learners to become keen observers, appreciating the beauty and order of the natural environment. It verifies classroom instruction and laboratory exercises. It also enriches the entire programme and develops in the learners a love for nature in all her beauty. This method is rarely used because of the responsibilities and cost involved. But even a walk in a nearby park can be environmentally educative (Jerath & Saxena, 2001).

The present study focuses on constructivist approach to Environmental Education using all the above mentioned methods. Because there is growing concern about the state of the environment, and at the same time we are very often confused by the complexities of economic, ethical, political, and social issues related to it.
Environmental problems become everyday news in our media. The Union of Concerned Scientists from "World Scientists' Warning to Humanity," have unequivocally stated, that we can no longer look to science and technology alone to solve these problems. We must also turn to ourselves as individuals to make change and develop a new ethic - a responsible attitude toward caring for the earth (Ministry of Education, 1995). Environmental Education intended to provide students’ opportunities to learn about the functioning of natural systems, identify their beliefs and opinions, consider a range of views, and ultimately make informed and responsible choices. Constructivism believes that knowing students beliefs, views in classroom process helps to make better understanding and meaningful learning among students. Before going to detail about this let us discuss about Environmental Education.

2.6 Environmental education-meaning and definitions
In general Environmental education is, forming desirable belief, attitude, value, interest and understanding about environment. While understanding the meaning of environmental education three of its connotations i.e. education about, education through and education for the environment are implicit in the meaning.

Education ABOUT environment means making environment a subject of investigation. It is based on a specific topic or a restricted area in which the main concern is to gain information and comprehension. It can be done in the classroom as well as in the field.

Education THROUGH environment usually connotes using environment as a medium for study, the use of real life situations as the basis for learning and enquiry. It is essentially an approach or method of enquiry usually conducted through field work.

Education FOR the environment means education for conserving and improving the environment, a study of environmental problems and working for their prevention and solution. Problem solving, decision making, development of an environmental ethics and critical judgment are called for here. Commonly accepted definition of environmental education is: Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment
and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution (Gigliotti, 1990).

2.7 Goals of environmental education
The overall goal of environmental education is to generate environmental action so as ‘to improve all ecological relationships including the relationship of humanity with nature and people with one another’ (Belgrade Charter, 1975). The Tbilisi Intergovernmental Conference on Environmental Education (1977) elaborated the goals of environmental education as the following: to foster clear awareness of, and concern about economic, social, political and ecological interdependence in urban and rural areas; to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment; and to create new patterns of behaviour of individuals, groups and society as a whole towards the environment.

2.8 Objectives of teaching environmental education
The Belgrade Charter has suggested the following six objectives for teaching environmental education.

Awareness: To help individuals and social groups acquire an awareness and sensitivity to the total environment and its associated problems.

Knowledge: To help individuals and social groups, acquire basic understanding of the total environment, its associated problems and humanity’s critically responsible presence and role in it.

Attitude: To help individuals and social groups, acquire social values, strong feelings of concern for the environment and motivation to actively participate in its protection and improvement.

Skills: To help individuals and social groups, acquire the knowledge and skills of solving environmental problems.

Evaluation Ability: To help individuals and social groups, evaluate environmental measures and educational programmes in terms of ecological, political, economical, social, aesthetic and educational factors.

Participation: To help individuals and social groups, develop a sense of responsibility and urgency, regarding environmental problems to ensure appropriate action for solving the problems.
2.9 Guiding principles of environmental education

The Tbilisi Declaration, a document resulted from this conference, outlined the following guiding principles for environmental education.

Consider the environment in its totality – natural and built, technological and social (economic, political, technological, cultural historical, moral, aesthetic); Continuous, lifelong education process beginning at pre-school stage and spanning the entire stages through all formal and non-formal systems of education. Inter-disciplinary in its approach, drawing from various branches and integrating into a holistic and balancing perspective. Environmental issues are examined from local, regional, national and international perspectives and students receive insight into the environmental conditions and problems in global contexts. Promote proper values and attitudes and the need for cooperation of local, national and international bodies in the prevention and solution of environmental problems. Develop environmental sensibility, knowledge and problem solving skills among the students.

Assist learners to discover the symptoms and real causes of environmental problems and arrive at strategies for environmental protection and preservation. Utilize environmental resources for teaching–learning processes and evolve educational approaches for teaching and learning with due emphasis on practical first-hand empirical experiences. Emphasize the complexity of environmental problems and develop critical thinking and creative problem-solving ability in order to deal with complex environmental problems (NCERT, 1985).

2.10 Need of effective teacher training for environmental education

To Indian school system, Environmental Education (EE) is not altogether a new thrust. Educating children about, through and for environment have always stressed by the earlier national commissions and committees. However, it was only during 1986, that a special focus was made in the country’s New Policy on Education. The Policy States that “There is a paramount need to create a consciousness of the environment. It must permeate all ages and all sections of the society beginning with the child. Environmental consciousness should inform teaching in schools and colleges. This aspect will be integrated in the entire educational process”. The National Curriculum Framework for School Education (NCFSE) 2000 (NCERT,
2000) also highlights the need for including environmental concerns at all the levels of schooling. It asserts the Fundamental Duties (Article 51 A of part IV A of the Indian Constitution): "...protect and improve the national environment including forests, lakes, rivers, wildlife and to have compassion for the living creatures... “(Common Core Components, p.36). As one of the General Objectives of Education, it mentions "understanding of the environment in its totality, both natural and social, and their interactive processes, the environmental problems and the ways and means to preserve the environment" (p.40).

In consonance with these documents, environmental studies was made an independent subject at the primary level and topics related to environment were suitably infused with different science and social science subjects at all school stages. As a sequel to this explicit policy statement, efforts have been made in the country to introduce EE in school education through reorganizing the content and methodologies of teaching. At the lower primary stage, i.e., up to class V, EE is introduced as integrated themes anchoring concepts of both natural and social phenomena. In Classes VI – X, Environmental Education has been integrated suitably in social sciences, languages and science and technology. The objectives at this stage are to help the children appreciate the contributions of scientists and develop sensitivity to the uses and misuses of sciences, as well as concern for a clean environment and preservation of the ecosystem. Environmental Education is infused into the teaching of other schools subjects like mathematics, crafts and work experiences, and languages.

It is a reality that a high percentage of teaching force at the school level suffers from environmental illiteracy – illiteracy in terms of lack of understanding of the gripping environmental issues the country is facing, the methodologies of teaching – learning for infusing EE in to the school curriculum (Ravindranath, 1997). Teachers need to plan for projects and activities for students’ participation in environmental problem – solving. This necessitates equipping teachers with necessary knowledge, attitudes and skills for the effective implementation of EE at the school level.

Realising the above need, the country has made several attempts in introducing EE as one of the thrust areas at teacher training level, and environmental education became a prominent component in in - service training programme. But, it
is impossible to achieve all competencies within a single education programme. In this context, pre-service training of teachers is of paramount importance. Recommendation 17 of the Tbilisi Conference emphasizes the pre-service training of teachers. Competent teachers do not emerge out of the blue. They must acquire and practice the attributes of competency and skills during their education. Teachers education colleges should, therefore, review their teacher education programmes in the light of the philosophy of environmental education.

2.11 Importance of constructivist approach in environmental education at pre-service teacher educational level

Environmental Education requires less focus on training and more focus on developing wisdom and flexible applications of diverse problem solving strategies. The teachers in classroom not just supply information, but make the student to understand the role of the individual in environmental problems and what alternatives and / or actions are necessary to solve such problems. It is important that the problem / issues of environment in EE should engage students with real life issues and reinforce the notion that scientific facts must be accumulated and analysed in social and cultural contexts in order to make valid value judgement.

The teaching methods and styles which environmental education requires is constructivist, student directed and experiential in orientation. Successful EE demands an in depth environment related content knowledge and ownership (responsible environmental behaviour) (Hungerford & Volk, 1990). This can be achieved through constructivist based learning. Learning activities in constructivist settings are characterized by active engagement, inquiry, problem solving, and collaboration with others. For making learning is a constructive process, the instruction must be designed to provide opportunities for such construction. For this, the teacher education programme should prepare student teachers to teach constructivist based student-centred methods. It is also useful to remember the educator's maxim, Teachers teach as they are taught, not as they are told to teach. Therefore, teacher educators should bring the constructivist learning practices in teacher education classrooms. Based on the guiding principle of constructivism and common methods and strategies of constructivist approach is used for the present study. The relevant review of related literature is presented in the following chapter.