Chapter – II

REVIEW OF RELATED LITERATURE
CHAPTER - II

REVIEW OF THE RELATED LITERATURE

2.1 Introduction

One of the most important early steps in a research project is the conducting of the literature review. A literature review is a critical and in-depth evaluation of previous research. It is a summary and synopsis of a particular area of research, allowing anybody reading the paper to establish why a particular research program is pursuing. A good literature review expands upon the reasons behind selecting a particular research question. A literature review is designed to identify related research, to set the current research project within a conceptual and theoretical context. When looked at that way, almost no topic is so new or unique that can't locate relevant and informative related research.

John W. Best (1977, p 27) states that a brief summary of the writings of recognized authorities and previous research provides evidences that the researcher is acquainted with what is already known and what is still unknown and untested. Since effective research is based upon past knowledge, this step helps to eliminate the duplication of what has been done and provides useful hypotheses and helpful suggestions for significant investigations. Citing the studies that show substantial agreement and those that seem to present conflicting conclusions helps to sharpen and define understanding of existing knowledge in the problem area, provides background for research project and makes the reader aware about the status of the issue. Indeed, review of the related literature is a valuable guide to defining the problem, recognizing its significance promising data-gathering devices, appropriate study design and sources of data.

The U.S. Office of Education (1966) advise proposal writers that, “Tie the relevant literature to the objectives of the proposed study. The literature does not have to be exhaustive but should contain the most pertinent related studies and show an awareness of promising current practices.”
Best and Khan (1993) also asserts that "Parading a long list of annotated studies relating to the problem is ineffective and inappropriate. Only those studies that are plainly relevant, competently executed and clearly reported should be included."

**Philosophical and Psychological insights into Constructivism**

Constructivism has three major historical sources. One source is philosophical, a general theory of knowledge that can provide background and support for more specific educational theory and practice. The second source is the experiences of reflective practitioners, teachers and those who seek to help and learn from them. A third source, growing in recent times is a professional research community, seeking to bring theory and practice more coherently together.

Constructivism is a set of interrelated doctrines and philosophies about learning. The concept may be traced from the works of a number of philosophers whose ideas have been recognized with strong associations with the current constructivist orientations. Vico for instance claimed, "human beings can know only what they themselves made"; and Kant wrote, "Human reason can grasp only what she herself has produced according to her own design". Piaget also wrote, "Children develop their own understanding of their environment from their own experiences and from manipulating their environments as they adapt to it" (Steffe and Kieren, 1994). Summing up, constructivism is the notion that learners construct their own knowledge out of their own experiences. From these classical ideas, constructivism emerged and was seen as a pivotal reform initiative in science and mathematics education in the west and has been described as the most appropriate learning theory (Yager, 1996).

Internationally, constructivism has made a strong impact on education for over 20 years. In particular, Science educators have been concerned with adopting constructivist teaching strategies. Consequently, it can be said that constructivist teaching has become a significant innovation in science education in order to improve science classroom environments. Research also continues to suggest ways in which classroom teachers can be helped to
engage in action research in attempts to improve their classroom environments. (Fraser, 1998a, 1998b).

Literature shows that debates within constructivism as reflected lively exchanges of ideas within the field and contained in thousands of articles and papers during the fourth quarter of the 20th century hang on four philosophical principles that have been termed as the tenets of constructivism (Doolittle, 1999).

For this study, it was necessary to review literature concerning the implementation of constructivist approach of teaching and learning to improve students' achievement and perceptions of science classroom environments.

2.2 Importance of Research Review

A literature review is usually a highly synthesized critique of the status of knowledge on a carefully defined educational topic. The literature review enables a reader to gain further insights from the result of a study.

To conduct a good research investigation, it is necessary to lay the foundation of the research. So it is very important to go through the literature regarding the research conducted in the concerned area. The research worker tried to get acquainted with the work already done in that area. Awareness of what might already have done diminishes the possibility of the duplication.

A review of the related literature serves several purposes in research. Knowledge from the literature is used in stating the significance of the problem, developing the research design relating the results of the study to previous knowledge, and suggesting further research.

A review of the literature enables a researcher to;

- Define and limit the problem.
- Place the study in a historical and associational perspective.
- Avoid unintentional and unnecessary replication.
- Select promising methods and measures.
- Relate the findings to previous knowledge and suggest further research.
To provide ideal, themes explanations or hypothesis valuable in formulating the problem.

By the review of related structure the unfruitful and useless problem area can be avoided.

To show whether the evidence already available solves the problem adequately without further investigation and thus avoids the risk of duplication.

Keeping in the view the significance of related research and suggestions made by the researchers offered in this regard, an attempt was made by the investigator to scrutinize the related relevant researches conducted in this field.

The present chapter entails the systematic presentations of review of the related researches to the problem under study into two parts.

1. Part-A - Studies conducted in abroad
2. Part-B - Studies conducted in India

Part-A

2.3 Studies Conducted in Abroad

Kant (1983), the first major precursor said that scientific knowledge is actively constructed from our observational experience. For Kant, the metaphor of construction is pointedly appropriate.

Resnick (1987) summarized the constructivism in three statements

(i) Learners construct understanding.
(ii) They do not supply mirror what they are told or what they read. To understand something is to know relationships.
(iii) Bits of isolated information are forgotten or become inaccessible to memory. All learning depends on prior knowledge.

Pearsons - chatman, Sahron (1990) Results of the study indicated that the (i) students went through the two phases viz Resistant and experimental phase; (ii) students reported an institutional resistance to using constructivist approach to science teaching; (iii) the personal disposition of
the student teacher together were institutional support appeared to be strong variables in influencing pre-service teachers' accessible a Constructivist approach; (iv) most of the students reported changing their views of teachers it was not supported in most cases in the practicum setting.

Martin A. Simon and Deborah Schifter (1991) the results of the study indicated that the Constructivist intervention has an important effect on teachers' beliefs about learning which in turn affected on the decisions that they made in the classroom.

Saunders (1992) explained that constructivism could be defined as that philosophical position, which holds that any reality is in the most immediate and concrete sense, the mental construction of those who believe they have discovered and investigated it.

Fosnot (1993) According to him, constructivism is derived from the field of cognitive psychology. The constructivist paradigm is based on the work of Piaget, Vygotsky and Bruner. He believed that knowledge acquisition could be explained just as an evolutionary acquisition. As described by the Piaget knowledge acquisition is a process in which learner actively constructs his or her knowledge, which is known as Constructivism?

Keith Alan Morris (1993) in his research project the effectiveness of instructional materials created for a junior high science classroom was studied. He employed a constructivist approach to teaching science that required students to explore concepts through hands-on laboratory investigations and construct meaning based on these experiences. This unit involved the study of physical and chemical changes in matter. The objectives of the unit match the goals and objectives presented in the Michigan Essential Goals and Objectives for Science Education (K-12). The goals of this research were to develop methodology 1.) To increase student understanding of the scientific principles discussed in the unit. 2.) To improve student interest and attitudes about science, and demonstrate how science relates to their everyday lives. 3.) To increase communication about science related issues between students and parents. Students demonstrated a significant improvement in their understanding of the concepts taught in the unit as
indicated by pre and post test scores. A survey of students indicated that their overall attitudes concerning science had improved and also indicated an increase in communication between students and their parents. Overall students were highly motivated and most of them thought that the techniques used in the unit were effective in helping them learn the material.

Kathleen Sledge Lovgren, (1993) in this study he evaluated the effectiveness of a mobile hands-on science program, known as The Science Van. The Program’s objectives were to motivate elementary and middle school teachers to improve their teaching practices and attitudes in science as well as to improve student conceptual understanding through hands-on science activities. The study compared three methods for science lessons: Textbook based, Video based and Science Van based. The study involved sixty-eight teachers from grades four through six with eighteen hundred students from Mecosta-Osceola Intermediate School District. The statistical analysis of the improvement means from pre-test to post-test scores showed no significant differences between methods. This analysis was based on classroom averages rather than individual student improvement, and on a test that may have been too difficult to detect improvement. The study also showed that although teacher attitudes toward science lessons have improved since their exposure to the Science Van program the amount of time spent on science activities has not increased. Student interviews revealed a preference towards the hands-on approach.

J. John Chorny (1993) the purpose of this study was to compare student achievement in a high school physics unit on pressure using two different teaching methods. The control group was taught in a traditional teaching environment where students heard teacher lecture, saw teacher demonstrations, and were assigned physics problems from the textbook in an effort to learn the content. The test group received very little direct teacher instruction. Rather, students worked in small groups and were given investigative activities to construct their knowledge of the objectives. The test group recorded their leaning in research lab books and the teacher acted solely as a facilitator. Both groups were expected to master the same objectives and were given identical tests and quizzes. When comparing
assessments, this study did not reveal extreme differences between the
groups, but some key points can be noted when the data are analyzed. When
assessments were analyzed more thoroughly, the test group showed a little
more thorough understanding of the concepts and were able to apply these
concepts in new situations.

Suzanne Elizabeth Donley (1993) In this study varied assessments
were used, including pre- and post-unit interviews, journal writing, laboratory
exercises, group work, student-driven class discussions, and observations. It
was found that With respect to content understanding, some activities were
successful and some were not. All new activities that required mental
engagement were effective in helping students stay motivated throughout the
unit, and the students were able to distinguish, compare the relationships and
they were also able to experience the conceptual change by applying the
critical skills.

Kinnear, J. (1994) this study suggested a number of strategies,
informed by science education research have been identified to assist the
understanding and communication of difficult concepts in science. A teacher's
craft lies in creating learning experiences that facilitate concept development
and challenge misconceptions from which students actively build, modify, and
extend their conceptual understanding. Concept mapping is accepted as one
of several research and evaluation tools that are valid devices for assessing
conceptual change. Concept mapping has also been identified by teachers
and researchers as a tool for assisting teachers to organize their teaching
strategies. Conceptual understanding is influenced by the prior knowledge
brought by students to learning situations. Effective teaching entails
recognizing students' prior knowledge including any alternative frameworks
and adopting teaching strategies to acknowledge those frameworks. Scientific
facts, if learned in a meaningful, rather than rote, manner produce much in
students' minds. Having identified their students' prior learning, educators are
then faced with the challenge of creating learning experiences to facilitate
meaningful learning and conceptual understanding. Meaningful
communication of concepts can be taught through the use of contexts and
case studies; discrepant events (when a mismatch exists between the
preconceptions that students bring to a learning situation); analogies, metaphors, and similes; examples and non-examples; and multiple representations of verbal and nonverbal information.

Deborah Tippins, Kenneth Tobin Sharon Nichols,(1995) They reported that Constructivism is a set of beliefs that can be used by teachers to think about learning and teaching and to plan and enact a science curriculum. This paper is a fictional account of an elementary science teacher and her use of constructivism as a referent for her various roles as a science teacher. The paper also describes how the teacher came to teach in this manner, describing her involvement in staff development activities and an evolution in her thinking from an objectivist to a constructivist system of semantics. Implications are presented for the reform of science education.

Boyer, Barbara A.; Semrau, Peneiope(1995) This study emphasizes that Educational Technology seems ideally suited for reinforcing Constructivist teaching and learning. Defines Constructivism and asserts that it moves away from the traditional objectivist approach to learning.

Birse, Margaret (1996) This paper aims to demonstrate useful and practical strategies for non-specialist science teachers to use in stimulating a positive scientific attitude among primary school students. It proposes that teachers should strive to develop children’s natural inquisitiveness and curiosity about the world around them, and that a constructivist approach facilitates scientific investigation because the curriculum is not teacher-centered. It describes how the constructivist approach uses specific strategies, including observation, designing, making, questioning, prediction, discussion, and recording experiences, which are characteristics of successful scientific inquiry. The paper explains that the constructivist approach to science encourages the process of discovery and learning rather than the "book teaching" of science, and that teachers who use this approach become good role models for developing a positive and successful scientific attitude. It encourages the strategy of using everyday situations to demonstrate basic scientific principles, and the example of investigating melting ice is given as a sample experiment. Three different experiments are created from the concept of melting ice: (1) Does ice melt at different rates in different locations?; (2)
Does ice melt quicker on colored surfaces?, and (3) Are all thermoses effective in keeping ice? Each of these experiments is described in detail to show the use of the constructivist approach.

Lynn Renz, B. (1996) carried out a study to examine how constructivist principles relate to school assessment. Eleven principles for the development of a school accreditation model from a constructivist perspective were presented.

Appleton, Ken (1997) reported that while cognitive and social constructivism have at times been portrayed as competing paradigms, some authors such as Cobb (1994) have suggested that they are different ways of looking at the same thing. In an earlier paper, aspects of both cognitive and social constructivism were incorporated into a model used to analyze and describe student learning in science classrooms (Appleton, 1997). The model has subsequently been revised and has been used to draw implications for the teaching of science. In this paper, key elements of the model are explained, and how each may be used to inform and shape science teaching is explored.

Heron, Lory Elen (1997) This study investigated the premise that the use of constructivist teaching strategies (independent variable) in high school science classrooms can cultivate positive attitudes toward science (dependent variable) in high school students. Data regarding the relationship between the use of constructivist strategies and change in student attitude toward science were collected using the Science Attitude Assessment Tool (SAAT) (Heron & Beauchamp, 1996). The format of this study used the pre-test, post-test, control group-experimental group design.

The subjects in the study were high school students enrolled in biology, chemistry, or environmental science courses in two high schools in the western United States. Ten teachers and twenty-eight classes, involving a total of 249 students participated in the study. Six experimental group teachers and four control group teachers were each observed an average of six times using the Science Observation Guide (Chapman, 1995) to measure the frequency of observed constructivist behaviors.
An initial significant difference in positive attitude toward science between females and males in the experimental group was established ($p = .05$). There was no significant difference in positive attitude toward science between those same females and males after the experimental period. Consistent with other results, attitudes toward science for both males and females in the control group became less positive after the study, while males and females in the experimental group had a more positive attitude toward science after four months of using constructivist strategies. Looking at females only, the control group started out with a significantly more positive attitude toward science (mean = 43.40) compared to the experimental group (mean = 39.26, $p = .0261$).

Although a significant difference in positive attitude between females in both groups was not found after the treatment period, the mean attitude score for females in the experimental group increased 2.044, while the mean attitude score for females in the control group decreased by 1.750. Constructivist strategies and their relationship with fostering positive attitudes toward science, might prove a viable solution for addressing the major concern of gender equity and enrollment in higher level science and mathematics courses.

**Dallal, Kamel Salim (1997)** They investigated the effect of guided constructivism (bridging analogies) and expository instructional methods on the attitudes of students toward physics. A non-randomize nonequivalent pretest-posttest control group quasi-experimental design was employed. The sample consisted of 127 eleventh-grade and twelfth-grade students from five selected classes from two private high schools in Beirut, Lebanon. Two intact classes were assigned to the control group and three classes to the experimental group. The experimental group was exposed to the bridging analogies instructional method, and the control group was taught using the traditional expository method.

The experimental groups had significantly higher means than the control groups on all criterion variables. A significant interaction was found between groups and performance levels in the following cases: (a) criterion
variable of attitude toward physics, (b) views toward physics learning; and (c) enjoyment of physics

This result indicated that the low performing students among the experimental group had greater gain in attitude toward physics than the high performing students in same group. On the other hand, no interaction occurred between treatment groups and gender, which shows that in this study gender, has no significant effect on attitude toward physics. Significant interactions between the treatment groups and cognitive levels were found on the criterion variable of beliefs about physics as a process of learning and enjoyment of physics. In both cases, the differences between the group means were widely different among students at the concrete and transitional levels, but narrowly different among students at the formal level.

Abbas, Abdullah Othman (1997) This interpretive research set out to investigate the characteristics of an exemplary college science instructor who endeavors to improve teaching and learning in a physical science course for prospective teachers. The course was innovative in the sense that it was designed to meet the specific needs of prospective elementary teachers who needed to have models of how to teach science in a way that employed materials and small group activities. The central purpose for this study is to understand the metaphors that Mark (a pseudonym), the chemistry instructor in the course, used as referents to conceptualize his roles and frame actions and interactions in the classroom. Within the theoretical frame of constructivism, human cognitive interests, and co-participation theories, an ethnographic research design, described by Erickson (1986), Guba and Lincoln (1989), and Gallagher (1991), was employed in the study. Data analyses and interpretation in the study focused on identifying the aspects which the instructor and the researcher might find useful in reflecting to understand what was happening and why that was happening in the classroom. The analysis reveals how the instructor used constructivism as a referent for his teaching and the learning of his students. To be consistent with his beliefs and goals that prospective teachers should enjoy their journey of learning chemistry, Mark, the driver in the journey, used the roles of controller, facilitator, learner, and entertainer as referents for actions to create
conducive learning environments. He was able to switch his actions based on which of the constituent metaphors he used as a referent to frame his actions and interactions, and thereby, to create an exciting environment for learning.

Henriques, Laura (1997) This study took place within a four year systemic reform effort collaboratively undertaken by the Science Education Center at the University of Iowa and a local school district. Key features of the inservice project included the use of children's literature as a springboard into inquiry based science investigations, activities to increase parents' involvement in children's science learning and extensive inservice opportunities for elementary teachers to increase content knowledge and content-pedagogical knowledge. The overarching goal of this elementary science teacher enhancement project was to move teachers towards an interactive-constructivist model of teaching and learning. This study had three components. The first was the definition of the prototype teacher indicated by the project's goals and supported by science education research. The second involved the generation of a model to show relationships between teacher-generated products, demographics and their subsequent teaching behaviors. The third involved the verification of the hypothesized model using data collected on 15 original participants. Demographic information, survey responses, interview and written responses to scenarios were among the data collected as source variables. Results indicate that newer teachers were more likely to implement features of the project. Those teachers who were philosophically aligned with project goals before project involvement were also more likely to implement features of the project. Other associations between reported beliefs, planning and classroom implementations were not confirmed by these data. Data show that teachers reported higher levels of implementation than their classroom teaching indicated. Qualitative analysis indicated teachers who were more likely to implement the goals of this project were flexible, spontaneous, and able to give students more choices and responsibilities for their own learning. These teachers routinely used children's ideas and interests to guide instruction. Recommendations for future inservice are included. Discussion centers around elements of time, teacher input,
teacher reflection teachers as leaders and leaders' modeling of advocated practices

**Gatlin, Linda Sue (1998)** The purpose of this study was to compare the effectiveness of two types of pedagogy didactic/traditional and constructivist-informed pedagogy on student achievement. Secondly, this study examined the relationship between students' and teachers' perception of constructivism in classroom environments. A nonequivalent control group pretest-posttest and delayed posttest quasi-experimental design was used in this study.

Student achievement was measured with a researcher-designed pretest, posttest, and delayed posttest. A significance difference was found on the science achievement posttest where the students receiving the traditional pedagogy scored higher than the students taught by the constructivist pedagogy. However, the scores of students receiving constructivist-informed pedagogy showed a slight increase on the delayed posttest, while the traditionally taught students' scores decreased, thus the difference in the achievement of the two groups was diminished over time.

**Mordechai Ben-Ari (1998)** The findings of the study indicated that Constructivism is a theory of learning which claims that student construct knowledge rather than merely receive and store knowledge transmitted by the teacher. Constructivism has been extremely influencing in science and mathematics education but not in computer science education.

**Helge Kragh (1998)** This study offers a critical examination of some of the basic claims of this branch of science studies and argues that the social constructivists cannot explain some of the most characteristic features of physical sciences. The implications of social constructivism are considered for science education. However, the rejection of social constructivism does not imply a rejection of social or cultural studies of science of their values in science education.

**Ken Appleton, Hillary Asoko (1998).** This study is a vignette of one teacher's science teaching some time after an in-service activity. It explores the ways the teacher implemented his perceptions of constructivist ideas.
about learning in his teaching topic. The extent to which the teacher used teaching principles based on constructivism was influenced by his views on science learning. The features of teaching reflect the constructivist views of learning.

**Saigo, Barbara Woodworth (1999)** The main findings of this study were that instructional approach did not have a significant relationship to immediate post test scores or gain, but that one month after instruction students in the constructivist group demonstrated less loss of gain than those in the traditional group; i.e., their longer-term retention was greater. Also, GPA instructional approach effects were detected for post-post-test gain. GPA and gender were significantly associated with pre-test, post-test, and post-post scores; however, in terms of change (gain) from pre-test to post-test and pre-test to post-post-test, GPA and gender were not significant effects. Section was a significant effect for all three tests, in terms of both score and gain. Gender section effects were detected for post-test gain and post-post-test scores.

**Thomas R.Lord(1999)** This study elaborate that the students in the Constructivist classes performed significantly better on exams, related the course higher, and participated more in campus and regional environmental support efforts than the students in traditional classes.

**E.W.Jenkins (2000)** The is suggested that the recent dominant emphasis upon constructivism in science education has narrowed both the professional and the research agenda relating to the school science teaching. The paper argues for greater clarity and precision when referring to Constructivist ideas in science education and for a better understanding of the role that learning theories should play in influencing the ways in which science is taught in schools.

**Latchman, Pooran(2000)** In this study a comparison of the adjusted mean scores was made between the two groups and between females and males. With constructivist-based teaching, students showed more favorable attitude towards science as a subject, obtained significantly higher scores in class achievement, total achievement and achievement on the knowledge
sub-scale of the knowledge and application test. Students in the traditional
group showed more favorable attitude towards school. Females showed
significantly more positive attitude towards the importance of science and
obtained significantly higher scores in class achievement. No significant
interaction effects were obtained for method of instruction by gender. This
study lends some support to the view that a constructivist-based approach to
teaching science is a viable alternative to traditional modes of teaching. It is
suggested that in science education, more consideration be given to those
aspects of classroom teaching that foster closer coordination between social
influences and individual learning.

O'Connell, Deborah (2000) The purpose of this research was to
investigate the effects of traditional instruction versus instruction employing
teacher-constructed and student-constructed instructional resources on the
short- and long-term achievement and attitudes of tenth-grade science
students.

The results indicated significant differences among traditional
instruction, teacher-constructed, and student-constructed instructional
resources (p < .05). Results of this study supported the belief that instruction
employing student-constructed instructional resources yielded higher scores
on science achievement tests. Attitudes also were surveyed in this research.
The results indicated a significant difference (p < .001) favoring teacher-
constructed and student-constructed instructional resources versus traditional
instruction.

David C. Gibbs (2000). Research was conducted to determine the
effect of a constructivist learning environment upon field dependent (FD) and
field independent (FI) students' achievement in an introductory computer
programming course. Prior research in traditional environments had
established a correlation between field dependence/independence (FD/FI)
and the design stage of programming. A correlational design was followed,
using introductory computer science students in their first programming
course.
No significant correlations were found between FD/I and the achievement scores of design and coding. No correlation was expected between FD/I and coding. There was no interaction between FD/I and design versus coding. The correlation between FD/I and the quantity of reconstructed programming elements was not significant. The correlation between FD/I and the quality of reconstructed programming elements was not significant. No interaction was found between FD/I and the quantity or quality of semantic versus syntactic elements. Stepwise multiple regression identified two predictors, for design, the predictor was the pretest. Coding was predicted by the quantity of syntactic programming elements. The principal finding of this research, in contrast to findings in traditional environments is that within this constructivist environment, the cognitive style of FD/I was not found to influence programming achievement.

**Russell Lauren Billings (2001)** Conducted a 5-year research study on using the Learning Cycle and Inquiry Based Learning in the field of physics with high school students. The objective of the research was twofold: (Part 1) to generally assess student response to the Learning Cycle as shown by enrollment trends; and (Part 2) to specifically assess the response and success of one group of students in that they enjoyed the instructional approach, learned the material as well if not better (than from traditional means), and demonstrated a proficiency of over 75% on tests and quizzes. It was hypothesized that the Learning Cycle would facilitate a greater learning and command of the concepts and make the subject matter more interesting, personal, and attainable to students. In Part 1, qualitative data demonstrated a high interest level for the Learning Cycle, while quantitative data, collected from student enrollment trends, showed an increase of 56% over the course of the study. In Part 2, quantitative data was collected from one group of 28 students, using test and quiz scores and a student survey that included a personal, written response. From the student written responses, 75% enjoyed using the Learning Cycle; 10% felt they adequately learned; while 32% felt they learned *better* with the Learning Cycle. From the survey, 66% had favorable response to the Learning Cycle. A rubric grading system was used in the research to measure student competency, showing class test score
averages equivalent to 85%. This demonstrates that the Learning Cycle is an effective teaching tool and does facilitate learning in an interesting way.

Paul B. Ciske (2002) The findings of the study showed considerable improvement by the students in the eleven topic areas on the posttest compared to the pretest. The data were also examined to compare the scores of the students who performed the demonstrations to those of students who observed the demonstrations. The data showed that the presenters typically performed better on the posttest than the observers. Improvement was also studied using a student opinion survey and collections of student responses to test questions.

Winnie Wing-Mui SO (2002) this study aimed to find out to what extent constructivist teaching was utilized in primary science lessons. Lesson observations allowed the identification of salient features of student teachers’ approaches to teaching in an appropriate setting. The evaluation approach used during the lesson observation pertained to a constructivist view of teaching and learning. Sections of the student teachers’ teaching and classroom events were compared and contrasted with reference to researchers’ work which advocates learners’ active learning.

A more detailed analysis of student teachers’ performance in the six areas (of features of constructivist teaching) showed that the overall performance of student teachers in the six areas of features of constructivist teaching was moderate. Student teachers during their micro-teaching had paid some consideration to learners’ prior understanding in their teaching. Comparatively, student teachers were more able to: use pupils’ existing knowledge to guide teaching and, devise incisive questions; provide opportunities for pupils to utilize ideas and guide pupils to generate explanations; and, alternative in a micro-teaching setting. They made frequent use of questioning to guide learners to understand new ideas. However, student teachers seemed quite satisfied with the short answers provided by learners and they seldom required learners to further elaborate on their responses. Only some student teachers provided opportunities for learners to make use of the new ideas learned. Discussion and interaction between learners were occasional: it was always the teacher who led the discussion.
Moreover, though it was not difficult to find materials and activities provided by student teachers to involve learners in the lesson, the activities mainly provided opportunities for learners to observe some phenomena or changes, without engaging learners in scientific inquiry, and learners were merely following teachers' instructions without any input on the suggestions and directions of their work. Micro-teaching may be regarded by some as a less intense teaching situation compared to school experience as the learners are the peers of the teacher, it is fully understood that the nature of micro-teaching may have some affect on the performance of some student teachers.

GIL-PÉREZ, DANIEL; GUIASOLA, JENARO; MORENO, ANTONIO; CACHAPUZ, ANTONIO; PESSOA DE CARVALHO, ANNA Ma. ; MARTÍNEZ TORREGROSA, JOAQUÍN; SALINAS, JULIA; VALDÉS, PABLO ; GONZÁLEZ, EDUARDO; GENÉ DUCH, ANNA; DUMAS-CARRÉ, ANDRÉE; TRICÁRICO, HUGO; GALLEGO, RÓMULO.(2002) they find out that impressive development throughout the last two decades, supported by a great amount of research and innovation, science education seemed to be becoming a new scientific domain. This transformation of Science Education into a specific field of research and knowledge is usually associated with the establishment of what has been called an 'emergent consensus' about constructivist positions. However, some voices have begun to question these constructivist positions and therefore the idea of advancement towards a coherent body of knowledge in the field of science education. The goal of this work is to analyse some of the current criticisms of the so-called constructivist orientations and to study their implications for the development of science education as a coherent body of knowledge.

Chrishon-Ford, Grace E. (2003) Studied the Impact of constructivist pedagogy on science education, this study focused on how constructivist pedagogy impacts science achievement of the fourth grade students in an elementary Department of Defense School. Constructivism is a learning or meaning-making theory that offers an explanation of the nature of knowledge and how human beings learn. The population of this study was two fourth grade classes in an elementary Department of Defense District School. Data collection was accomplished in four ways: (1) focus group interviews of
students, (2) individual interviews of students selected from the focus groups, (3) interviews of teachers, and (4) unobtrusive observations of science instruction. A six-step process was followed to gain entry for this study. The steps were my university dissertation committee, Department of Defense Education Activity Research Study Request, Endorsement and Agreement form to the Headquarters Office, school superintendent, school principal, teacher participants, and the final step was to seek parental approval of the fourth graders involved in the study. The findings from this study were an increase of 47% test scores; 57% revealed experiments/projects and 64% working on the computers in groups were the fun things; 100% student interaction; 100% student attentiveness; and 70% using other resources. Implications have demonstrated that the traditional classroom can be converted if the teachers and administrators would buy into the approach that this project demonstrated. As an advocate of the constructivist model the case study demonstrated students do indeed respond to the constructivist theory. If approached in a positive manner, it could be done in any kind of school setting.

Ellett, Frederick S. Jr.; Allison, Derek J. & Ericson, David P. (2003) in this study they consider Phillips framework for comparing the constructivism’s. They argue that it is important that Phillips finds Karl Popper to be situated at about the middle of the constructivists. In Part II, they argue that Phillips has not presented a full array of the significant possibilities at all. In developing the argument, they develop a framework that primarily takes into account the interrelations among epistemology, ontology, and (theories of) truth. They defend a form of constructivism in which realism and idealism come together. They also suggest that these matters are themselves related to theories of the person. To illustrate a broader framework, they present some of the features of a Hconstructivist view and then critically compare Hconstructivism with the Popperian viewpoint. In Part III, they use the Hconstructivist view to consider some of the important educational issues for the specialist in science and for the general student.

Lewicki, Daniel (2003) In this paper they deals with the qualitative aspects of a larger study of the effects of constructivist and traditional
teaching methods on achievement, conceptual change, attitude and perception of college students in the general chemistry laboratory (Lewicki, 1993). Specifically, six case studies that relate to conceptual change and knowledge construction will be presented and discussed. It is argued that laboratory experiences may be a worthwhile or essential aspect of science education, but the literature relating to research in this area does not always support these assumptions. While the laboratory may have value for nurturing positive student attitudes and for providing opportunities for students of all abilities to demonstrate skills and techniques (Bates, 1978), it appears that students may fare no better with a laboratory experience than without one in developing understanding of chemistry (Novak, 1984)

McAvoy, Rogers & Paparozzi, Christina (2003) This paper presented the epistemological assumptions of Constructivism in contrast to those of a more objectivist position. Within this framework is defined the concepts of learning, instruction and evaluation. It presents examples and draws implications for the application in the design of learning settings.

Tsai, Chin-Chung (2003) Observed that Science educators have identified an individual’s epistemological beliefs about science as an essential feature of his (or her) conceptual ecology; these beliefs may shape his (or her) metalearning assumptions and then influence his (or her) learning orientations or preferences. This study was conducted to explore the interplay between students’ scientific epistemological beliefs and their preferences for constructivist learning environments. Through analyzing forty-eight Taiwanese eighth graders’ questionnaire responses, in-depth interview results and their reflections on a series of treatment lessons conducted by a combination of both traditional and constructivist instructional strategies, this study found that students having epistemological beliefs more oriented to constructivist views of science (as opposed to empiricist views about science) tended to show significantly stronger preferences to learn in the constructivist learning environments where they could (1) interact and negotiate meanings with others (p<.05), (2) integrate their prior knowledge and experiences with newly constructed knowledge (p<.05), and (3) meaningfully control their learning activities (p<.001). Qualitative details also revealed that students holding
constructivist epistemological beliefs about science tended to employ more meaningful strategies when learning science, whereas students having epistemological beliefs more aligned to empiricism tended to use rote-like learning strategies to enhance their understanding. However, students' epistemological orientations were not significantly related to their achievement on traditional science tests. The main trust of the findings drawn from this study indicate that teachers need to be very aware of the student's epistemological orientation toward scientific knowledge, and to complement these preferences when designing learning experiences, especially to provide constructivist-based lessons to enhance science learning by students who are constructivist-oriented.

**Tveita, Johs (2003)** In this study they used untraditional teaching methods as well as traditional ones in teaching particle models in science like the kinetic particle model of matter and the electron model for electric circuits to students from grade-6 to grade-10. The methods called untraditional are drama (role play), concept mapping, writing about being particles (creative writing) and students "teaching" their parents about the models they have learned at school. Most research shows that these models are difficult to understand and to use. By using these untraditional methods alongside traditional ones more students were able to get a sound understanding of the particle models and able to explain physical phenomena by using these models.

**Judith Watson (2003).** In this article he uses examples from the classroom practice to demonstrate how, within a framework of social constructivism bring small changes in teachers' practice can promote effective teaching in pupils of all ages and levels of ability across the curricular activities.

**Jafer, Yaqoub J.(2003)**The study examined the impact of computer-assisted instruction (CAI) compared to conventional instruction on fourth-grade students' achievement and attitudes toward desert issues by using pre-test post-test experimental design. The study also examined the effects of CAI on the achievement and attitudes of students with high- and low-reading abilities in experimental and control groups. The study involved 181 fourth-
grade students enrolled in two schools in a rural school district located in northeast Utah. Students in the experimental group received CAI in science. Students in the control group received reading materials with content comparable to the CAI group. The study continued for five consecutive 45-minute sessions. Data related to students’ reading abilities were collected prior to the study. The achievement pretest scores were used as a covariate to account for possible preexisting differences with regards to the variables examined between the two groups. Findings showed that CAI did not improve students’ achievement and did not increase positive attitudes toward desert issues. The CAI also did not improve the achievement and attitudes of students with different reading abilities. These findings indicate that CAI is a tool that is no more effective than conventional instruction.

Urbanowski, Reg (2003) Probed into Constructivism promotes an understanding of the learner in the context of the learning environment where the learner is an active participating member that is constructing, reconstructing, and deconstructing knowledge constantly. With this in mind, constructivism seeks to find the balance between the learners and the instructors’ responsibility for designing, implementing, and evaluating the learning experience where knowledge emerges. There is a lot of discussion in educational literature of the health professions today regarding the use of clinical reasoning, problem-based learning, or the plethora of other curriculum design strategies that seek to develop the intuitive mind of the clinicians (Boelen, 1990; Jacobs, Aja, Hermenau, 1994; Lindsey, Pinnix Cox, 1994 Pope-Davis, Prieto, Whitaker, Pope-Davis, 1993). Effective and efficient evaluation of these various strategies requires the use of a philosophical kaleidoscope through which various strategies can be viewed. This article will provide the reader with an introduction to the constructivist kaleidoscope.

Soyoung Kim (2003) The results of the study suggests that authentic assessment strategy focusing on students’ learning processes may have a positive influence on students’ products, for a complete assessment, learning process should be considered with learning product.

Blake, Sally; Vandergrift, Guy & Gantner, Myrna (2003) executed a study that recent renewal efforts in science education may focus on
undergraduate research and teaching, but this is just one part of the continuum of educational reform that runs from preschool through postgraduate work. If science education is to improve in institutions of higher education, then a combined effort to improve all levels of science teaching and learning must be addressed. Simultaneous renewal of all players in the educational arena is necessary for real change to occur (Goodlad, 1990). Each link in the chain of science education interlocks to forge a substantive base for the future of scientific literacy in this country. The kinds of programs offered for graduate students have significant implications for the future of undergraduate education; the professional standards adopted for student learning in grades K-12 impact undergraduate education as well (NSF, 1996). Collaboration between Colleges of Science and Education are vital to the renewal effort. Traditionally these two disciplines worked within an isolationist model, where scientists often thought teaching was less intellectual than research, and teachers thought scientists were boring and arrogant. If scientific literacy is to become a reality, then both disciplines must find commonalities and unite to prepare future citizens to face the challenges of science, technology and society. America's undergraduates must attain a higher level of competence in science and America's institutions of higher education must expect all students to learn science and accept science as important to every student, rather than a field only for those interested in a specialized career (NSF, 1996).

Cohen, Michael R. (2003) Investigated how do our formal educational experiences affect the science concepts we think students should learn and the explanations used to teach those science concepts? What is it about our experiences as students and teachers that fosters or inhibits the implementation of a constructionist curriculum in science? This paper will look at some traditional approaches to curriculum development and suggest that what is intuitively obvious may provide a conceptual lock that remains unconscious and unknown and limits our ability to implement a curriculum that can build a constructed understanding. The paper will propose that research on children concepts, commonly called misconceptions, can expand our understanding of curriculum, and provide new views of science content and
explanations. Research on children concepts has also played a part in the development of a Constructivist approach to education and can help in our definition of Constructed Understanding.

**Harling, Frederick Jibran (2004)** the purpose of this study was to examine elementary students’ perspectives of a constructivist approach to enhance their knowledge about stress. Participants were fifth grade students in an elementary school in the northeast. Data collection included a pretest-posttest, teacher reflective journal and student interviews. A multiple choice pre-test was administered to students to obtain information about students’ knowledge of stress. The pre-test was followed by a four day unit that focused on the concept of stress employing a constructivist approach. The four day unit was monitored in two ways. First, a daily reflective journal was recorded by the teacher about each lesson. Second, students were interviewed at the end of the unit regarding their perceptions of learning through a constructivist approach. A post-test was administered to evaluate students’ knowledge. Data analysis for the pre-test consisted of descriptive statistics. The teaching reflective journal and students’ interviews were analyzed using constant comparison. An overview of the results of the study indicates that students reported increased self awareness, appreciation, and understanding of the feelings of others, and enhanced appreciation of human relations from the unit. Other findings indicate that the females scored higher on the pre and post test than the males. Both the individual groups of males and females improved as a result of the unit. The implications of this study may provide educators with insights into the possible effectiveness of a constructivist approach to teaching various health concepts.

**Abbott, Martin L., Jeffrey T and Baker B. Duane (2002)** The findings of this study were informative in pointing out the nature and extent of the kind of teaching that occurs in the school. The results of the study predict school level student achievement in school that varied by low income. Prior research suggests that Constructivist teaching has an impact on student achievement. The regression analyses show that Constructivist teaching does predict student achievement beyond the effects of school-level family income, albeit with a greatly reduced effect.
Guthrie et al (2004) compared three instructional methods for third-grade reading: a traditional approach, a strategies instruction only approach, and an approach with strategies instruction and constructivist motivation techniques including student choices, collaboration, and hands-on activities. The constructivist approach, called CORI (Concept-Oriented Reading Instruction), resulted in better student reading comprehension, cognitive strategies, and motivation.

Sandra Lum Erwin (2004) This study focuses on developing meaningful learning of motion and energy in ninth grade Physical Science classes through a constructivist approach and technology integration. Constructivist strategies empower students to build new knowledge on what they already understand. LEGO Minstorms and Texas Instruments TI-83 calculators/CBL sensors help implement constructivist learning. Pre and post test data show large gains in student knowledge of motion and energy. Students had higher achievement on performance-based as opposed to written or mathematical/calculations-based activities. Students preferred the more student-centered activities. Students found technology integration captivating. Students found the unit challenging but engaging. The study suggests that constructivist strategies and technology integration can improve learning in the study of motion and energy.

Brandi Marie Schmidt (2004) This research project was the development and implementation of a five-week weather unit in Integrated Science 10 classroom. The first goal of this unit was to make the sketch from a teacher-centered classroom to a student-centered classroom. He made this change by introducing new laboratories and activities as well as using demonstrations to enhance lecture information. The second goal was to emphasize the physical concepts of weather to enrich the science being taught. These new techniques were intended to increase student achievement in a unit that he felt was lacking in hands on activities and in depth science material. He implemented the new strategies while assessing student knowledge at the beginning of the unit, along the way, and through formal end assessments.
The unit was successful based on an increase in student achievement compared between the pre-assessment and the post-assessment data. The unit was also shown to be successful based on a subjective student survey.

Kim, Jong Suk (2005) The results of the study suggested that Constructivist teaching is more effective than traditional teaching in terms of academic achievement. Constructivist teaching is not effective in relation to self-concept, a learning strategy, but had some effect upon motivation, anxiety towards learning and self-monitoring, it was found that a Constructivist environment was preferred to a traditional classroom.

L L Liang, D L gabel (2005) This Study examines the effectiveness of a new constructivist curriculum model (Powerful Ideas in Physical Science) in improving prospective teachers, understanding of science concepts, in fostering a learning environment supporting conceptual understanding and in promoting positive attitudes towards learning and teaching science and chemistry in particular. It was found that the constructivist approach to science instruction is quite effective than the traditional methods of teaching for the prospective elementary teachers.

Star, Rachel Padma (2005) The purpose of this study was to examine the instructional practices used by middle and secondary school science teachers from the State of Ohio. Specifically, the study focused on the use of constructivist practices in their teaching. The participants in this study were science teachers from the State of Ohio. A databank including the names and addresses of teachers were received from the State Department of Education. The surveys were mailed to four hundred and sixty five teachers. A survey instrument was mailed to science teachers from the databank along with the cover letter explaining the study and participation agreement. Two hundred and two completed surveys were returned (43%). The survey was categorized into three groups such as Presenting New Information (PNI), Using Learning Activities (ULA), and Assessing Students (AS). Multivariate analysis was used to determine the statistical difference between teachers grade levels of the teachers who reported using constructivist practices in their classrooms. Results showed that the majority of teachers (70%) report that they use constructivist practices in their classrooms. Results also revealed that
teachers use constructivist practices mostly during the presentation of new information. Results also reveal that middle school science teachers use constructivist practices more than the secondary school science teachers. The results of this study hold implications for more research in the area of instructional practices and also careful examination of the beliefs of science teachers.

Jerry Van Horn (2005) The goal of this study was to teach electricity to freshmen physical science students using a constructivist approach utilizing a series of laboratories and hands on activities. The activities were designed to reflect five postulates of constructivist theory: utilize student’s previous knowledge, require sustained mental effort, create dissatisfaction with previous knowledge, contain a social component, and apply to the student’s lives. The hypothesis of this research was that the investigative experiences and constructivist approach would enhance the students’ conceptual understanding of electricity. Prior to the unit, the students were given a pre-test that included 15 short answer questions that covered information related to the unit. Of the fifty-seven participants involved in the study, the average score on the pre-test was 13.9%. Upon completion of the unit, students were given the same 15 questions on a post-test. The average post-test score of the fifty-seven participants increased to 84.3%. The results indicate that the unit successfully reshaped the students’ preexisting knowledge and misconceptions and provided them with a better conceptual understanding of electricity on cooperative learning activities. Their understanding of rocks and minerals was increased.

Robert A. Lonning (2006) This study evaluated the effect of Cooperative learning on student Verbal Interactions patterns and Achievement in Conceptual change Instruction model in secondary science. Here the conceptual change model recognizes the importance of student-student verbal interactions. The results of the study demonstrated that Cooperative learning strategies enhance conceptual change Instruction.

Denise D. Cunningham (2006) This study concluded that the education reforms and the current wave of “back to the basics” this qualitative study explores the qualities that identify a constructivist teacher. By applying the
thematic coding on the seven basic principles the data suggested that the teacher in the study easily met these principles which leads to produce the more efficient and effective teachers for the future.

**Sofie M.M. Loyens, Remy M.J.P. Rikers, Henk G. Schmidt (2007)**

This study investigated the impact of students' conceptions of constructivist learning activities on academic achievement and drop out. Results suggested that an indirect relationship between conceptions and achievement, mediated by actual learning activities. What students believe about the role of knowledge construction in learning predicts the actual learning activities they undertake. How important they consider inability to learn and motivation for learning predicts their study time.

**William B. Struck (2007)**

He undertook a study to see the effects of two types of microcomputer-based methods on the ability of high school physics students to accurately graph kinetics using distance, velocity and acceleration versus time graphs were studied. Student graphing skills were evaluated before, during and after they used data acquisition-probe ware (DAP) and digital video analysis (DVA) to investigate a variety of one-dimensional motions. Half of the students, placed in random groups, first investigated these motions with DAP and later with DVA. The other half of the students investigated the same motions with the same equipment but in the reverse order. Both these strategies were found to be successful and complementary. There were indications student achievement was higher for velocity-time and acceleration-time graphs using the DVA method.

**H. Karaduman, Dr. Mehmet Gultekin (2007)**

This study aims to investigate whether the learning material that based on Constructivist learning principles have an effect on Fifth grade social studies students' attitudes, their academic success and their retention. The findings of the research indicate that Constructivist learning principles based learning material increase students' academic success and retention in Social Studies but don't increase attitudes. Additionally, students think that Constructivist learning principles based learning materials reflect Constructivist learning principles.
Sagy John (2007) In this article, He averring that constructivism focuses on learner-cantered approach can transform thinking and practice beyond the conventional boundaries of our educational system, he states that the Constructivism actually enables the children to invent ideas.

Cook, Michele T. (2007) This study focused on the effectiveness of constructivist science instructional methods to motivate high school science students to complete classroom activities. The findings of this study were that teachers should provide students with constructivist lessons such as cooperative groups, problem-based learning, and inquiry questions in which to learn content objectives. As social beings, students are more motivated to participate in activities that allow them to work with peers, contribute their own ideas, and relate topics of interest to their own realities. Keeping these ideas in mind during lesson preparation will increase students' motivation and achievement. Variation of instruction should include activities that reflect multiple intelligences and real world situations. The researcher recommends the development of professional learning communities as a way for teachers to share teaching practices that motivate students to learn and become problem solvers, thus promoting social change in educators' pedagogy in the researcher's teaching community. In an era of educational accountability and federal regulations, this study provides an important tool for teachers to employ in order to meet the educational needs of their students.

Akcay, Hakan (2007) In this study they determined the impact of an Science-Technology-Society (STS) course for preservice science teachers. The course was designed to change not only preservice science teachers' attitudes toward science, scientists and science courses, but also the awareness and use of STS/Constructivist approaches in teaching. It also focuses on changes in preservice science teachers regarding the effectiveness of an STS/Constructivist learning environment. Both qualitative and quantitative research methods were used with and a one-group pretest-posttest design.

The major findings for the study include the following: (1) Preservice science teachers showed significantly growth over the semester in their perceptions concerning STS/Constructivism, beliefs about science teaching
and learning, and attitudes toward science and technology, and their implications for society. These significant changes were not affected by gender nor grade (elementary vs secondary) level. (2) Preservice science teachers gain in understanding of how students learn with STS/Constructivist approaches. They also increased their use of STS/Constructivist approaches which were developed and applied to teaching science for all students. (3) Preservice science teachers showed statistically significant growth toward an STS/Constructivist philosophy of science teaching and learning in terms of student actions in the classroom, as well as their increased understanding of science processes and content. (4) An STS/Constructivist approach provides student--centered learning environments that are relevant, motivational, and meaningful for preservice science teachers. Further, it encourages them to interact and to participate more actively in science classrooms.

Yigal Rosen and Gavriel Salomon (2007) find out that different learning environments provide different learning experiences and ought to serve different achievement goals. They hypothesized that constructivist learning environments lead to the attainment of achievements that are consistent with the experiences that such settings provide and that more traditional settings lead to the attainments of other kinds of achievement in accordance with the experiences they provide. A meta-analytic study was carried out on 32 methodologically-appropriate experiments in which these 2 settings were compared. Results supported 1 of their hypotheses showing that overall constructivist learning environments are more effective than traditional ones (ES = .460) and that their superiority increases when tested against constructivist-appropriate measures (ES = .902). However, contrary to expectations, traditional settings did not differ from constructivist ones when traditionally-appropriate measures were used. A number of possible interpretations are offered among them the possibility that traditional settings have come to incorporate some constructivist elements. This possibility is supported by other findings of their such as smaller effect sizes for more recent studies and for longer lasting periods of instruction.

Pettitt, Warren J (2008) the purpose of this study was to describe the effect of constructivist instruction on the mathematics achievement of
intermediate algebra students at a private college in Arizona. Achievement was measured using two teacher developed tests. The study was guided by the following research question: What is the effect of constructivist based instruction on the mathematics achievement of intermediate algebra students? This study compared students from 1999-2002 who were taught with traditional instruction and students taught after 2002 who were taught with constructivist instruction. A parametric t-test for unpaired independent samples was used to analyze the data for significant differences. The results indicated that, overall, the mathematics achievement of the treatment group was not significantly higher than that of the comparison group. It was concluded that the adoption of a constructivist methodology does not negatively impact test

Kelly A. Coppins (2009) He concluded that the combination of a hands-on approach to science with the accountability of daily assessments provides a greater opportunity for students who traditionally receive below-average grades to be successful in science classes. The addition of competitive elements and real world applications plays to their strength as kinesthetic learners without sacrificing the rigor required to meet graduation standards. Further, daily assessment allows students to develop test-taking skills they will need for the standardized tests used by the state and for college admission. Finally, the combination of daily feedback and daily accountability prevents a struggling student from slipping through the cracks.

Gökhan BAŞ and Orhan Kuzucu. (2009) The purpose of this study was to examine the effects of the Computer Assisted Language Learning (CALL) method supported with the DynED language learning programme on students’ achievement levels and attitudes towards the lesson in the 6th grade students’ English lesson. The research was carried out in the 2008 – 2009 education-instruction year in Karatli Sehit Sahin Yilmaz Elementary School, Nigde, Turkey. A total of 60 students in two different classes in the 6th grade of this school participated in the study. The pre/post-test control group research model was used in this study. The data obtained in the study was analysed using the SPSS 11.0 statistics computer programme. The arithmetic means and standard deviations were calculated for each group. In order to
test the significance between the groups, the t-test was used. The significance level was taken as .05. The results of the research showed a significant difference between the attitude scores of the experiment group and the control group. It was also found out that the CALL method supported with the DynED language learning programme was more effective in positive development of achievement levels of students. The research revealed that the students educated by the CALL method supported with the DynED language learning programme are more successful, have a higher motivation and better retention than the students who are educated by traditional methods of instruction.

Demirci, Cavide (2009) The aim of this research was to see if there is significant difference between the means of achievement and retention learning. The constructivist approach and conventional approach were applied to the both groups and it was found that the group taught with constructivist approach has high mean score of achievement and retention than that of the conventional group taught with the conventional methodology.

Yılmaz CAKICI and Gülben YAVUZ (2010) The aim of this study was to explore the effect of constructivist science teaching on the students’ understanding about matter, and to compare the effectiveness of a constructivist approach over traditional teaching methods. The study was conducted with 33 fourth grade students at a state primary school in the Babaeski-Kirklaireli district located in the Northwestern part of Turkey, during the autumn term of the 2007-2008 academic year. Students were randomly divided into two groups as control group (CG, n=17) and experimental group (EG, n=16). An achievement test consisting of 13 open-ended questions was developed through piloting. Initially, pre-tests were applied to both the CG and EG. Following the first four weeks, the EG was taught using the constructivist teaching practices, while the CG was taught using the traditional teaching practices based on direct speech and question-answer. Then, the post-tests were carried out in order to determine the effect of a constructivist teaching approach on student learning. Students’ responses to the questions have been categorized mainly as scientific, partially scientific and non-scientific. Responses in the non-scientific category were further classified as either
A comparison of the responses between the CG and EG was made using a chi-square test. The results revealed that there was a significant increase in achievement within the EG students compared to the CG. In particular, the teaching based on the constructivist approach appears to be effective in eliminating the misconceptions the EG students had prior to the instruction.

**Vaca, James L. (2010)** The studies revealed how American students showed little significant gain on standardized tests in science between 1995 and 2005. Little information is available regarding how reform in American teaching strategies in science could improve student performance on standardized testing. The purpose of this quasi-experimental quantitative study using a pretest/posttest control group design was to examine how the use of a hands-on, constructivist teaching approach with low achieving eighth grade science students affected student achievement on the 2007 Ohio Eighth Grade Science Achievement Test posttest (N = 76). The research question asked how using constructivist teaching strategies in the science classroom affected student performance on standardized tests. Two independent samples of 38 students each consisting of low achieving science students as identified by seventh grade science scores and scores on the Ohio Eighth Grade Science Half-Length Practice Test pretest were used. Four comparisons were made between the control group receiving traditional classroom instruction and the experimental group receiving constructivist instruction including, (a) pretest/posttest standard comparison, (b) comparison of the number of students who passed the posttest, (c) comparison of the six standards covered on the posttest, (d) posttest's sample means comparison. A Mann-Whitney U Test revealed that there was no significant difference between the independent sample distributions for the control group and the experimental group. These findings contribute to positive social change by investigating science teaching strategies that could be used in eighth grade science classes to improve student achievement in science.

**Elvan GENCE AKA, Ezgi GÜVEN, Mustafa AYDOĞDU (2010)** Results of study reveal that there is no significant difference between experimental and control groups students’ pre science process skills and pre achievement
test scores. Another result of study displays that experimental group students have higher mean scores than control group students in post science process skills and post achievement test.

**Renee L. Gilson (2010)** The study revealed that the students who are actively engaged and involved into the classroom discussion achieve greater success than students who aren’t. Student performance increased on all compared questions and the results of a paired t test showed significant p values for six out of the eight questions compared. Learning unit in earth science was taught to high school students, using a jigsaw-group mastery learning approach. The sample consisted of 73 students in the experimental group and 47 students who learned the topic in an individualized mastery learning approach. The study lasted 5 weeks. Pretests and posttests on academic achievement and affective outcomes were administered. Data were treated with an analysis of covariance.

The results show that students of the experimental group achieved significantly higher on academic outcomes, both normative and objective scores. On the creative essay test, the differences in number of ideas and total essay score were not significant between the groups, although the mean scores for number of words were higher for the individualized mastery learning group. On the affective domain, jigsaw-group mastery learning students scored significantly higher on self-esteem, number of friends, and involvement in the classroom. No differences were found in cohesiveness, cooperation, competition, and attitudes toward the subject learned. The results are discussed through the evaluation and comparison of the two methods of instruction used in this study.

The researchers were also concerned with the students' attitudes toward earth science, the course being taught at the time of the experiment. Both cognitive and affective outcomes for students who participated in the cooperative GML (Group mastery learning) approach were compared with outcomes for students who studied the same topic in an IML (Individualized mastery learning) approach. The study addressed a number of questions related to academic and nonacademic outcomes of the two methods of study. First, it sought to determine whether academic achievement of the students
taught in the cooperative GML mode would be different from the achievement of students who learned in an individualized method. Second, it sought to determine whether gains or losses would be seen in nonacademic outcomes, such as classroom learning environment, social relations, and students’ self-esteem experienced by the students.

The results of this study may support more use of cooperative learning in high school science.

Matthew W. Rofe (2010) This paper illustrated the challenges and rewards of a constructivist approach, this paper presents a case study of an annual international field school coordinated by the authors. This field school brings together some 40 senior undergraduate and postgraduate planning students from the University of South Australia (UniSA) and Universiti Sains Malaysia (USM) to work in cross-cultural project groups in George Town, Malaysia. For staff and student alike, the challenges and opportunities afforded by this field school are intellectually stimulating, professionally demanding and personally enriching. This paper draws upon student journals and course feedback, as well as the reflections of course staff to assess the merits of immersive field schools generally and constructivist teaching approaches specifically. This paper also asserted that much benefit for students and staff are to be found in immersive field based courses. Such an approach is often entrenched in a Constructivist teaching approach in which the field itself is the lecture theatre, where students are immersed for prolonged periods of time in collaborative research groups and actively positioned as a central actor in own learning and teaching.

Ambrose Hans G. Aggabao (2010) This study compared the effectiveness of three teaching approaches on achievement as well as retention of learning of students. It focused on comparing new teaching approaches that were designed based on constructivist learning philosophies (social and radical constructivism) to current tradition of teaching. Social constructivism used the interactive small-group learning while Radical constructivism used the individualized self-engagement approach. Both were supported with instructional materials and instructional protocol consistent with constructivist philosophies.
The study followed the Equivalent-Groups-Pretest-Posttest Experimental Design. The experiment was conducted using 92 freshmen math students of the Teachers College in 2005 now College of Teacher Education. Results of the study showed significant differences among mean gain scores on both achievement and retention measures. Radical constructivist approach showed significant advantage over the other two approaches, while the social constructivist approach showed better gain scores than the current, traditional teaching approach.

Leh Sikoyo (2010) This study suggested that the teacher’s implementation of the problem-solving approach was far more regulated by contextual affordances and constraints within schools and the broader education system and society than by their interpretations of the official curriculum. These findings highlight the influence of structural contextual factors in regulating pedagogical practice and teacher’s take up of learner-centered pedagogies in Africa. The evidence from this paper suggests the need for education researchers in developing countries such as Uganda to focus on helping teacher’s to develop strategies for teaching large classes as learner-centred pedagogies have a bleak future in the region.

Shieh Ruey (2010) This case study explores how a constructivist-based instructional design helped adult learners learn in an online learning environment. Two classes of adult learners pursuing professional development and registered in a web-based course were studied. The data consisted of course documents, submitted artifacts, surveys, interviews, in-class observations, and online observations. The study found that the majority of the learners were engaged in two facets of learning. On the one hand, the instructional activities requiring collaboration and interaction helped the learners support one another’s learning, from which most claimed to have benefited. On the other hand, the constructivist-based course assisted many learners to develop a sense of becoming more responsible, self-directed learners. Overall, the social constructivist style of instructional strategy seems promising to facilitate adult learning, which not only helps change learners’ perceptions of the online learning, but also assists them to learn in a more collaborative, authentic and responsible way. The study however a sc
disclosed that in order to maintain high-quality learning, appropriate assessment plans and adequate facilitation must be particularly reinforced. A facilitation model is thus suggested.

Haruthithanasan, Theera, 2010 The study draws on Dewey's theory that constructivist instruction embraces the philosophy of democracy with regards to enhancing students' individual and social constructivist learning. As a result, the hypothesis is that constructivist learning practices might be an effective indirect way to learn and value democracy. The hypothesis was confirmed by the structural-equation-modeling analysis result, indicating that Thai students' prior experiences with constructivist instruction were positively correlated with their attitudes toward democracy. Through a multistage sampling method, a group of 717 freshman college students were randomly selected from one public university in Bangkok, Thailand. They were surveyed by group-administration with a student questionnaire about their prior constructivist learning experiences in high school, as well as about their attitudes towards democracy. Moreover, the students' personal profiles such as gender, parent education, hometown location, and academic department were examined to find potential variables in the Thai students' attitudes toward democracy. The key findings derived from these statistical results were highlighted and discussed in order to provide some educational policy implications for Thailand.

Ogundola I. Peter1, A. Popoola Abiodun1 and O. Oke Jonathan (2010).

The main Findings of this study, were as follows:

1. Students taught with constructivism instructional approach scored higher in the post-test than those taught with conventional method. This signifies that the components of constructivism instructional approach such as concept mapping, cooperative work skills and cognitive apprenticeship lead to higher academic achievement in general metal work than the conventional method.

2. There was no significant difference in the mean scores of male and female students taught with the constructivism instructional approach.
This implies that constructivism instructional approach is not gender sensitive. Infusing Constructivism into a Curriculum Development Course.

**Jinyan Huang, Niagara University (2010)** This article provides a look at constructivism through the eyes of a English-as-a-second-language professor sharing how it was applied in a ESOL teacher education course on curriculum development at Niagara University. The article describes how the professor and the students worked collaboratively to develop curriculum in a constructivist manner for a new program being developed at the University for visiting scholars from China.

**Oludipe Bimbola1 and Oludipe I. Daniel (2010)** The results of the finding indicate that there was improvement in academic performance of students in constructivist group on pretest and delayed post test. Their scores in topics 1 and 2, at the post test level, were higher than their scores at the pretest levels compared to their colleagues in conventional lecture group. The same trend occurred at the delayed post test stage. students in constructivist group were able to retain 80% of the concepts taught compared to their colleagues in conventional lecture group who could only retain 10% of the concepts taught. In view of the afore-mentioned findings, this study has been able to establish that the hypothesis is acceptable because there was a statistically significant difference for the samples’ post tests and delayed post tests where the students who received the constructivist pedagogy scored higher than their colleagues in the conventional lecture group. The findings of this study are in line with the research findings of Saigo (1999); White (1999) and Brad (2000). Consequently, if constructivist approaches to learning could be used by integrated science teachers in Nigerian Junior Secondary Schools, there will be improvement in academic performance of the Junior Secondary School students in integrated science, hence they will develop positive interest in the core science subjects at the Senior Secondary School level which will eventually to students’ interest in science oriented courses at the tertiary education level. In view of this, integrated science teachers should incorporate constructivist based teaching strategy into their methods of teaching. The sample in this study showed a lack of representation in gender
Hence, additional research is needed to determine if there is a difference between how male and female students in Nigerian Junior Secondary Schools respond to constructivist and conventional lecture teaching techniques.

Gökhan BAŞ (2010) The aim of the research was to investigate the effects of multiple intelligences supported project-based learning and traditional foreign language-teaching environment on students' achievement and their attitude towards English lesson. The research was carried out in 2009 – 2010 education-instruction year in Karatli Sehit Sahin Yilmaz Elementary School, Nigde, Turkey. Totally 50 students in two different classes in the 5th grade of this school participated in the study. The results of the research showed a significant difference between the attitude scores of the experiment group and the control group. It was also found out that the multiple intelligences approach activities were more effective in the positive development of the students' attitudes. At the end of the research, it is revealed that the students who are educated by multiple intelligences supported project-based learning method are more successful and have a higher motivation level than the students who are educated by the traditional instructional methods.

Jazlin Ebenezer, Sheela Chacko, Osman Nafiz Kaya, Satya Kiran Koya, EDevairakkam Luke Ebenezer (2010). The purpose of this study was to investigate the effect of common knowledge construction model (CKCM) lesson sequence, an intervention based upon conceptual change theory. A mixed approach was used to investigate whether this model had a significant effect on seventh grade student's achievement and conceptual change. The achievement test indicates that the students in the experimental group achieved significantly higher scores than students in the control group taught by the traditional teaching methods. Qualitative analysis of the students' Pre and post teaching conceptions of excretion revealed the addition and deletion of ideas from pre to post teaching.

Gerald R. Fast, Judith E. Hankes (2010). It was resulted that on the pre test, the experimental group had a mathematics content knowledge mean score of 30.1 out of 50 or 60.3% correct, whereas the control group had a mean score of 24.3 out of 50 or 54.6%.
On the post test, the experimental group improved their mean score to 82.0% correct, whereas the control group scored 57.4%. The experimental group showed a significant improvement (p<.001) in mathematics content knowledge, but the control group did not (p=.06), which proves the effectiveness of Constructivist pedagogy in teaching learning process.

Kerim Gundogdu (2010). The results of the study shows that the attitudes of prospective psychological counsellors toward human rights education in both experimental and control groups increased. However, the difference in the experimental group, used Constructivist approach, was statistically significant those in control group, used traditional approach. Besides, the results of the follow up study showed that attitudes of the experimental group were significantly higher than the control group in terms of permanence.

PART-B

2.4. Studies Conducted in India

K. C. Garg and B. M. Gupta (1992) This study comprised of hundred thousand schools, over 8600 colleges, more than 200 universities, several institutes of specialized learning like Indian Institutes of Technology (IITs), Indian Institute of Science (IISc), Tata Institute of Fundamental Research (TIFR), about 40 scientific laboratories of the Council of Scientific and Industrial Research with an equal number of institutes of Defense Research and Development Organization. All this had a positive impact and we could produce renowned scientists, researchers and academicians. Curriculum development, textbooks production and teachers' training. Many scholars1-5 have shown concern for the decline of enrolment in science courses in higher education over the years. No attempt, however, seems to have been done to ascertain the situation of enrolment in science at school/college level. In the present preliminary study, the option exercised by children at 10 + 2 level for science subjects vis-à-vis accounts and economics has been studied for a11-year period, from 1992 to 2002, besides studying the drift-out rate at the first degree education in different streams of science at different colleges of the
University of Delhi for the sessions 1990–91 to 1997–98. These results have been compared with the corresponding data from some colleges outside the domain of the University of Delhi.

**P.S. Umashree (1999)** This study revealed that the science teachers were not clear about the Values of Science, hence the science curriculum should be made child and teacher centered.

**Kishor Kumar, K. Leuva (2002)** This study suggested that Inductive thinking Model to teach Science at Primary Level proved to be more fruitful in developing the reasoning ability among the students.

**Khriesamhalie Pienyu (2004)** concluded that more than half of the total numbers of science teachers (57%) were of the opinion that the objectives of science education were not clear to them, which resulted in less achievement of objectives of Science education.

**Rekha Aggrwal Neeru Chawla (2005)** The results of the study find out that the prepared instructional material is significantly effective for improving the Academic Learning outcomes' of the students at elementary level.

**K.V. Sridevi (2007).** The major finding of the study were:

1) Constructivist approach was found to be effective in improving the achievement in Science, Perception of nature of Science, Science process skills, scientific attitude and attitude towards Science among eight standards.

2) Constructivist approach was found to be equally effective for both girls and boys in improving their achievement.

3) There was a significant difference in scientific attitude of girls and boys.

4) There was significant interaction between gender and groups.

5) There was significant difference in the attainment levels of objectives (Knowledge, Understanding, Application and Skill).

6) Among all variables great change in the scores from pretest to post test in the achievement in science of students belonging to experimental group (20.80) There is 34.65 percent raise in the achievement of students.

7) There was a significant difference in the development of various selected dimensions of the scientific attitude of students.

8) There was significant difference in the development of various selected skills as an effect of Constructivist approach.

9) There was positive relationship among achievement in Science, Perception of nature of science Science process skills, scientific attitude and attitude towards science with each other.
The results of the study concluded that constructivist approach was found effective than the conventional methods of teaching in improving the achievement in science, perception of nature of science, science process skills, scientific attitude and attitude towards science among eighth standards students.

Jaya Saxena (2007) The present study was conducted to compare the effect of remedial instruction on achievement in mathematics of class IV students, and the findings of the study revealed that the no. of non masters reduced after remedial instruction in competency based teaching.

Prof. Mohd. Miyan, Priya Khanna (2007) The present study was aimed to investigate the prospective science teachers’ (pupil- teachers’), teacher educators’, school teachers’ conceptual understanding of nature and pedagogy of science and the extent to which these perceptions were aligned with the tenets of Constructivist philosophy and pedagogy. There is no denying the fact that science teaching is still based on traditional and objectivist views of knowing and learning which assumes scientific knowledge to be an absolute and infallible. Science pedagogy, based on such positivist views involves direct transmission of information to learners who tend to memorize it. Over past few decades, objectivism has been subject to criticism and consequently, constructivism evolved as a postmodern epistemology, which asserts that knowledge does not exist independent of the knower and is constructed when amalgamated with prior beliefs and experiences. Scientific knowledge, from constructivist perspectives is viewed as tentative, emerging, omnijjective (subjective to a Considerable extent), theory laden, imaginative and socio-culturally embedded.

Mamta Aggarwal, (2007) In this study she find out that the National Curriculum Framework-2005 proposed a shift in the approach to teaching and the learning and emphasized on Constructivist approach which believes that a child should construct his/her own knowledge. Presently the evaluation of the student achievement in different subject areas is largely memory based and higher mental abilities like reasoning, creative thinking, application of knowledge, interpretation, inference etc. are neglected. With the change in the approach to teaching and learning the children will be given more and more opportunities to think and reason out on their own. Consequently, the approach to pupil evaluation will also need to change. This paper presents an overview of what is constructivism and what a constructivist classroom looks like. It goes on to discuss the process of evaluation in constructivist environment, what are its
strategies and how the student performance may be evaluated using changed strategies and different typology of questions in examinations.

Saroj Pandey (2007) In this study she developed a paper against the backdrop of National Curriculum Framework-2005, which envisages major paradigm shift from behaviorist approach to learning to constructivist approach that lays stress on the personal experiences of learner in the process of knowledge construction. The role teacher in this approach has shifted from the transmitter of knowledge to facilitator of knowledge. The NCF-2005 also emphasizes on education for peace, not as a part of value education as traditionally been integrated in schools But as an independent value in itself.

The paper highlights the implication of this paradigm shift in the approach towards learning for promoting the culture of peace as both. The constructivist approach and the peace education are associated with humanistic philosophy which is dedicated to developing more mature and self directed learner- a pre-requisite for living together. To develop a culture of peace, the pedagogy of education needs to be broad, diverse and oriented towards lifelong learning. Active listening, problem solving, and conflict resolution skills help in inculcating feelings of living together, which are also basic to the constructivist way to learning. Therefore, the epistemological shift suggested in the NCF-2005 provides greater opportunity to promote the culture of peace than ever before.

Vickneasvari A/p krishnasamy (2007) The major findings of the study were: (i) the Multimedia Constructivist Instruction (MCI) students performed significantly better and were significantly more motivated than the Multimedia Objectivist Instruction (MOI). (ii) The high ability students performed better than the low ability students. (iii) The field independent did not perform better but were significantly more motivated than field dependent students. (iv) the male students did not perform significantly better but were more motivated than the female students. (v) the HA students performed significantly better and were significantly more motivated than the LA students in MCI, (vi) the high ability students using MCI performed significantly better but not were significantly more motivated than the HA students using MOI (vii) the LA students using MCI did not perform significantly better but were significantly more motivated than the LA students using MOI, (viii) the FI students performed significantly better and were significantly more motivated than the FD students in MCI, (ix) the FI students
using MCI performed significantly better but were not significantly more motivated than the FI students using MOI, (X) the FD students using MCI did not perform significantly better but were significantly more motivated than the FD students using MOI, (xi) the male students did not perform significantly better but were significantly more motivated than the female students in MCI, (xii) the male students using MCI performed significantly better but were not significantly more motivated than the male students using MOI, and (xiii) the female students using MCI also performed significantly better but were not significantly more motivated than the female students Using MOI. Overall, these findings support the positive effect of multimedia Constructivist environment on the learning of "Chemical Formulae and Equations".

**Patel, Kinnary (2008)** the study was resulted in the development of CAI programme on two topics of teaching of physics of class XI. The package was found to be significantly effective for the students of class XI of both groups of the selected schools. Comparative effectiveness of the CAI method and traditional method was measured by the experiment and CAI was found more effective in terms of achievement scores. It was also find out that the teachers and students both shows favourable opinion towards the CAI.

**Vandana Mehra, Rajeev Rumar (2008).** The results of the study revealed that the students taught by Mastery Learning Strategy Exhibited Superior performance as compared to their counterparts taught by Conventional Classroom teaching methods.

**V. Nimavathi, R. Gnanadevan (2008)** The main findings of the study were:

(i) There is no significant difference between the experimental and control group in the achievement of science at pre test level.

(ii) There is significant difference between the experimental and control group in the achievement of science at post test level. the students learned with multimedia performed better than the students learned with conventional method.

(iii) There is significant difference between the mean achievement score of the pre test and post test for the experimental group. This shows the effectiveness of multimedia programme.
There is no difference between the pre-test and the post-test in the achievement of the control group. This shows that the conventional method of teaching does not help in scoring more marks in the post test.

**Vandana Mehra and Kalpana Thakur (2009)** The present study was conducted to compare the effect of cooperative learning and conventional group learning on social skills of 112 seventh graders. The main findings of the study were:

- Students taught through Cooperative learning and Conventional group learning exhibited comparable social skills.
- Field Independent and field dependent students exhibit comparable social skills.

**Anita Rastogi, Babita Prasher (2009)** In this study an e-content package was developed by following Gagné’s instructional design based upon the concept of micro teaching. It was revealed that the e-learning environment makes the students retro-active participating in learning process as opposed to being passive in traditional teaching environment and makes their perception about learning positive and encouraging. The e-content package proved effective in enhancing their level of achievement and their proficiency in teaching skills.

**Vandana Mehra, Rajinder Kaur Gill (2009)** This study was conducted to compare the effect of Graphic Organizer Instruction and traditional instructions on achievement in Social studies of class IX. (i) It was observed that the students taught through graphic Organizer Instruction exhibited better mean gain on achievement scores as compared to those taught through traditional instruction. (ii) High Intelligence students attained better mean gain on achievement scores as compared to their low intelligence counterparts. (iii) Students attained better at knowledge level than at comprehension category of objectives.

**Celine Pereira, (2010)** He studied that collaborative method is more effective than the conventional textbook method on total achievement in science at secondary level. Comparison of experimental group and control in total achievement showed significant difference between two groups. It is also found out that collaborative method is more effective than conventional textbook method on achievement in science under the categories of objectives such as knowledge understanding and application. Comparison of experimental group and control group with regard to the categories of objectives such as knowledge...
understanding and application showed significant differences between the two groups.

Pallavi Kaul (2010) The results of the study showed that the learning together technique of Cooperative learning Method is more effective than the Traditional Method in math teaching at elementary school 7th grade. It was also noticed that the level “which is concerned with improvement of achievement in math” of the students in experimental group in which the learning together technique of Cooperative learning is applied was higher than the levels of the students in Control group “in which traditional teaching method was applied”. A significant difference between the scores of the experimental and control groups was found. Which shows the effectiveness of new methodology of teaching?

Pushpanjali B.S., Satyaparkasha C.V.(2010) They draw the conclusion that Cooperative Learning Strategy was superior to the Conventional method in significantly promoting the achievement motivation and reducing the anxiety among the students.

S.A. Annie Isabella (2010) This Study intended to explore if there was any significant relationship between academic Achievement and Socioeconomic Status of B.Ed. student teachers, and he found that there was no significant relationship between Academic Achievement and Socioeconomic status of B.Ed. students teachers.

Reena Agrawal, Nandita Nagar (2010) This study revealed that teaching through cooperative learning is able to bring significant changes in the cooperative behavior of teacher trainees.

Pradnya B.Patil (2010) In this study she asserts that the group taught through Jigsaw classroom showed a substantial progress than the traditional classroom. And 94% teachers respond that jigsaw classroom technique is easy to learn and 76% students actively participate in jigsaw classroom.

Saroj Sobit and Baljit Singh (2011) The Findings of this study indicate that the mean pre test score of experimental group and control group were 13.6 and 13.8 respectively. This shows that the mean score of the groups before the treatment was nearly equal. Further, it was found that the mean score of the control and experimental groups were 27.00 and 13.9 respectively. It is also found that means scores of the pretest and post test scores of the experimental and control group are 13.6 and 27.0 and the ‘t’ value was 5.27 which is significant
at both at .05 and .01 level. This proves the effectiveness of the new methodology of teaching.

**Renu Bala (2011)** In this study an attempt was made to study the attitude of the science teachers’ towards science and its effect on the student achievement in science. It was found that majority of students have favorable attitude toward science which effect the achievement in science.

**Amit Gautam, A.K. Kulshrestha (2011)** The authors stated that Constructivist teaching is an effective way to teach as it encourages active and meaningful learning and promotes responsibility and autonomy besides achieving desirable educational goals of teaching and learning.

### 2.5 Insight from Review

It seems from the review of related literature that the Constructivist Philosophy is even though very old, but the researches on its effectiveness in the field of education in particular Science education is of recent origin. Review of the literature made it clear that there is lots of researches were conducted on historical development of Constructivism than on its practice. The studies carried out were comparative, descriptive, experimental and correlational in nature. Certain studies conducted are of survey type on beliefs, attitudes, behavior, values and role of teacher. In Constructivist classrooms. Some of the studies were concentrated on Constructivist approaches like Constructivist learning environment survey scale, scientific attitude and construction of tools in the context of Constructivist approach, and only a few studies on effectiveness of various teaching methods in different subjects to enhance their academic achievement. It was found that the traditional or Conventional methods of teaching are less effective than the new methods of teaching such as Cooperative learning, programmed learning and activity centered teaching etc. Because the conventional methods of teaching are subjective rather than the modern methods are based upon the objectivist view of teaching.

The overview of the researches related to the historical development of the Constructivist approaches and their effectiveness on teacher education and particularly Science education crystallized some of the issues and observation that may help in framing the hypotheses, adopting experimental design and employing statistical techniques.

In Indian context, research in the area of Science education concentrated on designing and evaluation of Science curriculum, use of Computers (CAI) or
multimedia in Science teaching, various researches were also conducted on effectiveness of various teaching methods and approaches, models of Science teaching, relationship among the intelligence, achievement, attitude, Science process skill, nature of science and so on.

It can be seen from the review of the related literature that quantum of research studies are carried out on Constructivism or Constructivist Approach in India. Though NCF-2005 shows an optimistic inclination towards Constructivism followed by preparation of text books based on Constructivist principles for various classes up to high school level by the NCERT, New-Delhi; the impact of Constructivist Approach is yet to be studied empirically. This creates a need and sufficient base to carry out a research work to study the effect of Constructivist Approach on 6th Grade students Achievement in science.

A few studies attempted to evaluate the various aspects of personality, intelligence, self concept and motivation at different levels of education under varying environments. Further, a few studies attempted to evaluate the effectiveness of various methods in different subjects to enhance the academic achievement of the students. However, review of the studies on the constructivist approach, also points out to the fact that no attempt has been made by the any researcher to study the effect of constructivist approach on the 6th grade students achievement in science.

By drawing the essential cues and along with the research gap identified from the review and exercise carried out, the Investigator aims to explore upon the Effect of Constructivist approach on the 6th grade students achievement in Science.