Chapter – III

Review of Related Literature
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CHAPTER III

REVIEW OF RELATED LITERATURE

INTRODUCTION

In the words of Chapter V. Good, "The key to the best store-house of published literature may open the doors to sources of significant problems and explanatory hypotheses, and provide helpful orientation for definition of the problem, background for selection of procedure and comparative data for interpretation of results. In order to be truly creative and original, one must read extensively and critically as a stimulus to thinking".

In the field of education, as in other fields too, the investigator needs to acquire up-to-date information about what has been thought and in particular area from which intends to take up a problem for research. A investigator may be very keen to possess up-to-date information regarding his field. Review of related literature provides the background for methodology of the research under study. Moreover, recommendations or suggestions of previous studies may sometimes give valuable clues for the present research study. Hence, in this chapter the investigator has outlined reviews on the literature related to the present study. It includes studies conducted both in India and abroad.

STUDIES RELATED TO INSTRUCTIONAL STRATEGIES

Fieldman (1965) conducted several studies, using programmed instructional materials and text books used in traditional classroom. His
results were inconclusive because some studies showed the former to be superior, while some others showed no significant difference.

Dutton (1966) studied pupils achievement using programmed materials on heat, light and sound with fourth grade children found that children could perform simple science experiments with little teacher supervision. He also concluded that pupils using programmed materials learned concepts more effectively than did those in classes taught in a conventional way.

Shah and Kapadia (1972) studied programmed learning materials for underachievers in Algebra among the students of class VII by Shah and Kapadia, investigated the effectiveness of PLM in improving achievement. The findings of the study favoured programmed learning.

Chibbar (1973) studied conducted a comparative experimental study of programmed instruction and traditional classroom instruction for teaching biology. No significant difference was found between the two methods.

Pandya (1974) studied the effectiveness of programmed learning strategy in learning Physics in tenth standard of secondary schools. The major findings of the study were (i) the experimental group achieved more in all the tests (ii) the gain in the post test scores of the students of experimental group was significantly greater than the pre-test scores (iii) learning through programmed learning material benefited the students with high, middle and low IQ. (iv) The adjusted mean score showed that the experimental group achieved higher than the controlled group and (v) the developed programmed gave enough challenge to low motivated pupils.
Pocztar (1974) studied the effectiveness of learning through linear and branching styles of programmed learning materials. There was no significant difference in the results obtained by the two methods.

Reddy (1975) carried out a study entitled “Programmed learning Vs conventional learning in the instruction of language—a comparative study”, was to compare the programmed instructional methods with that of the conventional teaching method. The study revealed that the mean performance scores of the experimental group was higher than that of the control group which proved the definite advantages found in the programmed learning method over the conventional method.

Shitole (1976) studied the programmed learning material for agricultural subjects in Marathi medium secondary schools to study its utility for different categories of student. The superiority of programmed learning method was obvious from the results which also revealed that programmed learning requires less time than the traditional one.

Sharma (1978) studied an experimental study of teaching natural science at the primary level in central schools, found that most of the teachers adopted traditional method and the teachers were not well equipped for teaching science at this level. It was admitted by most of the teachers that activity should be the basis of teaching natural science at the primary level and guided activity was found to be more effective than self-activity in respect of concept formation, development of scientific attitude, acquisition of scientific knowledge, and the training in scientific skill.
Swarnamma (1978) attempted to study the process of teaching of Biology in the upper primary schools of Kerala. Lack of facilities in schools, lack of mastery over the subject matter by the teacher, lack of experimentation in the classroom, over dependence of the teacher on text-books, and overcrowding in the class rooms were identified as the problems. It was also reported that most teachers adopted lecture cum demonstration method in teaching biology in the upper primary classes.

Jha (1979) investigated the different methods of teaching high school Biology, it was found that there was strong evidence in favour of activity based approach in teaching school science in respect of acquisition of knowledge, application of the scientific knowledge and development of scientific skill.

Sharma (1981) attempted an experimental study of programmed Learning Method (PLM) of teaching physics to high and low intelligent Ninth grade students. The major conclusions are as follows: i) Neither programmed instruction nor traditional method of teaching physics to Ninth grade students is related to sex; ii) in comparison with traditional method; programmed instruction was a more effective method of teaching physics to both male and female students; iii) programmed instruction method was more effective method than the tradition method of teaching physics to both high and low intelligent students.

Holiday (1983) attempted to study the effect of over prompting the students in a programmed instruction in a segment of science content. Holiday concluded that over prompting the students by providing them
with strong hints to answer the questions in programmed instruction can do learner more instructional harm than good.

Bhargava (1983) studied cognitive process in science learning with reference to Physics of students of higher secondary classes. It was found that a moderate relationship of achievement in Physics was observed with three processes of Science, namely, observing, measuring, and drawing inferences. Boys were found to be superior to girls on the processes of observing, measuring and drawing inferences. With growth in age, a decline in ability to perform on science processes was observed, and urban students out performed their counterparts in rural areas on science processes.

Dighal (1985) studied on improved method of teaching Biological Science in schools in Tripura and West Bengal. It was concluded that there was a significant difference in the effectiveness of self activity method, life science club method and audio visual method. Two or three methods, when combined, resulted in improvement on the basis of their similar nature. According to the study continuation of a method could be made according to the need of the teacher. Preparation of charts and models, collection of specimens through local excursion, organization of science exhibitions by the students, arrangement of film shows by the school and orientation programmes for life science teachers brought better results.

Pillai (1987) conducted an experimental study of Gagne’s conditions of learning for instruction in Physics at secondary level. It was found that the instructional strategy developed based on Gagne’s
conditions of learning was found feasible for normal classroom teaching. It was also found to be more effective than the traditional method in terms of students' performance. Successful problem solvers were those who had shown better performance at the concept and the rule levels. The instructional strategy was found to change the cognitive preference from facts and applications to principles and problem solving.

Agnihotry (1987) conducted a study of influence of some methods of teaching Physics on the achievement of class X students in Delhi. It was found that out of the four methods viz. lecture cum demo method, laboratory method, programmed instruction and assignment cum-discussion method, the method of teaching systematically developed by the investigator was found to be most effective. Lecture-cum demo method followed by verification type of lab work was more effective than assignment cum-discussion method. With respect to achievement in Physics, the programmed instruction method was less effective than the method systematically developed by the investigator. The following was the ranking 1. Method developed by the investigator 2. Programmed instruction modified by the investigator 3. Lecture-cum-demo method followed by verification type of lab work 4. Assignment-cum-discussion method.

Kalacherry (1987) developed and validated programmed instructional materials in the syllabus of chemistry prescribed for standard viii in Maharashtra state. The programmed instructional materials were developed in linear style for the chemistry syllabus of standard VIII consisting for eleven units for the whole year.
Monapatra (1988) studied a pragmatic approach to teach the process of experimental work in Physics to pupils of rural schools. The investigator found that the process based laboratory experimental method had the scope to arouse curiosity among the students. It was also found that this method could be preferred in rural schools and it needed financial commitment.

Goel. et al., (1990) attempted a study on learning Physics through lecture demonstration method and individualized instruction method. It was reported that the acquisition of psychomotor skills favoured the group which followed the individualized laboratory method rather than the lecture demonstration method.

Gurumurthy (1990) compared the effectiveness of guided discovery approach and instructed performance approach in doing Physics experiments. It was found that the guided discovery approach was superior to the instructed performance approach in the development of cognitive abilities and practical skills.

Miller, Anne-Counthey Seigler (1990), studied the effects of hands-on, activity-based science and supportive instructional environment on the at-risk sixth-grade students' attitude towards science, achievement in science, goal orientation, and cognitive engagement in science. A pretest-posttest design was used with each student serving as his or her own controls. Staff developed service provided to the teachers who participated in the study, in order to provide materials, strategies and training in the use of hands-on, activity-based science and in developing supportive instructional environments in the science classroom. No
significant difference in the students' grade in science with the decrease in grades during the study. A significant effect was found on both task mastery goal orientation and cognitive engagement of the at-risk students with both having significant increase during the study. An additional element of the study was the description of the instructional environment of the classroom as it was related to cognitive engagement of all the students in the class. The classes that had a more supportive instructional environment had higher student cognitive engagement than classes that had a less supportive instructional environment.

Rajeswari (1991) studied the effectiveness of modular packages in atomic physics for 11th std pupils was to develop and validate the self instructional modules. The findings of the study suggested that both modular and traditional teaching were more or less equally effective.

Purushothaman, Stella, (1991) conducted a study to find out the effectiveness of Computer-Assisted Instruction programme on learning Set Theory at the eighth standard level. They found that the experimental (CAI) group has significantly performed better than the control group taught by the traditional method irrespective of sex. They concluded that CAI was a more effective method than the conventional method in teaching 'Set Theory'.

Patricia Nell (1991) conducted a field analysis of the Integrated Activity Learning Sequence (IALS) approach to science instruction at the elementary school level-part I student performance. The IALS consisted of six lessons taught in 8 week period. A study activity book containing the activities of the IALS was included to serve as a means of collecting student responses to those activities. A Teachers Guide was included
related objectives, goals, materials, preparation, investigative procedures and content. All materials were provided in a classroom kit. The major conclusions showed that the students using the IALS approach experienced the greatest success in approaches, learned the intended science knowledge and writing skills. The IALS approach resulted in significant academic gains for all genders, ethnic groups, academic standings, instructional programs and learning preference with the following exceptions; gains in science knowledge were comparatively lower for ESL students, as were gains in mathematical skills for the gifted. Additionally, the overall study determined that an IALS could be developed and effectively implemented by elementary teachers among diverse groups of fourth grade student.

Samanta (1991) studied the traditional teacher depends on verbal exposition considerable visualization of objects and process is essential for formulation of accurate concepts among the students. A teacher using multimedia can make even difficult concept clear to a below average students easily.

Sulimani, Traik, A. (1992) studied the comparative effectiveness between computer assisted video instruction and traditional teaching methods in providing computer literacy for Arab- speaking engineering students. It is found that students using CAVA performed equally well on all the tests.

Mason, Laynn Nerrick (1992) studied the effect of inter-active video simulated chemistry laboratories on learning outcomes and attitudes of students enrolled in a beginning college chemistry laboratory course. It is found that students will be able to achieve the knowledge of
laboratory safety, procedures, and the experiment without decreasing in attitude. Field-independent learners did achieve better than field dependent learners did.

Shah and Mandal (1993) compared the effectiveness of three instructional strategies for Higher Education. Lecture-cum-live demonstration, video film and booklet were the strategies followed. They found that video film was the best strategy followed by lecture cum demonstration and booklet methods. They suggested that video technology should be made more available to the educational institutions.

Dubey and Joshi (1993) studied the effectiveness of Self Learning Strategy (SLS) in terms of achievement at nursery teacher-training level. While the dependent variable of the study was achievement of the trainees the independent variable was the treatment namely the Self Learning Strategy. The post test experimental group design was employed. From the performance of the trainees, it was noted that the majority of the students performed very well through SLS, which was generally not seen in traditional method. The developed SLS was found to be effective.

Mahajan (1994) studied the effectiveness of CAI for teaching singular and plural at II grade. The study made a comparison between traditional lecture method and the CAI. It was found that the CAI was effective for teaching singular and plural as compared to traditional method.

Roberts, Michael R. (1994) compared the effectiveness of the delivery of an Interactive Computer-Assisted Instruction module to a traditional lecture/lab delivered module (CAI). It is founded that learners
in the experiment group (ICAI) scored 37.3% (19/51) on the pretest which is a significantly higher adjusted mean posttest score than those learners in the control group.

**Nishino, Alan Koki (1994)** studied an exploratory investigation to determine the effects of a Multimedia Computer-Based Science Learning Environment and Gender Differences, on achievement, and attitudes and interests of Students in an eighth-grade Science Classroom. The followings are found: (1) students in the experimental classroom had a significant high posttest mean score in ‘self-concept’ than the students in the traditional science classroom and (2) Female students in the experimental classroom had a significantly higher posttest mean score on ‘self perception as a student’ than both the males and females of the traditional science classroom and the males of the experimental classroom.

**Gangoli and Gurumurthy (1995)** studied to find out the effectiveness of a guided open-ended approach to Physics experiments. They have compared traditional laboratory approach and guided open-ended approach in doing physics experiments. It was obvious that the guided open-ended approach was superior in developing cognitive abilities and laboratory skills. No definite conclusion was made regarding the superiority in the development of creative abilities of the students.

**Rangaraj (1995)** studied the effectiveness of computer assisted instruction in Teaching Physics at Higher Secondary Stage. It is concluded that CAI as support system to teachers’ classroom instruction is more effective when compared to conventional lecture method and CAI
as individualized instruction in achieving the instructional objectives in Physics at all levels at Std. XII.

**Stone, Theodore Thomas, III (1996)** studied the academic impact of classroom usage upon middle-class primary grade level elementary school children. It is found that a significant difference was demonstrated in favour of the computer assisted instruction students. Further, the reading vocabulary, spelling and math problem solving achievement scores of this experimental group better adjusted mean scores in comparison to the traditional instruction students.

**Lalitha (1996)** studied the vocabulary required by class III students to achieve mastery level in environmental studies II as per minimum level of learning. It was concluded that the specially designed activities were effective. There was high correlation between the vocabulary level and achievement level in environment studies. The vocabulary required by the students to achieve mastery level in environment studies were identified.

**Padhi (1996)** studied on the effect of competency based, activity centered approach to teaching on attainment of mastery level learning in environmental studies. It was found that competency based, activity centered approach in environmental studies was more effective than traditional approach.

**May, Gwendolyn (1996)** studied the use of Computer-Assisted Instruction in Non-conventional classroom environment in higher education. It is found that there was no significant difference between the achievement levels of the experimental and control groups.
Saxena (1996) studied to identify the difficulties faced by a teacher to get first hand experience to visualize effective teaching method. Saxena used Activity approach used to locally available resources. It was inferred that activity learning was increased substantially. Difficulties were identified consequently during demonstration and students participation were incorporated.

French, Dorothy M. (1997) studied a computer-assisted instruction using interactive software versus traditional instruction in a college pre-calculus course. It is concluded that 1) the use of interactive computer software does increase the mathematics achievement of students, 2) the use of interactive computer software does not change the MAS-measured mathematics attitude of students and 3) the use of interactive computer software does change students’ attitude towards mathematics in a positive fashion.

Bradford, Johnella Elaine R. (1997) studied the effectiveness of instructional delivery systems on academic achievement in a selected college course. It is found that the female students’ academic achievement was significantly higher than male students on all components of the final history examination regardless of age or instructional delivery systems. Older CAI female students did significantly better than traditional and multimedia students. Younger multimedia female students did not significantly better than traditional students.

Johnston, Cynthia Wilson (1997) studied the comparison of the effectiveness of computer lab instruction to traditional classroom instruction in an adult reading program. It is found that there was no significant difference in posttest scores of adults in CAI lab versus
traditional classroom for reading instruction. Also, there was no significant differences between posttest scores when examining the variables race, gender, age, income and education at the 0.01 level of significance selected for this study.

**Chibbaro, Julie Segars (1997)** studied the cognitive effectiveness of Computer-Assisted Instruction and traditional classroom instruction for introductory level counselor education students. It is found that there were no significant differences between the two methods of instruction.

**Sharada (1998)** attempted to study activity-based teaching learning strategies (ABTS) in a large size class at primary level. It was found that proper preplanning was required to implement ABTS in large sized class learning-situations.

**Anandan (1998)** attempted to find out the effectiveness of CAI in teaching Economics at the XI standard level. It was found that CAI method has produced significantly positive effective on the achievement of the students compared to the traditional method. It was also observed that significant difference in achievement between CAI method and traditional method even after controlling intelligence and socio-economic status of the students.

**Allen, D’ Maris Anne Lumpkin (1998)** studied the effects of Computer-Based Multimedia Lecture Presentations on community college microbiology students achievement, attitudes and retention. It is found that incorporating multimedia lecture presentations into the microbiology classroom contributes to improved student satisfaction, as shown by significantly more positive attitudes toward learning presentations when compared with traditional lectures.
Lalitha (2002) attempted to study the achievement of higher secondary students in practical is a definite indicator of their achievement in theory, whereas their attitude towards laboratory work was not considered to be a predictor of their achievement in theory. It was concluded that the achievements of students in theory is independent of their attitude towards laboratory work. Age of the students has no influence on student’s attitude towards laboratory work and their achievement in theory. Age differences were evident in achievements in practical. Male and female students did not differ in their attitude towards laboratory work and in their achievement in theory. Age differences were evident in achievement in practical’s. Male and female students did not differ in their attitude towards laboratory work and in their achievement in both the theory and practical’s. Similar results were found in respect of schools and parental background.

Rama (2003) compared the effectiveness of play way technique with formal method in teaching of science at upper primary stage. Findings revealed that play-way technique of teaching sciences was superior to formal method.

Felisa Tibbitts (2005) studied the U.S. national assessment of 4th and 8th grade civic education classrooms found that students’ participation in group activities and projects tended to outscore those who rarely or never participated in this kind of classroom assignment. More specialized studies have not contradicted this finding. In Roma-integrated schools, more than ¾ of teachers considered that a range of socio-emotional improvements were stimulated by different project-related activities: group work (34%), cooperative learning activities (24.5%),
extra-school activities (reading clubs, exhibitions 23.4%), intercultural activities (10.6%) and other activities promoting Roma culture (9.6%). Positive effects generated by those activities were better understanding to each other, mutual acceptance, respect for cultural values and diminished prejudices and stereotypes. At the same time, extra school activities improved student-student, student-teacher and student-teacher-parent relationships.

Parameshwari, (2006) suggested that the ABL system will provide quality education to children in government schools while the uneducated children from poor background can be initiated in the system as well. Earlier, we used to pass every student even if they did not know how to read or write. In ABL, every child who passes the first and second standard will definitely know how to read and write.

Darnowski, Vincent S. (2007) Compared learning and retention of facts and principles of nuclear chemistry in the high school chemistry course using three forms of programmed materials, and the conventional lecture-demonstration method of teaching. Groups using the programmes gained significantly more than the control group, and among the three forms of programs, the group using either of the linear forms. The control group, however, showed significantly greater retention of facts and principles than any of the groups using programmed materials.

Ritu Sharma (2008) studied as per the module, there will be five groups in a class, of which, two groups will be supported by the teachers; one partially and the other fully. The other two will be supported by peers and the fifth one will be left completely independent on its own. Though it will be difficult for the teaching fraternity to adopt this method of
activity-based learning, but once they are accustomed to it, they will find it very convenient and helpful in the overall development of the child. Also, it will be a lesser burden on the teachers.

**STUDIES RELATED TO PRACTICAL ACTIVITIES AND SKILLS**

Adhinarayana (1979) studied in detail the teaching-strategy for developing appropriate skills required in students for conducting scientific investigations. It was indicated that the performance of the experimental group taught by the methods of learning package is significantly greater than that of the control group taught by conventional method. XII standard students showed favorable reaction towards learning package. Also, it was found that the effectiveness of learning through the package did not differ from unit to unit, class to class and teacher to teacher when examined in terms of acquisition of knowledge.

Ogunniyi (1983) analysed the laboratory activities in selected Nigerian secondary schools and the findings concluded that the teachers involved in the study dominated the laboratory periods.

Adinarayana (1984) studied a study on science teaching in that laboratory should be more than an extension of a lecture class. Primary schools. Instructional package was prepared for two units in class IV and V, a training programme was conducted to the teacher of 24 experimental schools. A total of 760 pupils were included in the study. It was found that there was a significant development of skills among the experimental groups in nine schools in class IV and eleven schools in class V of experimental group showed significant improvement in
observation skills. Investigatory skill was developed significantly in eleven schools. Ten schools in class IV and seven schools in class V of experimental group showed significant improvement in inquiry skill and the experimental group greatly favored science activities.

Paaila et al., (1984) studied the effects of instruction on integrated processing skill achievement. Findings of the study indicated that middle school level students could learn to use certain integrated process skills. The correlation between process skill and logical ability is strong and the abilities seem logically related. The most important finding from the study related how process skills should be integrated into the curriculum.

Burros et al., (1985) studied on the development of an integrated process skill test (TIPSII). It was found that TIPS provided another reliable instrument for assessing students’ competence in the integrated science process skills. The test was not specific to a given curriculum or content area, so it may be used across the various disciplines of science. TIPS II reflects students’ ability to apply the logic required to conduct fair investigation.

Berger et al., (1986) studied on the attainment of skill in using science processes grade and task effects. Micro computer simulation was used to collect data on student attainment of skill. It was found that age and amount of information presented in the task affected the performance of the students. Younger students did not perform as well as the old students. This study demonstrated developmental differences but does not provide any direct explanation of the differences.

Menon (1986) studied the system of science education in the perspective of the process of science inquiry and concluded that the
overall proficiency in the process skill. Skills steadily increased as students went up from standard to standard. There was a sudden transition in the overall development of process skills between standard X and XI. The skill of identifying variables which had been developed by the time students reached standard VIII. The skill of interpreting observational data was developed around 15 years. The skill of controlling the variables did not develop among the students in the system of 17 years of age. Children of the schools affiliated to the CBSE were found better in the development of the process skills. Text books were the curriculum materials through which the curriculum guidelines percolated up to practicing schools and mostly tested the product aspects and not the process aspects.

Barge, Zane lee (1988) conducted a study on the effect of group size, gender and ability grouping on learning science process skills using micro computers. Two response variables were used. The test of integrated process skills and a researcher developed test that students had during the intervention, were measured using a pre-test and post-test. Two hundred any forty five, seventh and eighth grade students were the focus of this study. Analyses indicated that the only statistically significant results was a main effect on ability for both response measures. However, the two post-test measures showed opposite trends in gain scores by low, middle, and high ability students. Speculation concerning this ability by post-test interaction was discussed. Other major conclusions included were 1. Teams of two and four members working together solved problems as effectively as individuals 2. The lessons and procedures implemented in the manner described generated gender-
neutral activities in science, and 3. Micro computers, using a file
management program and structured activities, can be used as a tool to
promote student learning of science process skills.

**Dwiredi (1988)** studied the effectiveness of microteaching and the
development of psychomotor skills in biology practical. It was found that
the skills relating to collecting, mounting preserving and the skills related
to observation and information locating are better developed by
microteaching than by conventional teaching.

**Vensel, George (1988)** studied the effects of computer delivered
science stimulations on the acquisition of process skills for gifted and
general population fourth and fifth graders. All students were pre and
post tested with the test of basic process skills. Treatment group
membership, gifted group membership and hours of stimulation use made
statistically significant contributions to the prediction of post-test scores.
However, the proportion of explained variance was low, about one
percent for each of the three variables. Further studies using multiple
measures of science process skills and greater control of classroom use of
the stimulations and recommended.

**Barbara Strawitz (1989)** studied the effect of testing of science
processing skills achievement using self-instructional materials. It was
found that the self-instructional materials increased the effect of testing of
science processing skills achievement.

**Pandit (1989)** studied eight major laboratory skills in chemistry in
their hierarchical order. The study revealed that a significant relationship
between the ability to learn the content in chemistry and the ability to acquire cognitive and manipulative skills.

**Baker et al., (1991)** conducted a study to estimate the process skill acquisition. Cognitive growth and attitudinal change of ninth grade students in a science literacy course. The results of the study indicated that it was possible to teach scientific skills directly, and to influence the way students perform on more general measurement of cognitive ability. It was also concluded that it was possible to change the attitude of students.

**Roger Lock (1992)** attempted to correlate study-the gender and practical skill development in science. Four problem-solving tasks were given as one to one testing. The practical skills like observation manipulation, interpretation, planning, reporting and self-reliance were tested. This study found little evidence to gender difference in performance. Few significant differences in the performance were also found.

**Anita Roychoudhury et al. (1993)** studied to find out the development of science process skills in authentic contexts. It was estimated that student centred open-ended laboratory experiments fallities the learning of higher order science processing skills like identifying variables, interpretation of data, hypothesis defining and experimentation. It was also found that weak as well as strong students showed such development.

**Srivastava (1997)** studied the analysis and interpretation skills in physics of Twelth Grade students. The students found the items of task
testing the prediction skill most difficult. In the whole test it was found that the gender difference was not significant. In the process skill of determining the relationship, interpretation and prediction, the average score of boys was more than girls. Though there was variation in achievement of students from school to school, but a definite pattern showing correlation between school and achievement of its students did not emerge from the study. It was found that the presently used curriculum of physics practical has failed to develop the analysis and interpretation skills in students up to a reasonable level. An analysis of the currently used physics practical curriculum shows that the two main reasons for the poor performance are (1) The type of laboratory extreme used in the course work. (2) The nature of assessment in practical.

Ganguli (2000) conducted a study on transaction of science curriculum based on open-ended approach using textbooks. After conducting a series of pre-tests and post tests, it has concluded that guided open ended approach of doing experiment was superior to the traditional approach in the development of cognitive abilities such as knowledge, understanding and application and Practical skills such as use of instrument organizational skills manipulative skill and communicative skill. These findings remained unchanged when the groups were divided according to intelligence level, socio-economic level and sex difference.

Thaker (2002) studied on inquiry for the science laboratory effectiveness of secondary schools. It was found that secondary schools did not score high on effectiveness of science laboratories. There was no significant difference in the mean scores of science the level of planning on the science laboratory effectiveness between the rural and urban
secondary schools. There was no significant difference in the mean scores of the level of arrangement on the science laboratory effectiveness between the rural and urban secondary schools. There was no significant difference in the mean scores of the level of the utility on the science laboratory effectiveness between the rural and urban secondary schools.

Chandrakanthi (2003) conducted a study on social, pedagogical factors affecting language skills among the Engineering college students. The study concludes the social factors such as socio-economic status, family environment, college environment and a few personality traits affect the language skills among the engineering college students. Further, pedagogical factors were also found to have influence on the language skills.

Caspo (2003) analysed the cognitive factors of the development of foreign language skills. Results of the study indicated that best predictor of better achievement is preliminary language knowledge, especially reading skills. However, the inductive reasoning is a significant predictor in the younger age group.

William A. Sandoval (2004), investigated, it has long been a goal of science education in the United States that student leave school with a robust understanding of the nature of science. Decades of research show that this does not happen. Inquiry-based instruction is advocated as a means for developing such understanding, although there is scant direct evidence that it does. There is a gap between what is known about students' inquiry practices and their epistemological beliefs about science. Studies of students' ideas about epistemological aspects of formal science are unlikely to shed any light on how they perceive their own inquiry
efforts. Conversely, inquiry-based instruction that does not account for the epistemological beliefs that guide students' inquiry stands very little chance of helping students to understand professional science. This paper reviews largely independent lines of research into students' beliefs about the nature of science and their practices of inquiry to argue that students' inquiry is guided by practical epistemologies that are in need of study. An approach to studying practical epistemologies is proposed that has the potential to produce a better psychological theory of epistemological development, as well as to realize goals of a science education that develops scientifically informed citizens.

Avi Hofstein (2004), Focuses on the ability of high-school chemistry students, who learn chemistry through the inquiry approach, to ask meaningful and scientifically sound questions. They investigated (a) the ability of students to ask questions related to their observations and findings in an inquiry-type experiment (a practical test) and (b) the ability of students to ask questions after critically reading a scientific article. The student population consisted of two groups: an inquiry-laboratory group (experimental group) and a traditional laboratory-type group (control group). The three common features investigated were (a) the number of questions that were asked by each of the students, (b) the cognitive level of the questions, and (c) the nature of the questions that were chosen by the students, for the purpose of further investigation. Importantly, it was found that students in the inquiry group who had experience in asking questions in the chemistry laboratory outperformed the control group in their ability to ask more and better questions.
Richard J. Ratz (2006) States in the United States are actively building science assessments to be administered annually in elementary, middle, and high school grades. The No Child Left Behind Act of 2001 requires that these assessments be in place for the 2007-2008 school year, be aligned with state academic content and achievement standards, and include measures of higher-order thinking skills. This article examines how the legislated accountability requirements might be met while preserving the goals for validity articulated in the National Science Education Standards. Practical considerations for building and implementing assessment programs are also discussed.

Gideon Horn, (2006) explained the new political dispensation and socio-economic transformation in South Africa do not, unfortunately, guarantee jobs for those who wish to enter the labour market after school. Indications are that only between 5-7% of successful Grade 12 candidates in the country find employment in the formal sector. The problem of unemployment and ways to improve the employability of learners, therefore, need to be urgently addressed. Reasons for the low employability levels of new entrants to the labour market include the structural change in the economy towards a more knowledge-based service sector; the lack of entrepreneurial skills and orientation among new entrants to create new business; and teachers with low morale who do not actively prepare learners for the job market. Strategies to increase the employability of learners include the successful implementation of the new FET curriculum from 2006 with the aim of increasing the employability of learners existing in 2008, by encouraging a more learner-centred and activity-based approach to education; teachers who
are well informed regarding current requirements in the labour market and prepare their learners accordingly; and continuous involvement by the private sector in the design of curriculum.

Paul Torrance, E. (2006), studied to improve instruction by teaching with creativity as well as teaching students to think creatively. This article reviews their investment theory of creativity, propulsion theory of creative contributions, and some of the data they collected with regard to creativity. It also describes the propulsion theory of creative contributions.

Starrett, C. (2007), describes experience teaching modeling at the high school level prior to teaching programming and embedded control. An implementation-independent form of UML modeling is being used to teach students to analyze various applications, systems and problem domains. The objective is to introduce the abstract thinking processes involved in modeling before introducing the more concrete thought processes involved in programming with frequently used textual imperative programming languages. The author reports on experience teaching abstraction and UML modeling to a class of 12th graders.

Avi Hosstein, (2007) composed of groups working in mathematics, physics, chemistry, computer science, earth and environmental sciences, life sciences and science and technology for junior-high school. In all these areas there are extensive research and development projects, aimed at (1) studying science and mathematics learning and teaching and their development, (2) producing and implementing improved and up-to-date learning and teaching materials that integrate the use of modern technologies, and (3) providing professional development for teachers.
all over Israel. Work is based on an underlying philosophy that considers curriculum development and implementation, teacher professional development, research and evaluation as interrelated and continuous long-term activities. Research studies focus on cognitive, socio-cultural and affective aspects to learning, teaching and learning to teach science and mathematics, using various research methodologies: quantitative, qualitative and mixed methods. The department operates three national centers for science teachers. Physics, chemistry (until September, 2007), and junior high school and technology-specializing in the development of leadership among science teachers and in continuous professional development for science teachers using research-based models.

**Bat-Sheva Eylon, (2007)** studied the Curriculum development and assessment methods for the new syllabus: In 2007, they have completed several units on the topic of radiation and matter and a revision of the mechanics course. The courses were accompanied by educational resources for students and teachers and include innovative formats for problem-solving activities, inquiry laboratories and computerized materials. They developed a new portfolio-based format for on-going assessment of laboratory work for the matriculation level that would encourage the use of investigations and inquiry labs.

The *IQWST* project (Investigating and Questioning our World through Science and Technology) aims to develop and test the next generation of inquiry-based science curricula for middle schools. The curriculum includes 12 units, 4 in each year, 3 in each of the following disciplines: physics, chemistry, life science, and earth science. The project collaborates with science educators, scientists, psychologists, and
literacy experts from Michigan State University, the University of Michigan, Northwestern University, the University of Illinois at Campaign-Urbana, Teachers College at Columbia University, and Project 2061 at the American Association for the Advancement of Science. The curriculum will be published by Glencoe/McGraw-Hill.

The *DGOA* project (Data Gathering, Organization, and Analysis) investigates how to develop students' skills in generating and working with evidence across various disciplines and what is the meta-knowledge associated with these skills.

The *CMLeS* project (Continuing Motivation to Learn Science) investigates the differences between the ways elementary and middle conventional schools, open schools, democratic schools, and anthroposophic schools foster student motivation to continue engaging in science-related activities after school.

Valarie L. Akerson (2008) conducted the study tracked the influence of explicit reflective instructional methods on cultural values, ethical and intellectual development, and the relationship of these with preservice teachers' views of nature of science (NOS). The researchers used the Views of Nature of Science Form B (VNOS B) to describe NOS views, the Learning Context Questionnaire (LCQ) to classify preservice teachers' ethical and intellectual positions using Perry's scheme, and the Schwartz Values Inventory (SVI) to measure preservice teachers' cultural values. The interventions took place in two concurrent courses: a science methods course, and a foundations of early childhood course. The science methods course explicitly emphasized NOS throughout the semester, and the foundations of early childhood course reinforced these ideas through
cultural activities that stressed empirical evidence. Analysis of data showed relationships between pre service teachers' Perry positions and responses on the VNOS B with those at higher positions exhibiting more informed NOS views. Relationships between pre service teachers' NOS views and their cultural values were identified, such as those at the dualism position holding achievement more highly for scientists than those at other Perry positions. The values pre service teachers held personally were different from those they held as important for scientists.

Topeka, Kansas (2008) studied the Partnership for 21st Century Skills, the nation's leading advocacy organization focused on infusing 21st century skills into education, recently approved the Kansas application to join with seven other Leadership States in promoting 21st century teaching and learning skills for all students.

DISCUSSION

Studies by most of the researcher showed that Activity Based Learning (ABL) teaching strategy was found to be superior than all the other methods. It was also found that there was strong evidence in favor of activity based approach in teaching school science in respect of acquisition of knowledge, application of the scientific knowledge and development of scientific skill by many researchers. (Dighal, 1985; Gurumuruthy, 1990; Miller, Anne-Counthey Seigler, 1990; Rajeswari, 1991; Patricia Nell, 1991; Dubey ad Joshi, 1993; Pandhi, 1996; Saxena, 1996; Sharada, 1998; Rama, 2003; Felisa Tibbitts, 2005; UNICEF, 2006; Parameshwari, 2006; IIT, Chennai, 2007; Ritu Sharma, 2008; Barbara Strawitz, 1989; Caspo, 2003; William A. Sandoval, 2004; Avi Hofstein,
Some of the studies revealed that CAI was found to be effective in promoting the mastery and achievement of the students compared to the conventional method. (Purushothaman, Stella, 1991; Sulimani Tarik A, 1992; Mason, Lynn Nerrick, 1992; Mahajan, 1994; Robers Michael R, 1994; Rangaraj, 1995; Theodone Thomas III, 1996; May, Bradford Johnella Elaine R, 1997; Johnston, Cynthia Wilson, 1997; Chibbaro, Julie Segars, 1997; Anandan, 1998).

Studies on different types of laboratory experiences were able to prove that, achieved in the students in the mastery of subject matter; developing scientific reasoning; understanding the complexity and ambiguity of empirical work; developing practical skills; understanding the nature of science; cultivating interest in science and interest in learning science; and developing teamwork abilities. (Pillai, 1987; Monapatra, 1988; Goel. et al, 1990; Gangoli and Gurumurthy, 1995; Lalitha, 2002; Ogumniyi, 1983; Adinarayana, 1984; Pandit, 1989; Thaker, 2002; America’s Lab Report: Investigations in High School Science 2005).

Studies on multimedia proved even a difficult concept was made clear to below average students by visualization of objects and the process was essential for formulation of accurate concepts among the students. (Barge, Zane lee, 1988; Samanta, 1991; Shah and Mandal, 1993; Jolinella, Elaine R., 1997; Allen D’Maris Anne Lumpkin, 1998)
Studies on programmed learning materials revealed that they were found to be more effective than conventional methods by some researchers (Fieldman, 1965; Duttons, 1966; Shah and Kapadia, 1972; Chibba, 1973; Pandya, 1974; Pocztar, 1974; Reddy, 1975; Shitole, 1976; Holiday, 1983; Kalacherry, 1987; Darnowski, Vincent S. 2007; Starrett, C. 2007; Darnowski, Vincent S. 2007)

Studies on demonstration method proved that it was very effective in science teaching even with the lack of facilities in schools, lack of mastery over the subject matter by the teacher, lack of experimentation in the classroom, over dependence of the teacher on text-books, and overcrowding in the classroom, by the researcher. (Swarnamma, 1978)

Studies related to promote students overall development of process skills should be integrated into the curriculum. (Adinarayana, 1979; Pailla et al., 1984; Burros et al., 1985; Berger et al., 1986; Menon, 1986; Dwiredi, 1988; Vensel, George, 1988; Baker et al., 1991; Roger Lock, 1992; Anita Roychoudhury et al., 1993; Srivastava, 1997; Ganguli, 2000; Chandrakanthi, 2003; Richard J. Ratz, 2006; Gideon Horn, 2006; Paul Torrance, E. 2006)

CONCLUSION

From the review of the above studies, it was concluded that there is a strong evidence in favour of Activity Based Learning (ABL) approach in teaching school science in respect of acquisition of scientific knowledge, application of scientific knowledge and development of scientific skills. It is also observed that laboratory experience is essential in developing integrated process skills in science as several researches
suggest that inquiry-based instructions have enhanced higher-order learning and development of questioning skills. Correlation between process skills and logical ability is also found to be strong. The conclusions of various studies indicate that guided, open-ended and inquiry approach of doing experiment is superior to the traditional approach in the development of cognitive as well as practical skills in science irrespective of the factors such as gender, intelligence-level, socio-economic status, etc., of the students. ABL ensures that each and every child participates fully in each activity. Self-learning, group-learning and peer group learning are encouraged. Pupils learn at their own pace. They are given full freedom to select the learning experience on their own. Since it is observed that none of the studies has dealt with studying the effectiveness of ABL method as compared to conventional method in developing practical skills in science at High school level, the investigator has selected the same as his research problem. The detailed methodology of the investigation is presented in the next chapter.