CHAPTER – 1
INTRODUCTION

1.0 GENERAL INTRODUCTION

An educational system is explicitly based on the quest, what to teach and how to teach. “What to teach” means the learning material, the quantum of which swings from linguistic to scientific knowledge. “How to teach” means the method of teaching, which varies from conventional lecture and chalk-board teaching to utilization of the modern technology in teaching. The recent reports – Pratham’s Annual Status of Education Report (ASER), the Programme for International Students Assessment (PISA) and the Quality Education Study (QES) by writers and educational Initiatives – gave a glooming, telling reality check, biting some long held stories about the strength of Indian Students. Consider this: in the top 89 urban schools across the country, the QES report says, there has been a 5 – 10 % drop in learning levels in the last few years in Mathematics, Science and reading literacy. Among 74 countries including the USA, UK, Canada, China, Korea, South Africa – Indian students rank second to last at 73rd position, just above Kyrgyzstan. Lots of people who are up in arms say that these reports are not valid, but why can’t one just accepts that there is something seriously wrong with the way teachers are teaching? The system is dumping down children, undermining their capacity to learn, breeding a whole lot of boredom in classroom. These findings impart a new urgency and depth to the understanding of India’s education crisis. The average Indian kid has greater ambition, greater access to information and greater aspiration. But Indian classrooms have failed
to match up to the challenge or channel that swelling aspiration or ambition (Outlook – February, 13, 2012).

In India Today’s ‘First Aspire Education Summit’ held in New Delhi on January 27, 2012, Principal of Delhi University’s Mirinda House College said, “the classroom is dead today because it’s boring for students and teachers”. She urged teachers to innovate. Teachers need to discuss and forge new methods. Speaking in the same vein at this summit, Anand Sudarshan, MD and CEO of Manipal Global Educational Services said, “teachers needed to use technology to generate curiosity for themselves and students” (India Today, February 13, 2012).

The world is continuously and constantly changing at a rapid pace and the ways in which one functions at home, workplace and school are also changing. The speed at which technology has developed plays a major role in these changes. From e-mail to on-line classes, computers are definitely influential in peoples’ lives, and can enhance the learning process in schools in various ways. With the increasing popularity of computers, it is essential for practitioners, parents and administrators to support and encourage computer technology in education system as it has become an important medium in instructional delivery and instruction management. The recognition of the value of computer in the teaching-learning process in the contemporary world is engendering the introduction of computer education into the school curriculum in most of the states across the India.

No doubt, computers are being used for a plethora of applications in every conceivable field, from engineering to music and yoga, and from law to microsurgery and space technology. However, it was only in the recent past that they have foraged into the territory of education which hitherto was the sole purview of teachers only. While many teachers find the advances of computer
in education distasteful and dehumanizing, others are hailing computers as “virtual” teachers and tools of immense educational possibilities (Lancaster, 1985; Anderson, 1986; Ramakrishnan, 1983; Bhatt & Prakash, 1994). However, since education is concerned with information, there is bound to be a wide scope of a tool like computer which can help in fast and accurate processing of information. Being an information processing machine par excellence, computers would therefore continue to play a crucial and critical role in educational processes. No wonder, after the invention of printing press, computers are being recognized as the most important invention of mankind in terms of revolutionizing educational theory and practice.

Schools are being probed to embrace technology for school improvement. Toffler (1991) explained that, no Nation can operate a 21st century economy without a 21st – century electronic infrastructure, embracing computers, data communication and the other new multimedia technology. This requires a population as familiar with this informational infrastructure as it is with cars, roads, highways, trains and other related transportation infrastructure facilities.

Our children are unfamiliar with the “informational infrastructure” that Toffler describes. Unfortunately most of our students do not have the facility of computer in our schools, and wherever they have, the same is being used for some purposes other than an educational resource. Also, there is a serious gap between job requirements and the ability to perform them. Advances in Science and technology have persistently raised literacy requirements and the 21st century economy depends on literate people. The new jobs of information age require increasing literacy and technical competence and also the ability to learn, to work independently and to work cooperatively. Public schools are being
asked by enthusiasts to incorporate technology in various forms in order to improve instruction and to give students valuable learning experiences with technologies.

At the beginning of last century, children were taught in a rigidly formal and stereotyped way. Education was then conceived as a process of transformation of factual knowledge only. The teacher used to adopt an authoritarian attitude. The facts learnt by children were tested once in a year and moreover these tests were highly subjective without conceptual understanding. The main emphasis was on testing memory. There was a huge gap between the child’s response and the teacher’s reinforcement. The teachers very often used the lecture method only which was not very effective for meaningful learning. The teachers did not use other visual techniques and materials to supplement oral teaching.

However, now a days, teachers do not consider children as a vessel to be filled up with facts or as a pliable plastic material which can be transformed into any shape enabling him to project his ideas on it. The modern teacher considers each child akin to a plant and helps the child to grow according to his abilities and aptitudes. He helps the child in self learning. He realizes that to teach is to nourish or cultivate the growing child or to give him intellectual exercise or to train him in the horizontal sense of directing or guiding his growth. The modern teacher sees education as a process of interaction between the child and his environment and helps him to learn in groups and also individually.

Increase in population and explosion of knowledge are affecting the pattern of human life and also exerting its full impact on education. The explosion of population and knowledge has raised the serious question of both quantity and quality of education. Educationists are of the opinion that the educational problems relating to the quantity and quality could be tackled only by
applying systematic approach of instructional technology. That is why there has been a rapid development of communication technology in education at all levels with a purpose of extending educational facilities and upgrading instructions. Instructional technology aids to improve the process of human learning.

Instructional technology is the systematic use of modern methods and technologies in teaching and learning. It involves teachers in a variety of roles, some of which are traditional whereas others are still evolving and emerging. Instructional technology is fundamentally aimed at improving the efficiency of the educational system by increasing the rate, depth, precision, retention and value of the learning which takes place as the ultimate outcome.

As a major field of education, Science in the Indian classroom was taught in an authoritarian manner as a ‘dogma’ of facts, principles and laws to be memorized and handed back during the examinations. The basic characteristics of Science i.e. excitement of discovery and invention, development of scientific temper, and critical thinking to mention a few, were altogether missing in Science teaching. There was exclusive reliance on chalk-talk method in Science teaching and very little emphasis was laid on laboratory and project activities. Two major problem areas that cause ineffective learning in Science can be identified:

1. **The limitation of the teacher:** Most Science teachers have in-depth knowledge only in one of the elective subjects such as Physics, Chemistry or Biology but they are hampered in teaching other branches which they must teach anyway. Many teachers are not adept at using quick sketches to explain certain concepts/contents, or in drawing diagrams in Biology. Some do not possess a big enough knowledge-base to link Scientific contents with day-to-day examples. For effective teaching, Science teachers need to collect ample
information, for which they may not have adequate resources, time, or even inclination.

2. Lack of Audio-visual Aids: Even for teaching a single topic effectively teachers often need to carry to their classroom several charts, equipment, specimen, etc. However, often these materials are either unavailable or inaccessible; moreover, teachers do not have enough time in between classes to procure and test it for its usability. Therefore, most Science classes are limited to uninspiring, and sometimes, incomprehensible verbal lectures.

Science Survey (Shukla, 2005) has shown that interest in Science as well as satisfaction with quality of Science teaching declined as the age of the students increased. Poor performance of the students in Science has been attributed to a number of factors including poor quality of science teachers, overcrowded classrooms, lack of suitable and adequate Science equipment (Bajah, 1979; Kareem, 2003). When traditional teaching methods are used in teaching science subjects, students understand the subject at knowledge level only and they usually memorize the science concepts without understanding the real meaning resulting in poor performance and decline in Science enrolment. It is obvious that to improve the students’ performance in Science and to increase their interest in Science, alternate teaching approaches are needed.

However, now the investigations have proved that classroom instructions alone cannot bring out the desired goals from the teaching learning process. It does not always motivate the students. Therefore, in the present state of knowledge explosion with increasing specialization, increased student population, higher pupil-teacher ratio, and increase in workload of teachers etc., the use of self-instructional techniques like television, radio, multimedia, programmed learning materials, modules and computer assisted
instructions etc. have become a part and parcel of teaching. In this age of computers, there appears to be a niche for computers in teaching and learning process. Such aids can be successfully used for their unique potential and features inherent in them to store, retrieve and transmit information.

The computers can play many roles in the classroom and therefore, can be utilized to help students in all areas of curriculum. It is not just a tool like blackboard or textbook, it is rather a teaching device which provides interactive involvement of the students with instructional material. The effectiveness of the computer as a teaching and learning device has been tested by many researchers in India and abroad in different areas like teaching mathematics, language skills (listening, speaking, reading and writing), arts, Science, teaching problem-solving skills, health and social studies etc. As a result of it, computers have enriched the entire education sphere. It plays a key role as a medium of instruction. Computer has become an integral part of teaching learning process in the advanced and developed countries of the world for formal and non-formal education at all the levels. However unfortunately, it has not made much headway in India in the education sector as yet.

1.1 POTENTIAL OF COMPUTER APPLICATIONS IN EDUCATION

In recent years, the availability of computers in the field of education has given education a totally new and vibrant outlook. Though computers have influenced each and every aspect of education but their applications are becoming increasingly visible and expanding deep and wide with respect to class-room teaching. Now-a-days, a computer is more to a teacher than just an audio-visual aid. It has become an integral part of the transaction of curriculum and is immensely helping the teacher to relate in a much better way to the students in the class room. It has shown great
potential in increasing the quality of student teacher interaction and also in encouraging student participation in the learning process which otherwise would not have been possible in case of conventional teaching especially in overcrowded classes. (Anderson, 1986; Johnson, Johnson, & Stanne, 1986; Shukla, 1991 and Bullough & Beatty, 1991).

With the widespread development in computer applications due to capabilities of computers to process numeric as well as non-numeric information, handle and process a large amount of information conveniently, educational experts are optimistic that the potential of computer must be realized to overhaul the process of class-room learning. According to Suppes (1988) the four main features of computers which have tremendous potential for education:-

(i) INTERACTIVE OPERATIONS: Computers are best utilized to perform a series of fixed operations numerous times.

(ii) SPEED: The most important factor in computer utilization is speed, especially for applications having large amount of data to be produced.

(iii) ACCURACY AND RELIABILITY: Its design assures correct processing of data.

(iv) INFORMATION RETRIEVAL: The computer has the ability to store large amount of data and make it available to users instantaneously.

Besides being problem solving tool, computers have many advantages in processing and retrieval of information and data. Some of these are:

- The amount of redundancy in stored data can be reduced.
- Problem of inconsistency in the stored data can be avoided.
The stored data can be shared for existing and new applications.

Thus, computers can be used as instructional media in a variety of ways. Computers can be programmed so that the person learning the subject for the first time with or without the help of the teacher can go through the contents of the subject; he or she can also ask any query while going through the contents. Also, the computer can summarize the lesson and can ask a number of questions to the learner to assess and evaluate if the lesson has been learnt properly. It can also evaluate the answers given in a particular format.

According to Punelekar & Trivedi (1992), in addition to the advantages given earlier, computers have the following specific merits especially in the educational context:-

(a) Computers require less space for storage of information. The data can be transferred and transformed into desirable framework.

(b) Computers have the merit of mobility i.e. they can be moved from place to place without much loss and damage in transit. For libraries and data archive, the computer is indeed a boon.

(c) Computers reduce the human error in calculation to the minimum because of automatic and accurate control devices in the hardware. This facilitates proper data output.

(d) Computers have generally the built in mechanism for incorporating future upgradation i.e. the improved software can be effectively used in the same old machine. It reduces overall cost and minimizes future investment. Not only this, hardware can be upgraded by changing inexpensive cards and components which are readily available.

1.2 Computer Assisted Instruction (CAI) – A BRIEF OVERVIEW

1.2.1 CAI - Terminology

As with any field of learning, acronyms abound in the computer assisted instruction/learning domain. Terms vary in the
breadth of their definition, or their specificity. Table 1.1 shows a brief list of some of the main terms that are used in CAI related field.

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Computer Assisted Instruction (CAI) is the process by which textual and visual information is presented to a learner in a logical sequence through a computer. The students learn by reading the text material presented or by observing the graphic information displayed. Some of the programmes provide audiovisual presentation with an option to the student to select audio presentation in addition to the visual media. Each segment of the text is followed by questions, for student’s response. Feedback on response is indicated immediately (Wang & Sleeman, 1993; Locatis & Atkinson, 1984).

Chauhan (1994) describes CAI system in terms of its hardware (the machine), its software (the programme), its communication link (the devices which allow learner to use the hardware and software), and the curriculum (teaching material stored in the computer). As CAI usually involves a dialogue between one student and a computer programme and student can learn at his/her own pace.
and time frame, it is called interactive and individualized learning (Curtis & Howard, 1990).

With the advancement of technology new dimensions of CAI have emerged. Bucholtz (1999) adds new meaning to CAI by using this term for internet based instruction through the use of web pages, web bulletin boards and real audio, graphics and hand-on-applications.

### 1.3 Types of CAI Software

CAI encompasses several teaching strategies of which four major categories are drill and practice, tutorial, simulation and games.

#### 1.3.1 Drill and Practice

Drill and Practice software provides exercise in which students work on example items and receive feedback on their correctness. Feedback and practice provided in the software enable the students to understand the learning material or refine the skills being taught to them. In drill and practice method, different format items are used such as multiple choice, fill in the blanks, odd man out, true and false, one word answers etc. Descriptive essay type long answers are avoided in CAI. This strategy is used extensively at all educational levels. Studies reveal that drill and practice software is oriented to behaviourist approach and works well to memorise and refine skills (Roblyer & Edward, 2000; Hsu, Chen & Hung, 2000; Allessi & Trollip, 1995; Maddux, Johnson & Willis, 1997).

#### 1.3.2 Tutorial

This software uses the computer to deliver an entire instructional sequence similar to teacher’s classroom instructions
on the given topic. Tutorial form of CAI teaches the student new information and the student interacts with the computer much like a student would interact with a tutor in a one-to-one session. Concepts are presented to the students through text/graphics in an interactive mode, the student’s understanding is measured through questioning and then after evaluation of the student’s response the computer provides more interaction or remedial instructions in the background of the performance of the student. Hsu et al. (2000) assert that tutorial programmes are associated to cognitivism. Roblyer & Edward (2000) also contend that tutorials can be designed to adopt Piaget’s cognitive approach.

1.3.3 INSTRUCTIONAL GAMES

These are the courseware with a function to increase motivation level of the participants by adding the elements of game its rules to learning activities. Instructional games can be very similar to drill and practice but have an interacting environment. Students may be more willing to work at practicing skills if they know they can do so by playing a game. Depending upon the particular game, student can compete with other students or the computer itself.

1.3.4 SIMULATION

Simulation is a computerized model of a real or imagined situations/phenomenon designed to teach the students how a system works. Simulation differs from tutorial and drill and practice activities by providing learner-structured activities. Educational simulations allow students to experience events or phenomenon that they are not able to witness personally and would be too difficult or dangerous to duplicate in the classroom setting. Fortunately, now-a-days, software is available which can simulate and manipulate objects performing a set of procedures in a given situation. The
person using the software usually chooses tasks and the sequence in which those tasks are performed and can also control the speed of execution of these processes to study their effect (Bitter & Pierson, 1999; Roblyer & Edwards, 2000).

1.4 EFFECTIVENESS OF CAI

Much research has been conducted to study the effectiveness of CAI in various subject areas and grade levels. Poole (1995) reviewed a number of research studies about the effectiveness of CAI and found that learning in languages, arts, mathematics, science and social studies was enhanced by CAI. He is also of the opinion that CAI can be designed to help students learn in a much better way.

Brophy (1999) investigated the effectiveness of CAI in the Science classroom. He tested several pieces of Science software. Test results revealed that CAI was an effective mode for teaching Science. Carter (1999) examined the effectiveness of CAI in the realm of vocational education and found that CAI was superior to traditional programme of vocational education for high school students. Tseng (1999) found CAI more enjoyable for students of first grade in ‘Math Family’ programme. It is under this background that worldwide CAI is being used at all grade levels from pre-primary to higher education set up.

1.5 ADVANTAGES AND LIMITATIONS OF CAI

Advantages of CAI beside other dividends include individualization of instruction. Learning can occur at learner’s own pace and time frame (Curtis & Howard, 1990; Munden, 1996; Cotton, 1999; Albon, 1997). CAI enhances learning and retention rate of the students; it motivates and develops sense of efficacy (Cotton, 1999). Meta–analysis of sixty five studies conducted by Kuchler (1998)
revealed that CAI has a positive effect on retention of mathematical concepts and skills of secondary school students; it improves student’s attitude towards several aspects of schooling and learning. CAI makes learning more convenient, comfortable and enjoyable for the students.

However, there are some limitations of CAI also as mentioned by Chauhan (1994). These limitations include constraints regarding hardware equipment and software development, lack of warmth and emotional climate which is created by teacher during classroom instructions. As it is well know that computers can’t appreciate the emotions of students, cannot understand their personal difficulties and are unable to solve their psychological problems. The limitations also include non-availability of or easy access to computer, expensive educational software and lack of adequate computer skills among students & teachers in general.

1.6 USE OF COMPUTER ASSISTED INSTRUCTION

Kent & McNergney (1999) critically reviewed the technological innovations in education and regarded computers as distinguished from all others since educational software is fast improving in functional application and in terms of content. Computer technology is changing at an incredibly rapid pace, so assumptions about today’s technology may not hold good for tomorrow’s innovations.

Developed countries have been using CAI for quite some time and a lot of research on various aspects of CAI has been conducted in these countries. The educationists have refined this mode of instruction in the light of findings of researches and are still looking for better use of it. It is encouraging to note that developing countries have also started using CAI in their educational set up and sincere efforts for the effective use of this innovative technique are being made in quite a good number of institutions across the country.
1.7 COGNITIVE STYLE OF THE LEARNER

The cognitive strengths, emotional traits, personality and other student characteristics vary enormously from student to student even if they are of the same age and are sharing the same classroom or technique of teaching. All these characteristics affect the success or failure of educational methods. That is a good enough reason to consider tailoring techniques of teaching to individual student or to a group of students. Cognitive styles are actually broad personal styles which show typical ways in which we process information. Some examples of cognitive style that have been identified include: reflectiveness versus impulsiveness, cognitive complexity versus simplicity (Bertini, 1986).

Cognitive cognitive styles are best described as the modes in which students approach, acquire, organize and process information. They are the consistent manner in which an individual perceives and carries out intellectual activities, and include such areas as how a student memorises and retrieves information (Witkin, Oltman, Raskin & Karp, 1971; Witkin & Goodenough, 1981). Furthermore, cognitive cognitive styles appear to be part of an individual’s underlying personality trends (Messick, 1996). The influence of cognitive style goes beyond learning to include the interpersonal, social and psychological functioning of individuals. Unlike a student’s intellectual abilities, which are domain specific, cognitive cognitive style constitute preferred ways of how an individual approaches the learning of a task or information.

There are a number of recognized cognitive style theories. Among the more substantiated are Kagan’s (1966) impulsivity/reflectivity, Pask’s (1972) holist/serialist and the theory of field-dependence and field-independence (Witkin et al., 1971). All of those cognitive cognitive styles fall under the category of
Wholist/Analytic and are derived from an individual’s ability to perform perceptual analytic tasks (Riding & Cheema, 1991). Of all cognitive cognitive style theories, field-dependence/field-independence is one of the most heavily researched theories (Witkin & Goodenough, 1981). Therefore, for the present study, the investigator has chosen Witkin’s field-dependence/field-independence theory because of extensive number of relationships researched between this theory and biological, psychological and socio-cultural functioning of human beings utilizing the Group Embedded Figure Test (GEFT) (Witkin & Goodenough, 1981; Wapner & Demick, 1991). In addition, this cognitive style may provide a great deal of potential for exploring educational issues (Luk, 1998).

1.8 STUDENTS’ ATTITUDE TOWARDS SCIENCE

Attitude towards Science, scientists and learning science have always been a matter of concern for science educators. Attitude is a very broadly used term in discussing issues in Science education and is often used in various contexts. Two broad categories are distinguishable here. The first one is the attitude towards Science (e.g. interest in Science, attitude towards scientists, or attitude towards social responsibility in Science). Attitude towards Science can be defined as the feelings, beliefs and values held about an object that may be the endeavor of Science, school Science, the impact of Science and technology on society. The second one is the scientific attitude (i.e., open-minded, honesty or skepticism). Scientific attitude is the desire to know and understand, questioning all the statements, search for data and their meaning, search of verification and consideration of consequences (Gardner, 1975; Osborne, Simon & Collins, 2003).

Research studies that indicate positive correlations between achievement in Science courses and positive attitude towards
Science, attitude and certain characteristics of the classroom environments that include personal support, use of a variety of teaching strategies, innovative learning activities, and student-centered instructional designs have all been reported in the recent researches (Osborne, Simon, & Collins, 2003; Russell & Hollander, 1975; Shrigley, Koballa & Simpson, 1988; French & Russell, 2006). Students who have positive attitude show increased attention to classroom instruction and participate more in Science activities (Germann, 1988; Jarvis & Pell, 2005).

1.9 STATEMENT OF THE PROBLEM

EFFECT OF COMPUTER ASSISTED INSTRUCTION (CAI) ON ACHIEVEMENT AND ATTITUDE TOWARDS SCIENCE IN RELATION TO COGNITIVE STYLE AT ELEMENTARY SCHOOL LEVEL

1.10 OPERATIONAL DEFINITIONS OF THE TERMS USED

1.10.1 COMPUTER ASSISTED INSTRUCTION (CAI)

CAI is the method of instruction in which the computer is used to instruct the student and where the computer contains the instruction which is designed to teach, guide and test the student until the desired level of proficiency is attained. In the present study, CAI was used in tutorial mode in which computer was used to deliver the entire instructional sequence similar to teacher’s classroom instruction on the topic.

1.10.2 COGNITIVE STYLE

Cognitive style is a term used to describe the way an individual thinks, perceives and remembers information or their preferred approach to using such information to solve problems. In the present study, cognitive style is classified as Field Dependent (FD)
and Field Independent (FI) as measured by Group Embedded Figure Test (GEFT) developed by Witkin, Oltman, Raskin & Karp (1971).

1.10.3 ACHIEVEMENT

Achievement refers to academic proficiency or performance in a given skill or body of knowledge. In the present study achievement was assessed on the basis of difference between the scores obtained by the student in pretest and posttest on an achievement test developed by the investigator.

1.10.4 SCIENCE

Science refers to the subject “general Science” which is a combination of Physics, Chemistry and Biology as prescribed by CBSE for elementary school level. In the present study, the investigator considered Biology (theory) part of the syllabi of grade VII only.

1.10.5 ATTITUDE

An attitude is a particular feeling about any object, event or person. In the present study, attitude of the students towards Science was assessed as any change in the liking of science by the student. It was measured through Biology Attitude Scale developed by Russell & Hollander (1975).

1.11 RATIONALE OF THE STUDY

According to Cotton (1971); Akour (2006) CAI as a supplement to traditional instruction produces higher achievement than the use of traditional instruction alone. The studies of Karper, Robinson, & Casado-Kehoe (2005) reveal that CAI has been found to enhance students’ performance better than the traditional instructional method in counselor education. Similarly, Mills (2001) found CAI, as
effective as classroom instruction for fact based learning, but not as effective for topics requiring critical thinking or mathematical problem solving. Jenk & Springer (2002) opined that how CAI is delivered can affect its effectiveness, and new studies are needed to clarify the effect of CAI in contemporary student environment. Research is inconclusive regarding the comparative effectiveness of the use of TI alone and CAI alone, and that computer based education (CAI and other computer applications) produce higher achievement than TI alone (Yusuf & Afolabi, 2010). Based on the review of the results of studies, the present study was proposed to explore the effect of individualized form of CAI on the achievement of VII grade students in Science.

Gender issues too have been linked with performance of students in academic tasks in several studies but without any definite conclusion. But there is a general conclusion as per the findings of many investigations that imbalance exists in computer use, access and attitude. Some studies revealed that male students perform better than the female in Physics, Chemistry and Biology (Danmole, 1998; Novak & Mosunda, 1991; Okeke & Ochuba, 1986). Studies such as those of Wozencraft (1963); Kelly (1978) revealed that female students perform better off than males where as Bello, (1990); Spence (2004); Yusuf & Afolabi, (2010) found that gender has no influence on the achievement in Science when instructions are delivered through computer. Keeping in view the variability in findings regarding interrelationship between achievement, computers and gender, the present study was proposed with an objective to study the effect of CAI on the achievement in Science in relation to the gender of the student.

Cognitive learning style of the student has been found to have potential and great implications for the educational process (Sternberg & Grigorenko, 1997) and is described as a model in which students
approach, acquire, organize and process the information. According to Witkin, et al. (1971) and Witkin & Goodenough (1981), cognitive learning styles are the consistent manner in which an individual perceives and carries out intellectual activities, memorizes and retrieves information. Though, CAI has been found to be effective in individualized tutorial form and also as supplement to the conventional teaching but unfortunately many CAI programmes have neglected cognitive learning style and the processes of how student learn.

Understanding of students’ attitude is important in supporting their achievement and interest towards a particular discipline however, earlier research studies focused mainly on Science in general (Dawson, 2000) and less attention was paid to specific branches like Biology, Physics or Chemistry (Saltta & Tzougraki, 2004).

Thus, in the light of the above researches, the present study was proposed to make an investigation on the effect of CAI on the academic achievement and attitude towards Science in relation to students’ cognitive style and their gender.

1.12 OBJECTIVES OF THE STUDY

The present study proposed to achieve the following objectives -

1. To develop a package for Computer Assisted Instruction (CAI) in the content area (Biology) for elementary level (VII class).

2. To determine the effect of CAI on students’ Achievement and compare it to Traditional Instructions (TI).

3. To determine the effect of CAI on students’ Achievement in relation to their cognitive style and gender.

4. To find out the effect of CAI on students’ Attitude towards Science.

1.13 RESEARCH QUESTIONS

Following research questions were framed to achieve the above given objectives:
1. Is there a statistically significant difference in the Mean Score on Achievement test in Biology of the group of students taught through TI and the group of students taught through CAI?

2. Is there a statistically significant difference in the Mean Score on Achievement test in Biology of the group of students of Field Independent cognitive style taught through TI and the group of students of Field Independent cognitive style taught through CAI?

3. Is there a statistically significant difference in the Mean Score on Achievement test in Biology of the group of students of Field Dependent cognitive style taught through TI and the group of students of Field Dependent cognitive style taught through CAI?

4. Is there a statistically significant difference in the Mean Score on Achievement test in Biology of boys taught through TI and boys taught through CAI?

5. Is there a statistically significant difference in the Mean Score on Achievement test in Biology of girls taught through TI and girls taught through CAI?

6. Is there a statistically significant difference in the Mean Score on Achievement test in Biology of boys of Field Independent cognitive style taught through TI and boys of Field Independent cognitive style taught through CAI?

7. Is there a statistically significant difference in the Mean Score on Achievement test in Biology of girls of Field Independent cognitive style taught through TI and girls of Field Independent cognitive style taught through CAI?

8. Is there a statistically significant difference in the Mean Score on Achievement test in Biology of boys of Field Dependent cognitive style taught through TI and boys of Field Dependent cognitive style taught through CAI?
9. Is there a statistically significant difference in the Mean Score on Achievement test in Biology of girls of Field Dependent cognitive style taught through TI and girls of Field Dependent cognitive style taught through CAI?
10. Is there a statistically significant change in Attitude towards Science of students of Experimental group after their exposure to CAI?
11. Is there a statistically significant change in the Attitude towards Science of Field Independent students of the Experimental group after their exposure to CAI?
12. Is there a statistically significant change in the Attitude towards Science of Field Dependent students of the Experimental group after their exposure to CAI?
13. Is there a statistically significant change in the Attitude towards Science of Field Independent boys of the Experimental group after their exposure to CAI?
14. Is there a statistically significant change in the Attitude towards Science of Field Independent girls of the experimental group after their exposure to CAI?
15. Is there a statistically significant change in the Attitude towards Science of Field Dependent boys of the Experimental group after their exposure to CAI?
16. Is there a statistically significant change in the Attitude towards Science of Field Dependent girls of the Experimental group after their exposure to CAI?

1.14 DELIMITATIONS OF THE STUDY

1. The instructional material for CAI as well as TI was developed only for some specific units in Science (Biology) for 7th class.
2. CAI was developed for one-to-one interaction in Visual Basic language.
3. The instructional material for CAI and TI was developed in English language only. Therefore, the experiment was confined to English medium students of 7th grade only.

4. The school with adequate computer facilities only was selected for experimentation.