Chapter I

Computers have no human properties which is the most important reason why they cannot replace human teachers.

1.0 INTRODUCTION

In the contemporary context computers have gained tremendous moments and as an important tool for instruction. Traditional teaching in the classrooms using blackboards can be supplemented with lessons prepared with the help of computers. Good teachers all over the world have always been looking for more effective teaching aids. To realize the vast potential of computers as a tool for education, effort is required in direction of thinking of how to use the computers as a teaching aid and consequently develop appropriate software for the subject matter.

Computer is an impersonal machine system which can help wonderfully to handle information needed to request, report and interpret data.

Man started developing language for communication and also started making documents on stones and wood by carving out pictures of animals and nature. They became the first script of the language. As the society grew and became more civilized, education of younger ones and new generation started taking place. It was by observation and imitation. The purpose of that education was mainly to produce off springs, take
care of the younger ones and their survival. As the achievements of human beings became more and more, the education also started getting a semblance of coordinated effort and was institutionalized. With the means of transport becoming faster, the men traveled to different areas and continents in search of food, fodder for animals and for the purpose of invasion. Such invasions and contact with new societies from different areas, the men learnt new things and his horizon of knowledge widened. The education became more advanced and schools, colleges and universities were found for different degree of education in different fields.

The progress was relatively slow till about 1000 A.D. The last 1000 years have seen many inventions as the needs became more. The man started exploring the outer world and also started thinking of various means to increase his efficiency. The 20th century witnessed a major hallmark in the form of computers. The computers have now made way into all walks of life. The Computers are used in almost all fields for collection, compilation of data, and execution of tasks which are remotely controlled and so on. One of the specific areas of use of computers is teaching. The computers have come in a big way in to teaching different subjects, which have been made easy and interactive because of their artificial intelligence.
1.1 COMPUTERS AS TOOLS FOR INSTRUCTION

The emergence of computer technology has affected all aspects of human life. The computers are being extensively used in households, in offices, at banks, at supermarket, for handling mammoth engineering plants, weapon systems, aircraft and space applications. The use of computers has become so advanced and extensive that their potential applications in the field of education appears to very limited. Therefore it is imperative for us to become computer literates for making best use of the machine. It is necessary for both the teachers and students to become aware of the computer applications to derive maximum benefit from this revolutionary system.

In recent years, the computers have become an integral part of education system and an exemplary tool for instruction. The traditional method of teaching in the classrooms with large number of students and using black boards, can be supplemented with computer aided lessons. The educationists all over the world have been looking for innovative and more effective teaching aids. The computers are suited and have great potential to be used for teaching any subject, for advanced studies and research work. The capability of the computers are storage and retrieving the data, when required, arrange in the desired order, can be exploited to the advantage of both teachers and students. The computers have come
as a boon in the field of teaching and can be imaginatively used to achieve our goals efficiently. Hence, the commitment to raise the standards of teaching and learning all subjects and areas in our schools must become part of a consolidated effort, to produce literate and technologically competent graduates.

Lately, the cost of computers has also dropped drastically with laptops, palmtops and a wide array of hardware being inducted into the market. This has resulted in affordability of computers by a common man and also almost all educational institutions across the world. The Computer Assisted Instructions (CAI) has been designed to successfully assist learners in attaining specific objectives related to concepts, facts, and problem-solving. The computers are being used to stimulate learning among students (Futrell and Geisert, 1984) and to tutor them through systematic presentation of new information with branching options depending on response. Simulations and games have been included as alternatives by which pupils can manipulate certain variables to produce desired outcome (Torrance, 1981).

Due to the versatility of CAI, it can be used to: (a) present special, unique challenges to teachers (b) profoundly affect the manner in which students are taught. For example, CAI has the flexibility and capacity for customizing instructions to suit individual requirements by permitting: (i)
active involvement of students; (ii) continuous evaluation of the answers of students; and (iii) adaptation of instruction to individual responses, levels of achievement, and specific interest. Because of that, it may become necessary for teachers to reconsider and revise becoming increasingly responsive to students working with the computer technologies.

The utilization of computers has a tremendous potential for psychological impact, including improvement in the process of learning. It will affect adults and children at homes and students in schools. Every child will have access to computing power. It is conceivable that our children will live in an extremely different world from the one in which we did. Therefore, a computer-centered curriculum should be examined to assist the effective use of modern technology.

However, the efficacy of computers, in student-teacher classroom interactions may depend, partly, on the individual learning styles and characteristics of students for whom CAI is being used. The educators have focused their interest, on the potential relationship between learning styles and microcomputer instruction (Freeley, 1984). There is a perceivable shift from the Iranian pen to the computer key board, from black board presentation to power point presentation, from paper and pens being used for examination to computer based test, from
interpersonal instruction to mediated instruction and from teacher
dependent learning to independent learning. This research will generate
insight into the nature of CAI with particular emphasis on how CAI based
teaching helps students develop interests in science subject and increase
conceptual understanding of theories of science subject. It will be useful
to 1) find out difficulties in understanding science subject in typical
classroom teaching, 2) test materials (educational software) that help
students to achieve better performance in science subject, 3) make several
assumptions about the theories and concepts of science subject and the
tasks that teachers must accomplish to achieve and 4) ensure that use of
computers leads to enhance quality of teaching and made the learning
process more efficient.

1.2. BACKGROUND OF THE STUDY

The CAI can be defined as a teaching method in which a student
interacts with a specialized computer application designed to instruct
certain skills and knowledge. The definition can be amplified as using
computers for all study tasks, such as students using computer
applications as tools (e.g., text processors, spreadsheet calculators),
teachers preparing lesson materials (e.g., lecture notes, presentation
materials, software demonstrations, CAI applications), and for school
administrative personnel functioning on computers (e.g., designing curriculum, maintaining student files etc.).

Use of computers in education can be made in several ways such as Computer-Aided/Assisted Instruction (CAI), Computer-Aided/Assisted Learning (CAL), Computer-Based Education (CBE), Computer-Based Instruction (CBI), Computer-Based Training (CBT), and Computer-Managed Instruction (CMI). These varied methods have different shades of meaning, though they all mainly refer to use of computers in education. This study concentrates mainly on CAI that is, the use of computer applications for imparting instruction.

CAI is considered to be based on Pressey’s teaching machines dating back to 1920s. According to Sloffer (1996), these teaching machines presented questions and problems to students, who were required to respond by writing an answer or pressing a certain button. Students were informed about the correctness of their answers and occasionally were given the explanation why their answers were right or wrong. A record of their responses was often kept. In the 1950s, Skinner introduced his version of a teaching machine and programmed instructions, which were based on his theory of operant conditioning. According to Li (1996), programmed instructions had important long-term effects on the evolution of educational technology. It had a strong
influence on the development of systems approach and it introduced the ideas of individualization of instruction. A decade later, the teaching machines were considered obsolete as researchers perceived them as mere tools that are not as important as the programs.

CAI is well-known and accepted method of instruction for independent studies. The Computer-Assisted Learning (CAL), Computer-Based Education (CBE), and Computer-Based Training (CBT) are synonymous with CAI. A number of applications of CAI have been reported in Library and Information Science (LIS). CAI includes approaches that utilize computers to deliver information in a step-by-step manner that is similar to programmed learning. CAI aims at enhancing the achievement of student specific, content-related instructional objectives (Simonson & Thompson, 1994; Weller, 1996). CAI improves instruction for students with disability (special education), as the students receive immediate feedback and do not continue to practice faulty skills. The computer programs can be conducted to suit the uptake level of the students and track of progress and errors can be kept. Computers captivate the students as the programs are interactive and engage their spirit of competitiveness to increase their scores. The CAI moves at appropriate pace and usually does not move ahead of the students until
they have mastered the skill. The programs provide differentiated lessons to challenge students who are at risk, average, or gifted.

The CAI refers to a system of educational instruction performed almost entirely by computer. Such system typically incorporates functions such as:

- Assessing capabilities of students with a pre-test.
- Presenting educational materials in a navigable form.
- Providing repetitive drills to improve the knowledge of students in computers commands.
- Providing games-based drills to increase learning enjoyment.
- Assessment of progress with a post-test.
- Subjecting the students to a series of courseware for instructional programs.
- Recording scores and progress of students, for later inspection by a courseware instructor.

The CAI is one among a wide range of strategies being used to improve student achievement in school subjects, including reading. Programs for CAI have come a long way since they were first developed over two decades ago. These programs tutor and drill students, diagnose problems, keep records of student progress, present materials as hard
copy and other manifestations. It is believed that CAI reflects what good teachers do in the classroom (Kulik, Bangert, and Williams, 1983). Contrary to traditional teaching methods, CAI forces the student to remain focused on the topic at hand. In a classroom, it is easy for students to simply nod their heads every time the teacher looks at them. However, CAI programs ensure that students pay attention and understand by constantly testing them on the information they are being taught. The assimilation by the students is readily ascertained. This is particularly helpful in teaching such subjects which are found difficult by the students.

1.3 IMPORTANCE OF THE CAI

Computers can help students visualize objects that are difficult or impossible to view. For example, computers can be used to display human anatomy, molecular structures, or complex geometrical objects. Exploration and manipulation of simulated environments can be accomplished with CAI ranging from virtual laboratory experiments that may be too difficult, expensive, or dangerous to perform in a school environment to complex virtual fields like those used in airplane flight simulators. They also facilitate communication among students, between students and instructors and beyond the classroom to distant students, instructors and experts. CAI systems can be categorized based on who
controls the progression of the lesson. Early systems were linear presentations of information guided drill and control was directed by the author of the software. In modern systems especially with visualization systems and simulated environments, control often rests with the student or with the instructor.

As a teaching/learning medium CAI brings with it several potential benefits. These include self-paced learning, self-directed learning, exercising various senses and the ability to represent content in a variety of media. Although CAI has not been studied in the Electronic Learning (EL) community situation, many of the benefits in the general context should also be available in the EL. With self-paced learning, learners can move as slowly or as quickly as they like through a program. If they want to repeat some task or review some material again, they can do so as many times as they choose. The program will not tire or complain about repetitions. Learners can skip over a topic if information is already known, making the learning process more efficient. With self-directed learning, learners can decide what they want to learn and in what order. Learners have different learning styles and learning strategies.

CAI packages are effective for many reasons. One of the most important reasons is that students like learning in the environment that the computer has to offer. CAI packages of today are more user-friendly and
entertaining than their predecessors. “This technology moves us years ahead of the tedious drills that early educational softwares promoted, and allow highly engaging activities like multimedia simulation” (Gifford, 1993). Students can now work at their own pace regardless of the level at which they are supposed to be. This promotes self-confidence because it gives the student a feeling of control over what they are learning. “The computer has allowed the student to become a more active participant in his/her education” (Matray and Proulx, 1995).

1.4 NEED AND IMPORTANCE OF THE STUDY

There are a number of electronic, audio-visual systems available in the educational institutions today which are used to teach students and contribute to their better understanding of the subject. Some of them are OHP, Slide Projector, Film Strip Projector, Film Projectors, Epidiascope, Radio, T.V, Computers, LCD Projectors, Multi Media Projector, DVD and Internet. With the computers being inducted into the field, they have revolutionized the teaching methods and also have increased the study material manifold. With the advent of internet, any information required for education can be accessed, with no regional and geographical barriers. The computers have been inducted in so big a way that proper, effective and bona fide utilization must be made for education. The education therefore enjoys the privilege of having large media (aids) for teaching.
More often than not it is likely that the media is used for teaching in an unimaginative way thereby giving rise to doubts about their credibility. This undermined credibility, many a times, is not found to be compatible with the results expected and the impact made on the students.

Attempts are rarely made to examine the message (teachings) - Vs - media compatibility. Most of the times the contents of the books, their formats, layouts and view compositions are not appealing and are found to be unimpressive. It is also paradoxical that with a hazy perception of using technotronics (technology + electronics) media particularly computers, the relevance and quality of message communicated is very often questionable. The technology and pedagogy do not seem to be integrated into a coordinated effort to serve the larger interest of making teaching more efficient. They seem to be functioning in water tight compartments, which may turn out to be a futile effort. The media seem to be more mechanistic than naturalistic and at times even pseudo-naturalistic. In the absence of technological proficiency of the academicians, the field of educational media scripting is found to be significantly wanting. Mostly, the production variables are not appreciated, understood in the correct perspective and adequately controlled. In this age of knowledge boom and media implosion, media
literacy is a mandatory requirement for all the teachers and learners irrespective of their levels.

A new kind of student with special abilities, including oral and written communication skills and the knowledge technology to be used as a tool to carve a niche for himself in the future, is expected to be found in 21st century. It will take years to formulate and mould such a student in an environment conducive to learning. Given the dilemmas of the present education system, a student is certain to find it difficult to clearly perceive the requirements and blossom. In the ideal learning situation, it is expected that the following components will be present: the learner, the educator, the learning theories and conditions, the methodology, and the environment. Blended together in appropriate proportions, they work out to be the most suitable chemistry for effective learning. Choosing whichever learning theory or condition and the appropriate methodology, the educator provides the student with the activities to assimilate and accommodate information, construct and invent operations, observe and imitate tasks. In essence, the student tends to learn when he is faced with learning activity or problem; when his needs and purposes are determined; when his needs produce the drive and motivation in him. These, in turn, produce the need for cues, information, models and opportunities for discovery, which then, drives the student towards the
goal and problem-solving situation, attending, encoding, storing, processing and retrieving the achievements and progress and abstract growth environment.

The student has to be actively involved in the learning activity. Reinforcement of the desirous behavior influences his learning progress. Schunk and Swartz (1993), suggest that repetition with feedback, reinforcement and practice develops habit and learning patterns that promote achievement. Thus, reinforcement in the classroom situation is an important part of the overall ideal learning process. It is reasonable to expect that the ideal outcome is not always possible. If one component is found to be weak or is missing, the learning outcome will be compromised. More often than not, a class is overcrowded with students with different levels of intelligence and backgrounds. The class may be teacher-predominant or subject-predominant, resulting in the student remaining passive. Ironically it is observed that there are many people with no teaching experience and knowledge of learning theories and instructional methodologies are employed as teachers. There are many institutions that expect teachers to complete the curriculum no matter how; this does not allow sufficient in-class explanation, practice, or reinforcement. Moreover, reinforcement in the classroom situation may
be overlooked. Likewise, allotting adequate practice time in each class as also in homework assignment may be neglected.

It is also possible that adequate time is not given to students for rehearsing different activities and restatement of learning principles. The opportunities for feedback may be minimal although it is needed throughout the session for successful learning and confidence building. While functioning under such constraints, the needs of the both the students and educator are not fulfilled. The student needs to overcome his own learning limitations, to communicate his needs, to have his effective and personal needs met and to master skills and grow cognitively within his world. The teacher needs to find effective methods and tools to teach and to promote learning among students of different levels (Sabieh, 1995). Moreover, the educator needs adequate time to master his own skills, to become aware of problems of student and his weaknesses, to know the needs and aspirations of the learner.

With so many imponderables, the effective teaching has become a complex process for fulfilling all the requirements of the system and yet achieves the desired results. The liabilities burden the teacher. Therefore, it is a definite requirement to find a suitable solution to the problem to bring the students of Ahwaz City at par with those in others in any other major city in Iran and perhaps in the world. Analysis of various systems
and considering their short comings suggests that the possible solution lies in the use of the computer, for it is believed to captivate and exercise the students in a desired manner. CAL or CBI means, using the computer to instruct a student. It does not mean teaching a student how to use a computer nor does it mean teaching a student about computer technology. The computer can assist the students with different requirements, such as the learning disabled, mentally challenged and behaviorally or emotionally disturbed students.

The computers greatly enhance teaching ability of teachers and ability of students to learn, Thus computers offer enormous opportunity to learn. Its incorporation into education system will immensely benefit the teachers and the students, making the education system meaningful. The students with higher degree of intelligence and uptake will enjoy the privilege of moving ahead with the curriculum. It is therefore strongly advocated that use of the computers as a tool and/or tutor is the best solution to overcome the drawbacks of the present day Education practices.

The last four decades of the twentieth century witnessed unprecedented advancement in electronic technology in general and information technology in particular. These advancements have had a profound impact on the nature and practices of the scientific enterprises.
Computation has become an increasingly crucial aspect of scientific investigation. The breakthrough in micro and super computer hardware, software design and developments in networking capabilities have rendered the analysis, modeling and visualization of complex systems, an increasingly important component of various scientific disciplines. For example, in physics, the current understanding of atomic and molecular structure and complex states of matter rest largely on computation. In biology, the ability to reconstruct genomes (human or otherwise) relies on supercomputers as much as on automated and rapid sequencing machines, since these machines produce random fragments of genetic code that must be assembled like a vast single-dimensional jigsaw puzzle.

Computers and micro electronic devices are used in variety of objects required for day to day use. However, the types of technology incorporated in the educational context tend to focus around the delivery of content and information to support formal learning processes. Schools are using Information and Communication Technology (ICT) to enhance and add a new dimension to the learning process and to increase communication between homes and school. Some schools use their own web sites to make learning resources available on line. With the functionality and capability of ICT, some schools are able to provide
parents and pupils with data relating to attainment, attendance or other school/community-related information (Blaylock, T Hendon, 2005).

Using communication aspect of ICT incorporating the networking of computers, increases the availability of a larger range of software and information. This also enables communication between and within institutions and access the Internet. The Internet can also be accessed through other media such as digital television, internet-enabled telephones and game consoles. Briefly from the learning perspective (K. J. Joseph 2004), the effective use of ICT can lead to benefits such as:

- Greater motivation.
- Increased self-esteem and confidence.
- Enhanced questioning skills.
- Promoting initiative and independent learning.
- Improving presentations.
- Developing problem solving capabilities.
- Promoting better information handling skills.
- Increasing time ‘on task’.
- Improving social and communication skills.
In the society of today, we are witnessing a dramatic boom in technology dealing with computers. With the Internet and World Wide Web, a global, electronic environment has been formed. It is because of this new technology that it is important to maximize the wisdom gained in the past in facilitating learning through the communication tools of the future. The role of education is changing. Now a day, with the computer techniques having been developed to a high level, application of Software and Hardware of computers in education has become a familiar feature. Multimedia methods used in teaching practice, such as CAI, can supply much more information to the teachers and students than ever earlier (Li, Tao. 2003). The ICT education has become more convenient than in the past few decades. It is expected that outcome in education would bring necessary competencies for living today and in future life. The advantages of teaching methods such as ICT, CAI and so on have motivated the authorities, planners and teachers to apply them in the classrooms making the teaching in schools interesting, fulfilling and dynamic (Hurd, 1993).

The findings of researchers have revealed that lack of adequate attention to use of computers is being observed in teaching some subjects wherein the computer could have had a higher priority for student to learn effectively. Among these subjects, science subject is important in the
school curriculum. It is said that most science subject classes are limited to uninspiring and some times incomprehensive verbal lectures (Wynne H.1995). We can include other factors contributing to science subject classrooms to be non-attractive. Insufficient knowledge of teachers in science subject, lack of teaching resources and teaching aids to support teaching, inadequate experience in conducting class activities and experiments and the difficulties in handling students (Collier S.O. E., 2001).

However, there is ample evidence that the intensity of use of CAI in developing countries is very low because of variety of factors than that in western countries. For instance, the computers in classrooms of developed countries firmly support teachers in teaching and using enhanced learning in demonstrable ways. While in some developing countries the computers in classrooms have not received sufficient attention. However, they do not entirely deny the potential of this technology as an effective teaching tool that will result in a quantum leap in the quality of teaching and learning. Often the traditional chalk and talk teaching, copying notes and cook book practical lessons have dominated the classrooms and offer little challenge or excitement to students (Ranade, M.D. 2001).
This study has been shaped on the basis of this claim that science subject is an essential component of education of all students. A quality science subject education promotes the development of scientific literacy which is the main priority for students, helping them to be interested in and understand the world around them, to take informed decisions about the environment, their own health and well being (Wynne H.1995). The science subject teaching at school should be engaging and challenging. The student engagement in learning will be more, when they are taught by enthusiastic and competent teacher, when there is a connection between student’s contemporary interests and experiences in conventional teaching classroom, when we use new instructional aids tools and when science subject teachers are not hesitant to change their instructional strategies to incorporate new computers.

This study is important because of its experimental methods and it will present special method of teaching to teach students in science subject which is a very different method than the traditional one. The information accumulated from this experimental study will help identify the importance of teaching through computer software packages and it will lead the teachers to provide an effective teaching environment to students in science subject. This study explores the variety of modalities necessary to gain higher achievement. This method of teaching using
computer and software packages is especially important than other methods and results of this experimental study will be particular. This way teachers and students can get information and knowledge about computers and teaching through it.

2. STATEMENT OF THE PROBLEM

"EFFECTS OF CAI ON SCIENCE ACHIEVEMENT, ATTITUDE TOWARDS SCIENCE AND SELF-ESTEEM AS LEARNERS OF HIGHER PRIMARY STUDENTS IN AHWAZ CITY (IRAN)"

2.1 OBJECTIVES OF THE STUDY.

The objectives of the study are:

(i) To study the effect of the use of CAI based software package on achievement in science among VIII standard students of Ahwaz City, Iran.

(ii) To study the effect of the use of CAI based software package on attitude towards science among VIII standard students of Ahwaz City, Iran.
To study the effect of the use of CAI based software package on self-esteem as learners among VIII standard students of Ahwaz City, Iran.

To compare effectiveness of CAI based software package on achievement in science among VIII standard students of Ahwaz City, based on gender and socio-economical status levels.

To compare effectiveness of CAI based software package on attitude towards science among VIII standard students of Ahwaz City, based on gender and socio-economical status levels.

To compare effectiveness of CAI based software package on self-esteem as learners among VIII standard students of Ahwaz City, based on gender and socio-economical status levels.

To study the reaction of students towards the CAI based software package in science

2.2 HYPOTHESES OF THE STUDY

The hypotheses of the study are:

H1: There will be significant mean difference in post-test achievement scores in science between the Experimental and Control groups among VIII standard students after the use of CAI based software package, after adjusting the initial differences in the three Covariates:
(Pre achievement in science in previous semester, Pre achievement level in science and Non Verbal Intelligence).

H2: There will be significant mean difference in Attitude towards science scores between the Experimental and Control groups among VIII standard students after the use of CAI based software package, after adjusting the initial differences in the three Covariates: (Pre achievement in science in previous semester, Pre achievement level in science and Non Verbal Intelligence).

H3: There will be significant mean difference in Self-Esteem as learners scores between the Experimental and Control groups among VIII standard students after the use of CAI based software package, after adjusting the initial differences in the three Covariates: (Pre achievement in science in previous semester, Pre achievement level in science and Non Verbal Intelligence).

Ho4: There is no significant mean difference between boys and girls of VIII standard students in post test achievement in science after the use of CAI.

Ho5: There is no significant mean difference between boys and girls of VIII standard students in attitude towards science after the use of CAI.
Ho6: There is no significant mean difference between boys and girls of VIII standard students in Self-Esteem as learners after the use of CAI.

Ho7: There is no significant difference among VIII standard students with Low, Average and High levels of Social – Economic Status in science achievement scores after the use of CAI.

Ho8: There is no significant difference among VIII standard students with Low, Average and High levels of Social – Economic Status in attitude towards science scores after the use of CAI.

Ho9: There is no significant difference among VIII standard students with Low, Average and High levels of Social – Economic Status in Self-Esteem as learners scores after the use of CAI.

2.3 VARIABLES OF THE STUDY

A. Independent Variables:

   Teaching method: CAI based software package approach and Traditional Teaching Approach.

B. Moderate Variables:

   (i) Gender

   (ii) Socio-economic status levels.
C. Dependent Variables:

(i) Achievement score in science subject

(ii) Attitude towards science subject

(iii) Self –esteem as learners.

D. Co-Variates:

(i) Non Verbal Intelligence

(ii) Achievement in science subject in previous semester.

(iii) Pre-Test scores

2.4 OPERATIONAL DEFINITION OF KEY TERMS USED

2.4.1 Computer – Assisted Instruction (CAI) based Software package approach in Science teaching.

In the present study educational software in science subject refers to a software program which includes explanations of selected contents of textbook of science subject with animation, description of examples and answers to all practical questions, self –evaluation for each part of textbook at the end, sample questions for final examination at the end of the textbook and some entertainment in the forms of games, conversations, stories and drills. The educational software used in this study has been created in association with Ministry of Education, Iran.
2.4.2 Traditional Teaching Approach (TTA) in Science subject teaching

In this study, the TTA approach in science subject teaching refers to use of traditional chalk and talk teaching. In traditional teaching, the teacher is the focal point of activity and learning and teaching is didactic; the teacher gives information to be memorized and teacher looks at students as "empty bottles" that should be filled with information. Emphasis is on memorization of knowledge. Assessment of assimilation by students, is primarily through worksheets, quizzes, testing and teacher seeks correct answers from students to validate learning and also he adheres closely to the fixed curriculum. The entire process is deskilled and mechanical. To find the effectiveness of CAI based educational software approach on the study variables on the experimental group, we have to adopt the TTA approach on control group, during the research.

2.4.3 Previous Achievement in Science scores (pre-scores)

The data obtained from permanent school records were the scores of the science of students at the end of previous semester. The scores were treated as previous achievement and were obtained to equate both groups on the variable of previous achievement.
2.4.4 Social – Economic Status level (SES)

In this study Social – Economical Status is based on family income. At first all students’ family incomes have been collected for this study. According to average of income which has been defined by government of Iran, the students divided in to three categories of SES levels (Low SES level, Average SES level and High SES level). The incomes of students’ family that were above the average of income which is defined by government of Iran, determined as High SES level and below of this average, Average SES level and Low SES level. In this matter 9 categories of incomes have provided depend to average income which were 1, 2, 3 as Low SES level, 4, 5, 6 as Average SES level and 7, 8, 9 as High SES level.

2.4.5 Reaction of Students

In this study the reaction of students has been measured by their own opinion. The students were free to write down their response with regard to CAI for teaching science, over and above their achievement test. After being accompanied for treatment, the researcher compiled and studied the opinions of students. The question was ‘How do you feel towards science when you are using the CAI method?’
2.4.6 Higher Primary Schools (Middle)

The educational system in Iran consists of Primary School (1\textsuperscript{st} to 5\textsuperscript{th} standard), Higher Primary or Middle School (6\textsuperscript{th} to 8\textsuperscript{th} standard), High School (9\textsuperscript{th} to 11\textsuperscript{th} standard) and Pre-University level (12\textsuperscript{th} standard). It is said that Higher Primary School stage plays an important and substantial role in the future of student. The scores secured at this stage in the three main subjects namely, Mathematics, Science subject and English are the determinants which govern the choice of special area for his/her vocational life in the future. For this reason this study focused on students of 8\textsuperscript{th} standard and science subject.

2.4.7 Attitude towards science

In this study, Attitude towards science indicates feeling of an individual or a group concerning science – like faith in scientific method, opinion about scientists, value of science, interaction of science with individual and society, opinion held about science related social issues. It is the tendency to react favorably or unfavorably towards science or in science. Hence attitude towards science is the generalized attitude the universe of science content exerts upon the subject and being measured in terms of its favorableness estimated from the scores obtained by the subject on an "Attitude towards Science Scale".
2.4.8 Achievement in science subject

In this study achievement in science subject is described as an increase in academic scores of students during treatment. This will be indicated by scores in related tests which will be developed by researcher.

2.4.9 Self – Esteem as learners

In this study self – esteem as learners refers to student’s belief of his ability and capability to learn science subject. This will be revealed by use of score obtained in self- esteem scale.

2.4.10 Gender

It is referred to boys and girls of Class VIII standard of High Primary Schools in Ahwaz City.

2.5 DELIMITATIONS OF THE STUDY

Following delimitations were the self imposed restrictions by the investigator due to paucity of time, limited availability of resources and several other aspects that cannot be covered in the present study due to practical constraints.

➢ The study was delimited to Higher Primary Schools only.
➢ The study was restricted to the teaching of science for VIII standard class.
The study was confined to the selected Urban schools.

The study was confined to selected topics of VIII class during the period April – June.

The study was delimited to VIII standard class students of 2006-2007 academic year only.

The study was delimited to see effect of computer-assisted instruction on the science achievement, attitude towards science and self-esteem of higher primary schools.

The study was delimited to area number 1 of Ahwaz City only.

The study was delimited to selected two higher primary schools of Ahwaz City.

3. OVERVIEW OF THE CHAPTERS

The second chapter presents the review of related literature in this study. The third chapter deals with the methodology of investment, which includes, objectives, design of the study, construction of tools, sampling procedure followed and statistical techniques used for data analysis. The fourth chapter consists of detailed statistical analysis, graphical representation of data and testing of hypotheses. The fifth chapter presents summary of the study, major findings, educational implications and suggestions for further research.