CHAPTER VII
SUMMARY, CONCLUSION AND SUGGESTIONS

“Not only a good summary serves as a time savers, it can help any no vile to better understand the conclusions, recommendations and generalization derived from data analysis.”

7.1 INTRODUCTION
The Progress and prosperity of any nation is determined by its standard in science and technology, which is an outcome of science education provided to its youngsters. The advancement of the developed countries provides ample evidence for this fact.

The destiny of the Country is shaped in the classrooms. This shape depends upon what teacher teaches and how it goes on moulding it. In other words destiny of our youngsters falls on the shoulders of teachers. "A teacher affects eternity, he can never tell where his influence stops." So observed the historian philosopher- Henry Adams (1907).

In the last two decades, the universalization of elementary education has emerged as a National goal. Education for all children up to Class X now seems a realistic target rather than a distant dream. It is therefore worthwhile to ask what the main aim of teaching science in schools is.

There is a shift in emphasis in only teaching of science content to that of teaching of science in helping students to develop competence in the science education. Science education includes intellectual skills used in collecting and analyzing data to solve problems. In almost all modern educational system, science education is given through actual scientific activities, experimentations and organization of first hand knowledge obtained through experiments to develop scientific attitude. But this approach is proved inadequate to meet the needs, because it does not equip the learners to acquire the intended understanding of scientific knowledge, develop scientific attitude and to apply this knowledge effectively in familiar and unfamiliar contexts and in problem solving situations. Majority of pupils fails to attain mastery over school science. Only a small group of pupils gain the meaningful understanding which helps them to use their knowledge effectively and creatively and form wholesome attitude. The schools are slowly moving away from scientific activities and if trend continuous, science education may lose its technical form and schools may find it difficult to continue in the science stream further. From the above discussion, it is very clear that science education is in deteriorating position in India. This compels the investigator to think over the emerging
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problem in the field of science. So there is also a necessity for the teacher to know the concept of teaching and teaching strategies.

7.2 INSTRUCTIONAL STRATEGY

Instructional strategy is something a teacher arranges that is designed to establish interaction between the teacher, student and the subject matter or any combination of these three dimensions. It is the total plan with carefully selected tools, techniques etc to be used in the classroom for optimum outcome.

The following four main types of instructional strategies these are:

- Direct Instructional strategy i.e :- Drill and Practice, Mastery lecture, Demonstration
- Indirect Instructional strategy i.e :- Problem solving, concept mapping
- Interactive Instructional strategy i.e :- Co-operative learning, Brainstorming
- Experimental Instructional strategy i.e:- Activity-oriented, Field Trips, Games etc
- Independent Instructional strategy i.e:- Computer Assisted Instruction, Learning and Activity Package etc.

Classrooms are places where teachers and students interact within a highly interdependent environment. For instance, lecturing or conventional learning creates a tightly structured learning environment where students are expected to listen, observe, and take notes. On the other hand, if the teacher divides students into cooperative learning groups, an environment is created where students are actively engaged and in charge of their own interactions is suitable for better learning. So environment should be such which promotes better learning conditions.

7.3 COMPUTER-ASSISTED INSTRUCTIONAL STRATEGY

Computer Assisted Instruction is a method of learning in which there is purposeful interaction between a learner and teacher with the help of computer device for helping the learner to achieve the desired learning objectives with his own pace. It helps in achieving educational outcomes through internet blog, e-mail source like e-learning. Teacher may use the CD’s, video clips, virtual field-trips, virtual science museum.

7.4 ACTIVITY-ORIENTED INSTRUCTIONAL STRATEGY

Activity Oriented Instructional strategy is "anything that involves students in doing things and thinking about the work done".

It is a process of exploring, experimentation, observation, data collection, analyzing, and justification communicating, or using new information or experience. It is a process whereby learners are actively engaged in the learning process, rather than "passively"
absorbing lectures. In this the learners have academic freedom. Learner think, observe, experiments, discuss, evaluate, reflect and thus gain new knowledge during process.

7.5 CONVENTIONAL INSTRUCTIONAL STRATEGY

Conventional based instruction or traditional classroom instruction is focused on the instructor and is teacher centered. Most of the information tends to flow from teacher to students. Students are passive listeners. Teacher has authoritarian role and transmit knowledge to the students who are considered as passive receivers. Teacher appears as ‘sage on the stage’

7.6 SCIENTIFIC ATTITUDE

It consists of attitude or readiness to be confident. Constituents of scientific attitude are: suspended judgment, honesty, objectivity, open-mindedness, curiosity, logical thinking and verification of problem, rational outlook, aversion to superstitions, flexibility and critical approach.

7.7 CREATIVITY

Creativity involves generation of new ideas. It brings into existence something new. It consists of fluency, flexibility and originality and expressed accordingly by subject scores. It is describable as novel, useful and understandable ideas come into mind. Creativity means numerous things to different people can be defined in number of ways. It is a divergent thinking usually includes the ability to elaborate and think of diverse and original ideas.

7.8 RATIONALE OF THE STUDY

India has been a major seat of learning for thousands of years. In spite of it, is well-renowned culture of education but still it is dealing with challenges in its primary education and striving to reach 100% literacy. Modern education in India is often criticized for being based on rote learning. The poor state of science education in India is reflected in the reviews of Government of India during 2011. It is seen that the students undergo passive type of learning in schools and colleges which does not help to understand the subject effectively. Due to lack of understanding of subject, our young future scientists who reach the secondary classes have crammed the content.

Attention is not being paid to develop scientific attitude of the students. Since the rate at which knowledge in science today gets obsolete is very high compared to that in the forties or fifties, it is essential that the emphasis of science education should be on the development of abilities and dispositions of mind rather than merely the transfer of dead subject matter.
Researchers’ show that intelligence is perhaps the single most effective prediction of academic achievement. It has been observed and discussed that outcome i.e. achievement, attitude and interest of students in science depends upon the way teacher teaching in the classroom, what objectives are kept in mind while planning the lesson, the way or direction he chosen to achieve desired goals and objectives. It has been proved in various studies that when students are actively and mentally involved in learning, the outcome in the form of achievement, scientific attitude, creativity, motivation and self-concept enhances upto a large extent. Number of studies has been reported (discussed in chapter-III, Review of Literature) about work done on outcome of various Instructional strategies studies in the area of CAI, problem solving, self instructional module, Activity oriented learning etc. But none of the study has been reported where Computer assisted Instructional strategy has been compared with the Activity –oriented Instructional strategy. Both of the strategies required students to explore, experiment, search, think etc but which is better and how they different from Conventional method do not searched by anyone. Apart from science teaching a teacher may also develop scientific attitude, creativity and achievement in science but none of the study has been done in the area of creativity, scientific attitude has seen after survey of related literature. While teacher teaches in the class not only he imparts knowledge but development of scientific attitude and creativity take place which are in the scope of the present study. In the present study the investigator tried to investigate how does the Traditional or Conventional method contribute to develop creativity and scientific attitude in contrast to CAIS & AOIS. By comparing with conventional method of teaching with other strategies will reflect about the direction of efforts to be made for better outcomes in terms of achievement, scientific attitude and creativity. After reviewing the literature it has been find out that no one of the study has still compared these methods in developing achievement in science, scientific attitude and creativity. Till now, the studies have directed toward the fundamental aspect of teaching science. No one find, are they learning what is being taught. Which strategy is most appropriate to inculcate scientific attitude, creativity and interest among students? Research in science education await answers these problems. Number of the studies has been referred in the review of literature, these studies are of: Austin (1983), Deopuria (2000), Jhag (1979), Jothikani and Thiagarajan (2004), Kumar and Sharma (1982). From these studies it is very clear that none of the study has been reported to compare strategies of computer-assisted instructional strategies, activity-
oriented instructional strategies. Apparently both the strategies seem to be very effective and student centered.

In nut shell, present investigation is aimed to find out the use of suitable instructional strategy leading to enhancement of creativity and scientific attitude to improve upon the academic achievement of the students of science.

**7.9 STATEMENT OF THE PROBLEM**

The problem under investigation hence reads as: **EFFECTIVENESS OF COMPUTER ASSISTED AND ACTIVITY ORIENTED INSTRUCTIONAL STRATEGIES ON ACHIEVEMENT IN SCIENCE IN RELATION TO SCIENTIFIC ATTITUDE AND CREATIVITY.**

**7.10 DELIMITATIONS**

1. The study is limited to the students of urban area of Faridkot district of Punjab.
2. The study is limited to VII th class students studying in school affiliated to P.S.E.B.
3. The study is limited to students from schools run by Government and Private managements of Faridkot district of Punjab.

**7.11 OBJECTIVES**

1. To study the effect of computer assisted, activity oriented and conventional instructional strategies on academic achievement in science teaching.
2. To study the effect of computer assisted, activity oriented and conventional instructional strategies on scientific attitude in teaching science.
3. To study the effect of computer assisted, activity oriented and conventional instructional strategies on creativity in teaching science.
4. To the study interactional effects of scientific attitude and creativity of students on academic achievement in science, taught through computer assisted, activity oriented and conventional instructional strategy in science.
5. To compare the interactional effect of scientific attitude and creativity of students on academic achievement in science taught through computer assisted, activity oriented and conventional instructional strategy science.
6. To study the gender difference in academic achievement in science, scientific attitude and creativity of students taught through computer assisted activity-oriented and conventional instructional strategy in science.
6.a. To study the gender difference in academic achievement in science of
students taught through computer assisted instructional strategy in science.

6.b. To study the gender difference in scientific attitude of students taught through computer assisted instructional strategy in science.

6.c. To study the gender difference in creativity of students taught through computer assisted instructional strategy in science.

6.d. To study the gender difference in academic achievement in science of students taught through activity-oriented instructional strategy in science.

6.e. To study the gender difference in scientific attitude of students taught through activity-oriented instructional strategy in science.

6.f. To study the gender difference in creativity of students taught through activity-oriented instructional strategy in science.

6.g. To study the gender difference in academic achievement in science of students taught through conventional instructional strategy in science.

6.h. To study the gender difference in scientific attitude of students taught through conventional instructional strategy in science.

6.i. To study the gender difference in creativity of students taught through conventional instructional strategy in science.

7. To study the difference in academic achievement in science, scientific attitude and creativity of students in relation to type of schools taught through computer assisted, activity-oriented and conventional instructional strategy in science.

7.a. To study the difference in academic achievement in science of students taught through computer assisted instructional strategy in relation to schools run by government and private management of urban area.

7.b. To study the difference in scientific attitude of students taught through computer assisted instructional strategy studying in schools run by government and private management of urban area.

7.c. To study the difference in creativity of students taught through computer assisted instructional strategy studying in schools run by government and private management of urban area.

7.d. To study the difference in academic achievement in science of students taught through activity-oriented instructional strategy studying in schools run by government and private management of urban area.
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7.e. To study the difference in scientific attitude of students taught through activity-oriented instructional strategy studying in schools run by government and private management of urban area.

7.f. To study the difference in creativity of students taught through activity-oriented instructional strategy studying in schools run by government and private management of urban area.

7.g. To study the difference in academic achievement in science of students taught through conventional instructional strategy studying in schools run by government and private management of urban area.

7.h. To study the difference in scientific attitude of students taught through conventional instructional strategy studying in schools run by government and private management of urban area.

7.i. To study the difference in creativity of students taught through conventional instructional strategy studying in schools run by government and private management of urban area.

7.12 HYPOTHESES

H01: There will be no significant difference in the level of academic achievement in science among students taught through computer assisted, activity oriented and conventional instructional strategies in science.

H02: There will be no significant difference in the level of scientific attitude among students taught through computer assisted, activity oriented and conventional instructional strategies in science.

H03: There will be no significant difference in the level of creativity among students taught through computer assisted, activity oriented and conventional instructional strategies in science.

H04: There will be no significant interactional effect of scientific attitude and creativity among students on academic achievement in science, taught through computer assisted, activity oriented and conventional instructional strategy in science.

H05: There will be no significant difference in the interactional effect of scientific attitude and creativity among students on academic achievement in science taught through computer assisted, activity-oriented and conventional instructional strategy in science.
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H06.: There will be no significant gender difference in academic achievement in science, scientific attitude and creativity of students taught through computer assisted, activity oriented and conventional instructional strategies in science.

H6.a.: There will be no significant gender difference in academic achievement in science of students taught through computer assisted instructional strategies in science.

H6.b.: There will be no significant the gender difference in scientific attitude of students taught through computer assisted instructional strategy in science.

H6.c.: There will be no significant the gender difference in creativity of students taught through computer assisted instructional strategy in science.

H6.d. There will be no significant gender difference in academic achievement in science of students taught through activity-oriented instructional strategy in science.

H6.e.: There will be no significant gender difference in scientific attitude of students taught through activity-oriented instructional strategy in science.

H6.f.: There will be no significant gender difference in creativity of students taught through activity-oriented instructional strategy in science.

H6.g.: There will be no significant gender difference in academic achievement in science of students taught through conventional instructional strategy in science.

H6.h.: There will be no significant gender difference in scientific attitude of students taught through conventional instructional strategy in science.

H6.i.: There will be no significant gender difference in creativity of students taught through conventional instructional strategy in science.

H07.: There will be no significant difference in academic achievement in science, scientific attitude and creativity of students studying in relation to type of schools taught through computer assisted, activity-oriented and conventional instructional strategy.

H7.a.: There will be no significant difference in academic achievement in science of students taught through computer assisted instructional strategy in relation to schools run by government and private management of urban area.

H7.b.: There will be no significant difference in scientific attitude of students taught through computer assisted instructional strategy in relation to schools run by government and private management of urban area.
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H7.c.: There will be no significant difference in creativity of students taught through computer assisted instructional strategy in relation to schools run by government and private management of urban area.

H 7d : There will be no significant difference in academic achievement in science of students taught through activity–oriented instructional strategy in relation to schools run by government and private management of urban area.

H 7e : There will be no significant difference in scientific attitude of students taught through activity–oriented instructional strategy in relation to schools run by government and private management of urban area.

H 7f. : There will be no significant difference in creativity of students taught through activity–oriented instructional strategy in relation to schools run by government and private management of urban area.

H 7g. : There will be no significant difference in academic achievement in science of students taught through conventional instructional strategy in relation to schools run by government and private management of urban area.

H 7h.: There will be no significant difference in scientific attitude of students taught through conventional instructional strategy in relation to schools run by government and private management of urban area.

H 7i. : There will be no significant difference in creativity of students taught through conventional instructional strategy in relation to schools run by government and private management of urban area.

7.13 TOOLS USED FOR STUDY

Following tools were used:

1. Academic Achievement Test in science was developed by investigator.

2. Shailaja Bhagwat Scientific Attitude scale (SBSAS) in English by Dr. Bhagwat (2005) for measuring scientific attitude of students.

3. A New Test of Creativity by Pal. (1991)

4. Unit Plan of science content to be used for three Instructional strategies was constructed and prepared by investigator.

7.14 SAMPLE

A random cluster sampling technique was used to select the secondary school students. The study was conducted on the sample of 300 students of class VIIth of Government and Private secondary schools of P.S.E.B from urban locality of Faridkot District of Punjab. Group was equated on the bases of Mean & S.D. 300 Students were divided into two
groups each having 150 students from Government and 150 students from private schools. Each group of 150 students were again be randomly furcated into 75 students for four schools. Each school contained 25 students in each of three groups.

7.15 DESIGN OF THE STUDY
Non-randomized control group pre-test and post-test design and two group randomized subject. Three groups of students were equated on the basis their science achievement exam taken by the school. Instructional strategies were applied on students belonging to three different equated groups. Pre- test was used to test the achievement level, scientific attitude and creativity of equated sample for pre-test and post-test design. After treatments post-test was applied. The effect of strategies was measured by differences in pre-test scores and post- test scores of both experimental groups and control group.

7.16 PROCEDURE OF THE STUDY
PHASE -I
1. Preparation of Unit Plan
Investigator designed the units for computer-assisted instructional strategy (CAIS), activity-oriented instructional strategy (AOIS) by taking the subject matter of science subject of 7th standard of P.S.E.B. Subject matter from physical science, chemical science, biological science, environmental science and general science etc were taken to plan the units. Units were designed as per requirements of all the treatments i.e. two instructional strategies viz CAIS, AOIS. The subject matter was uniform for all the three treatments but the unit plan was differ, based on assumption and requirements of CAIS and AOIS. After preparing the unit plan, investigator herself taught students in the class through CAIS, AOIS & CIS treatments. CAIS included use of CD-ROM, internet, video-clip & e-learning material etc. AOIS included making and using toys, working models, improvised apparatus, experiments, games, quizzes, out of class learning activities, nature trail etc. Hands-on activities help in observation, exploration, experimentation, analysis and synthesis etc. For conventional instructional strategies only the teaching points were arranged to maintain the uniformity of subject..

PHASE –II
2. Pre-test introduction
Pre-test was given to the students including: - achievement test in science, scientific attitude scale and creativity test. The tests were given one after another. Before giving tests instructions were given to the students regarding performance of tests. After applying
pre-test, experimental variables were introduced. Students were taught through Instructional strategies using unit-plan designed by investigator.

**PHASE –III**

3. Final level of attainment

It was seen by applying post-test using Achievement test in science, scientific attitude scale & creativity test. The experimental and control groups were taught five units of VII class science through three instructional strategies i.e. Computer assisted, Activity-oriented and Conventional instructional strategies. In this phase students were tested on achievement in science, scientific attitude and creativity.

**EXPERIMENTAL DESIGN OF THE STUDY**

**VII Standard Students**

- **Experimental groups I and II**
  - Pre-Test
  - CAI and AOI treatments
  - Post-Test

- **Control group III**
  - Pre-Test
  - CI Treatment
  - Post-Test
  - CI Treatment

**Comparison**

*Figure: 4.3 The Layout of the Design*
7.17 COLLECTION OF DATA

After finalizing the sample and tool used, investigator met the Principals of the school and fixed the time for collection of the data, most of the teachers allotted the whole afternoon periods for administration of the tools. Uniform procedure was followed in all schools in collection of data. The steps followed by investigator during collection of data:

- Distribution of answer sheets to the subjects with instructions for filling them up.
- Distribution of test booklets together with printed instructions regarding the test.
- Explaining the general instructions in the booklet.
- Familiarizing the subjects with answer sheets, method of entering responses etc.
- Clearing the doubt of the subjects, giving instructions regarding time-limit.
- Strict adherence to the time limit prescribed in the test booklet.
- Giving instructions not to disfigure the test booklets.
- Giving interval between tests.
- Collecting back the test booklets and answer sheets.
- After collection, data was analyzed.

7.18 MAJOR FINDINGS AND CONCLUSIONS

The effectiveness of all three strategies CAIS, AOIS and CIS is evaluated in terms of achievement in science, scientific attitude and creativity.

ANOVA

1. There is significant difference in the level of academic achievement among students taught through computer assisted, activity oriented and conventional instructional strategies in teaching of science.

2. There is significant difference in the level of scientific attitude among students taught through computer assisted, activity oriented and conventional instructional strategies in science.

3. There is significant difference in the level of creativity among students taught through computer assisted, activity oriented and conventional instructional strategies in science.

2X2 ANOVA based

4. There is no significant interactional effect of scientific attitude and creativity among students on academic achievement in science, taught through computer assisted, activity oriented and conventional instructional strategy in science.
5. There is significant relationship between academic achievement in science and scientific attitude of students taught through computer assisted, activity oriented and conventional instructional strategies in science.

6. There is significant relationship between academic achievement in science and creativity of students taught through computer assisted, activity oriented and conventional instructional strategies in science.

7. There is significant difference in the interactional effect of the scientific attitude and creativity on the academic achievement in science of students taught through computer assisted, activity oriented and conventional instructional strategies in science.

**t-test based**

8. There is no significant gender difference in academic achievement in science of students taught through computer assisted instructional strategies in science.

9. There is no significant the gender difference in scientific attitude of students taught through computer assisted instructional strategy in science.

10. There is no significant the gender difference in creativity of students taught through computer assisted instructional strategy in science.

11. There is no significant gender difference in academic achievement in science of male and female students taught through computer activity -oriented instructional in science.

12. There is no significant gender difference in scientific attitude of students taught through computer activity -oriented instructional in science.

13. There is no significant gender difference in creativity of students taught through computer activity -oriented instructional strategy in science.

14. There is no significant gender difference in academic achievement in science of students taught through conventional instructional strategy in science.

15. There is no significant gender difference in scientific attitude of students taught through conventional instructional strategy in science.

16. There is no significant gender difference in creativity of students taught through conventional instructional strategy in science.

17. There is significant difference in academic achievement in science of students taught through computer assisted instructional strategy in relation to schools run by government and private management of urban area.
18. There is no significant difference in scientific attitude in science of students taught through computer assisted instructional strategy in relation to schools run by government and private management of urban area.

19. There is significant difference in creativity scores of students taught through computer assisted instructional strategy in relation to schools run by government and private management of urban area.

20. There is significant difference in academic achievement in science of students taught through activity-oriented instructional strategy in relation to schools run by government and private management of urban area.

21. There is significant difference in scientific attitude of students taught through activity-oriented instructional strategy in relation to schools run by government and private management of urban area.

22. There is significant difference in creativity of students taught through activity-oriented instructional strategy in relation to schools run by government and private management of urban area.

23. There is no significant difference in academic achievement in science of students taught through conventional instructional strategy in relation to schools run by Government and Private management of urban area.

24. There is no significant difference in creativity of students taught through conventional instructional strategy in relation to schools run by Government and Private management of urban area.

25. There is no significant difference in creativity of students taught through conventional instructional strategy in relation to schools run by Government and Private management of urban area.

7.19 EDUCATIONAL IMPLICATIONS OF THE STUDY

Child is said to be the father of man. Right from the birth child is inquisitor and curious to know about living things, about his environment & surroundings. This interest in them is natural. No sound educational system can ignore and neglect curiosities and interests of children. Their curiosity is against the nature and surroundings to explore the things and to know the questions that arises in his mind like how, what, why, when. This curiosity can be only and only be satisfied by the science education letting them to know about the things and giving them the answers of what, why and when. So this is possible only by efficient and competent teacher. The present study focused to find out the effective instructional strategy which could be helpful in developing achievement in science,
scientific attitude and creativity among students so that they may understand science its importance and could compete with the world.

The finding of the study suggests that instruction through computer simulation may be used to teach important concepts in different subjects at secondary stages. The result of this study is limited by the fact that this was a small scale investigation and sample size was small still this study is very much significant for policy makers, principals and teachers. Because:

- In present study an effort has been made to see the effectiveness of instructional strategies to be employed by the teachers.
- In present study an effect of single strategy is being checked on achievement in science, scientific attitude and creativity to know that which strategy is helpful in enhancing them so that it may help the teacher at the time of teaching.
- Teachers should try to identify the scientific attitude, creativity of the students and should choose instructional strategies in accordance with their level of scientific attitude and creativity.
- The study also implies that course could be completed in comparatively less time when taught through computer simulated than teacher directed instructions and thus the spare time can be utilized for more enrichment of educational activities.
- When science is taught through computer the ability of drawing diagrams also improve.
- The below average students may be compensated by teaching through computers but before use teacher must be trained properly to utilize them. For this purpose, application of modern educational technology should be stressed upon.
- Teacher should be encouraged to prepare simple software package including animation and simulation as children are more attracted toward colored visuals.
- Teachers can use different instructional strategies to make their lesson interesting.
- To enhance scientific attitude and creativity activity-oriented instructional strategy can be used.
- Computer assisted instructional strategy can improve the knowledge of the students by using internet facilities.
Computer assisted instructional strategy helps in developing competencies among the students as they can answer to on-line quiz.

Computer assisted instructional strategy improve the open-mindedness, open-discussion when on-line discussion is done at the various places of the world.

Activity-oriented Computer assisted instructional strategy improve the cooperativeness, patience and competency among students.

Activity-oriented Computer assisted instructional strategy helps to develop dignity of labor among students when they work on improvised apparatus.

Activity-oriented Computer assisted instructional strategy improves the projective thinking among students.

Also fundamental concepts in science if cleared at middle level would inculcate in them love and curiosity for science and which is very important for the progress of science and technology.

7.20 SUGGESTIONS FOR FURTHER RESEARCH

1. This study can be conducted involving the entire course of science.
2. This study can be conducted in other subjects at middle or secondary level.
3. The study may be conducted by involving more variables like age, personality and socio-economic status of students.
4. Computer assisted Packages can be develop for other disciplines of science.
5. Similar studies may be conducted to compare the effectiveness of computer assisted instruction with other strategies of teaching.
6. The study may be conducted at college/university level to find out the effectiveness of computer.