CHAPTER- VII

SUMMARY

7.1 INTRODUCTION

The progress of any country depends upon the quality of education offered and practices in vogue. Indian education, well known for its Gurukul System of Education in the Vedic Age, has undergone various phases and stages of development over a period of time since then. It has witnessed many ups and downs down the stream of its history. Despite all that, it has not only evinced concern for quality education but has also pioneered the cause of seeking excellence in education in its search for truth, goodness and beauty as a perennial issue of human life and education on per se..

Recent developments in technology have changed the world outside as well as inside the classroom; making it quite eye-catching and interesting for the students to know and to learn. Developments in the application and dissemination of knowledge and information technology have had changing demands on education. The infusion of information and communication technology (ICT) into teaching and learning and for that matter into actual and virtual classroom has generated much interest in educational research in recent years. ICT have the potential of proving an alternative and more effective teaching and learning tool in education. Evidence emanating from research literature suggests that ICT has a powerful and significant impact on education both in terms of students’ affective and cognitive outcomes in learning any subject of their choice. It has tended to make learning joyful and lasting in very many ways.

7.2 NEED OF THE STUDY

Piaget’s (1973) revolutionary finding, “Every normal child is capable of learning mathematics” has put greater responsibility on dispensers of mathematical knowledge and producers of knowledge of mathematics education, To improve students’ mathematical knowledge, different researches have been done and are being done in different areas, namely, content, method, evaluation, etc., providing evidence that difference in mathematics achievement begins to appear at elementary level and perpetuates throughout the schooling years and that students have rarely understood mathematics in its right perspective and meaning. Learning to think mathematically
involves a great deal more than having large amounts of knowledge. It verily includes a flexible spectrum of behaviour that promotes mathematical thinking which subsequently crystallises into individual’s performance in mathematics.

Students are no longer “container to be filled”: instead they are curious people with much potential to learn anything new. Mathematics being a very interesting subject can help the students solve many problems they face. The quality of interaction in teaching and learning in the class, if properly performed, produces desired results, that is, better understanding and appreciation of mathematics in every day life.

In the present scientific and technological age, the conventional teaching methods may not be sufficient to arouse interest among students nor meet their intellectual, psychological and emotional needs in the new millennium, the methods of teaching mathematics need to be modified, enriched and changed to meet the aspirations of the new generation learners.

Traditionally, mathematics teachers lecture and their students learn by listening. Students develop a narrow set of skills, which quickly fade. More active approaches to ICT learning show that students can indeed develop deep understanding that does not fade over time. Computer animations actively engage students in the learning process. If a picture is worth a thousand words, then pictures that move must be worth a fortune. While mathematics is strongly related to abstractions that require particular representations/forms that allow students to relate concepts to what they already know, teachers need to know how to translate these abstractions into understanding representations. It is now established that ICTs can have a positive effect on students’ motivation on their attitude toward technology, instruction and the subject matter they are expected to learn and absorb.

Mathematical concepts and ideas can be visualized by computers. Computer programs allow students to manipulate on the screen, being more manageable, clean, flexible, as well as have the ability to change the arrangements of representations. Different representations such as pictures, tables, graphs and symbols enable teachers to reach to wide range of students. The effect of a change in one representation may be related to the other. For example, any stretch of rectangle on computer geoboard can result change in measures of the sides, perimeter and area of the rectangle. The dynamics
links help students to connect different aspects of mathematics and construct rich in mathematics representations to make their learning meaningful and effective.

The literature review has shown that low achievers in mathematics are a group that has been limited in developing mathematical understanding by a traditional mathematics. Most mathematics continues to be presented as a collection of facts and rules used to manipulate symbols, coverage of curriculum through textbooks lesson is still a priority and external representation and continue in the majority to be diagrams, tables, graphs, and world problems (Scott, 2001). So, mathematics remains a difficult and inaccessible subject to most students. This fact is not only accepted globally, but it is, consciously or unconsciously, being passed on from one generation to another. The problem of “Math drop-outs” has increased now that “mathematics for all” has come into fashion as a slogan.

The traditional classroom environment in mathematics has been strongly oriented towards a syllabus-based delivery, using teacher control and textbook resources. In today’s world, teachers need to be equipped not only with subject expertise and effective teaching methodologies but also with the capacity to assist students to meet demand of the emerging knowledge-based society with new forms of ICT and need to have the ability to use that technology to enhance the quality of learning.

7.3 STATEMENT OF THE PROBLEM

EFFECT OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ON THE STUDENTS' ACHIEVEMENT IN MATHEMATICS AT SECONDARY LEVEL

7.4 OPERATIONAL DEFINITION OF THE KEY TERMS

In the present study, a few terms have been frequently used that have got specific meaning for the present investigation. Given below are the operational definitions of some of these terms.

➢ ICT (Information and Communication Technology):

ICT is defined as the term used to describe the tools and processes to access, retrieve, store, organize, manipulate, produce and/or exchange information by electronic and automatic means. These include hardware, software and telecommunication in the form of personal computer, scanners, digital canvass, C.D. and D.V.D. players and
programmes like data base system, multi-media applications, power point presentation mode etc..

➢ **Achievement:** Achievement is a measure of knowledge gained by Plan Programme as indicated in the test score.

7.5 **OBJECTIVES OF THE STUDY**

The present study has been designed to realize the following objectives:

1. To develop the Power-Point Programme saved to CD ROM in mathematics for class IX.
2. To validate the Power Point Programme saved to CD ROM.
3. To study the effect of ICT used teaching on the students' achievement in mathematics.
4. To study the effect of traditional teaching on the students' achievement in mathematics.
5. To study the comparative effect of ICT used teaching and traditional teaching on the students' achievement in mathematics.
6. To study the effect of ICT used teaching on the students' confidence level in answering the test questions in mathematics.
7. To study the effect of traditional method of teaching on the students' confidence level in answering the test questions in mathematics.
8. To study the comparative effect of ICT used teaching and traditional method based teaching on the students' confidence level in answering the test questions in mathematics.
9. To study the relationship between students’ achievement and their confidence level in answering the test items on both groups of students.

7.6 **HYPOTHESES**

**H$_1$.** The students' achievements in mathematics are significantly higher who are taught using ICT than those who are taught using traditional method of teaching.

**H$_2$.** The students' confidence level in answering the test questions in mathematics is significantly higher in case of those who are taught using ICT than those who are taught using traditional method of teaching.

**H$_3$.** There is a relation between students' achievements and their confidence level.
level in answering the test items in both groups of students.

7.7 **DELIMITATIONS OF THE STUDY**

The present study was confined to:

1. 68 students of class IX
3. Sub-topics: Lateral/Curved Surface Area, Total Surface Areas, Volumes of different geometrical figures as Cuboids, Cube, Right Circular Cylinder, Right Circular Cone, and Sphere under the main topic "Surface Areas and Volumes".
4. Power Point Programme saved to CD-ROM. The Power Point presentation includes text, animated pictures and video clips with sound.

7.8 **DESIGN OF THE STUDY**

A design is used to structure the research to show all the major parts of the research project- the sample or groups, measures, treatments or programmes, and method of assignments.

*Winer (1971)* compares the design of an experiment to an architect’s plan for the structure of a building. The designer of experiments performs a role similar to that of the architect. The prospective owner of a building gives his basic requirements to the architect, who then, exercising his ingenuity, prepares a plan or a blue-print outlining the final shape of the structure. Similarly, the designer of the experiment has to do planning of the experiment so that the experiment, on completion, fulfils the objectives of research.

In the present study, students in the ICT group were taught using a power point programme saved to CD-ROM. The power point presentations included animated pictures and video clips. Students in the traditional group were taught using the chalkboard, textbooks, models and charts. Experimental classes housed a ceiling-mounted LCD projector that was connected to a computer and a document camera and classroom projector projected onto an interactive white-board. The power point presentation was presented on the ceiling-mounted LCD projector. The presentation expanded each lesson, of that 40 lessons delivered in this process, by providing extra examples and examples from the homework. Students were able to solve example
problems and then instantly see the answer on a large screen in the classroom. This provided them immediate feedback.

In the present study, pre-test post-test control group quasi-experimental, design was employed with a purposive sample in the form of intact sections of class IX of the same school. The study included a control group (34 Students) and an experimental group (34 Students). The experimental group was taught through ICT used teaching and the control group through the traditional method. The design involved three operational stages as identification stage, treatment stage and post-testing stage. The first stage involved pre-testing of all the students of both groups on achievement in mathematics, socio-economic status, and intelligence. The second stage involved the experimental treatment, which consisted of ten subunits of IX grade mathematics, taught through ICT used teaching and through traditional teaching to control group. The third stage dealt with post-testing of the control and experimental group using the achievement test in mathematics.

Variables under Study

In an experimental research, the relationship between two types of variables namely independent and dependent variables is studied. Independent variables are the causes while dependent ones are effects. Another category of variables, which is equally important, is of the intervening variables. The three kinds of variables, identified for the study are:

- **Independent Variables**

  These were the variables which were manipulated in order to see their effect on the learning outcome of students. In this study, ‘Treatments’ acted as an independent variable. The treatments involved the two approaches of teaching viz., ICT used teaching and traditional teaching. The experimental group was taught through ICT used teaching and the control group was taught through the traditional teaching. Thus, ICT used teaching and traditional teachings were the two independent variables for the study.

- **Dependent Variables**

  Achievement in mathematics and confidence level of these sets of students was taken as dependent variable, which was measured twice during the course of the study.
First before beginning the experimental treatment i.e., at the pre-test stage and then after completing the experimental treatment, i.e., at the post-test stage.

- **Intervening Variables**

  Variables known as intervening variables too have their effect on the learning outcomes and influence both independent and dependent variables. Intervening variables such as nature of school, grade level, teacher, subject to be taught, intelligence of pupils, their socio-economic status, previous knowledge etc. were controlled experimentally.

7.9 **SAMPLE**

A sample is a finite part of a statistical population whose properties are studied to gain information about the whole *(Webster, 1985)*. When dealing with people, it can be defined as the set of respondents (people) selected from a larger population for the purpose of a survey. In majority of the studies, it is just not feasible to collect data from each and every subject. In addition, to work on a sample saves time, labour and money.

Sampling makes it possible to draw valid generalization by studying a relatively small proportion of the population selected for observation and analysis. In the present investigation, Karnal district of Haryana was the field of study. The sample of the study comprised pupils studying in two sections of the IX class of M.M. public School, Assandh ,situated in Karnal district. One section formed the control group and the other section formed the experimental group.

7.10 **PROCEDURE**

Procedure of the experiment comprised two main stages, that is, selection of the sample and conducting the experiment.

**Stage1: Selection of the sample**

The sample of the study comprised of 68 students of class IX (34 as control group and 34 as experimental group) studying in M.M. Public School, Assandh Distt Karnal.

**Stage2: Conducting the experiment**

The experiment was conducted in three phases as given below:

- Phase 1 : Administration of the Pre-test
- Phase 2 : Conducting the Instructional programme
- Phase 3 : Administration of Post-test
Phase I: Administration of the Pre-test

This phase involved administration of the following tests to the students of both the groups, that is, the experimental group and the control group.

1) Culture Fair Intelligence Test
2) Socioeconomic Status Scale (updating the Kuppuswamy’s Socio-economic Status Scale up to 2009).
3) Achievement Test

Separate response sheets were provided. The answer sheets scored with the help of scoring key. The scores indicated the previous knowledge possessed by the students, their achievement and confidence level in Mathematics.

Phase II: Conducting the Instructional programme

The second phase of the experiment was concerned with the real execution of the experiment. In this phase, the experimental group students were taught by ICT used teaching and the control group students were taught by traditional method of teaching.

The instructional treatment was given for 43 days which included topics selected from the syllabus, using 33 lesson demonstrations based on ICT used teaching method, that is PowerPoint presentation for the experimental group, whereas the control group was taught by the traditional method. Same content was taught to both the groups following different methods.

Phase III: Administration of Post-test

Immediately after the instructional treatment was over, the researcher tested the subjects of experimental group and control group on the dependent variable (Academic Achievement and Confidence Level in Mathematics).

7.11 STATISTICAL ANALYSIS

The following statistical techniques were employed to analyse the data obtained from the experiment to test the hypotheses.

1. Descriptive statistics such as Means, S.D. and ‘t’ test worked out on the score of achievement.
2. ‘t’ value was computed in order to adjudge pupil’s intelligence and socioeconomic status.
3. Pearson Product Moment Correlation Coefficient was computed in order to
adjudge relationship between students’ achievement and their confidence level in answering the test items on both groups of students.

7.12 FINDINGS OF THE STUDY

(1) The results arrived during this study show that the post-test achievement mean scores of experimental group and control groups, matching on their intelligence and socio-economic status, differ significantly in favour of the experimental group. This implies that the students who were taught using ICT method of teaching show significant improvement in their achievement in Mathematics than the students who received instruction through the traditional method. It suggests that ICT used teaching method contributes towards raising the achievement of students in Mathematics.

2) A significant difference has been observed between the mean achievement pre-test scores and the post-test scores of control group related to their academic achievement.

(3) A significant difference has been observed between the mean achievement of pre-test scores and the post-test scores of experiment group related to their academic achievement.

(4) The group of students taught through ICT used method show significantly higher means gain in achievement than the group of students taught through traditional method.

(5) The results arrived at during this study also show that the post-TCLAQ scores of experimental group and control groups, matching on their intelligence and socio-economic status, differ significantly in favour of the experimental group, that is students who are taught using ICT method of teaching show significant improvement in their confidence level in answering the test questions than the students who received instruction through the traditional method. It suggests that ICT used teaching method contributes towards raising their confidence level in answering questions in Mathematics.

(6) A significant difference has been observed between the mean Pre-TCLAQ scores and the Post-TCLAQ scores of control group related to their confidence level in answering the test questions.

(7) A significant difference has been observed between the mean Pre-TCLAQ scores and the Post-TCLAQ scores of experimental group related to their confidence level in answering the test questions.
The group of students taught through ICT used method show significantly higher means gain in confidence level in answering the test questions than the group of students taught Mathematics through traditional method.

The results show that there are significant positive correlations between the post-tests achievement scores and post-TCLAQ scores for both the experimental and the traditional groups. The correlation between post-tests achievement scores and post-TCLAQ scores of experimental group students was found to be higher than that of the control group students.

7.13 RETENTION OF HYPOTHESES

It may be concluded from the above findings that ICT used method significantly improves students’ performance on the achievement test and their confidence level in answering the questions to prove that learning through ICT used method proves more meaningful and effective than the traditional classroom strategy. Expressed in terms of their global importance for educational purposes vis-à-vis the tested hypothesis of the study, prime-facie, the main focus of the study addresses the multi-sensorial approach of the innovative learning process and its impact on education for sustainable development of each and every individual learner in a school situation which is deemed to be a miniature technology-based society in itself. The fundamental variables of the study included: (1) The learning strategy, especially ICT used strategy; (2) the learning outcomes in terms of performance-Achievement; (3) the confidence level in answering the test questions.

The retention of all the three hypotheses of the study namely $H_1$: The students’ achievements in mathematics are significantly higher in those who are taught using ICT than those who are taught using traditional method of teaching; $H_2$: The students' confidence level in answering the test questions in mathematics is significantly higher in those who are taught using ICT than those who are taught using traditional method of teaching; and $H_3$: There is a relation between students' achievements and their confidence level in answering the test items in both groups of students does prove the superiority of the ICT used teaching method over the traditional teaching method, which indeed has been the growing demand of the fast changing educational scenario today, making
schooling a playful endeavour for all practical purposes of sustainable development and joyful learning, especially at the secondary school level.

7.14 EDUCATIONAL IMPLICATIONS

The present research shows that in changing from a traditional ‘chalk and talk’ method to an ICT used teaching method not simply enriches classroom teaching, it also significantly improves their achievement. It implies that ICT used teaching method proves to be more tangible in its effectiveness on achievement than the traditional classroom approach. It seems more practical and is widely acceptable to students. It also reduces individual differences and enables all types of students to perform better. It has many other advantages.

- ICT can be used as a substitute for almost anything in the class: pencil, book, TV, encyclopaedia, map, library and many more.
- ICT can be used as a supplement in a large group classroom teaching. It is easier to monitor students in ICT than in the traditional classroom setting.
- ICT can be used individually, in small or large groups, or by the teachers with the whole class.
- ICT suggests a new role for the teacher. A teacher accustomed to being the sole source of information for teaching the passive learners in the classroom, has to change to be a facilitator in the learning process to actively encourage the students to:
  - help each other and learn from each other.
  - participate in discussions.
  - encourage in problem solving in a free democratic way.

- The teacher can closely monitor the involvement of all kinds of students, high achievers, average and lower level achievers and motivate them to perform better.
- ICT can be used to enhance aspects of teaching through presentation of information in different ways and in different forms. Pupils can manipulate and make changes to information on computers so that they can develop understanding of the relationship between different types of information or through the process of changing that information dynamically.
• ICT used learning sessions in class may act as a source of edutainment (education plus entertainment) as well. The sessions may include games, recreational activities like solving puzzles and riddles, holding group discussions on some general topics related to current affairs to create more interest among students. So, teacher becomes more resourceful.

• Important skills such as critical thinking, creative problem solving and synthesis of knowledge can easily be accomplished through ICT used learning in the class.

• Findings of the study indicate that ICT can be perceived as a big change agent for education, and there is lot of scope for research in this field. ICT used teaching can revamp the traditional teaching process and make it more effective. The finding suggest that ICT can play a vital role in teaching of Mathematics, so, educationists need to develop more sophisticated understanding of the conditions, circumstances, means and mechanisms through which ICT can be closely connected to the young learners and their mathematics classroom.

7.15 CONCLUSION

The study provides potential inputs for teacher education. Given the current widespread use of ICT at all levels and for all subjects, it is imperative that pre-service teachers should learn the new technology. Besides pre-service training of teachers in the making, in-service training may also be given to the existing teachers to refurbish their acumen for teaching, that is teaching effectively and meaningfully.

7.16 EMERGING ROLE OF TEACHER EDUCATION

The set of 40 lessons, demonstrated and transacted through power point presentations duly enriched and supplementary a heavy dose of technological interventions like CD ROMS, graphics, pictures, animated presentations etc. in the classroom, as part of the study, not only indicated the vast horizons of information and technology that can be exploited for educational purposes but also for boosting the quality of human life in a knowledge oriented society that the contemporary generation seeks to create and at least dream of through the process of education, supported by the humane face of technology.

Quite in the past, stray efforts have been made to orient and educate teachers on a country wide scale through Satellite communication in programmes like SOPT(Special...
Orientation of Primary Teachers) and PMOST (Programme for Mass Orientation of Teachers) by Apex level national institution like NCERT for qualitative improvement of school education through technology –based professional development of teachers. The NCERT ;CLASS project and the concept of SMART SCHOOLS too address the same cult of computer and information technology for quality schooling and of late , the launching of EDUSAT, a Satellite exclusively meant for Education is a landmark development in the field of exploiting potential, information of technology for quality schooling and sustainable growing of school education in particular and of teacher education in general .The central institute of Educational Technology in the NCERT is also squarely engaged in backing and presenting up the use of information and technology in its typical way to promote the cause of quality schooling and teacher education by producing a whole lot of technology based instructional materials for teachers ,teacher educators and school education in specific.

Another Apex level national organisation popularly known as NCTE(National Council for Teacher Education) has also focused its attention on exploiting information and technology to promote technology-based instructions in Teacher Education to sustain its quality and standards in Teacher Education institutions through organizing work shops for teacher educators,teacher,teacher trainees to make them use ICT in their teaching –learning processes and practices, besides giving them on –the- spot training in computer technology as such based on a set of CD ROMS produced and freely distributed to all recognized Teacher Education institution for this purpose

In short, cyber technology seems to be gradually growing a loft to provide anchorage to prop up the process of schooling in quite a big way. It is high time for the teachers ,teacher educators and the teaching –learning community to make the best use of technological inputs ,as available ,to improve the quality of schooling at all levels and in turn raise the quality of life of the people in knowledge society.

7.17 SUGGESTION FOR FURTHER RESEARCH

- The study could be replicated to explore how ICT affects the students of various abilities on cognitive, emotional and motivational dimensions.
- There is need to compare ICTused teaching method with other methods of instructions at different grade levels.
• The study could be replicated on a large sample for validation and for a longer duration to examine the effects on non-cognitive variable like social skills or some personality variables which take more time to bring about a change.

• There is need to study the integrated effect of ICT used method with other institutional treatments.

• Research is needed to study the effect of ICT on special groups of children such as gifted, the learning disabled and other mildly handicapped students.

• Power point programme can be developed for other classes and research may be conducted to study the impact of power point programme on students’ learning in various subjects/levels, i.e; for subjects other than Mathematics and for various levels as well, as also to determine the extent to which it could be used with in the exiting conditions and parameters in schools and other educational institutions.