CHAPTER V

SUMMARY AND CONCLUSIONS

Introduction

The field of education is constantly changing. One of the goals of education is the all round development of the child. To fulfill this aim the child is exposed to various co-curricular and extra-curricular activities in school. The school provides the child with a conductive and favourable environment to grow where learning becomes effective. There may be certain obstacles which may hinder learning effectively. These stumbling blocks need to be overcome.

The recommendations of National policy 1986 to restructure the syllabi of subjects of secondary classes have been accepted by Maharashtra State Board of Secondary and Higher Secondary Education.

In view of these recommendations a uniform course for students of secondary schools has been prescribed in different states all over the country. Science is an important part of school curriculum. The term science has been defined differently by different philosophers and scientists. The comprehensive definition of Science can be stated as ‘A body of knowledge, a way of thinking, a way of investigation and a way of experimentation in the pursuit of exploring the nature’.

The task of the teacher in the present times has become complicated, challenging and more professional than a decade ago. The curriculum demands more thinking by the teachers and students and is no more just a routine task of teaching and learning. According to Jean Piaget the Swiss psychologist that, ‘the more the child has seen and heard the more he wants to see and hear’. Today though there are a variety of
instructional material available, offering a wide range of choice for the teachers to choose, the teacher must learn how to use new media as a part of modern learning system not merely to enrich but also supplement present methods of instruction. These new emerging media can transform classroom instruction into a series of rich memorable experiences.

Most of the teachers teaching Science still follow the traditional lecture method giving the students little chance of participation. Teachers are not even acquainted with the new instructional materials. This results in teachers failing to use modern media while teaching. Consequently students fail to achieve the objectives which are kept in mind while framing the curriculum and textbook to improve the Science teaching advanced methods should be used. The audio visual aids like television and interactive computer multimedia presentation should be used to support the teachers explanation.

General Science is a compulsory subject up to secondary level. This has led to the inculcation of Scientific temper, Scientific method, Scientific attitude among students in their various other activities in the curriculum; intellectual, vocational, cultural, moral, aesthetic.

To improve the Science teaching advance method need to to used to day.

Science is taught and studied as an integrated whole now, the present research is the product oriented investigation. Researcher developed the multimedia software based on Chemistry related topics of VI,VII and VIII classes. The General Science text books of VI, VII and VIII were analyzed and multimedia software was developed ,and effectiveness of the software was studied.
As this research involved the development of text-based multimedia software and assessing its effectiveness, the researcher used the experimental method. In this study, researcher developed text-based Computer Multimedia Software Packages related to Chemistry topics of the VI, VII and VIII standard Science textbooks used in the Maharashtra state schools.

While preparing Multimedia Software Package researcher prepared story boards for Chemistry related content in consultation of experts in the relevant fields: Science, Education, Computer Science, Electronics, Statistics and assistance of the computer professionals.

**STATEMENT OF THE PROBLEM**

Development of text-based Computer Multimedia Software Package for school students to enhance their academic achievement in Science and Chemistry in particular – A Study

**Operational definitions of the terms and phrases used in the study**

The different terms and phrases used in the statement of the problem are defined operationally for the sake of clarity indicating its scope and delimitations.

**Development**

Preparation of the Computer Software Package based on the textual matter related to Chemistry aspects in the General Science text-books of VI, VII and VIII standards used in the English medium schools and trying out its effectiveness.
**Text-based**

Based on the matter of study of Chemistry, in the Science textbooks prescribed by the Maharashtra State Government for standard VI, VII and VIII.

**Computer Multimedia Software Package**

The textual matter of the Chemistry in the text books of standards VI, VII and VIII prescribed by the Maharashtra State Government is recorded on CDs. The CDs are run on computer only. The content in the CDs is presented by text, pictures, sound and animation. Hence it is a Software Package.

**School Student**

Upper Primary School students (As per National Policy of Education, 1986 includes VI, VII and VIII standard) of English medium schools in Kolhapur city selected for this research study for the year 2010-2011.

**Academic achievement in Science and Chemistry in particular**

Achievement scores obtained by the students of VI, VII and VIII standards of English medium schools selected for this research study in Science in their annual examination as well as in the post-tests related to Chemistry.

**Enhance**

Enhance means increase. The enhancement measured in this study is between the Experimental Group and Control Group on the scores obtained in the post-tests as well as in the annual examination Science marks, after the use of Computer Software Multimedia Package.
Science

The topics included in the school Science text-books of standards VI, VII and VIII of Maharashtra State Bureau of Text-Book Production and Research, Pune.

Chemistry

The content matter in Science text-book of standards VI, VII and VIII related to substance, chemicals and reactions.

Objectives of the study
The present research was undertaken by keeping following objectives
1. To analyze the text books of standard VI, VII and VIII of Science and identify the topics of Chemistry on the basis of conceptual themes.
2. To find out the problems of learning Science and Chemistry components / aspects in particular of students at the Upper Primary School Level.
3. To find out from the teachers the problems they face while teaching Science and Chemistry in particular to Upper Primary School student.
4. To develop Computer Multimedia Software for Chemistry in the Science text books of standards VI, VII and VIII.
5. To test the effectiveness of the Computer Multimedia Software Package prepared for the study.
6. To compare the effectiveness of Computer Multimedia Software Package over the traditional method of teaching.
7. To enhance the academic achievement in Science and Chemistry in particular of Upper Primary Level school students with the help of Computer Multimedia Software Package.
8. To find out the school students view regarding the developed software.
9. To make appropriate suggestions to schools, Science teachers, parents, students and Government of Maharashtra.

**Delimitations of the study**

1. The research is restricted only to standards VI, VII and VIII which offering syllabus of Maharashtra State Bureau of Text book Production and Research, Pune.
2. The research is restricted to the students from English medium schools with computer facility in Kolhapur city.
3. The research is restricted to Chemistry part of Science text books of standard VI, VII and VIII.

**Limitations of the present study**

1. Only four English medium schools with computer facilities were chosen.
2. Only 312 students studying in VI, VII and VIII standards comprised the final sample of this study.
3. The research is restricted to Chemistry part of Science text books of Standard VI, VII and VIII.

**Significance of the study**

No such work (Ph.D level) has been undertaken by any researcher with particular reference to Chemistry in India. This Computer Software Package can be used by any student want to learn. This study will beneficial to Upper Primary Level school students to enhance their educational achievement in Science and Chemistry in particular.

The results of this study will motivate the Science teacher to use CAI and teach more effectively.
The results obtained can be generalize for Upper Primary Level school students wherever these topics are taught.

The software prepared on Chemistry topic will help to develop interest in Science subject.

This research will motivate other subject teachers to prepare Computer Multimedia Software for Upper Primary Level school students. This research will help Science teachers to develop new teaching strategies for teaching.

**Scope of the study**

The results obtained can be generalized for upper Primary level school students in Maharashtra.

The results obtained can be applicable to the Upper Primary Level school students in India where these topics are taught.

**Null hypotheses**

Following null hypothesis were tested

1. There is no significant difference in the mean pre-test scores obtained by the Control and Experimental Groups of standard VI.

2. There is no significant difference in the mean post-test scores obtained by the Control and Experimental Groups of standard VI.

3. There is no significant difference in the mean annual Science marks obtained by the Control and Experimental Groups of standard VI.

4. There is no significant difference in the mean pre-test scores obtained by Boys of the Control and Experimental Groups of standard VI.

5. There is no significant difference in the mean post-test scores obtained by Boys of the Control and Experimental Groups of standard VI.
6. There is no significant difference in the mean annual Science marks obtained by Boys of the Control and Experimental Groups of standard VI.

7. There is no significant difference in the mean pre-test scores obtained by Girls of the Control and Experimental Groups of standard VI.

8. There is no significant difference in the mean post-test scores obtained by the Girls of the Control and Experimental Groups of standard VI.

9. There is no significant difference in the mean annual science marks obtained by Girls of the Control and Experimental Groups of standard VI.

10. There is no significant difference in the mean pre-test scores obtained by the Control and Experimental Groups of standard VII.

11. There is no significant difference in the mean post-test scores obtained by the Control and Experimental groups of standard VII.

12. There is no significant difference in the mean annual science marks obtained by the Control and Experimental Groups of standard VII.

13. There is no significant difference in the mean pre-test scores obtained by Boys of the Control and Experimental Groups of standard VII.

14. There is no significant difference in the mean post-test scores obtained by Boys of the Control and Experimental Groups of standard VII.

15. There is no significant difference in the mean annual Science marks obtained by Boys of the Control and Experimental Groups of standard VII.

16. There is no significant difference in the mean pre-test scores obtained by Girls of the Control and Experimental Groups of standard VII.

17. There is no significant difference in the mean post-test scores obtained by the Girls of the Control and Experimental Groups of standard VII.

18. There is no significant difference in the mean annual Science marks obtained by Girls of the Control and Experimental Groups of standard VII.
19. There is no significant difference in the mean pre-test scores obtained by the Control and Experimental Groups of standard VIII.

20. There is no significant difference in the mean post-test scores obtained by the Control and Experimental Groups of standard VIII.

21. There is no significant difference in the mean annual science marks obtained by the Control and Experimental Groups of standard VIII.

22. There is no significant difference in the mean pre-test scores obtained by Boys of the Control and Experimental Groups of standard VIII.

23. There is no significant difference in the mean post-test scores obtained by Boys of the Control and Experimental Groups of standard VIII.

24. There is no significant difference in the mean annual Science marks obtained by Boys of the Control and Experimental Groups of standard VIII.

25. There is no significant difference in the mean pre-test scores obtained by Girls of the Control and Experimental Groups of standard VIII.

26. There is no significant difference in the mean post-test scores obtained by the Girls of the Control and Experimental Groups of standard VIII.

27. There is no significant difference in the mean annual Science marks obtained by Girls of the Control and Experimental Groups of standard VIII.

28. There is no significant difference in the mean pre-test scores obtained by the Control and Experimental Groups of Upper Primary School Level students.

29. There is no significant difference in the mean post-test scores obtained by the Control and Experimental Groups of Upper Primary School Level students.

30. There is no significant difference in the mean annual Science marks obtained by the control and experimental Groups of Upper Primary School Level students.
31. There is no significant difference in the mean pre-test scores obtained by Boys of the Control and Experimental Groups of Upper Primary School Level students.

32. There is no significant difference in the mean post-test scores obtained by Boys of the Control and Experimental Groups of Upper Primary School Level students.

33. There is no significant difference in the mean annual Science marks obtained by Boys of the Control and Experimental Groups of Upper Primary School Level students.

34. There is no significant difference in the mean pre-test scores obtained by Girls of the Control and Experimental Groups of Upper Primary School Level students.

35. There is no significant difference in the mean post-test scores obtained by the Girls of the Control and Experimental Groups of Upper Primary School Level students.

36. There is no significant difference in the mean annual Science marks obtained by Girls of the Control and Experimental Groups of Upper Primary School Level students.

**Research Design**

The purpose of this study is enhancing the academic achievement of Upper Primary Level School students in Science and Chemistry in particular through computer multimedia software.

This product oriented research was Experimental in nature and used two group design that is Experimental Group and Control Group.

Three text-based Computer Multimedia Software Package for chemistry related lessons of the general science text books for the students of VI, VII and VIII standard of English medium schools were developed.
The pre-test was used to equalize two groups and post-test was used to collect data from both the groups after giving the treatment to the Experimental Group.

**Sampling design and sample**

1. Mainly purposive sampling design was used for the selection of schools for this present study four English medium schools with computer facilities (and following the general science text books prescribed by the state Government of Maharashtra) were randomly selected out of four, two schools were selected as Experimental schools and remaining two schools were retained as control schools.

2. The total sample of this study was 312 students.

3. Two almost identical groups of 156 students in Experimental Group and 156 students in Control Group were made based on pre-test scores.

**Data Gathering tools techniques**

1. Pre-test prepared by the Researcher with the help of subject expert.

2. Post-test prepared by Researcher with the help of subject expert.

3. Computer Multimedia Software Package developed for this study.

4. Annual examination marks taken from the school records.

5. Interview technique

6. Focussed group discussions

**Procedure of Data Collection**

1. Analyzed standard VI, VII and VIII science text-books to identify the topics in chemistry on conceptual themes.
2. Developed the Computer Multimedia Software Package for school students of standard VI, VII and VIII.
3. Developed and administered the pre-test on school students of the selected schools.
4. Made almost identical two equal groups that is Experimental and Control Group based on the pre-test scores.
5. Two schools were randomly selected as Experimental schools and remaining two schools were retained as Control schools.
6. Treatment was given to Experimental Group where the Researcher taught Chemistry aspect of the science subject with the help of the developed Computer Multimedia Software Package.
7. Control groups were taught Science subject with the help of traditional method by their school teacher.
8. Developed and administered the post-test on the sample.
9. Annual science marks of the sample were drawn from the school records.
10. The collected data was analyzed as per the objectives of the study and results drawn.
Analysis and Interpretation of Data

Main purpose of this research was the development of text based computer multimedia and investigating the effectiveness of this multimedia. The other important purpose of the study was to enhance the achievement of students in Science and Chemistry in particular for all these purposes suitable statistical measures / tools were used; they were as follows.

1. Mean
2. Standard deviation
3. `t` test
4. Percentage

Objective wise findings and discussion.

1) There are seven lessons related to Chemistry components in the General Science text-book of Upper Primary School Level, for which Computer Multimedia Software Package was required to be prepared. (Table No.4.1)

2) There are various problems faced by teacher of Chemistry subject. But contradiction between students personal experience and theoretical Knowledge in General Science text-book, improper designing of text book and inadequate instructional material, improper sequencing of topics in General Science text book, unnecessary information in text book, these are some prominent problems. (Table No.4.3)

3) Students of Upper Primary School Level found problems related to learning Chemistry are lack of effective teaching, improper content to
Students, lack of students participation, some concept are too much abstract, memorization of some ideas; these are some vivid problems faced by students. (Table No. 4.2)

4) The results of the study showed that the Computer Multimedia Software prepared for teaching Chemistry components can be effectively used for enhancing academic achievement and proved to be effective in enhancing the students learning of Upper Primary School Level Students in General Science.


5) Most of the Upper Primary School Level Students opined that Computer Multimedia Software helps to learn easily and effectively (Table No. 4.4) This finding is in conformity with Baviskar C.R. (2005), Bhapkar D.S. (2007), Uplane M.M. (2011).

**Main Conclusions**

Conclusions have been drawn from the findings of the study keeping in mind the objectives of the study. The conclusions drawn from the findings of this study are as follows

1. The main problem of learning Science is related to faulty and defective methods of teaching which are not suitable for learning Science in general and Chemistry in particular.

2. Contradiction between student’s personal experience and theoretical knowledge in books is also one of the persisting problem.
3. Sometimes some teaching aids also create misconception in understanding Science concepts.

4. Evaluation methods which are mainly dependent on memorization also create difficulty, in scoring good marks.

5. Science teacher face some problems while teaching Science, most of the problems are related to teachers own difficulty in understanding their subject of teaching as there is difference in their graduation subject and teaching subject.

6. Some problems of teachers are pertaining to the syllabus of Science.

7. Some problems of teachers are pertaining to insufficient provision of infrastructural and support facilities.

8. Certain problems are related to student’s understandings of some science concepts.

9. The text based Computer Multimedia Software developed in this research is effective.

10. The Computer Multimedia Software is equally beneficial for the Girls and boys of VI and VII standard.

11. The Computer Multimedia Software is more beneficial to girls than boys of VIII standard students.

12. The Computer Multimedia Software is equally beneficial for the Girls and boys of Experimental Group of Upper Primary Level.

13. The result of the study shows that the text-based Computer Software Package developed by sound research methodology will contribute to the enhancement of the student’s academic achievement of upper primary level.

14. Students of Upper Primary Level are ready to learn Science and other subjects with Computer Multimedia.

15. Student showed interest in learning with Computer Multimedia.
16. Students stated that Computer Multimedia developed by researcher is appropriate and have a good balance of text, picture, sound, and animation.

17. Students revealed that they can learn Science by themselves using good Computer Multimedia Software Packages but the teacher cannot be replaced by CAI. The Computer Multimedia Software Packages should be used by teachers to teach more effectively for the effective learning to take place in students.
Suggestions

Keeping in mind the findings of the study the following action plans have been suggested for implementation

Suggestions for the Students

1. Students should take interest in acquiring the basic computer skills so that they can use computer multimedia package that available in schools.

2. Student should learn independently by using CAI, / CBL and get the pleasure of self learning as it is important for enhancing the understanding level and self confidence.

3. Students should not only learn Science subject but also enhance their school performance.

4. Students should take interest in e-learning and enrich the subject – content beyond the text book syllabus.

Suggestions for Science Teachers

1. Science teachers should equip themselves with I.T skills; particularly computer skill and the internet, web tool to enrich the subject knowledge.

2. Science teachers should attend workshops, group discussions, conferences, orientation courses related to development and use of multimedia software for teaching.

3. Science teacher should himself / herself try to prepare Computer Software Multimedia to enhance their teaching performance.

4. Science teachers should not only depend upon lecture method and other traditional ways of teaching but should use ICT for teaching.
5. Science teacher should master the computer skills for teaching through computer multimedia.

6. Science teacher should motivate other subject teachers for using computer multimedia for teaching.

7. Science teachers should motivate students for learning Science and other subjects through computer multimedia, PPT available in schools and also those which can be freely downloaded from Internet.

**Suggestions for Parents**

1. Parents should encourage their wards to use Computer for Educational purpose besides entertainment.

2. Parents should take interest in their wards learning through computer.

3. Parents should also acquaint themselves with computer technology.

4. Parents should keep track of the changes taking place in the teaching learning process i.e. the new teaching technology.

5. Parents should buy computer for use at home.

6. Parents should get acquainted with the role of ICT in education.

7. Parents should attend parents meeting and find out how the school is applying new ways of teaching and learning.

8. Parents association should collect funds for purchasing computers for school in case the school is not financially sound.

9. The parents having knowledge of ICT and Computer use and who are professional in ICT field IT software professional should help for creating text-based Computer Multimedia Software for school use.
Suggestions to State Government of Maharashtra

1. State Government of Maharashtra should train all teachers in ICT skills and particularly in computer software.

2. State Government should provide funds for computer purchase for all schools.

3. The Government of Maharashtra should develop text-based computer multimedia for all School subjects for all level education with the help of Balbharti./Universities.

4. SCERT of Maharashtra state should open a special cell for developing the educational softwares which helps in new dimensions of teaching and learning process.

5. The government of Maharashtra should organize training centers for teacher about development of multimedia software.


7. NCERT should make it compulsory for opening teacher training college.

8. The State Government of Maharashtra should enhance and motivate for e-learning.

9. All the school under each DIET should form network and undertake projects or research work related to computer multimedia.

10. The State Government of Maharashtra should make the use of ‘computer’ compulsory from standard I and start with computer games.
and gradually introduce their subject and then to learn by creative multimedia software and thus enable students to develop computer skills

**Suggestions for further Research**

Every research is the part of a stream of research. A single research will not be able to answer all questions related to a varied particular issue.

The present investigation is related to the development of text based Computer Multimedia Software Package for the subject science and Chemistry in particular and testing its effectiveness of computer multimedia. Following are some topics for further research:

1. Text-based computer multimedia may be developed for other subjects
2. Text-based computer multimedia for Marathi medium schools may be developed.
3. Text-based computer multimedia for secondary and higher secondary level can be developed.
4. Computer Multimedia Software may be developed for Arts, Commerce and Social Science subjects.
5. Through research computer multimedia can be developed for D.Ed., B.Ed. and M.Ed. level content
6. Through research, Computer Multimedia Software can be developed for special children i.e. Mentally retarded, Gifted, Slow learners etc.
7. Besides the use of Computer Multimedia Software Package for learning, research may be conducted on, online learning, e-learning, e-teaching, e-evaluation etc.