CHAPTER - VIII
SUMMARY AND CONCLUSION

8.0 INTRODUCTION

The impact of science and technology on human life has been phenomenal It has changed the nation's economy and lifestyle of the people in the society at such a fast rate that man continuously struggles to catch it up This change has affected millions of people. In this changing technological world, computer has occupied an important place. Computer is being used from the household management to the technological fields, almost in all the fields of life. Computers are handling not only financial and material accounting in industries, trade, banks, insurance companies, railways, post, but also widely used in universities, colleges and schools for preparing admission list, roll call, examination results, mark sheets etc The society as a large is becoming increasingly aware of the ever-growing use of computers and it is also affecting the way of life of individuals, groups, and organizations In a developing country like, India, it is essential to adopt these various emerging areas of technology to make people aware of their potentials, to make them informative and skilled and to educate them in newer technology, which can contribute towards personal as well as national development. Since long, the western countries have been using computers in the area of education. The educational use of computers in India is only dated back to the last part of eighties. It was a felt need to use computers in the schools that gave birth to the subject like, Computer Education.

Education is preparation for the future and a nation's future prosperity depends on the quality of the present education of those who will become tomorrow's work force. Children, who are today in primary and secondary schools, will be the bearers of this computer-based industrial and social revolution in the country from which no individual household, business or occupation would have been left untouched. As the patterns of employment are changing rapidly, today's children will need to be trained for jobs which such technological advances will generate. If these opportunities are to be accepted, an essential part of the spectrum of educational skills will be familiarity with the uses and applications of computers. With this in mind,

Computer Education in schools was introduced during eighties. Since two decades different five year plans, committees and commissions like, NPE (1986), revised NPE (1992) and POA (1990) and (1992) have highlighted the importance of computer in education and also have suggested different strategies to implement the recommendations at different school levels. Even the National Curriculum Framework for School Education (2000) and National Curriculum Framework (2005) have mentioned the integration of Information and Communication Technology in school education. Because of this, an attempt had been made by the central government in eighties and nineties for the development of Computer Education and Computer Literacy in schools. On the guideline of central scheme the Government of Gujarat introduced Computer Education as a subject from Standard VIII from 1998. Lots of developments have taken place in the field of Computer Education at secondary school level with respect to specification for introducing Computer Education in school as a subject, for getting grants from the state government and training of teachers. Through the schemes of government some teachers are trained in computer fundamental and courseware, but no efforts were made in training teachers related to pedagogy of computer teaching. In the proposed study an attempt has been made to develop a teacher training programme for existing Computer Education teachers to teach Computer Education at Secondary School level and to see its effectiveness.

8.1 IMPLICATION OF REVIEW OF RELATED LITERATURE

The studies reviewed in this chapter were of to kinds: (i) assessment of Computer Education programme in schools, and (ii) studies related to training programme. Studies conducted by McCrow (1993), Shashrabudhe (1994), Jabber (1997), Gupte (1999), Gujarati 1999), Biswal and Das (2001), Shah (2002), Ansari (2002), Chandrakar (2002)and Gohil (2005) emphasized the need of training for Computer Education teacher working in the schools. Further, Pusuiri (1992), Kabbi (1995) identified the lack of qualified teachers for Computer Education at school level. Gujarati (1999), Vaghela (2000) showed that students are not satisfied with the method of teaching of Computer Education teachers. Al-Furaih (1998) emphasized on the need for more training methods appropriate to the computer literacy curriculum and less training focused on curriculum content. Chandrakar (2002) identified the lack

of proper interaction among the Computer Education teacher and students. Studies conducted by ISRO (1990), Patadia (1993), Gupta (1999), Gujarati (1999), Vaghela (2000), Ansari (2002) showed the insufficient time and weightage of time allocation differs from school to school were the major barriers for the implication of Computer Education in school. Al-Furaih (1998) also emphasized on the support needed from the principals to reinforce the importance of computers in daily school activities. Further, Matai (1998) identified that computer teachers were not able to teach the subject effectively and there was also improper importance given to Computer Education subject in the school. Studies conducted by Eleeen (1999), William (1999), Thompson (2000), Vusumeri (2001), Unger (2002) showed the effectiveness of teacher training programme. Further, Toshigko (2001) showed the effectiveness of teacher training programme on electronic presentation skill on the improvement in participants' presentation skill and confidence level. William (1999) emphasized on in-service training taking into account the curriculum requirement of teachers and students and suggested that in-service training should be continuous and ongoing to be effective. Further, Tengku (1994) suggested that a computer in-service programme should have at least two characteristics, (1) the concern and needs of the teachers and clear and relevant objectives; and (2) innovations that clearly affect teachers in bringing change.

From the review of the studies, following implication for research can be drawn.

1. There is a need of training programme for Computer Education teachers. Further, there is an absolute lack of research in Computer Education training programme on pedagogy for Computer Education teachers in India.
2. There is no proper interaction among teachers and students in the computer classroom and students are not satisfied with the methodologies of teaching which became the barrier in students learning. So, computer classroom requires proper interaction and appropriate methodologies of teaching.
3. Educational environment (inside the computer classroom both in theory and practical) provides opportunities to foster higher order thinking skills and develops creativity in the students.
4. Any training programme based on the need of teachers and innovations affects teachers in bringing desirable change in learning situation.

8.2 RATIONALE OF THE STUDY

21st century is characterized as the century of development in science and technology. In this science and technological world, computer has occupied an important place. Recognizing this importance, the Sixth Five Year Plan (1980-85) stated that "the importance of educational technology has to be adequately provided for greater efficiency, effectiveness and wider reach of the educational programmes". Over the last two decades the **NPE (1986)**, revised **NPE (1992)** and **POA (1990)** and **(1992)** have highlighted not only the importance of computers in education but also have suggested different strategies to implement the recommendations at different school levels. **Ramamurthy Committee Report (1990)** laid emphasis on making Computer Education an integral part of school timetable. The **National Curriculum Framework for School Education (2000) and (2005)** has also mentioned the integration of information and communication technologies into schooling.

Realizing the importance of computer, the center and state governments are emphasizing on the implementation of Computer Education at school level and some state started working in this direction. The research conducted by (Clements, 1987; Clements & Gullo, 1984; Clements & Nastasi, 1988; Keller, 1990; Decorte, 1996) on LOGO programming environment shows that the LOGO programming fosters higher order thinking skills, develop creativity, and produces other desirable out comes. The **National Curriculum Framework 2005** also mentioned that "Providing children more direct access to multi-media equipment and Information and Communication Technology (ICT), and allowing them to mix and make their own productions and to present their own experiences could provide them with new opportunities to explore their own creative imaginations". Computer Education is being imparted in the schools without knowing the nature and the ways its learning takes place. The learning nature of the subject can decide the ways and means of teaching the subject. Though Computer Education is being taught using different approaches, it is essential to know the approaches that can be suited best for the subject. There is a need to provide suitable approach for the Computer Education teaching learning that needs the analysis and study of the system of Computer Education teaching learning process on the basis of which special training programmes for computer teacher could be

designed There is also a need to standardize different methods and approaches of computer teaching and learning that needs the experimentation of training programmes of varied nature. The testing of training programmes for Computer Education teachers can also help to develop special methods of teaching Computer Education that can be a part of pre-service teacher education programmes.

The Gujarat State government has introduced Computer Education as a subject from 1998 at secondary stage. To provide Computer Education a status of a special discipline, there is drastic need to formulate appropriate teaching learning processes in terms of approaches, models and theories those can be used properly in an appropriate way. There is also a need to prepare proper teachers to teach Computer Education at different levels of learning. Bradford (1999) mentioned the lack of computer, computer laboratories, lack of training and knowledge of how to use software are the major barriers to integrate computer technology into the teaching and learning process. Biswal and Das (2000),Chandrakar (2002), and Gohil (2005) suggested for the training need of computer teachers as they were found untrained. Research on Computer Education: Past, Present and Future by Jeffery (2000) highlighted the necessity of teacher training to use high quality instructional programme and technology to its full potential. There is much needed research work in this area as Computer Education has been implemented in schools across different states. A proper structurized and rationalized courseware and teaching learning process and teachers' training programme can accelerate the pace of Computer Education learning at school level. It can help to strengthen the subject as a special discipline. There is a need to prepare disciplinarian approach to the subject As computer and its related education occupied the status of a professional course in general stream and technical stream at higher education stage, there is an increasing demand of introducing Computer Education at secondary and higher secondary stages. As a transit period between school education and higher education, the need of Computer Education at this stage is felt important. Though secondary stage is considered as the starting stage for Computer Education by many schools, the proper teaching learning should be started at this stage which needs a proper training programme for computer teachers teaching at secondary stage

Most of the teachers those are teaching Computer Education in the schools are untrained teachers and hence need to know the pedagogical aspects of general teaching learning including psychology of learning, methods, models approaches of teaching, lesson planning, technique of class room management etc. They need comprehensive in-service training may be of short duration which can help them to teach Computer Education effectively to the students. It is an attempt in this direction in the present study to study the process of Computer Education courseware and the teaching-learning process and to design, develop and implement a suitable training programme for teachers to strengthen the subject learning at secondary level. Though few universities and teacher training institutions are lunching programmes to prepare Computer Education teachers in pre-service mode, very less effective programmes are available for in-service counter parts. Even the teachers those are working as the Computer Education teachers are quite experienced and only programmes of short duration on pedagogy of Computer teaching can help them a lot in molding their teaching style. Hence the programme prepared by the researcher is of short duration including the important needed teaching pedagogy related to Computer Education teaching. Though Computer Education in schools started as a formal course from the standard VIII, the researchers had taken the teaching learning of standard VIII the present study which would help the teachers get initial knowledge about the teaching learning pedagogy and that may help to transfer learning for higher classes and better implementation of the learned training. Any training programme may help teachers to shape their behaviour in terms of their teaching in the form of approach, method, skills etc. used, but it should have some effect on the learning of the students. Change in the teacher's teaching behaviour without any betterment in the learning behaviour of the students is meaning less and has no use. To know the betterment in the learning behaviour of the students in Computer Education due to the training of students provided by the researcher, the change in achievement of the students in Computer Education was considered in the present study. Hence the present study, details of which are presented in the form of the statement, objectives and methodology.

8.3 STATEMENT OF THE PROBLEM

Designing, Developing and Implementation of a Teacher Training Programme to Teach Computer Education at Secondary School Level.

8.4 OBJECTIVES OF THE STUDY

The present study was designed with the following objectives.

1. To study the Computer Education teaching-learning process at secondary school level.
2. To design a teacher training programme to teach Computer Education at secondary school level.
3. To develop a teacher training programme to teach Computer Education at secondary school level.
4. To implement the developed Computer Education training programme.
5. To study the effectiveness of the developed teacher training programme in terms of teachers' reaction.
6. To study the effectiveness of the developed teacher training programme in terms of teachers' teaching behaviour.
7. To study the effectiveness of the developed teacher training programme in terms of students' achievement in Computer Education.

8.5 HYPOTHESIS

The following null hypotheses are formulated for the present study.

1. There will be no significant difference between the mean Computer Education overall achievement scores of students' taught by the teachers with and without training programme while taking the pre-test score of the students as co-variate.

2. There will be no significant difference between the mean Computer Education theory achievement scores of students' taught by the teachers with and without training programme while taking the pre-test score of the students as co-variate.

3. There will be no significant difference between the mean Computer Education practical achievement scores of students' taught by the teachers with and without training programme while taking the pre-test score of the students as co-variate.

4. There will be no significant difference between the mean Computer Education overall achievement scores of English medium students' taught by the teachers with and without training programme while taking the pre-test score of the students as co-variate.

5. There will be no significant difference between the mean Computer Education theory achievement scores of English medium students' taught by the teachers with and without training programme while taking the pre-test score of the students as co-variate.

6. There will be no significant difference between the mean Computer Education practical achievement scores of English medium students' taught by the teachers with and without training programme while taking the pre-test score of the students as co-variate

7. There will be no significant difference between the mean Computer Education overall achievement scores of Gujarati medium students' taught by the teachers with and without training programme while taking the pre-test score of the students as co-variate.

8. There will be no significant difference between the mean Computer Education theory achievement scores of Gujarati medium students' taught by the teachers with and without training programme while taking the pre-test score of the students as co-variate

9. There will be no significant difference between the mean Computer Education practical achievement scores of Gujarati medium students' taught by the teachers with and without training programme while taking the pre-test score of the students as co-variate.

8.6 OPERATIONAL DEFINITION OF THE TERMS

Computer Education: It refers to the education related to computer provided by secondary schools including the components like, fundamental of computers, computer software (operating systems, packages and languages) (both application & programming) and hardware. It includes both theory and practical.

Computer Education at Secondary School Level: It refers to the Computer Education that Gujarat State Education Board has recognized as a subject for 8th, 9th and 10th standard in 1998-99 and prescribed a course outline for the same as per the GSEB (1998) circular 1197/C.M/6T6.

Computer Education Teaching Learning Process: It refers to the transaction of teaching Computer Education at secondary schools by the Computer Education teachers and the process of learning Computer Education by secondary school students.

Achievements in Computer Education: It refers to the score secured by the students in theory and practical Computer Education achievement tests prepared by the researcher. The sum of both the test scores will be the overall achievement in Computer Education.

Teacher Training Programme: It is a short duration training programme for in-service Computer Education teachers that will be designed and developed by the researcher.

Reaction of Teachers: It is the reaction of teachers in a five point scale towards the developed training programme and its implementation prepared by the researcher.

Teachers Behaviour: It refers to teachers' teaching behaviour in terms of the use methods, approaches, use of lesson planning, use of teaching skills etc, during the transaction of Computer Education teaching learning

8.7 LIMITATION AND DELIMITATION OF THE STUDY

Following limitations and delimitations were considered while carrying out the present study.

1. The study is delimited to Computer Education teaching learning process at standard VIII of English and Gujarati medium schools.

2. The study is limited to the Computer Education syllabus prescribed by the Gujarat State Board of School Textbooks for standard VIII.

8.8 METHODOLOGY OF THE STUDY

In order to realize the objectives of the study, two types of empirical data were collected i.e. qualitative and quantitative. Though both qualitative and quantitative data were used in the present study, the major focus was on the qualitative data. To realize objective one i.e. *'to study the Computer Education teaching-learning process at secondary school level'*, data were collected through observation of the Computer Education theory and practical classes. All the specific behaviour of teachers and students were recorded along with description of various teachers and students behaviour. Further, this paved the way for identifying and developing the required inputs for the training programme for teachers for effective transaction of Computer Education curriculum. To realize objective two and three i.e. *'to design a teacher training programme to teach Computer Education at secondary school level'* and *'to develop a teacher training programme to teach Computer Education at secondary school level'* respectively, content analysis of Computer Education textbook was done to design and develop training programme for teaching Computer Education. The data

collected for objective one through observation were also utilized for developing the training programme. To realize objective four i.e. *'to implement the developed Computer Education training programme'*, the developed training programme was conducted for teacher for 36 hours spread over nine days. To realize objective five and six i.e. *'to study the effectiveness of the developed teacher training programme in terms of teachers' reaction'* and *'to study the effectiveness of the developed teacher training programme in terms of teachers' teaching behaviour'* respectively the data were collected through reaction scale and observation after implementation of the training programme. To realize objective seven i.e. *'to study the effectiveness of the developed teacher training programme in terms of students' achievement in Computer Education students' achievement'* both in theory and practical were collected before and after the training programme with a gap of five month which were analyzed quantitatively. A detail of the present chapter is presented as follow.

8.9 DESIGN OF THE STUDY

The present study was experimental in nature where Quasi-experimental design was used. The Pretest-Posttest Nonequivalent-Controlled Group Design was followed in this research. The design of the study is presented as follow.

O_1	X	O_2
O_3	C	O_4

Where, O_1 and O_3 are pretest

O_2 and O_4 are posttest

X stands for Experimental Group and

C stands for Control Group

Following this design, the achievement of students in computer will be measured before and after the experimentation. The similar procedure will be followed for control group. This data will be analyzed quantitatively. Teachers change in behaviour due to training programme will be studied in experimental group while transacting Computer Education curriculum with the help of observation. These data will be analyzed qualitatively.

8.10 POPULATION OF THE STUDY

The population of the present study comprised of all the Computer Education teachers teaching Computer Education as a subject at secondary school level (both Gujarati and English medium) following the Computer Education textbook prescribed by Gujarat Secondary Board of Education and all the students of English and Gujarati medium schools studying Computer Education as a subject at Secondary School level.

8.11 SAMPLE OF THE STUDY

The sample of the present study was taken purposively keeping in mind the feasibility aspect of the experimentation. For the purpose of pre-training observations eight schools of Baroda city (four English medium and four Gujarati medium) were selected purposively. Out of these eight schools, four schools (two English medium and two Gujarati medium) were selected as the sample for the experimentation in the present study From these four schools, two schools (One English medium and one Gujarati medium) were taken as experimental group and two schools (One English medium and one Gujarati medium) were taken as the control group. For the implementation of the developed teacher training programme all the six teachers of the experimental group teaching Computer Education at secondary level were taken as the sample who were given training. 205 students of standard VIII studying computer as a subject in all the four schools were taken as the sample for the present study. 87 students of standard VIII of the two schools in the experimental group were considered for the experimentation and 118 students of standard VIII of the two schools in the control groups were considered for the control group. The students who didn't appear either theory or practical achievement post-test were discarded. The sample of students after administration of post-test achievement test was 197. Thus, the student sample of the present study became 82 students of experimental group (35 English medium and 67 Gujarati medium) and 115 students of control group (48 English medium and 67 Gujarati medium).

8.12 DATA REQUIRED FOR THE STUDY

Keeping in view the objectives of the study and the nature of data required, necessary information in the form of inputs for the training programme were collected through various sources. The sources of data were observation of both theory and practical classes of eight schools in Baroda city, content analysis of the standard VIII Computer Education Textbook to design framework for Computer Education teaching, students' pre-test and post-test achievement score in computer and reactions of the teachers on training programme

8.13 TOOLS AND TECHNIQUES

To collect the data of the present study in the stated required form, the investigator prepared and used the following tools

(i) Observation Schedule (for Theory class)

(ii) Observation Schedule (for Practical Class)

(iii) Achievement Test

(iv) Reaction Scale

For the present study four tools e.g observation schedule for theory class, observation schedule for practical class, achievement test and reaction scale were constructed by the investigator. After construction, the tools were given to the experts to obtain their opinion about the validity of the items in the tools as well as the clarity of items and their comprehensibility. The feedback obtained from the experts was utilized for the revision of the tools. The revision was mainly of done to avoid ambiguous items, rephrasing items to avoid repetitions of meaning of the items and refining the language of the certain items Keeping in view the above points, a revised final draft of the tool was prepared by incorporating the comments and suggestions of the experts. For the Gujarati version of achievement tests both theory and practical, it was given to the Gujarati Computer Education teachers for translation and then given to language expert. Keeping in view their comments and suggestions, revised and final draft was prepared (For tools Refer Appendices).

8.14 METHODS OF DATA COLLECTION

The main data collecting strategies employed in this study were participant observation, content analysis of textbook and administration of achievement test and reaction scale. This has been summarized in the table 8.1.

Table 8.1: A Summary of Data Collection Methods and the Sources of Data According to Different Areas of Enquiry.

S.No.	Area of Enquiry	Data Collection Methods	Sources of Data
1	Preparation of the training programme Pre-Testing Phase – I	- Participant observation - Textbook analysis -Pre-Testing (Achivement Test)	-Teacher - Student -Informal discussion with teachers - Textbook
2	Implementation of training programme Phase – II	Administration of Reaction Scale	- Teachers
3	Post-training period Phase III	Post Participant observation Post-Testing (Achievement test)	- Teachers - Students

8.15 PROCEDURE OF DATA COLLECTION

The data for the present study was collected through participant observation, textbook analysis and by administering achievement test and reaction scale The data were collected in three phase i.e. pre-training phase, training phase and post-training phase. Details of the data collection procedure are given as follow.

8.15.1 Pre-training Phase

In this phase, 32 theory classes and 25 practical classes were observed. During this phase, the investigator observed all the activities and interaction of teacher and students in both theory and practical classes. All the teaching behaviour of teachers was recorded in observation schedule. Also, informal discussions with teachers were carried out to know about their pedagogical knowledge and needs. The investigator also analyzed the Computer Education textbook of standard VIII to design framework

for effective teaching-learning process. The combination of observed data, informal discussion with teacher and textbook analysis paved the way for identifying and developing the inputs for the training programme. An achievement test (pre-test) was administered on computer theory and practical to both experimental and control group students in order to know the achievement of students in Computer Education.

8.15.2 Training Phase

In this phase, the learning material of the training programme was prepared by the investigator. The prepared learning material of the training programme was given to three experts for its scrutiny, relevance and appropriateness. Based on experts' comments and suggestion, the learning material was modified and made ready for the training programme. The training programme was conducted during 13-06 -2005 to 21-06- 2005 for a period of 9 days. The training programme spread over 18 sessions, a total of 36 hours. To conduct the training programme experts from the Centre of Advanced Study in Education (CASE), Department of Education, Faculty of Education & Psychology, the Maharaja Sayajirao University of Baroda, Vadodara were invited. The investigator also conducted few sessions of the training programme. The major components of the training programme were : Importance /need of training, Aims and Objectives: Meaning of aims and objectives, Instructional objective: it's meaning and writing instructional objectives in behavioural terms; Principles and Maxims of Teaching: General principles and maxims of teaching, Skills of Teaching: (i) Introducing lesson, (ii) skill of questioning, (iii) skill of Probing, (iv) Skill of Explanation, (v) Skill of Stimulus Variation (vi) skill of Reinforcement; Instructional Media (i) Blackboard, (ii) Charts, (iii) Over Head Projector, (iv) Computer (v) LCD Projector; Classroom Environment: Classroom environment and learning process, Dimensions of classroom environment: Teacher-student interaction, student-student interaction; Methods of Teaching: (i) Lecture Method, (ii) Demonstration Method, (iii) Problem Solving Method, (iv) Assignment Method; Approaches of Teaching: (i) Inductive Approach, (ii) Deductive Approach, (iii) Problem Solving Approach, (iv) Participatory Approach; Classroom Management; Cooperative Learning; Models of Teaching: (i) Advance Organizer Model of Teaching, and (ii) Mastery Learning Approach of Teaching; Lesson Planning and Evaluation. The training programme was a combination of both theory

and practice. During the practice session activities related to training programme components were given to the teachers for workout and it was followed by discussion. Details of the training programme are given in Appendix I. After the training programme, the reaction scale prepared by the investigator was administered to the teachers to take their reaction about the training programme.

8.15.3 Post-training Phase

After the training programme the teachers were instructed to implement the learning of the training programme in their theory and practical computer classes. During this period, the investigator collected the observed data with the help of a trained observer with respect to the activities and interactions of teachers and students in 16 theory and 14 practical classes of experimental group. All the teaching behaviour of teachers was recorded in observation schedule. Besides, an achievement test (post-test) was administered on computer theory and practical to both experimental and control group students in order to know the effectiveness of training programme in terms of students' achievement.

8.16 PROCEDURE OF DATA ANALYSIS

As the present study was an experimental and developmental in nature, data analysis was done following experimental design. In the first phase, data collected through observation and content analysis of the Computer Education Textbook. This helped to prepare framework for teaching Computer Education and in developing the inputs for the training programme for teachers. The data were analyzed using both qualitative and quantitative methods. The details regarding the procedure of data analysis have been presented objective wise in the table 3.2 as follow.

Table 8.2 A Summary of Data Analysis Procedure Adopted According to Different Objectives of the Study.

Objectives	Purpose	Types of Data	Techniques Used
Objective 1	Analysis of Computer Education teaching learning process	Qualitative	Frequency and percentage
Objective 2 & 3	Designing and development of training programme	Qualitative	Content analysis
Objective 4 & 5	Implementation of training programme and reaction of teachers	Qualitative	Frequency and percentage
Objective 6	Effectiveness of training programme in terms of teachers' teaching behaviour	Qualitative	Frequency and percentage
Objective 7	Effectiveness of training programme in terms of students' achievement	Quantitative	ANCOVA

8.17 MAJOR FINDINGS OF THE STUDY

Major findings of the present study are presented objective wise as follow.

8.17.1 Major Findings Related to the Content Analysis of the Computer Education Textbook

Content analysis of the Computer Education text book was done to derive at the nature of the Computer Education content and the components needed for the training programme. The major findings related to the content analysis is presented as follow.

1. From the content analysis of chapter one i.e. *Introduction to Computers*, it was found that the chapter was of information type dealing with computer terminologies. It was found to be theoretical which needs lecture and discussion method, Advance Organizer Model, teaching aids related to computer hardware and adequate teacher-student interaction. The chapter needs mainly project work and evaluation with 60 percent to 70 percent mastery.

2. From the analysis of chapter two i.e. *Windows concepts and Components*, it was found that the chapter was of mixed type i.e. theory cum practical dealing with concepts and components of Windows XP operating system. It was found to be theory cum practical which needs demonstration and discussion method, inductive approach, Mastery Learning Model, teaching aids like, computer and LCD projector and adequate teacher-student interaction. The chapter needs mainly project work along with continuous and comprehensive evaluation with 80 percent to 100 percent mastery.

3. From the analysis of chapter three i.e. *Files and Folders*, it was found that the chapter was of mixed type i.e. theory cum practical dealing with creating and managing files and folders. It was found that the major emphasis was on practical which needs demonstration and discussion method, inductive approach for theory and participatory for practical, Mastery Learning Model, computer and LCD projector as teaching aids and adequate teacher-student and student-student interaction. The chapter needs mainly project work along with continuous and comprehensive evaluation with 80 percent to 100 percent mastery.

4. From the analysis of chapter four i.e. *Using Additional Windows Facilities*, it was found that the chapter was of mixed type i.e. theory cum practical dealing with the use of Accessories. It was found that the major emphasis was on practical which needs demonstration method, inductive approach for theory and participatory approach for practical, Mastery Learning Model, computer and LCD projector as teaching aids and adequate teacher-student and student-student interaction. The chapter needs mainly project work for evaluation with 80 percent to 100 percent mastery.

5. From the analysis of chapter five i.e. *Introduction to Word Processing Using MS Word*, it was found that the chapter was of mixed type i.e. theory cum practical dealing with features of Word Processor. It was found that the major emphasis was on practical which needs demonstration method, inductive approach for theory and participatory approach for practical, Mastery Learning Model, computer and LCD Projector as teaching aids and adequate teacher-

student and student-student interaction. The chapter mainly needs project work for evaluation with 80 percent to 100 percent mastery.

6. From the analysis of chapter six i.e. *Introduction to Internet (Part-I)*, it was found that type chapter was of mixed type i.e. theory cum practical dealing with internet and its use. It was found that the major emphasis was on theory which needs lecture cum discussion method, participatory approach, advance Organizer Model, chart of computer network, working of World Wide Web and picture of modem and server as teaching aids and adequate teacher-student and student-student interaction. The chapter also needs project work for evaluation with 60 percent to 80 percent mastery.

7. From the analysis of chapter seven i.e. *Algorithm Development (Part-I)*, it was found that the chapter was of theoretical dealing with Algorithm development, flow chart and variable, The major emphasis was on theory to develop logical thinking ability of the students which needs problem solving and discussion method, inductive approach, Mastery Learning Model, flow chart and its symbol as teaching aids, and adequate teacher-student and student-student interaction. The chapter also needs project work for evaluation with 80 percent to 100 percent mastery.

8.17.2 Major Findings Based on the Pre-Training and Post-training Observation of Theory Classes

Here, the major findings of the pre-training and post-training observation of theory classes are presented in tabular form containing two columns. The first column 'A' is based on the major findings arrived at through the analysis and interpretation of pre-training observation of Computer Education theory classes. The second column 'B' is based on the major findings arrived at through the analysis and interpretation of post-training observation of Computer Education theory classes. The detailed findings are as follow.

Table 8.3 Major Findings based on the Pre-training and Post-training Theory Observation Analysis and Interpretation of Data

(A) Findings based on the Pre-training Observation of Theory Classes	(B) Findings based on the Post-training Observation of Theory Classes
1. In terms of use of lesson plan/outline, it was found that in all the classes teachers didn't use lesson plan/outline for teaching.	**1.** In terms of use of lesson plan/outline, it was found that in 68.75 percent of classes teachers used lesson plan/outline for teaching.
2. In terms of introducing the lesson, it was found that in 34.48 percent cases; lessons were introduced using *'previous knowledge'*, 12.50 percent by *'demonstration'* and 53.12 percent *'arbitrarily'*.	**2.** In terms of introducing the lesson, it was found that 81.25 percent of classes' lesson was introduced using *'previous knowledge'*, and rest in 18.75 percent by *'demonstration'*
3. In terms of use and purpose of using textbook during teaching, it was found that in 50 percent of classes textbook was used. In 12.50 percent classes, the purpose of using text book was *'to dictate'*, in 50 percent *'to explain'* and in rest of 37.50 percent, it was for *'something else'* like *'to show window screen', 'to refer the topic to be taught', 'to confirm what to teach', 'to draw picture and to refer content and examples'*.	**3.** In terms of use and purpose of using textbook during teaching, it was found that in 75 percent of classes textbook was used. In 8.33 percent of classes, the purpose of using textbook was *'to dictate'*, in 50 percent *'to explain'* and in rest of 41.67 percent, it was *'something else'* like – *'to show the picture of hardware', to explain the content', and 'to underline important points'*.
4. In terms of approaches of teaching, it was found that in 65.33 percent of classes teachers followed *'inductive approach'* and in 34.37 percent *'problem solving'*. It was	**4.** In terms of approaches of teaching, it was found that in 68.75 percent of classes, teachers followed *'inductive approach'*, in 18.75 percent *'deductive approach'* and in

found that teachers had no knowledge about the approaches of teaching.	12.50 percent *'problem solving' approach.*
5. In terms of students' participation during teaching, it was found that in 40.63 percent of classes it was *'moderate'* and in one-forth of classes it was *'no participation'*, where as, in 6.25 percent, students' participation was *'maximum'*.	**5.** In terms of students' participation during teaching, it was found that in 87.50 of classes it was *'maximum'* and in 12.50 percent it was *'moderate'*.
6. In terms of students' response during teaching, it was found that in.43.75 percent of classes, it was *'moderate'* and in one-eighth of classes, there was *'no response'* at all, where as, in 6.25 percent students' response was *'maximum'*. It was also found that there was no scope for students' response as teacher himself gave response immediately after asking questioning.	**6.** In terms of students' response during teaching, it was found that in 87.50 percent of classes it was *'maximum'* and in 12.50 percent it was *'moderate'*. It was also found that teachers gave chance to students for answering questions.
7. In terms of use of blackboard, quality of blackboard work and purpose of using blackboard during teaching, it was found that in 68.75 percent classes blackboard was not used at all, where as, in 31.25 percent classes it was used. The quality of blackboard work was *'satisfactory'* in 60 percent of classes. In 20 percent of classes' blackboard was used for *'detailed work'*, whereas, in equal 40 percent of classes each blackboard was used for *'explanation of difficult content'* and for *'drawing different components of computer'*.	**7.** In terms of use of blackboard, quality of blackboard work and purpose of blackboard work, it was found that in 93.75 percent of classes' blackboard was used. The quality of blackboard work in 73.33 percent classes was *'excellent'*, where as, in 26.67 percent classes it was *'satisfactory'*. In 60 percent of classes' blackboard was used for *'detailed work'*, in 26.67 percent for *'explanation of difficult content'*, and in 13.33 percent for *'drawing components of computer'*

8. In terms of teaching aids, it was found that in 59.37 percent of classes teaching aids was used. With respect to type of teaching aids, it was found that in majority of classes i.e. 73.68 percent *'computer'* was used as a teaching aid and in 15.79 percent classes real objects like, Mother Board, Hard Disk, CPU, Computer and Monitor were used as teaching aid. computer was used as an aid in theory cum demonstration class.	**8.** In terms of teaching aids, it was found that in. 62 50 percent classes teaching aids were used. With respect to type of teaching aids, it was found that in equal 40 percent classes each *'computer'* and *'model'* (real object) like, Mother Board, Hard Disk, CPU, Computer and Monitor used. In 20 percent classes *'diagram'* was found used.
9. In terms of use of skills, it was found that in majority of classes i.e. 62 52 percent explanation was *'poor'*, in 34.38 percent and in 87.50 percent classes illustration with example and reinforcement skill was *'not used'* at all respectively and in 56.25 percent classes questioning was *'poor'* and in 90.63 percent classes achieving closure was *'not used'* at all. Further, it was found that teacher explained the content by reading the textbook, didn't write key points and statements on blackboard, teachers didn't gave chance to students for answering and asked two to three question at time.	**9.** In terms of use of skills, it was found that in majority of classes i.e. 93.75 percent, 68.75 percent, 74 percent and 81.25 percent classes explanation, illustration, reinforcement and questioning skills were *'excellent'*, where as, in an equal 31.25 percent of classes each achieving closure was found *'excellent'* and *'average'*.
10. In terms of level of questions asked in classes, it was found that *'knowledge level'* and *'understanding levels'* of questions finds equal weightage of 32.57 percent	**10.** In terms of levels of questions asked in classes, it was found that in 47.45 percent, 34.18 percent and 13 27 percent of classes *'knowledge level'*, *'understanding level'*

each, while *'application levels'* of questions were not given importance.	and *'application level'* questions were asked respectively.
11. In terms of students' questions, it was found that in. 65.63 percent classes students *'didn't asked questions at all'*, in 28.12 percent classes, *it was 'rarely'* asked and in 6,25 percent classes *it was 'sometimes' asked.*	**11.** In terms of students' questions, it was found that in equal 25 percentage of classes each it was found *'very often'* and *'sometimes'* and in 18.75 percent classes students 'rarely' asked questions.
12. In terms of assignment and type of assignment given by teachers, it was found that in majority of classes i.e. 78.13 percent of classes *'teachers didn't gave assignment'*, and 21.87 percent *'teachers gave assignment'*, where as, in 57.14 percent of classes the given assignment was of *'oral'* assignment and 28.57 percent was of *'written problem solving'*. Assignments.	**12.** In terms of assignment and type of assignment given by teacher in theory classes, it was found that in 25 percent of classes *'teachers gave assignment'* and 75 percent *'teachers didn't gave assignment'*, where as, 75 percent from the given assignment was of *'oral assignment'* and 25 percent was of *'written problem solving'* assignments.
13. In terms of home work given by teachers, it was found that in large majority of classes i.e. 84.37 percent *'teachers didn't give home work'* to students based on the content taught.	**13.** In terms of homework given by teachers, it was found that in large majority of classes, i.e. 87.50 percent *'teachers didn't give homework'* to students based on content taught.
14. In terms of quality of classroom management, it was found *'average'* in 53.12 percent of classes and *'poor'* in 28.13 percent classes. Further, it was found that teachers didn't pay attention to students' other activities like, talking among themselves, teasing to one another etc. and	**14.** In terms of classroom management, it was found *'good'* and *'average'* in 93.75 percent and 6.25 percent classes respectively. It was also found during observation that teachers immediately intervened while students were talking to each other; there was good interaction

there was no interaction between teacher and students.	between teacher and students through the process of questioning and discussion. Teachers also ensured proper sitting arrangement during demonstration.
15. In terms of summarization and process of summarization of lesson at the end of the classes, it was found that in large majority of classes i.e. 84.37 percent teacher didn't summarize the lesson and in 15.63 percent of classes' teachers summarized through *'questioning'*, *'demonstration on the computer'* and *'consolidation of major points'*.	**15.** In terms of summarization and the process of summarization of lesson at the end of the period, it was found that in large majority of classes i.e. 87.50 percent teachers summarized through *'questioning'* and in 14.28 percent each classes were summarized by *'demonstrating on computer'* and *'consolidation of major points'* respectively.
16. In terms of method of teaching, it was found that in 43.75 percent, 53.13 percent of classes teachers used *'lecture method'* and *'demonstration method'*, where as, in 3.12 percent classes *'question answer method'* was used.	**16.** In terms of method of teaching used by teachers, it was found that in 37.50 percent of classes teachers used *'lecture method'*, where as in equal percent of classes i.e. 31.25 percent *'demonstration'* and *'lecture cum demonstration'* method was used.
17. It was found that in large majority i.e. 71 42 percent, 78.57 percent and 64.29 percent classes lecture method was *'appropriate'*, *'less interesting'* and *'less involved'* respectively. Further it was found that in. 64.71 percent, 47.06 percent and 76.47 percent classes demonstration method was found *'appropriate'*, *'less interesting'* and *'less students' involvement'* respectively.	**17.** It was found that in majority of classes i.e. 88.33 percent, 66.67 percent and 88.33 percent lecture method was *'most appropriate'*, *'more interesting'*, and *'more involved'* respectively. In majority of classes i.e. 80 percent each demonstration method was found *'most appropriate'* and *'most interesting'*, where as, in all the classes there was *'more involvement'* of students. In all the classes lecture cum demonstration method was *'most*

	appropriate', where as, in equal percentage of classes i.e. 80 percent each lecture cum demonstration method was *'more interesting'* and *'more involved'*.

8.17.3 Major Findings Based on Pre-training and Post-training Classroom Observation of Practical Classes

Here, the major findings of the pre-training and post-training observation of practical classes are presented in tabular form containing two columns. The first column 'A' is based on the major findings arrived at through the analysis and interpretation of pre-training observation of Computer Education practical classes. The second column 'B' is based on the major findings arrived at through the analysis and interpretation of post-training observation of Computer Education practical classes. The detailed findings are as follows

Table 8.4 Major Findings based on the Pre-training and Post-training Practical Observation Analysis and Interpretation of Data

(A) Major Findings based on Pre-training Classroom Observation of Practical Classes	**(B) Major Findings based on Post-training Classroom Observation of Practical Classes**
1. In terms of sitting arrangement and instruction by teacher, it was found that teacher didn't give importance to sitting arrangement of students and in almost all the classes no clear/specific instruction regarding practical was given to students.	**1.** In terms of seating arrangement and instruction of the teachers, it was found that teachers allotted computer to pair of students and gave instruction for seating in a half circle manner during demonstration on T.V. attached to CPU. It was also found that clear instruction leads to the consistency among students work.
2. In terms of nature of work assigned to work out in practical classes, it was found	**2.** In terms of nature of work assigned to workout in practical classes, it was found

that teachers assigned most of the works orally.	that teachers gave importance to step wise written instruction to assign practical work. The nature of practical work was found to be creative, skill based, problem solving ad application type.
3. In terms of use of textbook, it was found that teachers used the textbook to show the different components of computer and to explain particular paragraph during demonstration. On the other hand students used the textbook to type the text and to practice the exercise.	**3.** In terms of use of textbook, it was found that there was decrease in use of textbook and increase in the use of workbook and note book. It was found that teachers used workbook to dictate project and students used note book to follow instruction.
4. In terms of teachers' activities, it was found that teachers' activities were routine like i.e. demonstrating and didn't enquire or questions whether students had understood or not. Further, it was found that teachers didn't provide opportunities to students for interaction and clarification of their doubts. Again, it was found that teachers used negative remark to maintain discipline.	**4.** In terms of teachers' activities, it was found systematic i.e. first dictating the work to be done; demonstrating on T.V. and randomly asking few students to demonstrate it. It was also found that teachers provided opportunities to students to help each other and clarified their doubts by individual guidance.
5. In terms of students' activities in the practical classes, it was found that students' practical works were based on the instruction and attention of the teacher. Teachers' improper attention leads to inconsistency in students' practical work. Further, it was found that cooperation and discussion among students helped them to	**5.** In terms of students' activities in the practical class, it was found that their practical work was based on the project work dictated by teacher at the beginning of class. It was also found that teachers' proper attention leads to consistency in their work. Further, it was found that cooperation and discussion among students

solve their problems or tasks.	made their task easy and teachers extra effort during recess time helped weak students to complete their task.
6. In terms of students' query/questions and teacher's response, it was found that students query were specific problem/task based. It was also found that bigger size class with single teacher and engagement of teacher other than practical activities became the obstacle for providing individual attention.	**6.** In terms of students' query/questions and teacher's response, it was found that students query were specific and problem based, where as, teachers responded students query individually by going near to the students.
7. In terms of practical class management by teachers, it was found that teachers were lacking in classroom management and used undesired measure to maintain discipline.	**7.** In terms of practical class management by teachers, it was found managed properly.
8. In terms of the assignment for next class, it was found that teachers didn't give assignment to students.	**8.** In terms of assignment for next class, it was found that in six classes' teachers' gave assignment and asked the students to complete the work in next class to those students who had not completed the task.
9. In terms of supervision by teachers, it was found that the teachers were not able to supervise students work because of single teacher for supervision, less time and busy of teachers in other than practical work.	**9.** In terms of supervision by teachers, it was found that teachers checked students' practical work by attending individual students and also checked their work at the end of the period. It was also found that teachers guided students during recess time.

8.17.4 Major Findings Related to the Effectiveness of the Training Programme in Terms of Teachers Reaction

The findings of the effectiveness of the training programme have been observed in terms of the reaction of the teachers on the nine days training programme that they had undergone. The findings of the reaction of teachers are presented in three sub-sections. They are as follows.

8.17.4.1. Major Findings based on the Content of the Training Programme

In terms of the content of the training programme, it was found to be good according to the reaction of the participant teachers. A large majority of the respondent teachers were *'strongly agree'* to the statements related to the contents like, importance of the training, aims, objectives and writing instructional objectives, principles and maxims of teachings, skills of teaching, instructional media, classroom environment, classroom management, methods and approaches of teaching, cooperative learning, models of teaching- Advance Organizer Model and mastery learning Model, evaluation, and cognitive lesson planning. Teachers varying from 16.67 percent to 66.67 percent with *'agree'* for the statements related to the mentioned content of the training programme. This shows that a large number of respondent were either *'strongly agree'* or 'agree' to the statements related to the content of the training programme. It shows highly positive reaction of the participant towards the content of the training programme.

8.17.4.2 *Major Findings Related to the Reaction of Teachers on the Implementation of the Training Programme*

In terms of the implementation of the training programme, it was found to be positive according to the reaction of the participant teachers. A large number of the participant teachers varying from 33.33 percent to 100 percent were *'strongly agree'* to the statements related to the aspects of the implementation of the training programme like, training provided by experts, language of the experts, dealing of content by exerts, activities after each session, interesting of the activities, comprehensiveness of training, adequacy of training material, time management of

the training programme, time duration of each session, adequacy and appropriateness of used media, arrangement during training programme and participation of teachers during training.

Again the percentage of respondents varying from 16.66 percent to 50 percent was found *'agree'* to the statements related to the implementation of the content of the training programme. Further, 16.66 percent of respondents said *'can't say'* to the statement related to dealing of content by experts, activities after each session and adequacy of the training material. Further more, 16.66 percent of respondents were *'strongly disagree'* to the statements related to time management of the training programme and time duration of each session. This shows that majority of the respondent teachers were either *'strongly'* or *'agree'* to the statements related to the implementation of the content of training programme, where as, very less number of respondent was neutral to some of the statements dealing with the content by experts, activities after each session and adequacy of the training material and also some were *'strongly disagree'* with the statements related to time management of the training programme and time duration of each session. It shows highly positive reaction of the participant teachers towards implementation of the training programme. Hence, it may be considered that the implementation of the training programme found appropriate and effective in terms of participant teachers reaction.

8.17.4.3. *Major Findings Related to the Feasibility and Usefulness of the Training Programme*

In terms of the feasibility and usefulness of the training programme for computer teachers, it was found to be good according to the reaction of the participant teachers. A large number of the participant teachers varying from 50 percent to 66.67 percent were *'strongly agree'* to the statements related to the feasibility of the input of the training programme for computer teachers.

Again the percentage of respondent varying from 33.33 percent to 50 percent were *'agree'* to the statements related to the feasibility of the input of the training programme and usefulness of training programme for computer teachers. It shows that majority of the respondent were either *'strongly agree'* or *'agree'* to the feasibility

and usefulness of the training programme. It shows the positive reaction of the participant towards the feasibility of the input and usefulness of the training programme for Computer Education teachers. Hence, it may be considered that the content of the training programme will be feasible and useful for Computer Education teachers in future.

8.17.5. Major Findings Based on the Computer Education Achievement of Students

The major findings of the effectiveness of the training programme in terms of students achievement in Computer Education overall, theory and practical are as follow.

1. In terms of overall, theory and practical adjusted mean achievement scores of students taught by the teachers' undergone training were found significantly higher than the same of the students' taught by the teachers without the training programme.
2. In terms of overall and practical adjusted mean achievement scores of English medium students taught by the teachers' undergone training programme were found significantly higher than the same of the students taught by the teachers without the training programme.
3. In terms of the theory adjusted mean achievement score of English medium students taught by the teachers' undergone training programme was not found different from the same of the students taught by the teachers without the training programme.
4. In terms of the overall, theory and practical adjusted mean achievement scores of Gujarati medium students taught by the teachers undergone the training programme were found significantly higher than the same of the students taught by the teachers without the training programme.

8.18 SUGGESTION

On the basis of researchers experience during the process of research, interaction with Computer Education teachers, School authorities, experts of

Computer Education from University, analysis of government letters and findings of the study, researcher would like to give few suggestions which may be useful for the Gujarat Secondary Board of Education, school authorities and above all for the improvement of Computer Education at school level. The suggestions are as follow.

1. The Gujarat government should create new post for Computer Education teachers in the school, so that the same teachers can continue and do not left the job in between the academic session and also they can go for in-service training programme through IGNOU.

2. The Gujarat government should specify the minimum required Computer Education qualification along with basic qualification for the appointment of Computer Education teachers.

3 During research, it was found that the Computer Education teachers were very good in content but they were lacking in pedagogy of teaching. Therefore, the state government and/or school authorities should make provision for pedagogical training for Computer Education teachers.

4. As the training programme was found effective in development of skills and competencies, change in teaching behaviour and also students achievement, such short duration training programme should be organized by the Gujarat government and/or school authorities.

5. The researcher's own observation during the process of research and also the students' reaction during the practical, it was found that the allotted period for Computer Education is not sufficient. Therefore, some more periods should be allotted for Computer Education.

8.19 SUGGESTION FOR FURTHER RESEARCH

Research studies in general open new avenues for further research in concerned area. The present study is not an exception. The following are the suggestions for further research.

1. The developed training programme was aimed at bringing changes in computer teachers teaching behaviour and students learning which was of very short duration. So, a long term in-depth training programme could be designed and implemented by incorporating needed pedagogical components.
2. Research could be conducted for in-depth understanding and exploring the nature of Computer Education and the process of students learning.
3. Research could be conducted especially focusing on only Models of Teaching like Advance Organizer Model and Mastery Learning Model.
4. Research could be conducted to evolve new strategy and methods of teaching Computer Education.

8.20 CONCLUSION

It is assumed that the teachers generally have more or less mastery over the theoretical as well as practical aspect of their concern subject area. But this theoretical and practical knowledge of the subject can be transferred effectively to students by applying suitable methods, techniques, skills and creating conducive atmosphere. The findings of the present study shows that the training programme given to Computer Educating teachers of experimental group did make a difference in teachers teaching behaviour during transacting curriculum and also brought significant difference in students' achievement on overall, theory and practical of Computer Education as compared to their control group. From these findings, it could be concluded that the trained teachers utilized the training input and such short term training programme for in-service Computer Education teachers are essential to bring desirable change in teachers' teaching behaviour and students' learning.