Chapter 3

Research Methodology

3.0 Introduction

Any research can hardly be completed without the details of a procedure of study to be adopted by the researcher. In fact, this is the soul and substance of a research. Unless researchers have clearly visualized and definitely outlined the sequential steps by which they will study a problem in their view, researchers can hardly accomplish the task. Plan and procedure includes method of investigation, selection of sample, tools and/or technique to be used, aspects of research design and data collection. It bears a very close relationship with the purpose and objectives of the study. Methodology is the part of the plan and procedure. It is desirable to have a proper methodologically designed research plan. An appropriate methodology can help in getting proper research outcomes. The present study is developmental cum experimental in nature; the procedure of scientific research has been followed as presented below.

3.1 Objectives of the Study

1. To develop multimedia learning package for enhancing ICT skills at pre-service level.
2. To implement multimedia learning package for enhancing ICT skills at pre-service level.
3. To study the effectiveness of the developed multimedia learning package with respect to academic achievement in pre-test and post-test of student-teachers of experimental and control group.
4. To study effectiveness of multimedia learning package in terms of ICT based lesson plan developed by student-teachers of experimental group.
5. To study the change in perception of student-teachers of control and experimental group with respect to ICT skills and application of ICT in Education
6. To study the reaction of the student-teachers of experimental group on developed multimedia learning package.

3.2 Hypothesis of the study

- There will be no significant difference in the mean achievement score of the student-teachers of experimental and control group in pre-test and post-test.
- There will be no significant difference in the perception of the student-teachers regarding ICT skills and application of ICT in Education of experimental group before and after intervention.
- There will be no significant difference in the perception of student-teachers regarding ICT skills and application of ICT in Education between control and experiment group.

3.3 Methodology

Researcher adopted experimental design for the present study presented as follows.

3.3.1 Design of the Study

The present study was experimental in nature. The researcher adopted Quasi-experimental Design. Pre-test Post-test Nonequivalent group Design was chosen for the present research. The researcher did the real-time experiment for the present study, where it was difficult to use randomization for the selection of samples for experimentation and thus the researcher took the sample purposively. The experimental design of the present study is presented in figure 3.1 as below.

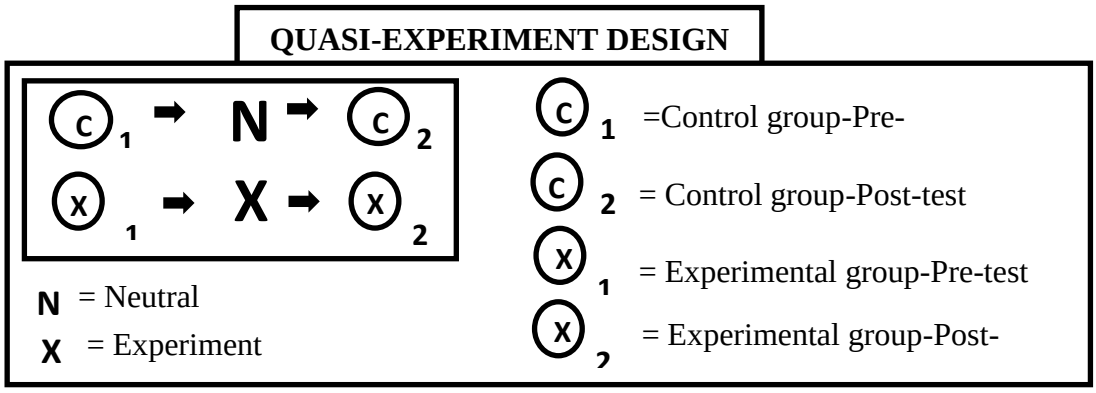

Figure: 3.1

Quasi Experiential Design of the Study

Present study has two variables- 1) Dependent Variable: Academic achievement, Perceptions 2) Independent variable: Multimedia learning package.

With the help of pre-test and post-test, the academic achievement of student-teachers was measured before and after the experimentation respectively for both the experimental and control group. First pre-test was implemented to both experimental and control group. Then the experimental group was subjected to intervention. Finally post-test was given after the intervention. Students teachers of experimental and control group were also given perception scale before and after intervention program. After testing, effectiveness of the multimedia learning package was studied by applying appropriate data analysis technique. The student-teachers of experimental group were also given reaction scale to study their views on multimedia program.

3.3.2 Population of the Study

The population for the present study consisted all B. Ed. Student-teachers studying in English medium B.Ed. Institutions of Gujarat.

3.3.3 Sample of the Study

Sample for the present study was selected purposively considering the experimental nature of the present study and keeping in mind the feasibility aspect of the experimentation. Two teacher education institutions of Vadodara city were taken purposively as the sample for the present study. Student-teachers of the Department of Education, The Maharaja Sayajirao University of Baroda were selected as experimental group and student-teachers of Navrachna University were selected as the control group. There were 48 and 47 student-teachers in the sample of experimental and control groups respectively having Science/Chemistry/Physics/ Biology as one of their method. Pre-test was administered to both control and experimental group. Total 34 student-teachers attended intervention program fully while 32 student-teachers of Navrachna University attended both the pre and post-test. So, the sample comprised of 34 student-teachers of The Maharaja Sayajirao University of Baroda considered as experimental group and 32 student-teachers of Navrachna University considered as control group.

3.4 Tools and Techniques for Data Collection

Achievement Test: The researcher constructed achievement test as a pre and post-test to test academic achievement in ICT Skills among student-teachers. Achievement

test was developed based on blue print of the achievement test. The achievement test constituted the questions covering different aspects like knowledge, understanding and ICT Skill. It covered all types of questions related to awareness about the use of ICT in Education, knowledge about educational software packages in Education, ICT skills and application of Web 2.0 tools in Education. The constructed achievement test was given to the experts in the field of Technology and Education for the purpose of its validation. The suggestions of the experts were noted down and incorporated then it was revised. The achievement test is given in appendix I and Blueprint of the achievement test is given in appendix II.

Perception Scale: Perception Scale was prepared by the researcher to study the perception of student-teachers regarding Information and Communication Technology and related skills. Perception scale having twenty five statements covering statements comprising of skills of data processing, skills of technology integration, skills of media design, skills of communication and collaboration in education, skills of web enhanced learning environment etc. Student-teachers marked their perception on a 5 point Likert scale ranging from 'strongly agree' to 'strongly disagree' through 'agree', 'can't say', and 'disagree'. Student-teachers were supposed to show their reaction by putting a tick mark (√) in the appropriate box for each statement. For validation, the perception scale was given to the experts from the field of Education and ICT for their suggestions and accordingly their suggestions were incorporated in the perception scale. The perception scale is given in Appendix III.

Reaction Scale: Reaction Scale was prepared by the researcher that was of 5 point scale to know reaction of the student-teachers toward developed multimedia learning package used for developing ICT Skills among student-teachers. Reaction scale having twenty five statements covering various aspects of the multimedia learning package like clarity of concepts presented under package, comprehensiveness of the package, ICT skill development through package, usability of the package, utility of the package etc. The five points of reaction were ranging from 'strongly agree' to 'strongly disagree' through 'agree', 'can't say', and 'disagree'. Student-teachers were supposed to show their reaction by putting a tick mark (√) in the appropriate box for each statement. For validation, the reaction scale was given to the experts from the field of Education and ICT for their suggestions and accordingly their suggestions were incorporated in the reaction scale. The reaction scale is given in Appendix IV.

Rubrics: Rubrics was prepared to assess developed digital lesson plans and Powerpoint presentation by the student-teachers. There were total 25 marks assigned in the rubrics for all the items and components of developed lesson plans and 25 marks for the Powerpoint presentation too. Rubrics to assess digital lesson plan containing assessment criteria for the items of the digital lesson plan like unit summary, design of instructional objectives, design of instructional strategies, use of materials, organization and presentation, use of technology, way of assessment etc. Rubrics to assess powerpoint presentation containing assessment criteria for title slide, content presentation, organisation of content, use of audio and video, use of images/charts/smartArt, use of animation and slide design, references and websites referred etc. Digital lesson plan and PowerPoint presentation were analyzed based on rubrics and marks were given out of 25 marks for the developed lesson plan and PowerPoint presentation. Rubrics to assess digital lesson plan and Powerpoint presentation is given in appendix V.

3.5 Development of Multimedia Learning Package

The researcher developed multimedia learning package for enhancing ICT skills. In order to develop a multimedia learning package the researcher followed different stages of its development.

- Selection of the content and categorization in terms of topics and sub topics
- Assembling the features with text, pictures, audio, video graphics in multimedia learning package
- Developing video script and video of the content to be presented in the package
- Validation of Multimedia Package
- Tryout- The pilot study

3.5.1 Planning and Analysis of Content

The researcher identified thrust area of ICT in Education by considering recommendations of NPE (1986), National Policy on Information and Communication Technology (ICT) in School Education (2011), NCFTE (2006), UNESCO (2002, 2009), UNESCO ICT-CFT (2011), NKC (2009), FICCI (2009) towards use of ICT to deliver his/her lesson more effectively by using different media like Audio, Video, Animation, Picture etc. Researcher developed learning material for the following topics.

Table 3.1

Selected Topics and Subtopics

Sr. No.	Content	Sub point
1	Microsoft office 2010	Word Processors, Spread sheets, Powerpoint presentation, Publisher
2	Search Engine	Google
3	Development of Movie	Windows Movie makers, PICASA Software
4	Development of Educational Websites	Google Site
5	Web 2.0 Tools	Facebook, Twitter, Edublog, Skype

All five topics of ICT integration in Education namely, Microsoft Office 2010 and educational implications, effective searching in Google search engine, development of movie, development of educational websites, Web 2.0 tools etc. were taken for the study and development of multimedia learning package. The researcher developed learning resource draft of content. After initial planning and analysis of the content, the researcher drafted the blueprint for the multimedia package by outlining the content. Initially learning material was developed of all the content and sub topics. For information collection to design learning resources and the layout for multimedia package, the researcher browsed the topics on the Internet and in the books/ articles like-

Books/Articles:

- The Cambridge handbook of multimedia learning (Mayer, 2005)
- Creating instructional multimedia solutions: Practical guidelines for the real world (Fenrich, 2005)
- Multimedia for learning: Development, application, evaluation (Gayeski, 1993)
- Teachers as multimedia designers? Rethinking prospective teachers making multimedia learning packages (Hu, 2005)
- Digital Teaching Skill (March, 2009)
- Multimedia Learning (Mayer, 2001)
- Interactive Multimedia in Education and Training (Mishra & Sharma, 2005)
- Methodology of Multimedia Production (Pant,1998)
- Educational characteristics of multimedia: A literature review (Stemler, 1997)

- Theoretical foundations of multimedia (Tannenbaum, 2000)
- Teacher motivation and the use of computer-based interactive multimedia (Toth, 2002)

Websites:

- GCF- LearnFree.org
- http://herinst.org/sbeder/home.html#resources (Beder, 2001).
- www.gesci.org/old/files/docman/TPD_Workshop-Concept_Note.doc (Hooker, 2008)

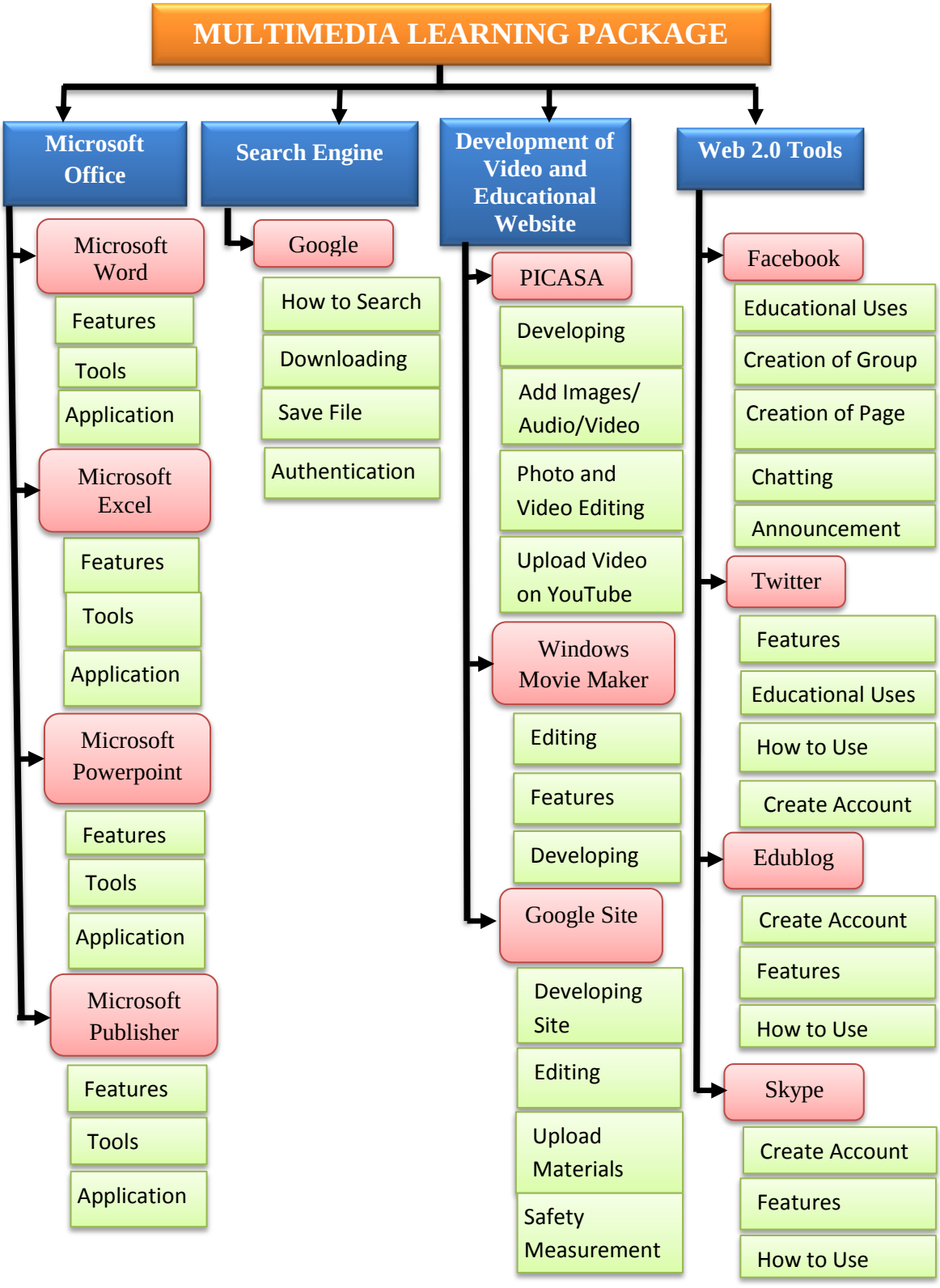

Figure 3.2

Selected Topics and Sub Topics for the Multimedia Learning

Learning material was developed with the help of snapshots and images along with the text.

Step by step procedure was presented with the help of is. On completion of initial planning and analysis of the content, the researcher drafted the script for the multimedia package by outlining the content.

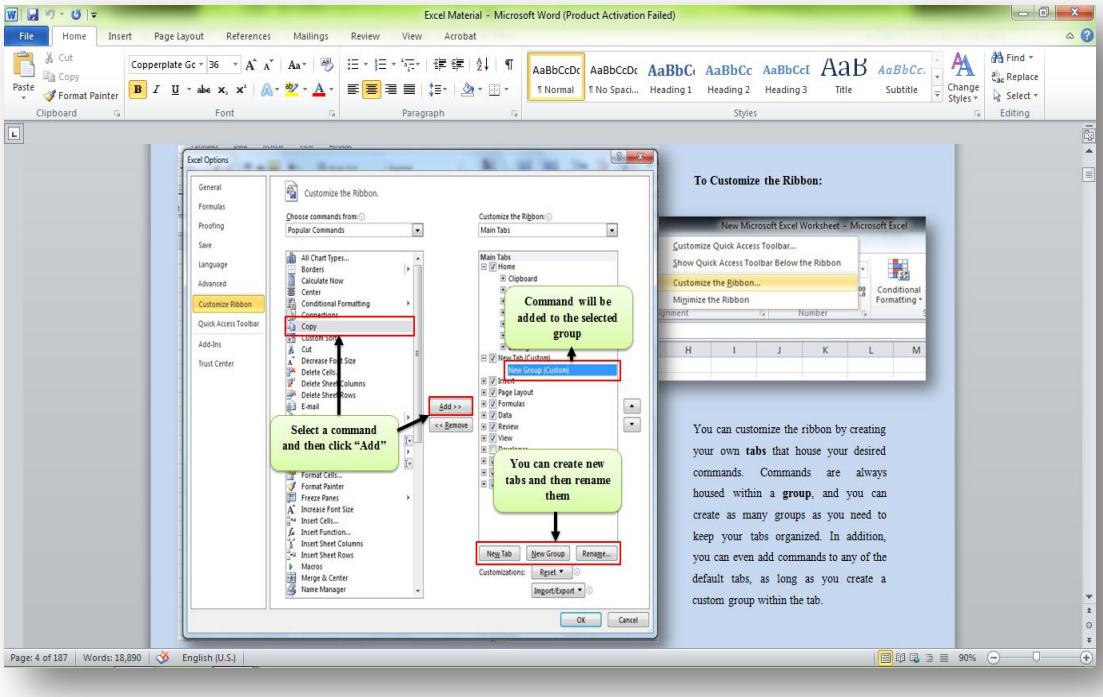

Figure 3.3

Draft of Learning Resources

3.5.2 Assembling Developed Learning Materials

The researcher developed the text material along with pictorial presentation. Learning resources were assembled and assimilated in the Adobe Acrobat software to create multimedia learning package. Researcher used trial version of the Adobe Acrobat to create multimedia learning package. The principles for the development of multimedia package were taken into consideration by the researcher during development of the multimedia package. Researcher studied and considered characteristics of the components of multimedia like background color, text size, color, size of pictures etc. for the effective presentation of the multimedia learning package. Content presented in the form of text and pictures simultaneously. The Multimedia learning package had enough scope for the student-teacher to learn

concept effectively. It had enough scope for self-learning.

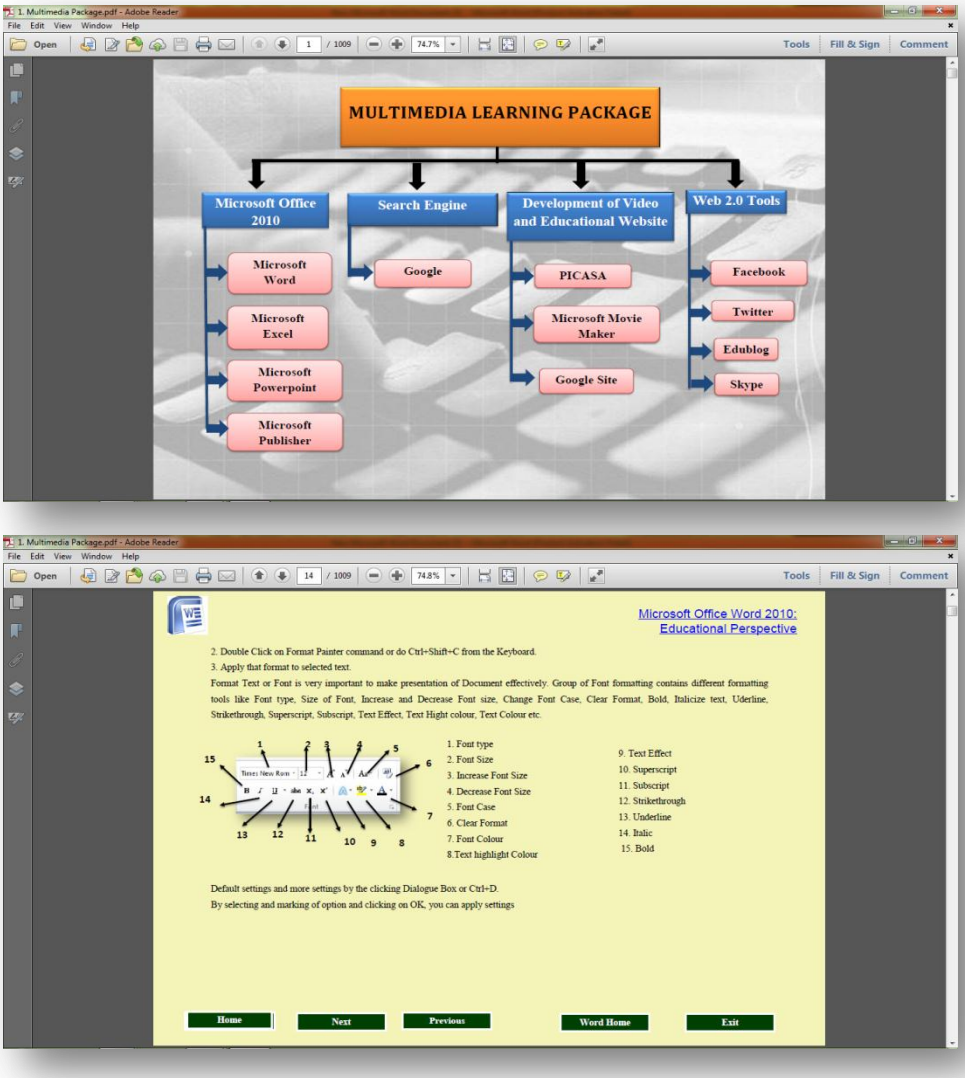

Figure 3.4

Draft of Multimedia Learning Package

Researcher developed content and assemble in multimedia learning package. Each graphic was edited for proper matching of images and text. The developed package was given to the experts in the field of Education and Technology and package was validated. The appropriate changes were made in the package as per the suggestions. Pilot study was also carried out by the researcher to ascertain its utility.

Figure 3.5

Organization of Topics and Subtopics in Multimedia Learning Package

For the effective presentation of the content, number of links were presented in multimedia learning package. e.g. by clicking on “Microsoft Word” button takes one to the tutorial of Microsoft Word. Each unit was divided into subunits. By clicking on particular sub topic, student-teachers could go to that sub unit. e.g. By clicking on subunit “Text Basics” they could go to a particular section.

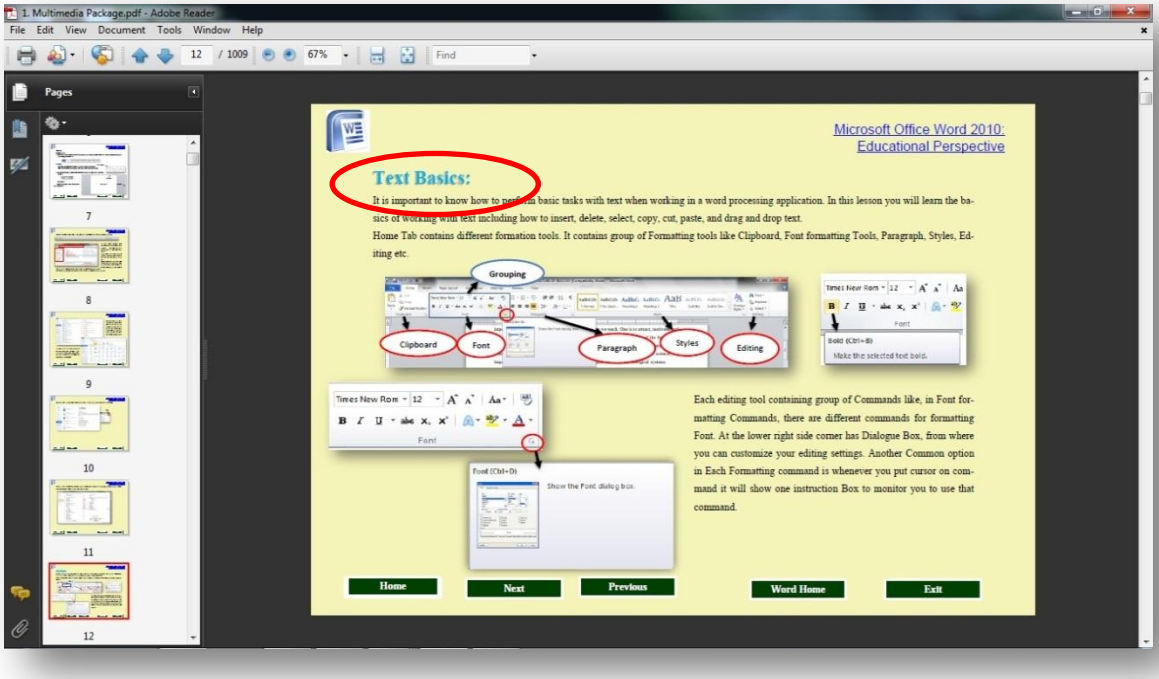

Figure 3.6

Layout of Subtopic in Multimedia Learning Package

The navigational bar containing the icons placed at the bottom of the screen and the Buttons with the icons like Home, Next, Previous, Exit were given that remained constant throughout the package.

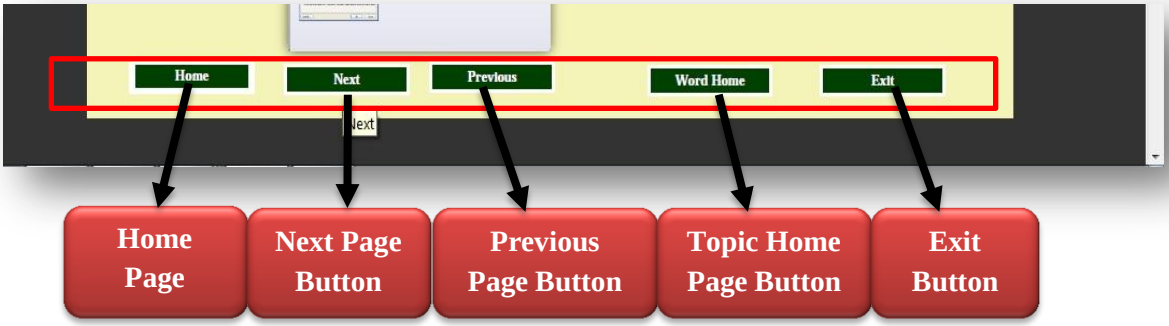

Figure 3.7

Layout of Navigation Bar

Home: Home button brings to Home page of the package.

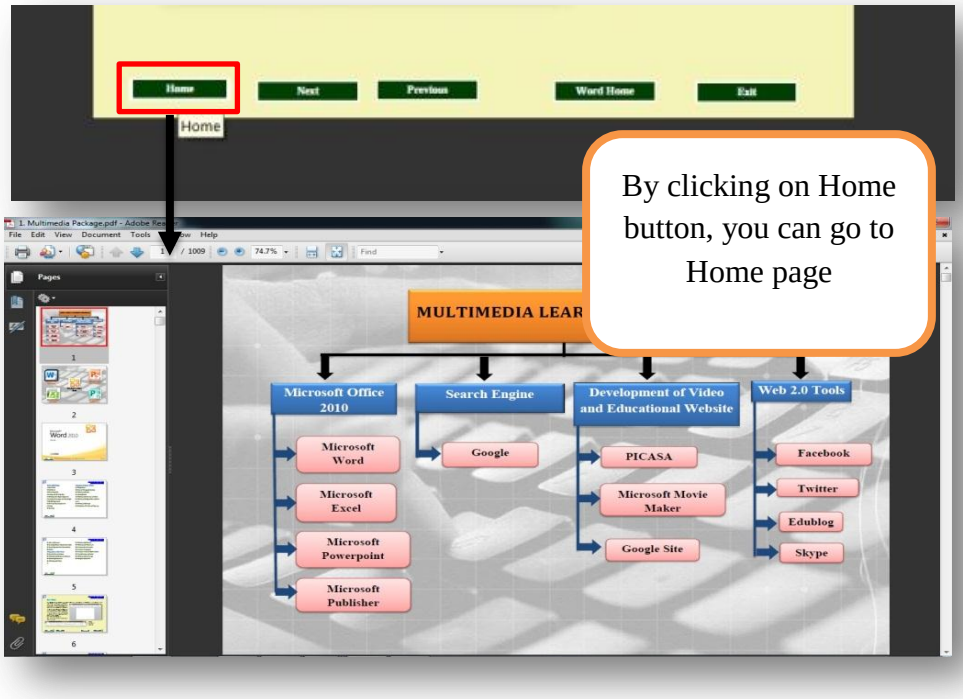

Figure 3.8

Use of Home Page Button in Multimedia Learning Package

Next: Next button brings to next sub topic of the section.

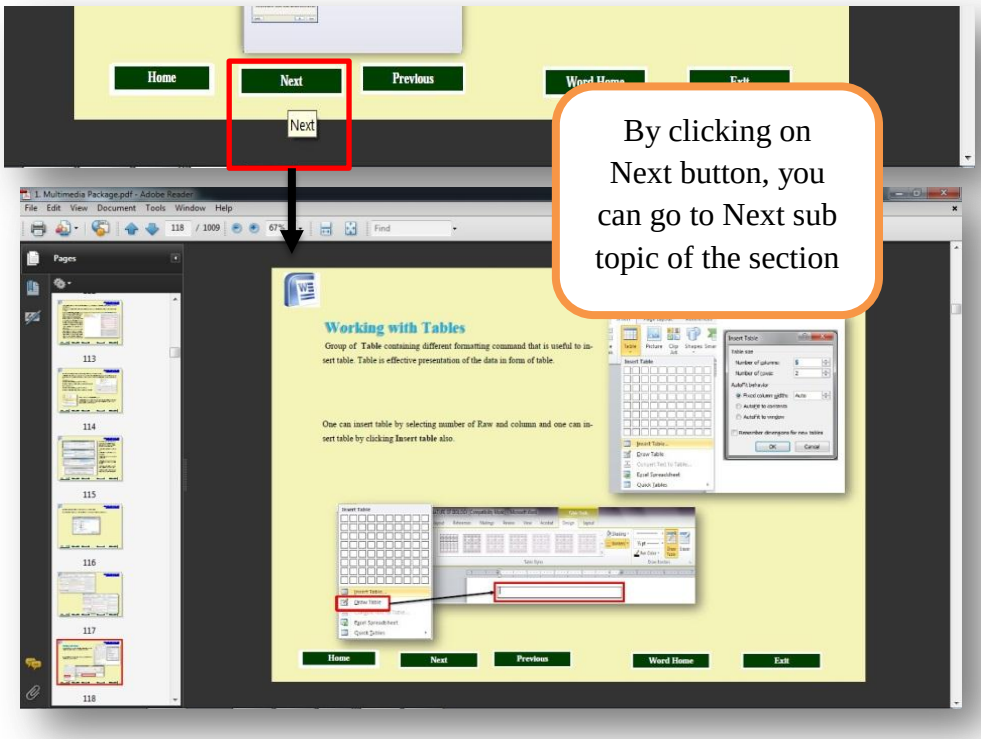

Figure 3.9

Use of Next Page Button in Multimedia Learning Package

Previous: Previous button brings to previous sub topic of the section

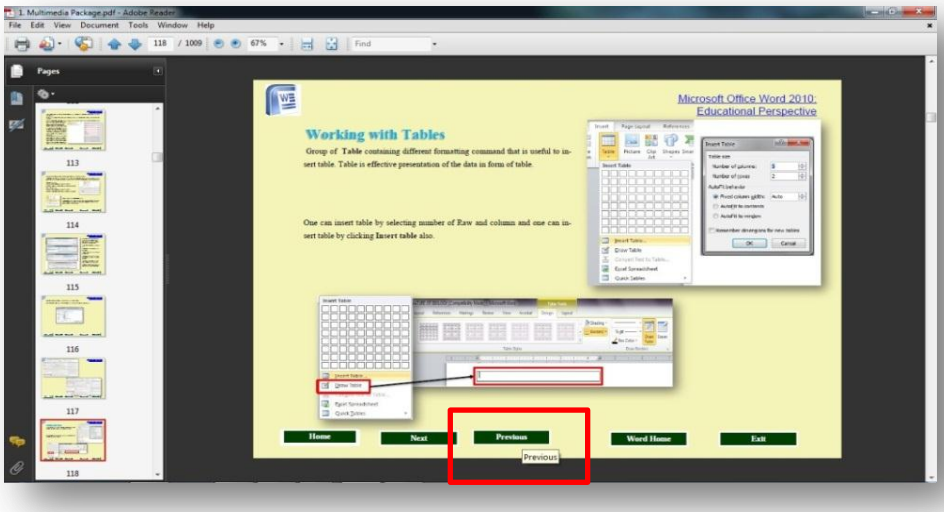

Figure 3.10

Use of Previous Page Button in Multimedia Learning Package

Topic Home: This button brings back to homepage of that respective topic.

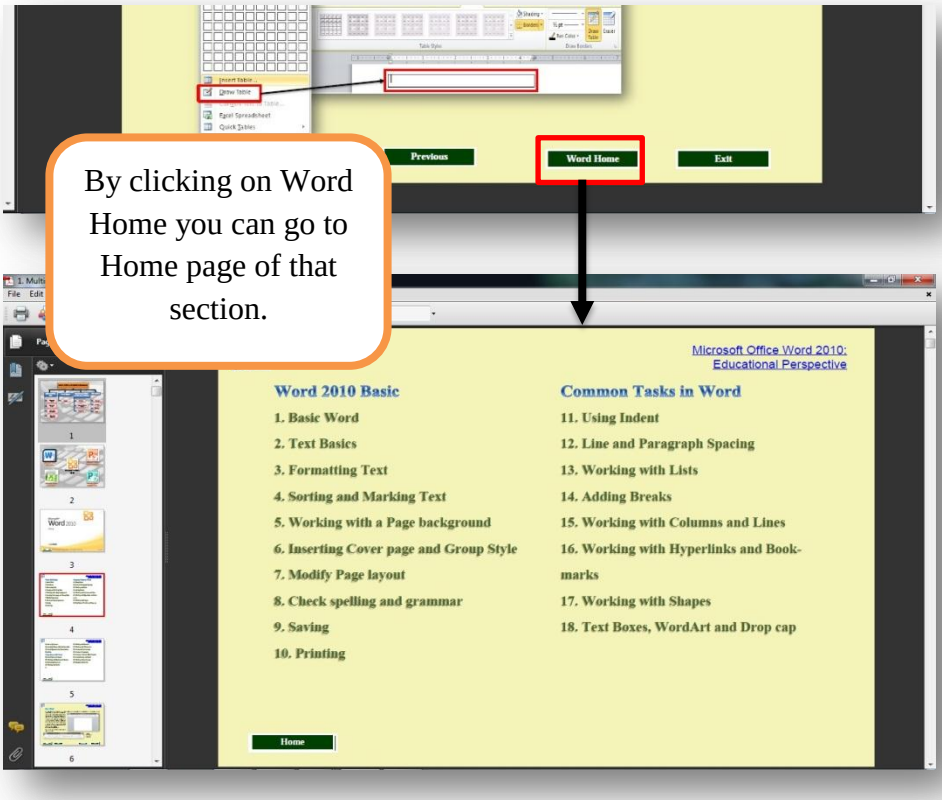

Figure 3.11

Use of Topic Home Page Button in Multimedia Learning Package

Exit: Exit button to come out of the package.

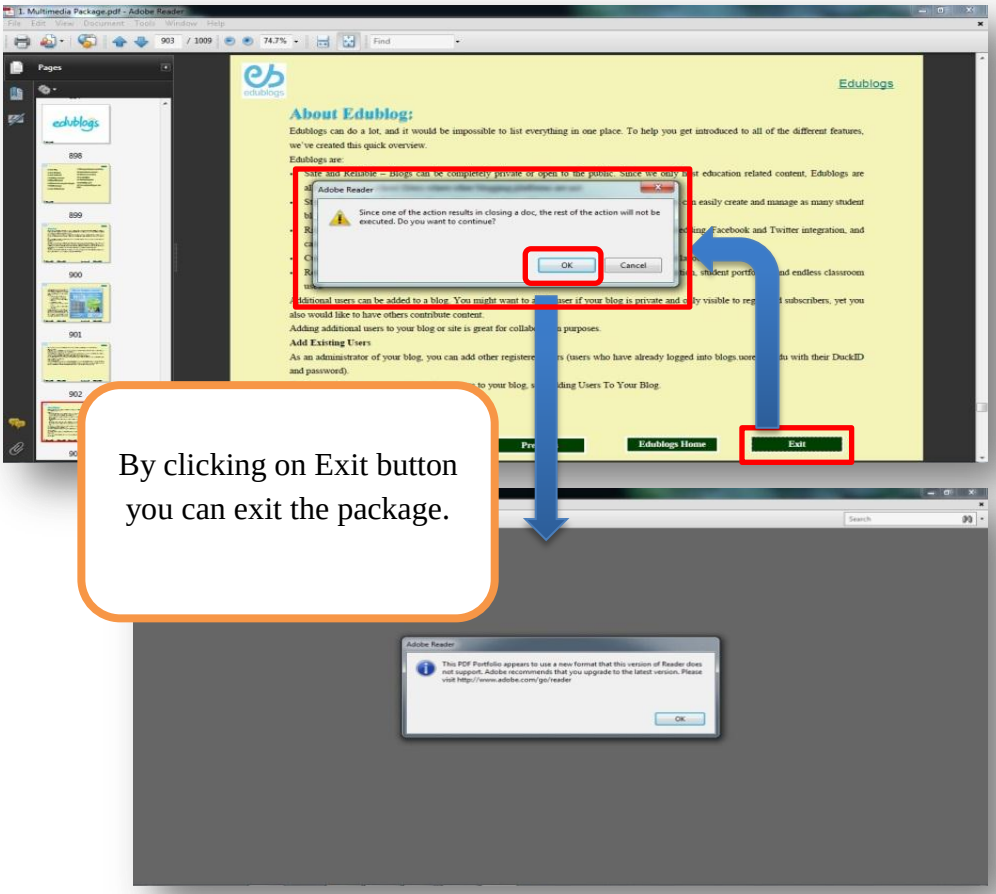

Figure 3.12

Use of Topic Home Page Button in Multimedia Learning Package

As showing in figure 3.13, there are options of zooming, move from one page to another, view mode etc. under Menu Bar that help student-teachers to move from one page to another easily.

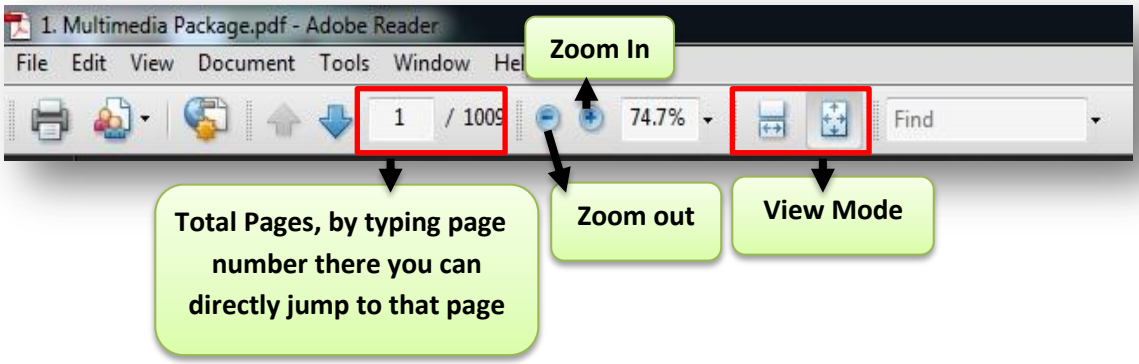

Figure 3.13

Use of Home Tab of Adobe Reader Software

Navigation pane on the left side of the screen helps student-teachers to jump directly from one page to another by clicking on it. You can also hide or explore this navigation pane as per the requirement.

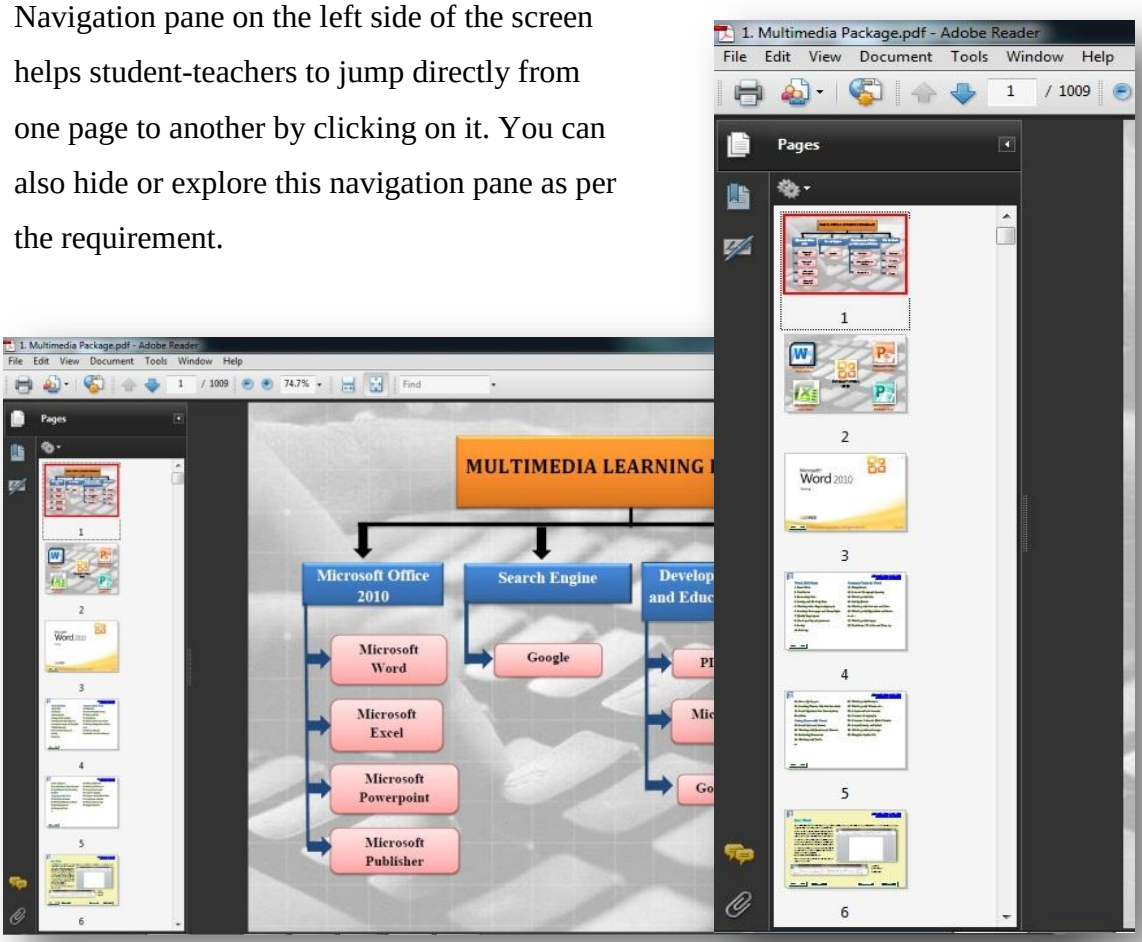

Figure 3.14

Use of Navigation Pane of Adobe Reader Software

3.5.3 Drafting Video Script and Development of Video

The content of each topic is to be presented with the help of video. The learning resources in form of text for all content were converted to voice recording to incorporate in the package.

The researcher tried his best to give better tone and style to the speech and recording. It was really challenging to incorporate video file of high memory size and there were error of the software while incorporating. Thus, video file is given separately in given CD of multimedia.

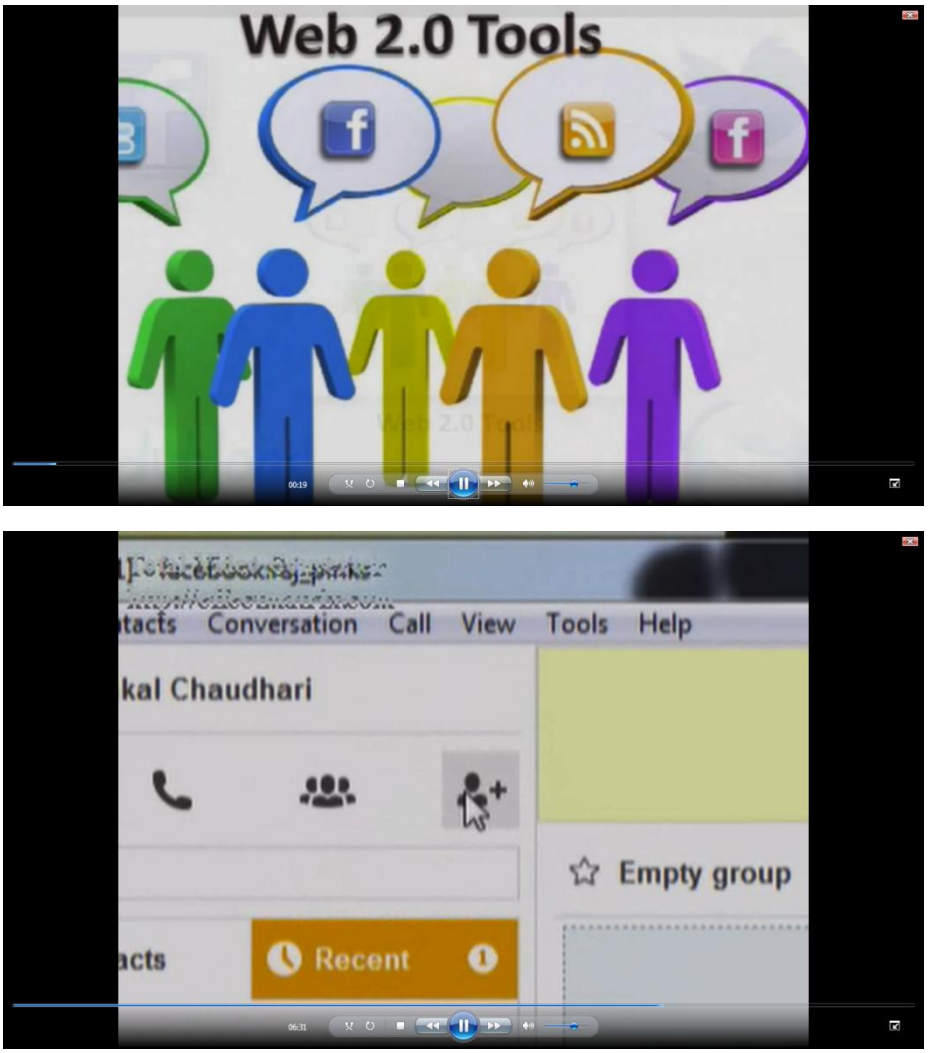

Figure 3.15

Presentation of the Content with the help of Video

3.5.4 Tryout of the Multimedia Learning Package

Pilot Study is a testing phase to ensure reliability and validity of the multimedia learning package. The pilot study of the package was conducted on the student-teachers of the Maharaja Sayajirao University of Baroda during academic year 2013-14. The researcher implemented multimedia learning package and collected their observation in the form of students reactions, their participation, recorded their view to improve applicability and usability of the package. After discussion, suggestions were incorporated in the package. The soft copy of multimedia package is provided with the thesis.

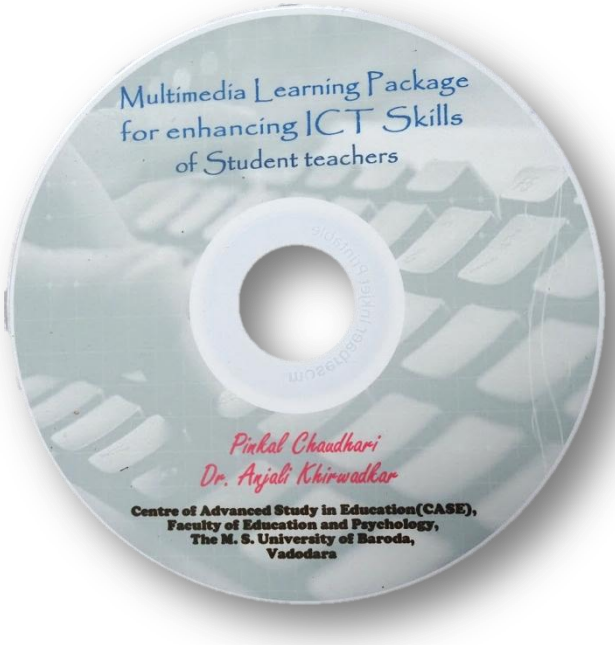

Figure 3.16

CD-ROM of Multimedia Learning Package

3.6 Procedure of the Study

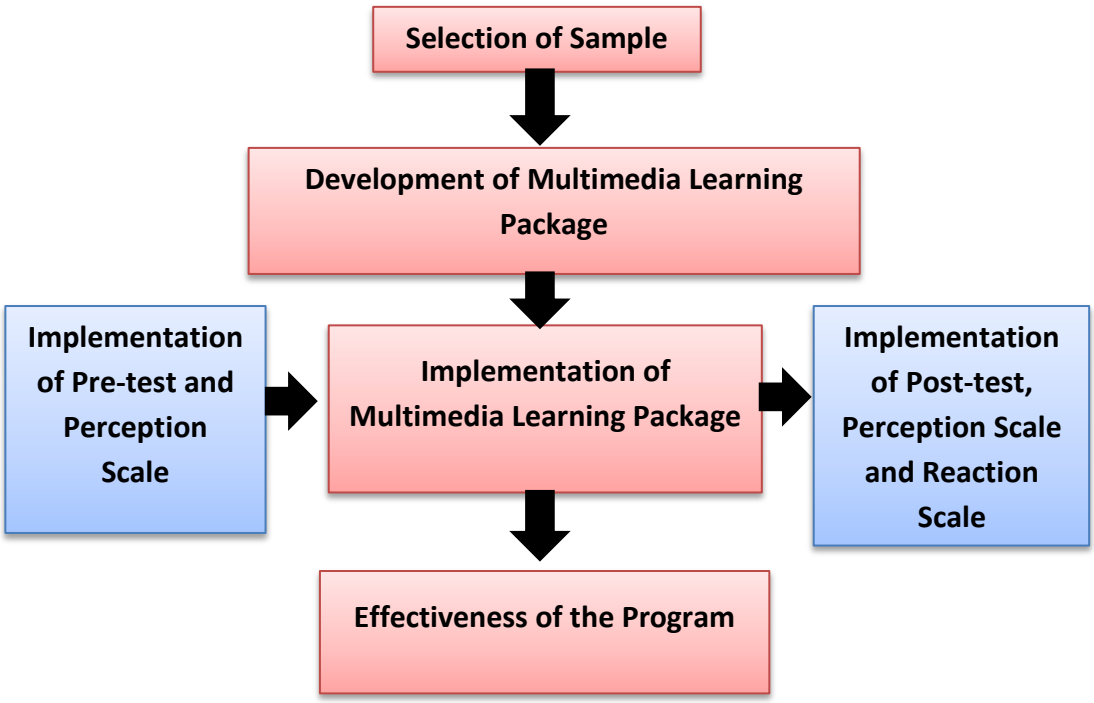

Figure 3.17

Procedure of the Study

Phase 1: Development of Tools for Data Collection

Present research has total four tools to collect data from the student-teachers. Researcher developed tools like Achievement test, Reaction scale, Perception scale, Rubrics for the data collection. Researcher identified components of the tools. After identification of the components, researcher designed blueprint for the achievement test, outline of the perception scale, reaction scale, and rubrics. After drafting and reviewing many time, draft of the tools were prepared. Experts from the field of ICT and Education validated the tools. Valuable suggestions were collected and noted down. Suggestions were incorporated after discussion with guide. After drafting tools many times, final draft of the tools was prepared. All the tools- achievement test, perception scale, rubrics, reaction scale are given in the appendix I,III,,IV and V respectively.

Phase 2: Development of Multimedia Learning Package

Multimedia learning package was developed in the subject of ICT in Education as a combined output of varied aspects in the form of text, audio, video and animation. During design integration of ICT components and content were the main constituents. Along with this context is also vital while integration of technology. So it was important to select appropriate media and learner control along with content selection. The researcher took care of all these components, selected topics and designed learning material carefully, took care while use of text, images, audio and video carefully. Researcher also took care of learner control during development of the package. Researcher used language that is understandable for all learners. Necessary software like M. S. Office 2010 package, Adobe Reader, Picasa, Skype, VLC player etc. were also given along with Fonts setup CD provided to the student-teachers. User's Manual was also given along with CD.

Phase 3: Administration of the Pre-test and Perception Scale

Researcher took the required permission from teacher education institutes of the control and experimental group to conduct study (Permission letter is given in Appendix VII and VIII). Researcher administered pre-test and perception scale on student-teachers of the control and experimental group. Both the control and experimental group students were informed about the test before implementation.

Time duration of the test was fifty minutes for the 50 marks' achievement test, and 20 minutes for the perception scale.

Phase 4: Implementation of the Multimedia Learning Package

Implementation of the developed multimedia learning package was done after the administration of pre-test and perception scale. Researcher managed total 40 periods in the morning time before college time and in regular classes in the timetable each with the duration of 45 minutes from August to March month during the academic year of 2014-15 for the implementation of the multimedia package. The researcher taught to the whole experimental group for the eight months period with the help of the developed multimedia learning package. Initially orientation was given about the program and multimedia learning package. Researchers took sessions and taught student-teachers of experimental group. Along with the process of teaching-learning the researcher acted as a facilitator and guide while practical work. To facilitate self learning, CD of the multimedia learning package was given to all the student-teachers of the experimental group. During the same duration the control group was taught by their own teacher through traditional method.

Phase 5: Post-Test

After intervention of the program, the student-teachers were given post-test, perception scale and researcher collected Digital lesson plan and PowerPoint presentation developed by the student-teacher in Science subject. Along with that researcher also implemented reaction scale to seek the reaction of the student-teachers of the experimental group about multimedia learning package.

In the last week of March 2015, researcher completed the implementation program for experimental group through multimedia package. After intervention researcher implemented same achievement test and perception scale as a post test on both the control and experimental group. Same time was given to answer achievement test (50 mins) and perception scale (20 mins). The reaction scale was administered only on experimental student-teachers of experiment group. Enough time was given to the student-teacher to mark their opinion. Similarly Digital lesson and Powerpoint presentation were collected from the student-teachers of experiment group in the form of CD.

3.7 Procedure of Data Analysis

Data collection was done in 3 Phases during Academic year 2014-15.

1) By employing pre-test and implementing perception scale before intervention on both the control and experiment group student-teachers.
2) By collecting developed technology based digital lesson plan from experiment group student-teachers.
3) By employing post-test, perception scale and reaction scale after the intervention. Post-test, perception scale was employed on both the control and experiment group student-teachers and reaction scale administered only on experiment group student-teachers.

Table 3.2 is providing information regarding the use of tool for objective wise data Collection.

Table 3.2

Use of Different tools and Techniques to collect data to achieve Objectives

To achieve…	**Tools used for Data Collection**
Objective 3	Pre-test and Post-test
Objective 4	Rubrics
Objective 5	Perception Scale
Objective 6	Reaction Scale

The data collected through pre-test and post-test was analyzed by employing quantitative data analysis techniques. The non-parametric techniques was used to analyze the data as the sample was taken purposively. Mann-Whitney U-test was used to analyze the quantitative data collected through post-test as it is considered as the most powerful non-parametric equivalent of t-test of parametric family. The researcher calculated mean, Standard Deviation, Standard Error of Mean and Mann-Whitney U-test. For testing the significance between the perceptions of student-teachers of experimental group, non-parametric Wilcoxon Sign Rank test was used to know significance before and after implementation of the package among experimental group's student-teachers. Researcher used Wilcoxon Rank Sum Test for two independent groups. To study level of change in perception between control and

experiment group student-teachers, intensity index (II) was used by the researcher. Percentage, frequency and intensity index (II) for the reaction scale were used as data analysis techniques. Digital lesson plan was analysed with the help of percentage and frequency. Manual calculation and SPSS software were used to analyse data. The detailed analysis and interpretation of the data is given in chapter IV.