pointed out the limitations of the researchers in preparing the TAL packages at school and college level.

- It helped the researcher to identify the student-outcome variables of his study viz. academic achievement of the students in the present study.
- The literature review also helped the researcher to gather related data, methodology of preparation of TAL package, information and requirements of software. It also focused on the methodology used by previous researchers to conduct research and come to the final conclusions.

CHAPTER III
RESEARCH DESIGN

The main objective of the study is to develop Technology Assisted Learning Package (TALP) in the subject of educational psychology and educational management for B. Ed. Students. This chapter deals in details the research design of the present study. It includes, methodology used for research, sampling techniques, the
procedure of selection of content for developing package, method of developing the package, pilot study to see suitability of the package, selection of sample, selection and construction of tools for data collection and method of conducting a final experiment. An attempt has been made to present the details of steps taken to develop the TALP and later on to find out its effectiveness.

**Meaning of Research**

Research has been defined as ‘the systematic and objective analysis and recording of controlled observations that may lead to the development of generalizations, principles or theories, resulting in prediction and possibly ultimate control of events’ 24

Research is not mere information gathering. It is a systematic process of study the problem, search the reasons and finally reach to the conclusions. It provides systematic support of data to answer a question, the resolution of a problem, or a greater understanding of a phenomenon.

**Educational Research**

Educational Research refers to a systematic attempt to gain a better understanding of the educational process, generally with a view to improving its efficiency. 25

**Meaning of Research Design**


“A research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure.”

In fact, the research design is the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data.

**Need for Research Design**

‘Research design is needed because it facilitates the smooth sailing of the various research operations, thereby making the research as efficient as possible yielding maximal information with minimal expenditure of effort, time and money. Just as for better, economical and attractive construction of a house, a blueprint is needed (or what is commonly called as the map of the house) well thought out and prepared by an expert architect; similarly a research design or a plan is needed in advance of data collection and analysis for our research.’

**Research Methods**

There are different methodologies included under the term research. Researcher follows a particular method of research suitable for his/her study which is directly connected to the actual statement of problem and goal of research under study.

Research methods can be broadly classified into three main categories:

---


a. Historical research

Historical research involves the systematic search for documents and other sources that contain facts related to historians, questions about the past. It is the process of systematically examine past events to draw conclusions about the past. In historical research the researcher is totally dependent on the availability of documentary sources.

b. Descriptive Research: Descriptive research is concerned with the current or past status of something. A descriptive study asks what is or what was; it reports things the way they are or were. Descriptive research does not involve manipulation of independent variables. Descriptive research is concerned with studying conditions and practices that exists, opinion that are held currently, relationships that exists among variables, trends, that are developing, processes that are going on, structures that exists. It usually deals with relationships between variables, testing hypothesis, developing generalizations, principles or theories that have universal validity.

c. Experimental Research: Experimental research describes “what will be” when certain variables are carefully controlled or manipulated. The focus is on variable relationships. It provides a systematic and logical method of answering the questions. Experimental research in education is often termed as field research because it is done in schools and classrooms and not in the laboratory. The results of educational experiments may have a direct impact on the
adoption of new materials, curricula, teaching methods etc. because most of the experiments carried out in educational research are concerned with the same.

**Methodology of the present study**

The experimental method of research was used to achieve the specific objectives. The research aimed at comparing the impact of two modes of learning namely Face to Face (F to F) learning and the Technology Assisted Learning (TAL) on B. Ed. students in learning theory based topic and skill based topic from the regular B. Ed. syllabus. The researcher prepared two similar groups of students on the basis of their CET scores obtained by the students. The student were divided into 5 ranges of score obtained by them in B. Ed. CET from 20-24, 25-29, 30-34, 35-40 and 41 & above. The numbers of students from above ranges were divided equally into both the Groups.

A pre-test for both the groups with the same test paper was conducted. One group was taught the theory based topic namely 'Motivation' with F to F mode whereas another group learnt the same topic by TAL mode. Finally a post-test was conducted for both the groups with same test paper. The marks obtained by the students were considered as test scores. The difference between pre-test and post-test scores were considered as Gain scores which were used for further analysis and conclusion after applying 't' test. Same method was followed for the skill based topic namely 'Unit Test Plan'.

**Population**

The first step in developing any sample design is to clearly define the population. A population is any group of individuals who
have one or more characteristics in common that are of interest to the researcher.\textsuperscript{28}

In the present study, the population comprised of students of B. Ed. colleges situated in Thane district and affiliated to the University of Mumbai.

**Sample**

The representative proportion of the population is called a sample.\textsuperscript{29} Sampling may be defined as the selection of some part of an aggregate or totality on the basis of which a judgment or inference about the aggregate or totality is made.\textsuperscript{30}

Sampling is the process by which a relatively small number of individuals or measures of individuals, objects or events are selected and analyzed in order to find out something about the entire population from which it is selected.

In the present study, all the colleges were selected from Thane district.

Thane district is selected for research study due to following reasons:

a. As per Census 2011, average literacy rate of Thane city is 91.36\% percent. The male and female literacy rate is 94.19 and 88.14 \% respectively.

b. Thane city is a part of Mumbai Metropolitan Region and very close to Mumbai city. The Mumbai city culturally impacted the Thane city.

\textsuperscript{28} Kothari, C.R.  \textit{Op. Cit.} p. 55 - 60
\textsuperscript{29} Koul, L.  \textit{Op.Cit.} p.105
\textsuperscript{30} Kothari , C. R.  \textit{Op. Cit.} p. 45
c. Thane city is linked with and surrounded by suburbs through Central and Trans-Harbour Line Suburban railway network. It is a railway junction for the Thane-Vashi Harbour Line and Central Line too. So it is well connected with urban and rural parts of the district.

d. The people of Thane largely influenced by Maharashtrian culture and a cosmopolitan culture as well like Mumbai city. The population of Thane city is increased since last five years and experienced huge residential boom. Due to its close location to Mumbai and low rates of land as compared to Mumbai, a large number of immigrants shifted from Mumbai city other regions of the country.

e. The city is full of multi culture and variety of people. Besides Marathi, the people from all regions of the country with different languages such as Mallyali, Sindhis, Punjabis, and Gujaratis from different regions live in Thane. It has language, regions and religious diversity. In other words, Thane district is inhabited with socio-cultural diversity including SC, ST, OBC and Minorities people.

f. A number of B. Ed. colleges located in Thane district are more than any other district of Maharashtra under the jurisdiction of University of Mumbai.

g. The Thane district is selected for sample of the research because, the students taking admissions to B. Ed. colleges located in Thane districts are belonged to this diversity which is one of the requirements of sample for research purpose.

**Size and Composition of the Sample**
The sample of the study includes all the students enrolled from these six un-aided B. Ed colleges in Thane district. Currently more than 400 students were enrolled for B. Ed. program for this academic year across all these six unaided B.Ed. colleges. But, those who have responded to tools of data collection are selected as a sample.

As these colleges are affiliated to University of Mumbai, they are expected to follow reservation policy as stipulated by the Government. Further they are admitted through passing the CET conducted by the Government of Maharashtra. The table 3.1 below presents the breakup of students across the six colleges and the sampling procedure which is adopted for the study.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>College 1</th>
<th>Col. 2</th>
<th>Col. 3</th>
<th>Col. 4</th>
<th>Col. 5</th>
<th>Col. 6</th>
<th>Total</th>
<th>Mode of learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>32</td>
<td>32</td>
<td>28</td>
<td>35</td>
<td>36</td>
<td>26</td>
<td>189</td>
<td>Face to Face</td>
</tr>
<tr>
<td>Group 2</td>
<td>31</td>
<td>31</td>
<td>28</td>
<td>36</td>
<td>36</td>
<td>27</td>
<td>189</td>
<td>Technology Assisted Learning</td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>63</td>
<td>56</td>
<td>71</td>
<td>72</td>
<td>53</td>
<td>378</td>
<td></td>
</tr>
</tbody>
</table>
The researcher made two groups of students from B. Ed. class on the basis of CET score obtained by the student teacher. The students were divided into the 5 ranges of score obtained by them in B. Ed. CET from 20-24, 25-29, 30-34, 35-40 and 41 & above. The number of students from above ranges was divided equally into both the Groups.

The total sample consisted of 378 students both boys and girls from unaided B. Ed. Colleges affiliated to University of Mumbai and situated in Thane district.

In the present study, initially the sample size comprised of 420 students. After editing for completion of the tools, the total sample amounted to 378 students. 42 forms were discarded on account of incomplete information. Hence the final sample size was 378 students.

Table 3.2 shows the final sample size included in the study.

<table>
<thead>
<tr>
<th>Data Collection</th>
<th>No. of Students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of forms distributed</td>
<td>420</td>
<td>100.00</td>
</tr>
<tr>
<td>No. of incomplete forms discarded</td>
<td>42</td>
<td>10.00</td>
</tr>
<tr>
<td>No. of forms included in the final sample</td>
<td>378</td>
<td>90.00</td>
</tr>
</tbody>
</table>

Table 3.2 shows that the wastage rate of the data was 10% on account of incomplete information.

Figure 3.1 shows the final sample size along with the wastage rate.
FINAL SAMPLE SIZE ALONG WITH THE WASTAGE RATE

![Pie chart showing 90% inclusion and 10% wastage rate.](image)

FIGURE 3.1

Table 3.3 shows distribution of sample from each group.

TABLE 3.3

DISTRIBUTION OF SAMPLE FROM EACH GROUP

<table>
<thead>
<tr>
<th>Data Collection</th>
<th>No. of Students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of students included in F to F mode</td>
<td>189</td>
<td>50.00</td>
</tr>
<tr>
<td>No. of students included TAL mode</td>
<td>189</td>
<td>50.00</td>
</tr>
<tr>
<td>Total no. of students</td>
<td>378</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Table 3.2 indicates the equal proportion of students from each of the group.

Figure 3.2 is a graphical representation of distribution of sample from each of the group.

GRAPHICAL REPRESENTATION OF DISTRIBUTION OF SAMPLE FROM EACH OF THE GROUP
FIGURE 3.2

TOOLS OF RESEARCH

The researcher requires many data-gathering tools or techniques which may vary in their complexity, design, administration and interpretation. Each tool is appropriate for collection of certain type of information. The researcher has to select from the available tools, may modify them or construct his own tool, which provide data he seeks for testing hypothesis.

Tools Used in the Present Study

For the purpose of the present study, the researcher has used five tools to collect information from students.

The following is the list of tools which have been employed by the researcher to aid in the process of data collection.

Tools of data collection:

The four tools developed for data collection include:
1. Personal data sheet
2. Technology Assisted Learning Package (TALP) developed for theory and skill based topic.
3. Test prepared by the researcher to measure learning retention for both the topics
4. Questionnaire for students on satisfaction regarding mode of learning.

1) **Personal Data sheet:** The students were required to give personal information such as their name, name of their college, gender (male/female) and faculty at degree level (arts/commerce/science). CET score, social, educational and linguistic background, Location of residence, level of computer literacy and accessibility to computer etc. of the respondent.

A copy of personal data sheet is given in Appendix B.

2) **Instructional Material:** The researcher had selected the topic of ‘Motivation’ of educational psychology subject and ‘Unit Test Plan’ of Educational Management of B. Ed. syllabus for this year. This was done on the basis of difficulty level of this chapter in understanding the concepts which was expressed by many students and teachers from various B. Ed. Colleges and also review of literature (Prabhakar 2000). So the researcher selected B.Ed. colleges from Thane district for the experiment and developed the first draft of TAL packages including the contents of selected chapters of B. Ed. Class.

The TAL package for chapter of ‘Motivation” includes following contents:
Motivation (theory based topic)
  o Introduction
  o Definitions of Motivation
  o Concept of Motivation
  o Examples of Motivation
  o Objective test on Motivation
  o Motivation Theories
  o Maslow's Hierarchy of Needs Theory
  o Revision and Examples of Hierarchy of Needs Theory
  o Objective Test result

The TAL package for chapter of ‘Unit Test Plan” includes following contents:

Unit Test (Skill based topic)
  o Introduction
  o Concept of Unit Test
  o Contents of Unit Test
  o Purpose of Unit Test
  o Unit Plan Design
  o The Blue Print of Unit Plan
  o Design of Unit Test
  o Objective test on Unit Test
  o Hands on experience to prepare a draft of Unit Test
  o Objective Test result
3) Achievement tests: The researcher prepared an achievement test which was used for pre-test and post-test. The test was prepared for the topic of Motivation of the subject of educational psychology and the topic of Unit Test Plan of the subject of Educational Management. It was validated by the experts in the subject of education and research. The pre-test was of 25 marks and it took 45 minutes for administration. The copy of the test is given in Appendix C.

### A. Following is a blue print of the test for Theory based topic of Motivation

I) Weightage to the content matter

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Content Area</th>
<th>%</th>
<th>Total Marks =25</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Motivation- Definitions, Concept, examples.</td>
<td>32</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>Motivation Theories, Maslow's Hierarchy of Needs Theory</td>
<td>48</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>Examples of Hierarchy of Needs Theory</td>
<td>20</td>
<td>5</td>
</tr>
</tbody>
</table>

II) Weightage to the objectives in the test for topic of Motivation
III) Difficulty level in the test for topic of Motivation

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Difficulty level</th>
<th>%</th>
<th>Total Marks =25</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Knowledge</td>
<td>48</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>Understanding</td>
<td>28</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Application</td>
<td>16</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Skill</td>
<td>08</td>
<td>2</td>
</tr>
</tbody>
</table>

IV) Weightage to the type of questions in the test for topic of Motivation

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Type</th>
<th>%</th>
<th>Total Marks =25</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Long answers</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Short answers</td>
<td>60</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>Objectives</td>
<td>20</td>
<td>5</td>
</tr>
</tbody>
</table>

V) Following is the question wise distribution of marks in the test for topic of Motivation

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Questions</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fill in the blanks by choosing appropriate alternative given below statement.</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Say whether the statement is True / False</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Answer in one sentence only</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Answer in two to three sentences</td>
<td>6</td>
</tr>
</tbody>
</table>
(any three)

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Objectives and Content</th>
<th>Knowledge</th>
<th>Understanding</th>
<th>Application</th>
<th>Skill</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Do as directed (any two)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>Long answers type question</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>25 Marks</strong></td>
</tr>
</tbody>
</table>

VI) Objectives and content wise distribution and weightage of marks in the test for topic of Motivation

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Objectives and Content</th>
<th>Knowledge</th>
<th>Understanding</th>
<th>Application</th>
<th>Skill</th>
<th>Total Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Motivation-Definitions, Concept, examples.</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Motivation Theories, Maslow's Hierarchy of Needs Theory</td>
<td>5</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Examples of Hierarchy of Needs Theory</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Total Marks</td>
<td></td>
<td>12</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>25</td>
</tr>
</tbody>
</table>
B. Following is a blue print of the test for Skill based topic of Unit Test Plan.

I) Weightage to the content matter in the test of Unit Test Plan.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Content Area</th>
<th>%</th>
<th>Total Marks =25</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction, Concept of Unit Test, Contents of Unit Test, Purpose of Unit Test</td>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Unit Plan Design, The Blue Print of Unit Plan,</td>
<td>28</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Design of Unit Test, Hands on experience to prepare a draft of Unit Test</td>
<td>48</td>
<td>12</td>
</tr>
</tbody>
</table>

II) Weightage to the objectives in the test of Unit Test Plan.

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Difficulty level</th>
<th>%</th>
<th>Total Marks =25</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Knowledge</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Understanding</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Application</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Skill</td>
<td>48</td>
<td>12</td>
</tr>
</tbody>
</table>

III) Difficulty level in the test of Unit Test Plan.
IV) Weightage to the type of questions in the test of Unit Test Plan.

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Sr. No</th>
<th>Questions</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Fill in the blanks by choosing appropriate alternative given below statement.</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Answer in one sentence only</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Answer in two to three sentences (any two)</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Do as directed (any two)</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>Long answers type question</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>25 Marks</td>
</tr>
<tr>
<td>Sr. No</td>
<td>Objectives</td>
<td>Knowledge</td>
<td>Understanding</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------------------------------------</td>
<td>-----------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long answers Short Objectives</td>
<td>Long answers Short Objectives</td>
</tr>
<tr>
<td>1</td>
<td>Introduction, Concept of Unit Test, Contents of Unit Test, Purpose of Unit Test</td>
<td>- -</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Unit Plan Design, The Blue Print of Unit Plan,</td>
<td>- 2</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Design of Unit Test, Hands on experience to prepare a draft of Unit Test</td>
<td>- 1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td><strong>Total Marks</strong></td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

The test was administered to both the groups together in the same circumstances. Minimum score obtained by students was 6 marks and maximum score was 24 marks in the final test.

**Validity of the Achievement test**
Validity: Validity is that quality of a data gathering instrument or procedure that enables it to measure what it is supposed to measure. Without ascertaining the validity, the tool can lead to incorrect research conclusions which in turn can influence educational decisions.

In the present study, the content validity has been ascertained. Content validity is the degree to which the sample of items represents what the test is designated to measure. The researcher conducted the pilot study to determine the content and face validities of the tool. The researcher initially prepared achievement test. It was sent to the experts for content validation. The content and the face validity of the tool were established by seeking the opinion of experts in the field of education. A copy of experts’ names is given in Appendix A.

Those items, which were agreed upon, by most of the experts were retained, as per the suggestions of the experts a few items were modified. The remaining items were deleted from the tool. The face validity and content validity of the tools were thus established.

Item Analysis: The main objective of item analysis was to determine item validity by computing the discrimination index for each item.

The researcher established the item validity of the tool. He administered the tool to 60 students from one of the B. Ed. College. Now, the difficulty level has been determined. 20% of the questions

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in the tool were difficult, 56% of the questions were average and 24% questions were easy to solve.

**Content Analysis**

After selecting the contents, the content analysis was done keeping in mind the following aspect:

1. Listing of sub-points
2. Logical sequencing of sub points
3. Detailing out the sub-points
4. Figures and examples to be used
5. Any additional point necessary to be covered.

The content of the chapters were further analyzed and updated by taking help of the text book of the reputed authors in the educational psychology which were relevant for the purpose. Then the researcher developed TAL package for the study.

The researcher took help of computer experts having expertise in computer programming to prepare TAL package. The researcher himself also took training from the experts to develop TAL package with various commands and programs to run the software and to make the frames of presenting the learning material with the assistance of a computer.

**Instructional objectives to prepare TALP:**

The researcher determined the following instructional objectives while preparing TALP after deciding the contents for teaching.

- To make the students aware of the concepts from the contents.
• To make the students aware of the examples from the contents.
• To enable the students to understand the concepts.
• To enable the students to differentiate two diverse concepts.
• To arouse the curiosity among the students to learn the contents by their own with the help of TALP.
• To generate interest among the students for the use of TALP for self-learning.

Procedure of Development of TAL Package by the Researcher

By considering the instructional objectives, the researcher constructed a learning material on the selected chapter of "Educational Psychology" and "Educational Evaluation" subjects of B. Ed. syllabus. The researcher downloaded and developed some useful three dimensional colorful graphics from various web-sites. These three dimensional colorful graphics are used logically and appropriately in the TAL package. This learning material has been made on the principle of programmed learning material in a CD format. When the learner starts the CD with the computer directly, the window of the course module opens giving further instructions. Developed program material has different frames. Each frame contains a part of content of the particular topic. The learner has ‘to click’ the option given in the module and select the frame for learning and read it, understand it and then proceed further one by one. While the frame is being displayed on the screen, an audio commentary is also being presented simultaneously. After a completion of particular topic an evaluation test has been incorporated with the help of evaluation frame with multiple choice questions such as ‘Choose the correct alternative, Match the pair, Put the items in sequential
order’ etc. When the learner is giving correct responses and proceeding further, the frame appears on the screen and motivates him / her by praising his / her efforts. In this way, a learner gets the feedback after each answer. There are total 25 objective type questions asked in the package.

In the evaluation process, when the learner gives correct response to the question asked, he / she is being motivated by the another frame which also advises him / her to proceed further. Similarly, when the learner gives incorrect response to the question, he / she is being advised by the another frame to study the content again. The researcher also took care that the learner should not skip any of the content frames. If he / she did so, the frame immediately appears on the screen advising the learner not to do so as the learner will lose his achievement score. The learner is able to study the slide for any number of times till he / she understands it well. After the evaluation process for particular content is over, the learner can see his / her achievement score in the next frame. In a similar way the entire chapter is presented into different frames. Developed TALP contains the general description of use of this TALP and detailed explanation on the topics of selected chapters including graphics, figures, animation effects, sound and 3-D effects. In this format, the researcher has tried to develop two different TAL packages 1. Motivation, 2. Unit Test for the research purpose.

4) Questionnaire for students on satisfaction regarding mode of Teaching.

Pre-Pilot Study
At this stage, content and face validity of the tools were established. The face validity and the content validity of the Questionnaire for students on satisfaction regarding mode of teaching was ascertained. In order to ascertain the content validity and to carry out an item-analysis of the questionnaire, a pre-pilot study was conducted. For this purpose, the questionnaire was given to experts in the field of Education and Psychology to ascertain the relevance of the items with the concepts. Those items, which were agreed upon by the experts were retained and five items were modified in accordance with their suggestions. The content validity of the questionnaire was thus established.

Finally the discrimination index of the items included in the questionnaire was calculated. In order to determine the validity of each item, item validity was computed. The tools were administered for pilot study. The discrimination index shows how sharply an item differentiates between persons high on the scale of criterion from those low on the scale. According to Garret, “items with validity indices of 0.20 or more are regarded as satisfactory.” (Garret, 1958, p.368).

The item analysis was carried out by computing the Discrimination Index (D.I.) for each of the items using the following formula:

\[
DI = \frac{N_H - N_L}{0.27N}
\]

Where,

\(N_H\) = Number of students getting a high score in the upper 27% of the group.
\[ N_L = \text{Number of students getting low score in the lower 27\% of group.} \]
\[ N = \text{Sample Size} \]

Items with discrimination index of 0.20 were retained and those with a discrimination index less than 0.20 were removed from the scale. Accordingly, 5 items were dropped from the draft form of the scale. Thus the final forms of the questionnaire comprised of 21 items.

**Pilot Study**

A pilot study was carried out to determine the reliability of the scales after the face validity and content validity of the tools. For this purpose, internal consistency reliabilities have been calculated. The sample size for establishing the reliability coefficients was 60 students including 38 males and 22 females.

The internal consistency reliability coefficients were found to be 0.79 for internal consistency reliability and 0.76 for test-retest reliability of questionnaire for students on satisfaction regarding mode of teaching.

Table 3.4 shows the internal consistency reliability and the test-retest reliability coefficients of the questionnaire.

**TABLE 3.4**

**RELIABILITY COEFFICIENTS OF THE SATISFACTION QUESTIONNAIRE**

<table>
<thead>
<tr>
<th>Type of reliability</th>
<th>Reliability coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Consistency Reliability</td>
<td>0.79</td>
</tr>
<tr>
<td>Test-retest Reliability</td>
<td>0.76</td>
</tr>
</tbody>
</table>
From this it can be concluded that the questionnaire for students on satisfaction regarding mode of teaching is reliable and internally consistent and stable over time.

After ascertaining the face validity, content validity, internal consistency reliability and test-retest reliability the final form of the questionnaire was prepared which comprises of 21. This included 9 items related to TAL mode and 8 items related to Face to Face mode and 4 for both the methods including positive and negative statements.

**Scoring of the Questionnaire**

For the purpose to carry out statistical analysis of the data, scoring is a prerequisite so as to enable quantification of the responses. A five-point scale has been adopted for the purpose of obtaining responses on this tool on each item. The responses categories and the scale values are as follows:

<table>
<thead>
<tr>
<th>Response Categories</th>
<th>Scale Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>5</td>
</tr>
<tr>
<td>Agree</td>
<td>4</td>
</tr>
<tr>
<td>Not sure</td>
<td>3</td>
</tr>
<tr>
<td>Disagree</td>
<td>2</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>1</td>
</tr>
</tbody>
</table>

For negatively worded items, the scoring pattern is in the reverse order. The scale values are so assigned to each item that a higher score is indicative of a satisfaction towards TAL mode.

The highest and the lowest possible scores for each individual on scale are 105 and 21 respectively. The Questionnaire on satisfaction regarding mode of teaching is given on Appendix D.
DATA COLLECTION

Data collection is an activity which is very important in conducting the research. It is essentially an important part of research process so that the inferences, hypothesis or generalizations tentatively held may be identified as valid, verified as correct or rejected as untenable.

The researcher personally met the principal of colleges of education included in the research to seek permission for data collection. On the appointed day and time, the researcher met the B. Ed. class, explained the purpose of research and appealed to the students to fill up the personal data sheet carefully. The section of the class who were selected to use the TALP moved to the computer lab and the researcher explained the procedure of responding TALP, clarified the doubts of the students if any. Therefore, before the teaching session, the researcher provided the personal data sheet to all the students to fill up.

Preparing Groups for Data collection

The researcher made two groups of students from B. Ed. class on the basis of CET score obtained by the student teacher. To get the admission to the B.Ed. program every student has to succeed in B.Ed. CET out of 50 marks. The students were divided into the 5 ranges of score obtained by them in B. Ed. CET from 20-24, 25-29, 30-34, 35-40 and 41 & above. The number of students from above ranges were divided equally into both the Groups, (e.g. if CET scores of 6 students range between 20-24, then 3 students were placed in Group1 (i.e. the group of students learning in face to face
(F to F) mode) and other 3 were placed in Group 2 (i.e. the group of students learning with Technology Assisted Learning (TAL) mode (with TAL package). In case of availability of odd number in any of the above range, an additional student was adjusted in any of the group as per the need for sample & research.

When the groups were formed (Group 1 and Group 2) by the researcher, they remained the same for both the topics and mode of learning (i.e. F to F and TAL) for data collection till the end. Since the CET scores were available with the researcher collected from the principals of the colleges, the formation of above groups was done in advance.

Teaching the contents of theory based topic of Motivation

In the first session, the researcher took pre-test on the topic of ‘Motivation for the research purpose. The test paper for pre-test and post-test was same. Then the researcher taught Group1 the topic of Motivation using F to F mode of learning in the classroom with the best of his ability. At the same time, he allowed Group 2 to learn the same topic of Motivation with TAL using TAL package to learn by their own in the computer lab of the college. The computer lab session was monitored by the college teacher. The duration of both the sessions was 90 minutes each.

Administering the test for theory based topic of Motivation

Once the session gets over, the researcher gave same test paper based on contents of learning (by F to F mode and through TAL mode) to both the groups simultaneously to solve in the regular examination settings in the classroom. The test paper is an unit test paper of maximum 25 marks with 45 minutes of duration. The solved
test papers (answer sheets) were examined by the college teacher. The marks obtained by the students were their achievement scores and were used as data for research study.

Teaching the contents of skill based topic of Unit Test

After the data collection for knowledge based topic of Motivation gets over, the next day, second session was started for teaching the contents of skill based topic of Unit Test as scheduled. The researcher first took the pre-test of the students on the skill based topic. After the pre-test, the researcher taught Group1 the skill based topic of Unit Test using F to F mode of learning in the classroom with the best of his ability. Here, the students were given the demonstration and drill and practice session to prepare unit test plan and sample of unit test paper so that they can acquire the skill to prepare the same. At the same time, the researcher allowed Group 2 to learn the skill of preparing unit test plan and sample of unit test paper with TAL using TAL package to learn by their own, drill and practice in the computer lab of the college. The computer lab session was monitored by the college teacher. The duration of both the sessions is 90 minutes each.

Administering the test for skill based topic of Unit Test

Once the session gets over, the researcher gave same test paper based on contents of learning to both the groups simultaneously to solve. The test paper included objective plus long answer type question in which students has to actually prepare the sample of unit test plan and unit test paper. The paper carried maximum 25 marks with 45 minutes of duration. The solved test papers (answer sheets) were examined by the college teacher. The marks obtained by the
students were their achievement scores and were used as data for re-
search study.

The difference between the pre-test and post-test scores was used as Gain score in the study. While conducting the experimental study a good rapport was built between the researcher and the school members. At the end of the teaching session, researcher gave the satisfaction questionnaire to the participants.

**Quantification of Data**

After collection of data, the responses of students were quantified by assigning scale values to the items and the scores were so organized that the process of tabulation becomes an easy task.

**Tabulation of Data**

Tabulation refers to the recording of the classified score. The method of tabulation depends upon the aims and objectives of the study. The data was tabulated with statistical methods by using computer.

**ANALYSIS OF THE DATA**

At this stage, the tabulated data were scientifically and systematically studied in order to determine the underlying inherent facts or relationship. The data collected through achievement test and questionnaire was analyzed qualitatively.

The methods of analysis used for the present study are:

- Descriptive analysis
Techniques of data analysis

The descriptive methods used for present study include Measures of Central Tendency including Mean, Median and Mode, Measures of Variability including Standard Deviation, Skewness and Kurtosis and graphical representation of data including bar diagrams and pie chart. The inferential methods used for testing of hypothesis for the present study was t-test. The researcher analyzed the Gain scores to study whether learning with F to F mode or TAL mode is better for theory based topic or skill based topic. The researcher compared the gain scores between the groups to find out whether overall students had better learning retention in F to F mode or TAL mode on the basis of medium of instruction, gender, locality and social category.

- The researcher has analyzed the scores with Group 1 as to whether learning with F to F mode is better for theory based topic or skill based topic.
- The researcher has analyzed the scores with Group 2 as to whether learning with TAL is better for theory based topic or skill based topic.
- The researcher has compared the gain scores between the groups to find out whether overall students learnt better in F to F mode or TAL.
- The researcher compared the satisfaction with the mode of learning between the groups through specifically design questionnaire.
- The Researcher has analyzed the relationship between
a. medium of instruction and learning retention,
b. social background and learning retention,
c. geographical locations (urban / rural) and learning retention,
d. gender and learning retention.

While learning theory based topic (TBT) and skill based topic (SBT), it was tested whether there is any significant difference between the pre-test scores of students with the help of ‘t’ test.

Table 3.5 shows the relevant statistics for pre-test scores of learning retention in both the modes for theory based topic.

TABLE 3.5
RELEVANT STATISTICS FOR PrSLR OF F TO F MODE AND TAL MODE FOR TBT

<table>
<thead>
<tr>
<th>Topic</th>
<th>Modes of Learning</th>
<th>Mean</th>
<th>N</th>
<th>SD</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBT</td>
<td>F to F mode</td>
<td>6.33</td>
<td>189</td>
<td>2.89</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td>TAL mode</td>
<td>6.14</td>
<td>189</td>
<td>2.46</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, ‘t’ is not significant. It was concluded that there was no significant difference in the pre-test scores of learning retention of B. Ed. students in F to F and TAL mode for theory based topic.

Table 3.6 shows the relevant statistics for pre-test scores of learning retention in both the groups for skill based topic.

TABLE 3.6
RELEVANT STATISTICS FOR PrSLR OF F TO F AND TAL MODE FOR SBT

<table>
<thead>
<tr>
<th>Topic</th>
<th>Modes of Learning</th>
<th>Mean</th>
<th>N</th>
<th>SD</th>
<th>Obtained ‘t’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Therefore, ‘t’ is not significant. It was also concluded that there was no significant difference between pre-test scores of learning retention of these students in learning skill based topic.

Therefore, it was further concluded that both the groups were similar in understanding the contents of both the topics. It indicated that the students involved in F to F mode and TAL mode were similar in their prior knowledge about both the topics.