CHAPTER - IV

DESCRIPTION OF TOOLS
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DESCRIPTION OF TOOLS

In the previous chapters we study about the history, meaning, scope, need of the study and the objectives of the study and what are the different researches done in the field of multimedia.

The present chapter deals with the description of various tools used for the study. For the present investigation, the following self-developed tools were used.

1. An Achievement Test
2. Opinionnaire for teachers
3. Opinionnaire for students
4. Multimedia Learning Package (MML)

4.1 ACHIEVEMENT TEST

‘Achievement Test’ refers to the assessment of the outcomes of formal instruction in cognitive domain (Dywer, 1982). Achievement tests attempt to measure what an individual has learned – his or her present level of performance. They are particularly helpful in determining individual or group status in academic learning. In research, achievement test scores are used frequently in evaluating the influences of courses of study, teachers, teaching methods, and other factors considered to be significant in educational practice.

Achievement Test may mean a sample of behavior that provides opportunity for comparison with performance standard, as in criterion referenced testing. (Hrunland, 1973, Hambleton et. al, 1976, Popham 1978)

An Achievement Test is essentially a tool or device of measurement that helps in ascertaining quantity and quality of learning attained in a subject of study or group of subject after a period of instruction by measuring the present ability of the individual concern.

The investigator made a thorough survey of Achievement Test in the current available literature for B.Ed. students but could not locate an appropriate Standardized Achievement Test in 'Educational Technology' for the study. Therefore, it was decided to develop an Achievement Test in 'Educational Technology' to evaluate the pupil's knowledge, comprehension, application and
skills on the topics of 'Educational Technology' selected for treatment. The following steps were followed for developing the tests:

**a) Planning of the Test**

Planning Stage of the test tries to answer what content area is to be covered by the test? What type of items are to be included in the test and what are the objectives that are going to be tested?

Stanley and Hopkins (1978) observed that the planning stage of a test should include the nature of the test items and the statement of conditions under which it will be administered.

The Achievement Test was planned with the objective of measuring Achievement in 'Educational Technology' for B.Ed. students. According to Groundland (1988), the planning of Achievement Test takes into account:

a) Determining the purpose of test;

b) Identification and defining the intended learning outcome;

c) Preparing the test specifications; and

d) Constructing relevant test items;

**Steps for Preparing Achievement Test**

1. Instructional Objectives
2. Design
3. Blue Print

**Objectives of the Test**

For the purpose of constructing achievement test, objectives were defined in behavioural terms for all the topics of B.Ed. Since the major concern here was to test the academic achievement, it was decided to test the four major areas of cognitive domain, i.e. knowledge, understanding, Application and Skill. After determining objectives, the learning outcomes were stated as observable terminal performance. In order to make sure that Achievement Test measurer a desired behaviour, test specifications were developed covering the objectives and subject matter selected to be taught during the experiment.
Content of the Test

The test covered the following ten topics:

i. Educational Technology
ii. Communication
iii. Micro-Teaching
iv. Flander’s Interaction Analysis
v. Role Playing and Gaming
vi. Programmed Learning
vii. Action Research
viii. Models of Teaching
ix. Information Technology
x. Computer Fundamentals

To decide the weightage to be given to different content areas, objectives and different forms of questions, expert opinion of the concern teacher were taken into consideration.

Preparation of the Test Items

150 objective type items (Multiple choice, True/False and Fill in the blanks) with wide range of difficulty were constructed for ten topics of ‘Educational Technology’ of Paper IV of B.Ed Syllabus Class. Items were prepared in conformity with the Blue-Print. While constructing items, it was ensured that no objective remained untested and language of the test items was understandable and unambiguous and the instructions were clear. The test items were arranged in the order of difficulty. The test items were arranged properly and assembled into the test. Easy items were given a place in the beginning and difficult items towards the end. The preliminary draft in achievement test was given to experts in education, which included experts in measurement and evaluation, experienced educational technology teachers. They were requested to give their opinion about the language and appropriateness of the items. Only those items were selected which were having 80% unanimity. Items that were having difficult language were modified to simple language. Finally, 98 items constituted the Achievement Test.
**Preparation of Directions to Test Items**

Appropriate directions to test items were prepared. The directions were clear and concise so that the students understand them easily. As test was divided into three sections, viz., multiple choice questions fill in the blanks and true/false questions, clear instructions were given at the beginning of each section. For the first section (Multiple Choice Question), the students were instructed to tick the correct response in the given answer sheet. For the second section (Fill in the Blanks) the students were asked to write the correct response in the answer sheet. For the third section (True/False) the students were asked to write T or F as the correct response in the answer sheet.

**Preparations of Directions for Administration**

A clear and detailed direction as to how the test is to be administered was provided.

**Preparation of Directions for Scoring**

To facilitate the objectivity in scoring, scoring keys were prepared. Scoring keys were prepared separately for multiple choice questions, fill in the blanks and True/False questions.

**First Try-Out**

The test was administered to 40 students of B.Ed. class and discriminating power (DP) was computed for each item after forming top 27 percent and bottom 27 percent group from the total subjects as suggested by Kelley (1939). The blueprint of the first draft of Achievement Test and distribution of discriminating powers (DP) is given in Table 4.1 and 4.2
<table>
<thead>
<tr>
<th>Chapters</th>
<th>Knowledge (Q₁)</th>
<th>Comprehension (Q₂)</th>
<th>Application (Q₃)</th>
<th>Skill (Q₄)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational Technology</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Communication</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Micro-Teaching</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Flander's Interaction Analysis</td>
<td>7</td>
<td>5</td>
<td>3</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Role Playing &amp; Gaming</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Programmed Learning</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>Action Research</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Models of Teaching</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Information Technology</td>
<td>9</td>
<td>2</td>
<td>4</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Computer Fundamentals</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>65</td>
<td>40</td>
<td>33</td>
<td>12</td>
<td>150</td>
</tr>
</tbody>
</table>

Q₁ = Knowledge
Q₂ = Comprehension
Q₃ = Application
Q₄ = Skill

Distribution of discriminating Powers of items was calculated by formula

\[ D_p = \frac{R_u - R_l}{0.5 N} \]
TABLE 4.2

DISTRIBUTION OF DISCRIMINATING POWERS (D.P.) OF ITEMS OF FIRST DRAFT OF ACHIEVEMENT TEST

<table>
<thead>
<tr>
<th>Discriminating Power</th>
<th>Frequency</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.40 and above</td>
<td>68</td>
<td>Very good items</td>
</tr>
<tr>
<td>Between 0.30 and 0.39</td>
<td>30</td>
<td>Reasonably good</td>
</tr>
<tr>
<td>Between 0.20 and 0.29</td>
<td>24</td>
<td>Needs Improvement</td>
</tr>
<tr>
<td>&lt;0.19</td>
<td>29</td>
<td>Very Poor</td>
</tr>
<tr>
<td>Total</td>
<td>150</td>
<td></td>
</tr>
</tbody>
</table>

Second Try-Out

The revised version of the achievement test was administered on another group of 50 students of B.Ed. class. Again discriminating power of 98 items were computed. The distribution of discriminating powers is given in Table 4.3

TABLE 4.3

DISTRIBUTION OF DISCRIMINATING POWER (D.P.) OF ITEMS FINAL DRAFT OF ACHIEVEMENT TEST

<table>
<thead>
<tr>
<th>Discriminating Power</th>
<th>Frequency</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.40 and above</td>
<td>68</td>
<td>Very good items</td>
</tr>
<tr>
<td>Between 0.30 and 0.39</td>
<td>30</td>
<td>Reasonably Good</td>
</tr>
<tr>
<td>Between 0.20 and 0.29</td>
<td>-</td>
<td>Needs Improvement</td>
</tr>
<tr>
<td>&lt;0.19</td>
<td>-</td>
<td>Poor Items</td>
</tr>
<tr>
<td>Total</td>
<td>98</td>
<td></td>
</tr>
</tbody>
</table>
In the light of above results, out of 150 items, 52 items below the discriminating power of 0.30 were dropped and 98 items were retained. This led to the proportion of final draft of the achievement test. The draft of achievement test comprised of 98 items. The table of specifications of blue-print for achievement test is presented in the Table 4.4 and the numbers of retained items are shown in Table 4.5

| TABLE 4.4 |
| BLUE-PRINT OF FINDL DRAFT OF ACHIEVEMENT TEST |

<table>
<thead>
<tr>
<th>Chapters</th>
<th>Knowledge (Q₁)</th>
<th>Comprehension (Q₂)</th>
<th>Application (Q₃)</th>
<th>Skill (Q₄)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational Technology</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Communication</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Micro-Teaching</td>
<td>5</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Flander’s Interaction Analysis</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Role Playing &amp; Gaming</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Programmed Learning</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Action Research</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Models of Teaching</td>
<td>4</td>
<td>4</td>
<td>-</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Information Technology</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>-</td>
<td>13</td>
</tr>
<tr>
<td>Computer Fundamentals</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>29</td>
<td>19</td>
<td>9</td>
<td>98</td>
</tr>
</tbody>
</table>

Q₁ = Knowledge
Q₂ = Comprehension
Q₃ = Application
Q₄ = Skill
TABLE 4.5

NUMBER OF ITEMS RETAINED IN THE FINAL DRAFT OF ACHIEVEMENT TEST AT DIFFERENT COGNITIVE LEVELS OF OBJECTIVES

<table>
<thead>
<tr>
<th>Cognitive Levels of Objectives</th>
<th>Serial Number of items Retained</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding Level</td>
<td>1,6,10,13,15,25,27,34,40,48,51, 55,60,63,69,71,72,74,86,90,96, 107,123,125,137,139,143</td>
<td>27</td>
</tr>
<tr>
<td>Application Level</td>
<td>9,18,19,30,58,70,81,82,83,87, 92,94,99,192,195,198,112,117, 135,140,144</td>
<td>21</td>
</tr>
<tr>
<td>Skill Level</td>
<td>31,45,57,103,145,141,148,149, 150</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>98</td>
</tr>
</tbody>
</table>

Standardization of Achievement Test

98 items constituted the final form of the Achievement Test. The Achievement Test was further standardized by experimental validation of the test that included establishing reliability and validity.

Reliability of the Test

Reliability is the one of the most important pre-requisite of a measuring tool. It is the degree of the consistency between two measures of the same test. The reliability of a test refers to the extent to which a test measures consistently from one administration of the test to another. The reliability of the test was measured by split-half method. The co-efficient of the Reliability, as found by split-half method was 0.89 which indicates that the test is highly reliable. Studies reveal that most test constructors are satisfied when their test yields reliability co-efficiency in the vicinity of 0.90. The reliability co-efficient of the present test was 0.89. Therefore, the achievement test may be considered fairly reliable.
Validity of the Test

Validity is a concern for the relationship between, the purpose set to achieve, on the one hand, and the efforts made, the means employed and what these efforts and means actually achieve, on the others. The validity of the Achievement Test constructed for the study was taken for granted because this is in accordance with Guilford (1971) who said, “There are some measures whose validity is taken for granted, for example, Achievement Test scores.”

Regarding the method of establishing the validity of the test Mouly (1970) stated, “At the most elementary level, it is necessary for all the test to have content validity, i.e., each question must be related to the topic under investigation, there must be adequate coverage of the overall topic, the question must be clear unambiguous etc. The most adequate approach to validation consists of checking the agreement between the responses elicited by the question against the criterion.

The present achievement test was validated against the criterion of content validity. Content validity is the most important criterion for the usefulness of the test, especially of an achievement test. It is a measure of the match between the content of the test and the content of “teaching” that preceded it. The measure is represented subjectively by the researcher after a careful process of inspections comparing the content of the test with the objective of the course of instruction. So, the Achievement Test was found to possess Content Validity as there was correspondence between the table of specifications and test items.

Final Form of the Test

The Final form of the “Educational Technology” Achievement Test contained 98 items along with a scoring key (Appendix G)

4.2 OPINIONNAIRE FOR TEACHERS

Opinionnaire – Opinionnaire refers to a formal statement or estimation of professional advice. How people feel, or what they believe, is their attitude. But it is difficult, if not impossible, to describe and measure attitude. This is the area of opinion. Through the use of questions, or by getting people’s expressed reaction of statements, a sample of their opinion is obtained.
In the context of the present study, the opinionnaire aids the researcher in assessing the effectiveness of multimedia learning package in terms of content, language, presentation and its utility for teachers. It also helps in evaluating the acceptability of MML package by teachers to further judge the effectiveness of MML package as compared to traditional method of teaching.

No suitable opinionnaire was found to elicit the opinions of the teachers; hence it was decided to develop an opinionnaire for teachers to seek to their opinion on the MML package.

In the present study, an opinionnaire which was developed consists of 31 items. In which 30 items have three alternative responses at the 3 point scale (Agree, Disagree and Undecided) i.e. A score of 1, 0 and 0 were assigned to alternative responses respectively. The last item has a column for remarks. The opinionnaire was submitted to the same four experts’ along with the design of the MML package for establishing the validity. The format was accepted by the experts. The opinion of 10 Educational Technology experts teaching at college level was obtained.

**Development and Description of Opinionnaire**

The subject teacher is considered the pivot upon which lies the success or failure of an educational programme. The opinionnaire was meant to obtain the information about the effectiveness of the Multimedia Learning Package in Educational Technology for B.Ed. Students.

**The Opinionnaire comprised of two parts**

**Part-A** aimed at eliciting information from the teacher with regard to Name, Sex, Age, Education Qualification, Professional Qualification, Designation, Name of College, Teaching Experience, Teaching Background and Methodology used by them in the classroom.

**Part-B** was meant for obtaining information regarding the MML package used and their opinions on the various aspects, relevance and effectiveness of Multimedia Learning Package for teachers.
The following steps were taken for developing the opinionnaire

**Planning the test**

Planning stage of framing opinionnaire focuses on the areas to be conversed by the opinionnaire which may also include the listing of items and the objectives for the opinionnaire. This stage was very important because it threw light on the core areas of MML package. The opinionnaire under reference was planned for the teachers of Educational Technology with the objective of seeking them opinion on the statements on Multimedia Learning Package of B.Ed. Class.

The Planning of opinionnaire aims at:

- Determining the purpose of opinionnaire.
- Identify and defining the intended teacher’s opinions;
- Preparing the opinionnaire specifications and
- Constructing relevant items for the opinionnaire

For constructing opinionnaire, the objectives were outlined from the text books of Educational Technology of B.Ed Class. The major concern was to seek the opinion of the teachers.

**Objectives of the Opinionnaire**

To find out the effectiveness of MML package for teachers, the opinionnaire covered the following areas of MML package.

- Content
- Presentation
- Benefits to students
- Benefit to teachers

**PREPARATION OF OPINIONNAIRE ITEMS AND FIRST TRY OUT**

60 statements were framed to elicit the views of teachers on a three-point rating scale. The preliminary draft of opinionnaire was framed and given to 20 teachers of college of Education after showing the MML package. They were requested to give their opinion about the language and appropriateness of items, based on the MML package. Only those items were selected which were having 80% unanimity. 39 statements constituted the opinionnaire after first try-out.
As the table 4.6 has shown that if discrimination index is either equal to or greater than 0.30 (>0.30) than the item discriminate otherwise not. So, the investigator selected the statements discrimination index of 0.30 or above.

**TABLE 4.6**

**INTERPRETATION OF DISCRIMINATION INDEX OF EACH ITEM OF OPINIONNAIRE**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Discrimination Index</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Below 30%</td>
<td>Poor items to be rejected</td>
</tr>
<tr>
<td>2.</td>
<td>30% - 60%</td>
<td>Reasonably Good</td>
</tr>
<tr>
<td>3.</td>
<td>60% - 80%</td>
<td>Good Discriminate</td>
</tr>
<tr>
<td>4.</td>
<td>80% - 100%</td>
<td>Best Discriminator</td>
</tr>
</tbody>
</table>

**TABLE 4.7**

**DISCRIMINATION INDEX AFTER FIRST TRYOUT SHOWS 39 ITEMS ABOVE 30%**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Discrimination Index</th>
<th>Item No.</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Below 30%</td>
<td>1, 7, 8, 9, 10, 11, 12, 13, 14, 17, 19, 20, 21, 24, 25, 26, 27, 32, 33, 36, 38, 55, 58</td>
<td>Poor items to be rejected</td>
</tr>
<tr>
<td>2.</td>
<td>30% - 60%</td>
<td>2, 3, 4, 5, 6, 18, 22, 28, 31, 34, 35, 37, 39, 40, 41, 42, 45, 46, 48, 51, 53, 54</td>
<td>Reasonably Good</td>
</tr>
<tr>
<td>3.</td>
<td>60 – 80%</td>
<td>16, 23, 30, 40, 47, 49, 50, 60</td>
<td>Good Discriminator</td>
</tr>
<tr>
<td>4.</td>
<td>80% - 100%</td>
<td>15, 29, 57</td>
<td>Best Discriminator</td>
</tr>
</tbody>
</table>
SECOND TRY-OUT

The opinionnaire was tested and tried out with a group of another 20 teachers. Out of the 39 statements another 8 were rated below the acceptability level, while 31 statements were selected for the final draft. The blue-print of the draft of opinionnaire and distribution of discriminating powers is given in the table.

Final form of Opinionnaire

After going through 2 try-outs the final form of opinionnaire had 31 statements (Appendix H). On the basis of it the investigator categorized each item according to their discrimination index as shown in the Table 4.8.

| TABLE 4.8 |
| DISCRIMINATION INDEX AFTER SECOND TRYOUT SHOWS 31 ITEMS ABOVE 30% |

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Discrimination Index</th>
<th>Item No.</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Below 30%</td>
<td>1, 7, 8, 9, 10, 11, 12, 13, 14, 17, 19, 20, 21, 24, 25, 26, 27, 30, 31, 32, 33, 36, 38, 43, 44, 52, 55, 56, 58, 59</td>
<td>Poor items to be rejected</td>
</tr>
<tr>
<td>2.</td>
<td>30% - 60%</td>
<td>2, 3, 4, 5, 6, 18, 22, 28, 31, 34, 35, 37, 39, 40, 41, 42, 45, 46, 48, 51, 53, 54</td>
<td>Reasonably Good</td>
</tr>
<tr>
<td>3.</td>
<td>60 – 80%</td>
<td>16, 23, 47, 49, 50, 60</td>
<td>Good Discriminator</td>
</tr>
<tr>
<td>4.</td>
<td>80% - 100%</td>
<td>15, 29, 57</td>
<td>Best Discriminator</td>
</tr>
</tbody>
</table>

Reliability-The reliability is the property of an item which reflects its consistency. If the same opinionnaire is given second time, similar results must be achieved. The present form of opinionnaire stood firm on the two trails. The reliability of the opinionnaire was measured by split-half method. The co-
efficient of the reliability, as found by split half method, was 0.91 which indicates that the opinionnaire is highly reliable.

Validity—Validity of a test or opinionnaire is the extent to which it measures what is attempted to be measured. This implies that the opinionnaire here should confirm to the objectives of the testing. It was found that the statements of the opinionnaire were framed with the objective to seek the opinion of the teachers on MML package. The opinionnaire was given to 2 Educational Technology experts and they made few suggestions which were incorporated, but it was widely accepted by the experts and the response from teachers further established the validity of the opinionnaire. The present opinionnaire is reliable, valid, covers all the elements catering to the objective, length of the opinionnaire is optimum, it is easy to administer, has scorability and above all the comprehensiveness takes care of all the aspects and nothing goes un-escaped (Appendix H).

After the final draft was accepted these opinionnaires were filled up by the teachers providing the required information in different columns. Teachers were required to provide answers to the questions where some information is sought by writing in the space providing for it. They had to tick the right column where their opinion was sought. They had to tick one of these columns (agree/disagree/undecided) as per their choice. The teachers were requested to make information as elaborate and descriptive as possible to enable to understand the effectiveness of Multimedia Learning Package and for further planning new inputs and improvement of existing Multimedia Learning Package. Their comments were sought on the issues like the strong points and the weak points/problem areas of this package, their suggestions for making this Multimedia Learning Package better in future.

4.3 OPINIONNAIRE FOR STUDENTS

In the present study, the opinionnaire aids the researcher in assessing the effectiveness of Multimedia Learning Package in terms of content, presentation and its utility for B.Ed. Students. It also helps in studying the role of MML package in creating the learning readiness, arousing interest of students, creating
favourable attitude towards the subject. It also helps in evaluating the acceptability of MML package by students to further judge the effectiveness of the Multimedia Learning Package as compared to traditional method of teaching. Through the survey of literature researcher was not able to locate any such appropriate opinionnaire based on MML package catering to the topics selected for the study. Hence, it was decided to develop an opinionnaire to study the reactions of students towards MML package.

An opinionnaire was developed to elicit the opinions of students to study the effectiveness and the acceptability of the Multimedia Learning Package. An opinionnaire consists of items with three alternative responses at the 3 point rating scale (Agree, Disagree and Undecided). At the end of the opinionnaire, a column for remarks was made. The opinionnaire was submitted to the same two experts along with the design of the Multimedia Learning Package for establishing the validity. The format was accepted by both the experts. The opinion of 50 students teaching through Multimedia Learning Package was obtained.

**Development and Description of Opinionnaire**

Today’s education is child-centered. All the educational programmes revolve around the child. So the opinionnaire was meant to obtain the effectiveness of Multimedia Learning Package for students studying Educational Technology.

**The opinionnaire comprised of two parts Part**

**Part-A** aimed at eliciting General information about the students. The information is collected about Name, Age, Sex, Educational Qualification, and Need of Change in Methodology.

**Part-B** was meant for obtaining information regarding the MML package used and their opinions on the various aspects, relevance and effectiveness of the Multimedia Learning Package for B.Ed. Students.

**Planning the Test**

Planning stage of framing opinionnaire focuses on the areas to be covered by the opinionnaire which may also include the listing of items and the objectives for the opinionnaire. This stage was very important because it threw light on the
core areas of MML package. The opinionnaire under reference was planned for the B.Ed. Students taught through MML package.

The planning of opinionnaire aims at:

- Determining the purpose of opinionnaire;
- Identifying and defining the student's opinion;
- Preparing the opinionnaire specifications; and
- Constructing relevant items for the opinionnaire.

One of the major concerns was to seek the opinion of the students.

**Objective of the Opinionnaire**

To find out the effectiveness of MML package for B.Ed students, the opinionnaire covered the following areas of the MML package.

- Content
- Presentation
- Benefits to Students

**PREPARATION OF OPINIONNAIRE ITEMS AND FIRST TRY-OUT**

40 statements were framed to elicit the reactions of students on a three point rating scale. The preliminary draft of opinionnaire was framed and given to 30 students after showing the MML package. They were requested to give their opinion about the language and appropriateness of items, based on the MML package. Only those items were selected which were having 80% unanimity, 30 statements constituted the opinionnaire after first try-out.

As the table 4.9 has shown that if discrimination index is either equal to or greater than 0.30 (>0.30) that the item discriminate otherwise not. So, the investigator selected the statements having discrimination index of 0.30 or above.
TABLE 4.9
INTERPRETATION OF DISCRIMINATION INDEX OF EACH ITEM OF OPINIONNAIRE

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Discrimination Index</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Below 30%</td>
<td>Poor items to be rejected</td>
</tr>
<tr>
<td>2.</td>
<td>30% - 60%</td>
<td>Reasonably Good</td>
</tr>
<tr>
<td>3.</td>
<td>60% - 80%</td>
<td>Good Discriminate</td>
</tr>
<tr>
<td>4.</td>
<td>80% - 100%</td>
<td>Best Discriminator</td>
</tr>
</tbody>
</table>

TABLE 4.10
DISCRIMINATION INDEX AFTER FIRST TRYOUT SHOWS 30 ITEMS ABOVE 30%

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Discrimination Index</th>
<th>Item No.</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Below 30%</td>
<td>2, 3, 4, 5, 6, 17, 21, 23, 27, 38</td>
<td>Poor items to be rejected</td>
</tr>
<tr>
<td>2.</td>
<td>30% - 60%</td>
<td>1, 7, 8, 9, 10, 11, 12, 13, 14, 15, 20, 24, 25, 26, 30, 31, 32, 33, 34, 35, 39, 40</td>
<td>Reasonably Good</td>
</tr>
<tr>
<td>3.</td>
<td>60% - 80%</td>
<td>18, 19, 22, 36, 37</td>
<td>Good Discriminator</td>
</tr>
<tr>
<td>4.</td>
<td>80% - 100%</td>
<td>16, 28, 29</td>
<td>Best Discriminator</td>
</tr>
</tbody>
</table>

SECOND TRY-OUT
The opinionnaire was tested and tried out with group of 30 students. Out of 30 statements another 10 were rated below the acceptability level, while 20 statements were selected for the final draft. The blue-print of the draft of opinionnaire and distribution of discriminating power is given in the table.
Final Form of Opinionnaire

After going through 2 try out the final form of opinionnaire had 20 statements (Appendix I). On the basis of it the investigator categorized each item according to their discrimination index as shown in the table 4.11.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Discrimination Index</th>
<th>Item No.</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Below 30%</td>
<td>2, 3, 4, 5, 6, 7, 10, 14, 15, 17, 20, 21, 22, 23, 24, 27, 36, 38, 39, 40</td>
<td>Poor items to be rejected</td>
</tr>
<tr>
<td>2.</td>
<td>30% - 60%</td>
<td>1, 8, 9, 11, 12, 13, 25, 26, 30, 31, 32, 33, 34, 35</td>
<td>Reasonably Good</td>
</tr>
<tr>
<td>3.</td>
<td>60 - 80%</td>
<td>18, 19, 37</td>
<td>Good Discriminator</td>
</tr>
<tr>
<td>4.</td>
<td>80% - 100%</td>
<td>16, 28, 29</td>
<td>Best Discriminator</td>
</tr>
</tbody>
</table>

Reliability

The reliability is the property of an item which reflects its consistency. If the same opinionnaire is given second time, similar results must be achieved. The present form of opinionnaire stood firm on the two trials. The reliability of the opinionnaire was measured by split-half method. The co-efficient of the reliability, as found by split-half method, was 0.89 which indicates that the opinionnaire is highly reliable.

Validity

Validity of a test of opinionnaire is the extent to which it measures what is attempted to be measured. This implies that the opinionnaire here should confirm to the objectives of the testing. This opinionnaire was again given to Educational Technology experts and suggestions were incorporated, it was widely accepted by
the experts and the response from students further established the validity of the opinionnaire. (Appendix)

After the final draft was accepted these opinionaries were filled up by the students studied through Multimedia Learning Package. Students were asked to tick one of the columns (agree/disagree/undecided) as per their choice. Students were also asked to give their remarks about using the Multimedia Learning Package so that researcher will be able to understand the effectiveness of Multimedia Learning Package in Educational Technology.

Their comments were sought on the issues like the strong points and the weak points/problem areas of MML package, their suggestions for making MML package better in future.

4.4 DEVELOPMENT OF MULTIMEDIA LEARNING PACKAGE

This is the heart of the whole research thesis. It focuses on the actual multimedia cocktailing of elements (text, audio, video, animation and graphics) that is combining all the elements of multimedia together and delivering them in one go. It also highlights the development of Multimedia Learning Package and its various stages. Since no syllabus based, MML package was available, so the investigator decided to develop the MML package on her own. The development of MML package was a rigorous process and it includes the following three stages.

4.4.1 Multimedia Learning Package Development Stages

1. Concept
2. Design
3. Production and Implementation
1. Concept Phase (First Stage)

Every Programme and Project begins with a concept. It is very important that concept should be clear so that an effective Multimedia Learning Package can be developed.

So at this stage first of all researcher clear the concept to avoid any confusion during the development of the package. If the concept is changed during any subsequent stages can turn disastrous.

[Diagram showing basic questions at Concept Stage]

Significance of Plan Approach at Concept Stage

The concept phase was crucial because it had impact on both design and production and the overall shape of the Multimedia Learning Package. So careful
thought was given to the implications of the concept, for instance, including heavy layering or extra information was avoided, since it could lead to problems at the designing and production stage. Design directly gets affected by any inclusion or exclusion of texts and graphics thereby affecting the production which may over extend itself as resourcing and configuration issues also arise because of any additional considerations at the concept stage. It is always recommended that a clear plan approach should be undertaken.

Following points were kept in mind at the concept stage

- Defining Instructional goals and Learning objectives
- Decision about the length and duration
- Selection of the content
- Brief Content Outlines
- Outline of proposed methodology was framed
- Description of proposed application (format, media etc.)
2. **Design Phase (Second Stage)**

Design is a complex area in the development of Multimedia, however to be easily understandable by the students it is recommended that the design of the package should be simple and adhere to usability guidelines wherever possible. This means that design elements must be comprehensible and support the drive for user intuitiveness. Consistency is also essential for design. Any design features should adhere to usability standards. So an utmost ease was taken in keeping the consistency at all steps. Following points will take care of while designing the MML package.

List of actions addressed at the Design Stage:

- Designing a Script
- Storyboard, the content and screen elements were short listed.
- Media type, format, standards were specified.
- Flowchart of components was constructed.
- Images, Graphics, Animation items, Audio and Video to be included were decided.
- Consistency in layout (e.g. design, color etc.)
- Consistency in terminology was maintained (e.g. menus, commands)
- Consistent Titling/Headers were done.
- Font size was made readable.
- Content layout was kept sensitive to screen size/view area.
- Simple background colors were used to allow enough contrast for users with vision disability.
- Video and Audio clips had text equivalent.

Elements of a good script for a MML package. Following points were being taken care of by the researcher while writing the script of MML package.
3. **Production and Implementation Phase (Third Stage)**

The production period is dependent on the concept and design processes; being harmonized through agreement in appropriate resourcing, scoping and development time. It was thus essential to plan out the issues of workflow, and that the researcher recognized the projected deliverables and outcomes in the
production stage, in the light of objectives desired at concept stage. Mapping of milestones was done and activities were minutely monitored. Additionally, a post-production period was included in the overall development plan for quality assurance, testing, tweaking and evaluation. So production stage was the stage of implication. At this stage implementation was done. The production phase including post-production, had taken into consideration the following:

- Production of MML package including visual, audio, animation, graphics and video.
- Mapping Milestones
- Workflow, Progress reporting and Monitoring
- Testing with target audience
- Evaluation (Production and Post-Production)
- Incorporation of modifications on the basis of feedback.
- Review processes to see the effectiveness of the programme.

4.4.2 Steps of Development of Multimedia Learning Package

The following list provides an overview of the various stages that were crossed in developing MML package.

I. Data Gathering
II. Navigation Method
III. Media Contents
IV. Interface Designing
V. Storyboard
VI. Authoring
VII. Data Delivery
Figure 4.5 Steps of Developing MML Package
4.4.2.1 Data Gathering

Date gathering was the first step and it included following phases –

- Information Collection
- Analysis and Filtering
- Organization
- Verification

Stage – 1 Information Collection – As the name indicates at this stage all of the relevant information about MML package is collected. What type of content to be included is decided at this stage? The information was collected from various text books, reference books and it was further enriched from the web, library and also from teachers teaching Educational Technology. After collecting the information it was analyzed, filtered and organized.

Stage – 2 Information Analysis and Filtering – Analysis means breaking down of complex information into smaller components so that the required information which is useful should be used for MML package. Filtering is
a process of deciding which information is reliable and authentic and which is not. This helps in deciding the volume and depth of the information needed for the MML package.

**Stage 3 Data Organization** – The filtered was keyed into computer for further processing. A blue print of the MML package got ready. At this stage the researches got a fair idea about how the package would be evolved in terms of the content. The information was organized in a logical and sequential manner. This stage was the backbone of the package development.

**Stage 4 Data verification and Authentication** – Once all the necessary information had been collected and organized, it was verified and authenticated as per the specifications of the syllabus and necessary corrections were made.

**4.4.2.2 Navigation Method**

Linear structure approach was used for navigation. It is the simplest approach where the user moves through a sequential straight lined path, one path after another. Here the user had the option of moving one step upwards and backwards.

![Figure 4.7 Navigation Method - Linear](image)
4.4.2.3 Media Contents

Once the contents and navigation structure had been organized, the attention was paid to multimedia elements required for development of MML packages. These included elements of multimedia namely; audio, video, graphics, text and animation.

Table 4.12
MULTIMEDIA ELEMENTS AND CONTENTS

<table>
<thead>
<tr>
<th>Media Elements</th>
<th>Typical Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio</td>
<td>Background Music, Background Voice</td>
</tr>
<tr>
<td>Video</td>
<td>Video of teaching through Traditional Method and through Multimedia Approach. Video of Communication Barriers.</td>
</tr>
<tr>
<td>Text</td>
<td>Content used in MML package, the whole content related to syllabus</td>
</tr>
<tr>
<td>Graphics</td>
<td>Background, Pictures, Images, Widely used in the package.</td>
</tr>
<tr>
<td>Animation</td>
<td>Used for Titling and highlighting effects as used in all the content e.g. A red ball moves all over the cycle, line by line coming of all the text.</td>
</tr>
</tbody>
</table>

There are following elements of multimedia which were used in the package.
Text has played an important role in the development of multimedia Learning package. The extent to which texts have been used in MML package depended upon three major factors –

- The nature of the content (which chapter is covered e.g. communication, micro teaching, programmed learning)
- The subject/content (specific title and portion of the chapter taken)
- The treatment of the subject/content (Heavy graphics/light graphics, heavy text/light text)

Text have been used in MML packages for different purposes

- Title Texts
- Body Texts
- Menu
- Miscellaneous Texts

The design rules that governed multimedia texts largely depended upon the context in which particular text appeared. In general the title texts were bigger in size and were employed brighter colors than the body texts.

Designing text involved two basic aspects of information that were content and display.
• Content covered the matter that was being presented.
• Display covered how that matter was being presented.

The three parameters that controlled the display design of multimedia text were
• Fonts
• Font Color
• Backdrop (background)

It was noticed that while the fonts affected the profile of the displayed texts, colors and background affected the overall appeal of the same.

Graphics

Graphics play a pivotal role in multimedia applications. The maxim a picture is worth a thousand words; is so factual that one cannot underestimate the impact of visuals over plain text or audio in the context of multimedia.

Graphics in multimedia represent a collective terminology that includes all kinds of still pictures like images, photographs and art works used in MML package. Graphics used in MML package were characterized by certain attributes which made these MML package effective.

• Graphics were kept simple and appealing.
• They fittingly captured the mood of the title.
• They were designed and selected suitably to fit the overall theme of the design.
• They were even used as background image or moving from one concept to other.
• They were developed in exact concurrence with other forms of media presented like texts, videos so that all these elements fitted together as one seamless stream of information.

Types of graphics mainly used in MML package fall under any one of the following categories.
• Photographs (either scanned, digitally photographed or downloaded from Internet)
• Clip Arts (drawings drawn or taken from clip art files)
• Miscellaneous Variety (all other types of images)
Graphics are important companions to information, when suitably presented. In the present MML package 30-40% of space was dedicated to graphics and the rest was filled by textual information. Pictures can hold the attention of the viewers longer because of its interactivity and wide variety. Pictures have been used by the researcher to cover the various aspects of the selected topics. For example for explaining different input and output devices in computer the pictures of keyboard, mouse and CPU was shown because any concept can be explained better with visuals.

**Audio**

The most common reason for using audio is to be able to use M/M with its full potential. The most common requirement is to be able to input sound. Basically sound is a repeated pattern of pressure is the air and microphone converts a sound wave into an electrical wave and sound can also be recorded and reproduced using digital signals.

Sound Recording was a serious business which needs great effort and expertise.

The three major steps of audio input are

- Sound Recording
- Sound Editing
- Sound delivery

**Step One**

**Sound Recording** – Sound recording was done taking all the precautions like when microphone based recording was done, a place was selected with least noise disturbances from outside. The microphone was connected to the mic-in-jack of the sound card (It is a device added to the basic machine by inserting it in free slot. The reason for adding a sound card to PC is to be able to use M/M fully by recording and playing back the digital video of the computer and the sound was recorded). After the recording got over, the stop button was pressed and the sound file was saved on the computer using one of the media players.
Step Two

Sound editing – Sound editing demanded even more expertise than the sound recording. Effective sound editing demanded a great deal of creativity and timing. It was the stage where all the errors of sound recording were noticed and corrected. The noise reduction was done in order to enhance the audio quality/volume or chillness in some places.

Step Three

Sound delivery: Audio has been delivered using MP3 or Microsoft WAV formats. Audio has several purposes.

- It offers a commentary that supplemented text.
- It has been included to enhance the phonetics sense and pronunciation of what had been incorporated in text.
- Audio files being smaller to load than video and proved less fidgety than video plug-ins.

So sound has been an essential element of MML package. It was therefore, very important for the researcher to understand the nature of sound, its components and characteristics. By using commentary, background music and dialogues, wonderful and fascinating pictures could be created.

The voice of teacher in the form of dialogues has worked like magic and has been made the multimedia learning package interesting and fascinating. The background music used all over the MML package gives the refreshing effect. It is the magic of sound which provides rich and enormous possibilities to enrich the teaching-learning process. Audio has been used in the entire MML package and it has added to the effectiveness of MML package.

Video

Video has been delivered using media player. Video proved to be an effective supplement to text and images and provided enhanced experience. In the MML package, a video clipping of communication has been used. Video makes the package more effective.
Animation

Animation also plays a vital role in the M/M Program. The dedicated H/W and S/W build into system increases the animation speed. An Animation is just a continuous series of still images that are displayed in a sequence. There are two types of animation used in M/M i.e. 2D and 3D. In simple language Animate something is, literally, to bring it to life. A computer based animation is an animation performed by a computer using graphical tools to provide visual effects.

Animation has been used by the research for:
- Showing concepts or states in transition
- Indicating Dimensions
- Visualizing 3D Structures

Educationists have found that children love animation by nature. In the present MML package animation effect was added to show the cycles of communication and micro-teaching. It has highly stimulating and brought in the feeling of participation in the programme. It was also found that it results into higher retention scores. The viewers were completely involved and remained active. It helps in creating new, extremely motivational and conducive environments for students.

4.4.2.4 Interface Designing

Interface means to communicate with another object. A user interface allows the user to communicate and use the programme of the Computer Software for Multimedia – It has been clear that movies, sound, text, graphics and animations are the integral part of M/M software. To produce these media elements, there are various softwares are available in the market, e.g. Imaginet, Apple Hypar Card, Authoware, Flash (Macromedia) etc. For developing the present MML package 'SWISH FLASH' was chosen. Flash is a technology that allows web designers to create animations and interactive movies.

- Flash movies can be stored in very small file sizes, so they can download and start playing rapidly.
• Flash has now become a very well-recognized format on the web and macromedia estimates that over 90% of web users now have the flash player installed on their computers.
• In addition to being embedded within web pages, flash movies can also be exported to create stand alone executable applications (called projectors), which are ideal for distribution on CD-ROMs.

Technical Vocabulary for Multimedia

Every instructor who wants to develop MML package needs to familiarize with the vocabulary of Flash. Following are the few common terms used throughout while developing a MML Package.

Technical Vocabulary for Multimedia

Every instructor who wants to develop multimedia programme needs to familiarize with the vocabulary of Flash. Following are the few common terms used throughout while developing an MML package

Create New: Creates a new file, it shows a list of the file types of choose from, such as Action Script or Document of a quick way to open a new file.
Menu Bar

Menu bar is used to give commands to a computer as to do certain tasks. You give commands to work with Flash through the menu Bar. It is located at the top under the Title bar.

Stage and Work space

When investigator starts Flash, stage and work space was shown on the screen where all tools and commands, which will help in creating movie was found. The stage is where the investigator created the content for package. Investigator can change the view of the stage by changing the magnification level or moving the stage within the Flash work environment.

Time line

Time line organizes and controls the movie. Timelines consists of three main things: layers, Frames and Play head. Every object investigator created was placed on the frame. Flash movies divide length of time in frames.
• **Play head:** Indicates the current frame on the stage.

• **Timeline Header:** is on the top of the timeline and it indicates the number of frames. There is no limit to the number of frames.

• **Timeline Status:** is at the bottom of the timeline and it indicates the current frame number, the current frame rate, and the elapsed time in the current frame rate.

• **Layers:** are like multiple film strips stacked on top of one another, each containing different object that appears on the stage.

• **Frames:** frames and key frames helps to place the object in the order investigator want the objects in the stage to appear.

**Development of Multimedia Learning package using flash.**

**The Toolbox helps the investigator Perform various task**

Swish Flash has toolbox divided into four parts: Drawing Toolbar, View Toolbar, Colors Toolbar, and Options Toolbar. Which helped the investigator to make the presentation quickly and easily? Each tool plays an individual role and has different properties but they are interlinked.

**To show/hide the main Toolbox:**

Select Window > Tools

• **Drawing Toolbar:** It is the first part of the toolbox and as the name indicates it is used to draw and modify shapes. Each tool has a different application and properties.
- **View Toolbar:** It is the second part of the toolbox and is used for zooming and panning objects in stage. The view toolbar has two tools: Hand tool and Zoom tool.

  **Hand Tool:** When the stage is magnified it is not possible to see all the shapes and objects created. The hand tool helps to move the stage to change the view without changing the magnification.

  **Zoom Tool:** Zoom tool magnifies work area or object for a better look. The minimum percentage of zooming the area is 8% and maximum is up to 2000%.

- **Colors Toolbar:** It is the third part of the toolbox. It is used to fill colors in the objects to make them more attractive. Color toolbar covers two tools: Stroke color and Fill color.

- **Option Toolbar:** It is the last part of the toolbox. It allows to set additional control for the tool which has been selected in the drawing tool. It keeps on changing according to the selection made by the user in the drawing toolbar.
Using Drawing Toolbar

The Drawing toolbar contains tools to create and modify shapes for the artwork in the documents. The tools panel contains tools for selecting, creating and manipulating graphics and changing the view of the stage. The tools panel contains tools for selecting, creating and manipulating graphics and changing the view of the stage. Some tools might also have several options available, which appear in the options toolbar when the tool is selected. The options toolbar is at the lower section of the toolbox.

The over Tool

The over tool is used to make basic circular shapes like an oval, or a circle. To constrain a circle, hold down the shift key and drag to draw. By default the shape created was filled and have a stroke. There are no options available for oval tool in the option toolbar.

The Rectangle Tool

The Rectangle tool is used to make basic shapes like a Rectangle, or a square. To constrain a square, hold down the shift key and drag to draw. By default the shape created has a stroke. When Rectangle tool was selected Round Rectangle Radius option gets highlighted in the Option toolbar, which is used to give rounded corners to the rectangle or square.
2. Set the value in the Corner radius box.
3. Click and drag on the stage to get a rounded corner rectangle.

Properties Panel

Properties Panel is used to change the most commonly used attributes of a document/objects. It can set document attributes in the Properties Panel without actually accessing the menus or panels. When the object is selected the related attributes like fill, stoke color, and stroke size. To show/Hide the properties Panel, select windows properties. To show/Hide the properties panel, select windows properties.

Panels

Panels or palettes in Flash helps to view arrange and change the elements in a document. For example to create colors, use the Color Mixer panel, and the Align panel to align objects to each other on the Stage.

Investigator use panels to customize the Flash interface, by showing the panels for a specific task and hiding other panels.

Investigator also arranged the panels within the panels group and created new panel groups and dock panels to existing panel group.

The investigator created a Document and set the properties

Flash are movies are called Documents. Documents consist of Scenes, Layers and Frames.
Creating Flash Document

Investigator created a new document or opens a previously saved document for working in Flash. New option was used from the file menu to open a document of the same type as the last document created.

The investigator click on Text Tool for typing on workspace

The Text Tool A in the Drawing toolbar is used for typing characters, number etc. Investigator set size, typeface, spacing color, etc for the text. The text can also be transformed like shapes i.e. rotating scaling, skewing and flipping and still edit its characters. Investigator includes text boxes for user input or for displaying text that can update dynamically.

The investigator performed the following tasks to create a text

1. Select the Text tool
2. To Create a text block that displays text in a single line, click to type the text.
3. Type the text.
4. To create a text block with fixed width (for horizontal text) or fixed height (for vertical text), the pointer was positioned from where to start the text and drag to the desired width or height
To Change the direction of the text Investigator
1. Select the text with the Text Tool or Text block with the Arrow Tool
2. In the properties panel, click the change orientation button and select an option to specify the orientation of the text.

The investigator Format Text by Using the properties panel, see the font, Font size, style, and color of the selected text. When applying a color to the text only solid colors were applied and not the gradients. To apply gradient to the text convert the text to lines and fills using Modify > Break apart.

For Formatting Text following steps were followed by the investigator
1. Select the text with the text tool or the text block with the Arrow Tool
2. In the properties panel, click the triangle next to the Font Text box and select a font from the list, or enter a font name.
3. Click the triangle next to the Font size and drag the slider to set the size or enter a value in the font size text box.
4. To make the text Bold i.e. thicker, select Bold Button.
5. To make the text italic, i.e. titled towards the right side, select italic button.
6. To choose a fill color for text, investigator click the Font color box and select the color.
Layers

Layers are similar to transparent sheets that contain parts of artwork and are placed one over the other, but when viewed together they form a complete artwork.

It is an important tool that allows investigator to organize the work into distinct levels that can be edited and viewed individually. Every document created in Flash contains at least one layer. Layers are extremely versatile and can help to manage complex animation.

Layers are very useful in animating the objects and placing of the object, which in turn depends on how the layers are placed. The object in the bottom most layers is placed last while the object in the top most layers is placed in front.

When investigator creates a new layer, it appears above the selected layer. A newly added layer becomes the active layer.

Right click on a layer name in Timeline and choose insert layer from the context menu.
Organizing Layers

The investigator arranged layers and folders in the Timeline to organize Flash document. Layer folder helps to put the work flow in the order by letting place layers in a tree structure. Investigator expands or collapses a folder to see the layers it contains. Folders can contain both layers and other folders, allowing arranging layers in much the same way as to arrange the files on computer.

The following steps were followed for organizing the layers

1. To Change the order of layers
   Drag layers or layers folders in the Timeline to the desired position.

2. Expand or collapse a layer folder
   Click on the triangle to the left of the folder name to expand it.
   Click on the triangle again to collapse it.

3. Move a layer or layer folder into another layer folder
   Drag the layer or layers on folders to the destination layer folder. The layer of layer folder will appear inside the destination layer folder in the Timeline.
Setting Layer Properties

By default, the new layers are named by the order in which they are created: Layer 1, Layer 2 and so on, using layer properties the renaming of layers was done to better reflect their contents. The layers and folders were locked to prevent from being edited.

Rename a layer or a layer Folder

1. Right click on a layer name in the Timeline and choose properties from the context menu.
2. The Layer properties dialog box appears. Investigator enters the name in the text field.
3. After clicking OK, renaming of the layers was done.

Change a layer's outline color

1. Right click on a layer name in Timeline and choose properties from the context menu.
2. In the layers properties dialog box, the investigator click the outline color box and select the new color, or enter the hexadecimal value for the color.
3. After clicking OK, the color was applied

Now the text is written on the workspace and the layers are organized and properly set; now it is the time for adding animation.

What is Animation?

Animation is creating a timed sequence or series or graphic images or frames together to give the appearance of continue movement. Animation is one of the core functions of Flash. Flash is a 2D animation application. Animation in
Flash was created by changing the contents of subsequent frames. The objects were animated by moving across the stage, increasing or decreasing the size of the object, rotating, changing color, fading in or out, or changing the shape. Changes can occur independently, or along with other changes. For example, an object rotates and fades in as it moves across the stage.

**Methods of Animation:** There are two methods for creating animation sequences in Flash: Frame-by-Frame animation and Tweened animation.

- **Frame–by-Frame animation:** In Frame–by-Frame animation, changes were done in every frame. It is suitable for creating complex animation. Where the object changes in every frame instead of simply moving across the stage. Frame–by-Frame animation increase file size more rapidly than tweened animation.

- **Tweened animation:** In Tweened animation changes are made in the start and end frame and flash creates the frames in between. Tweened animation is a useful way to create movement and changes over time while minimizing the size. Flash can create two types of tweened animation. Motion Tweening the shape Tweening.

**Frames and Key frames**

The Timeline organizes and control a movie's content over time in layers and frames. The major components of the Timeline are layers, play head and the Frames. Frames contained in each layer appear in a row to the right to the layer name. The Timeline header at the top of the Timeline indicates frame numbers. The playhead indicates the current frame displayed on the stage.

Frames in the timeline are used for animation. A frame may contain one object or none or many. A Flash movie creates an illusion of movements by displaying the objects placed in a sequence. These objects are placed on different frames, which represent a unit of time. A key frame was added for every change
in the position, size and color. There are three types of frames, Frames, Key frame, and Blank Key frame.

- **Frames**: Frames are used to place an object for longer duration. Investigator inserts frames for that object.

**For inserting a frame**

Select a frame or frames in the Timeline and following steps were followed:

1. Right click on selected frame or frames in Timeline
2. Choose Frame from the context menu.
3. Insert the frame into layer.

- **Key Frames**: A key frame is used to define a change in an animation. In tweened animation, to create key frames at important points in the Timeline and let Flash create the frames in between. In frame-by-frame animation every frame is a key frame. Solid circles in a frame indicate key frames.

**For inserting a key frame**

To create a Key frame, following steps were followed by Investigator.

1. Right click a frame in the Timeline
2. Choose key frame from the context menu
3. Insert the key frame into frame.

Blank key frame can be used to give a blinking kind of effect, where investigator want the object to hide for some particular frames, blank key frames were used.

**To insert a Blank Key frame**

Right click a frame in the Timeline and choose insert Blank key frame from the context menu.
Creating Frame-by-Frame Animation

Frame-by-Frame animation changes the contents in every frame and is best for complex animation in which an object changes in every frame instead of simply moving. To create a frame-by-frame animation, investigator defines each frame as a key frame. Each new key frame initially contains the same contents as the key frame preceding it, so the frames in the animation incrementally modified.

To create frame-by-frame animation following step were followed

1. Click on the layer to make it the current layer and select the frame in the layer from where investigator wanted to start animation.
2. If the frame doesn't have a key frame, select insert>Timeline>Key frame or press F6 to make it one.
3. Create the artwork (investigator use the drawing tools, paste graphics from the clipboard, or import a file) on that key frame which will be the first frame of the sequence.
4. Click on the next frame and insert a key frame by pressing F6. This adds a new key frame whose contents were the same as the previous Frame.
5. Change the contents of this frame as required on the stage to develop the next increment of the animation.
6. Repeat steps 4 and 5 to complete frame-by-frame animation sequence until the desired motion was obtained.
7. To test the animation on stage Control >Play
   Press Enter
Frame-by-Frame animation increases file size more rapidly than tweened animation.

Investigator creates frame-by-frame animation in several different ways in Flash.
To create "Typed out" effect using frame-by-frame animation following steps were followed:

- Select file>New and choose Flash document from the General tab to create a new document. The document included layer with Blank key frame.
- Select the text tool on the Drawing toolbar, open the properties panel and select the Static Text option.
- Select font, its size and color as required.
- With the Text Tool Selected, Click on the Stage and Type the letter "F". Finally the word "FLASH MX" was spelled out, but since to appear as the word is being "typed out", create a new letter in each frame. The Blank Key frame is now filled.
- Now select the second frame on the Timeline and select Insert>Timeline>Key frame or press "F6". A key frame was inserted on Frame 2, which has same content as frame 1.
- Select the Text Tool again and click inside the Text box that contains letter "F" and add the letter "L" to the Text book.
Now the package is ready, following steps were used to save the MML package.

The following steps were used for saving a file:

Flash files are saved with extension. FLA. Save a Flash FLA document using its current name and location, or save the document using a different name or location. Investigator reverts to the last and saved version of a document. Save Flash MX 2004 content as a Flash MX document.
1. Save a document as a template, in order to use the document as the starting point for a new Flash document.

2. Select File > save as template.

3. To save as template dialog box, enter a name for the Template in the name text box.

The file that is uploaded on the web or shown as presentation is the shockwave files saved with the extension SWF and not the FLA files. SWF files are the final movies that are uploaded on the web. SWF files can be saved only after saving FLA Files.

   Select, Control > Test Movie OR CTRL + Enter to Create SWF File

   By default SWF files are saved in the same location where FLA file is located. SWF files cannot be edited. Flash player to run a shockwave file. Flash player is a plug in, which is used to view SWF files on the Web Browser and also as stand alone file.

4.4.2.5 Story Boarding

   The researcher had collected the information, organized it sequentially. Now it was further enriched with various multimedia elements to make it more effective. At this stage the researcher decided about the placing of various elements in various steps or parts of MML package. It was more about the arrangement of the content for the presentation purpose. The researcher decided about the background music input, fading in and fading out of the text and images on the frames of MML package. A smooth transition was also worked out at this stage.
Fig 4.9 Listing of topics of MML Package
4.4.2.6 Authoring

Once all the related media elements are created and digitized according to specifications, then comes the final stage of production process called "AUTHORING".

Authoring is nothing but joining or combining of different media elements like audio, video, text, graphics together and compose them so that they look and sound right.

There are 4 basic functions done at this stage –
1. Importing – It should be able to import media elements which may have been developed using other software packages.

2. Creating – It should allow some basic future creation of text, graphics and sound.

3. Integration – It should be able to combine different sequences and provide them a proper linkage.

4. Delivering – It should allow developing self-running applications.

Authoring can be described as creating highly interactive applications in which information can flow in both the direction i.e. from application to user and from user to application.

Authoring tools are used for developing interactive user interface to present the project in an effective and real situation. They help in creating higher quality audio & video application.

In case of MML package the page-based and time-based authoring tools have been used where content is conceived as a sequence of pages or frames. So MML package can be visualized as a sequence of pages of frames which contain media elements embedded in them. Like every page of the book each frame contained many media elements like-text, audio, video and animation. The instructor could always manually visit the slides in any sequence.
Figure 4.11 Page based Multimedia Authoring
Figure 4.12 Time based Multimedia authoring
4.4.2.7 Data Delivery
The MML package were developed by the researcher and written on the CDs and pen drives and were presented by the researcher to the teachers who taught Educational Technology. This MML package was also shown to experimental group of students.

Try-out of the MML package – After development, the MML package was tried out on a group of 30 students of B.Ed. students to obtain their response regarding effectiveness of the package.

Validation of MML package
Validation (or testing) is a painstaking procedure but on essential part of the total quality assurance process. It is the study of the effectiveness of design prototypes, acknowledging any weakness encountered. The purpose of validation was to check to see if the program could meet its specified objectives. Realizing the objectives of the validation process required clear testing procedures to be devised. Responses of teachers and students, their positive results and scores in the post-test indicated that they were instructionally sound. Changes were made when needed with respect to sequence, content, presentation and clarity in language. The suggestions of 4 educational technology experts were also incorporated and MML package were again reviewed and thus the final draft of MML package was accepted and presented to the experimental group in the study.

4.4.3 SETTING UP MULTIMEDIA STUDIO
Before embarking on the journey of developing MML package the instructor thought of the approach to be adopted and laid out a plan. For setting up a Multimedia Studio it was necessary for the researches to have an understanding of the following –

1. Knowledge and understanding of various medias – software and hardware.
2. Listing and understanding of various mediums.

4.4.3.1 Hardware and Software requirements
The researcher begins with setting up and running up Multimedia Hardware in such a manner. So that a well equipped multimedia studio could be
set up. The researcher studied and found that there were two distinct kinds of multimedia hardware available in the market.

1. Those with multimedia enabled motherboards – requiring little or no additional multimedia peripherals.
2. Those built with additional multimedia peripherals.

So the researcher could choose to buy a motherboard with audio input and output capabilities and thus save some cost on buying an external card or even could choose to buy a basic motherboard without multimedia capabilities and later on, add favourite sound card to it.

The computer with Motherboard integrated multimedia was selected with a dedicated sound card with advanced capabilities to create next generation audio effects for MML package.

AGPI Graphics accelerator cards were used as an interface between and computer and the monitor. While AGP cards merely handled the color display and resolution, graphics accelerators helped in sophisticated graphics acceleration. So AGP cards helped in getting better visuals and performances in MML packages.

The sound cards or the audio cards managed almost all possible kinds of audio including digital audio or mp3 etc.

Figure 4.13 Multimedia add-on cards (Hardware setup for MMTPs)
The researcher also used a pair of speakers or headphones for audio recordings. And of course, two good cars to actually hear the sounds as they come out of a sound card.

The CD controller cards were used to handle CD-ROM/CD-Drives Video Capture Boards were used by the researcher to capture video contents from VCRs and Handy Cams into the computer, in digital video format.

VGA to PAL INTSC Conventor Card was used to convert PC to TV.

**Multimedia Software**

The multimedia software is very generic and conceptual in nature. Theoretically, any type of software performing multimedia function or other can be termed as multimedia software. It encompasses a wide variety of tools, application, packages, device drivers and utilities – all related to multimedia, in one way or the other.

![Multimedia Software Tools](image)

**Figure 4.14 – Multimedia Software Tools**

**Multimedia Software Tools**

The following multimedia software was required for MML package development.
Device Driver Software – meant for installing and configuring multimedia peripherals.

Media Players - meant for handling Multimedia file formats.

Media Conversion Tools – meant for encoding/decoding multimedia contents and for converting one file format to another.

Media Editing Tools – meant for creating/editing multimedia data.

Multimedia Authoring Tools – meant for combining different kinds of media formats and deliver them as multimedia contents.

While developing MML Packages Applications were created with the help of above-mentioned Multimedia Software Tools and Packages. External multimedia equipments used by the researcher for developing multimedia learning package.

**External multimedia equipments used by the researcher for developing Multimedia Learning Package**

Apart from all those add-on cards that listed in the above section, some external multimedia equipment was used to carry out the tasks. Some of them were:

- Scanner
- Digital Camera
- Laser Printer
- Microphone
- Multimedia Speaker
- Cam Corder

*Figure 4.15 External Multimedia equipments for developing MMTPs*
1. **Scanner**
   A scanner may be the most useful equipment along with M/M component for scanning the pictures and putting them in digitized form in a computer scan makes clear electronic image of existing artwork such as photos, adds and cartoons.

2. **Digital Camera**
   A camera that stores images digitally rather than recording them on film. Once a picture has been taken, it can be downloaded to a computer system, and then manipulated with a graphics program and printed.

3. **Digital Handy Cam/Camcorder** — a light weight hand held television camera with an incorporated VCR, forming a compact self-contained unit.

4. **Colour Laser Printer** — A high speed printer that uses a laser to form dot-matrix pattern and on electrostatic process to fuse metallic particles to paper a page at a time. Capable of producing a variety of character fonts, graphics and other symbols.

5. **Microphone** — are those which are used for on line recording of sound using various multimedia software.

6. **Multimedia Speaker** — These are the speakers which produces sound output.

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**Figure 4.16** Figure External and Internal Multimedia devices

A high quality display monitor at least VGA

Sound Card with external speaker and a mmicrophone

Input Devices such as mouse, scanner etc.

Keyboard

Computer having at least 486 DX Processor with in built Co-Processor

Video-Capture Board

CD-ROM Device
How we can choose the right multimedia peripherals and equipments -

Given the myriad of brands and products available in the multimedia peripherals category, it was but a complex exercise to choose the best products among the lot and to identify those that provided professional services and offer good value for money.

A good starting point, before buying any piece of multimedia hardware, the researcher checked up IT magazines and websites and caught hold of reviews comparisons about the product. The researcher studied some data in the periodicals that provided monthly research results and offered information on multimedia hardware and the best of the breeds available in all categories.

4.4 MULTIMEDIA FORMATS AND THEIR FUNCTIONALITY

The selection of the most common multimedia formats required a great care because when the researcher selected a format, also needed to time it judicially only then it could make the entire presentation could be made effective. There was no overlapping of any particular element since it could cause overdosing. Animation makes a presentation effective and moving images have the multiple uses, but a screen should not include permanently moving animation so not to distract the user from interpretative text. The various formats of multimedia were used by researcher independently or in combination with one another in the right proportions. The choice of the format largely depended upon the nature and objectives of the concept and the availability of resources, time budget, 2-D and 3-D animation facilities for the multimedia learning package. Furthermore, it may be noted that though multimedia learning package can be a powerful learning and teaching tool because it engages multiple senses, but its success or failure largely depends on the teacher using it. Multimedia Learning Package creates a better learning environment and the students actively participate in the class. So Multimedia Learning Package can prove an effective tool in the hands of teachers if, it is lightly used in the class.

4.5 OVERVIEW

It was envisaged that the use of three-fold self developed tools namely - Achievement Test, Opinionnaire and Multimedia Learning Package would
provide enough data to examine the effectiveness of multimedia in its minutest
details and help suggest the measures of impact on the stipulated variables
outlines for the study. The entire self-developed tools whole-heartedly endorsed
the effectiveness of MML package. The data thus collected was subjected to mean
score analysis and 't' value was computed to arrive at significant findings of the
study.