CHAPTER IV

METHODOLOGY
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References
CHAPTER IV

Methodology

Methodology possesses a key part in any research and is the description of procedures or techniques adopted in the research study. The present study is intended to study the feasibility and effectiveness of implementing modern instructional strategies in the institutions of Teacher Education in Kerala. This chapter gives a detailed account of the method adopted for the study, objectives, hypotheses, tools used for the study, validity and reliability of the tools used, sample for the study, preparation and administration of the tools and statistical techniques adopted.

4.1 Objectives of the Study

1. To ascertain the methods of teaching adopted in the Institutions of Teacher Education.
2. To examine the extent of awareness of modern teaching methods among teacher educators.
3. To survey the facilities available in the Institutions of Teacher Education in Kerala for attempting modern instructional strategies.
4. To ascertain the attitude of teacher educators towards modern instructional strategies.
5. To establish the relationship between Socio-economic status of teacher trainees and their achievement in Modular and Mastery Learning strategies.
6. To compare the effectiveness of Modular and Mastery Learning strategies.

4.2 Hypotheses of the Study

1. Certain pre-conditions are essential for the effective implementation of modern instructional strategies in the Institutions of Teacher Education.
2. Majority of the teachers in the Institutions of Teacher Education in Kerala are unaware of the innovations in teaching.
3. Use of modern Instructional strategies will be more effective than the approaches followed by teachers in the Institutions of Teacher Education in Kerala.
4. Existing physical facilities and academic atmosphere in the Institutions of Teacher Education are inadequate for the effective implementation of modern instructional strategies.
5. Socio-economic status is a deciding factor in improving achievement of teacher trainees through modern instructional strategies.

4.3 Method Adopted for the Study

The details of the Institutions of Teacher Education of Kerala State were obtained through a survey covering all the Teacher Education Institutions (Appendix A). Of these, 50 Teacher Education Institutions were brought under the purview of this study. The intention was to obtain
a status report on the conditions to be analysed in terms of requirements of modular and mastery learning strategies. The relevance of the methods for the investigation is obvious from the commentary of Best and Kahn¹ (1996). The investigator felt that the survey method would help in bringing out the extent of relationships of modern instructional strategies.

The Experimental Method was adopted to find out the feasibility and effectiveness of modern instructional strategies like Modular and Mastery Learning strategies in the Institutions of Teacher Education in Kerala.

Campbell and Stanley² (1966) defined experimentation as research in which variables are manipulated and their effect on other variables observed. Cattell³ (1966) described experiment as a recording of observations, quantitative or qualitative made by defined and recorded operations and in defined conditions. Experimentation is the classic method of science laboratory, where elements manipulated and effects observed can be controlled. It is the most sophisticated, exciting and powerful method of discovering and developing an organised body of knowledge Best⁴ (1977).

The design selected for the study was **post-test only control group design**. This design is one of the most effective in minimising the threats of experimental validity.
Table 4.1
Secondary Teachers Training Institutions (B.Ed) Under Five Universities in Kerala.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of University</th>
<th>Nature of Management</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Govt.</td>
<td>Private Aided</td>
<td>Private Unaided</td>
<td>University Centre</td>
</tr>
<tr>
<td>1.</td>
<td>Kerala</td>
<td>1</td>
<td>6</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>Calicut</td>
<td>2</td>
<td>2</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Mahatma Gandhi</td>
<td>0</td>
<td>7</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>3.</td>
<td>Sree Sankaracharya</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>Kannur</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>17</td>
<td>24</td>
<td>33</td>
</tr>
</tbody>
</table>

Source: Teacher Education in Kerala (2000)

4.4 Tools Used for Study

The instruments employed for collecting data are called tools. "Tools employ distinct ways of describing and qualifying the data", according to Best (1992). It depends on the nature of the problem and the kind of data required.

The tools and techniques used for collecting data for the present investigation included the following:

1. Personal Data Sheet
2. Scale of Attitude towards Modern Instructional Strategies (SATMIS).
3. Modular Awareness Questionnaire.
4. Mastery Learning Awareness Questionnaire.
5. Achievement test on the selected unit ‘Individual Differences’.
6. Questionnaire showing the opinions regarding the present physical facilities academic atmosphere in the Institutions of Teacher Education.
7. Checklist to find out the methods of teaching adopted by Teacher Educators in the Institutions of Teacher Education.
8. Module on the selected topic ‘Individual Differences’.

4.4.1 Description of tools.

1. Personal Data Sheet

This is used to collect basic information about respondents and to measure the following variables, Parental education, Parental income and Parental occupation. A copy of the personal data sheet used in the study is given in Appendix B.

Academic achievement of teacher trainees and other personal details of the sample selected for the study are collected through the personal data sheet.
The Socio-economic Status Scale

The investigator used the Socio-economic status scale standardised by Nair (1970) with necessary modifications (in scoring) to measure Socio-economic status of the subjects. In this study, Socio-economic status is measured in terms of, parental education, parental income and parental occupation. Taking into consideration the increased standard of living, the income limits are modified in consultation with experts. The weightage given to different items of the Socio-economic status scales is given in Table 4.2.

Table 4.2
The Weightage Given to Different Items of the Socio-economic Status Scale

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Education</th>
<th>Weight-age</th>
<th>Occupation</th>
<th>Weight-age</th>
<th>Income per month</th>
<th>Weight-age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Doctoral Degree, Master’s Degree, Professional Degree, etc.,</td>
<td>10</td>
<td>Professional</td>
<td>10</td>
<td>Above Rs.15,000/-</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>Bachelor’s Degree, Engg. Diploma</td>
<td>8</td>
<td>Semi-professional</td>
<td>8</td>
<td>Between Rs.10,000-15,000/-</td>
<td>8</td>
</tr>
<tr>
<td>3.</td>
<td>Pre – Degree, TTC, etc.,</td>
<td>6</td>
<td>Skilled work</td>
<td>6</td>
<td>Between Rs.5001-10,000/-</td>
<td>6</td>
</tr>
<tr>
<td>4.</td>
<td>S.S.L.C.</td>
<td>3</td>
<td>Semi-skilled work</td>
<td>3</td>
<td>Between Rs.2,001-5,000/-</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>Standard VIII</td>
<td>2</td>
<td>Unskilled labour</td>
<td>2</td>
<td>Between Rs.1,001-2,000/-</td>
<td>2</td>
</tr>
<tr>
<td>6.</td>
<td>Illiterate</td>
<td>0</td>
<td>Unemployed</td>
<td>1</td>
<td>Below Rs. 1,000/-</td>
<td>1</td>
</tr>
</tbody>
</table>
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Classification of occupations

I. Unemployed: No regular employment and no special qualifications or skills.

II. Unskilled: Coolies, ordinary labourers, watchmen, peons and other low level employees in establishments, and similar categories.

III. Semi-skilled: Small scale merchants, Police constables, library and office attenders.

IV. Skilled: Mechanics, Fitters, field workers, electricians, drivers, Photographers, laboratory assistants, carpenters, masons, document writers, vakil clerks, head constables, village officers and similar categories.

V. Semi-Professional: Chemists, druggists, qualified nurses, trained teachers, managers, superintends of offices, small-scale land owners sub-inspectors of police/equivalent, sub-registrars, assistant education officers, block development officers of sub district level, public health workers and similar categories.

VI. Professional: Judges, bank executives officials, doctors, engineers, lawyers, university teachers, heads of research organizations heads of govt. Departments, Secretaries to govt, high land owners, business executives and equivalent categories.

Each subject was assigned a score on each of the three categories—parental education, parental income and parental
occupation. The three independent scores added (with equal total weights given to each) yielded the score of the socio-economic status for the family or for the respondent.

2. **Scale of Attitude Towards Modern Instructional Strategies (SATMIS)**

This scale was developed by the investigator with the help of his supervising teacher, in order to measure the attitude of teacher educators towards modern instructional strategies. Learner attitudes also affect the potential for future learning. Attitudes have been defined as mental status that influences the choice of personal actions according to Gagne's (1985) Attitudes are learned predispositions to act in a consistent way towards particular persons, objects for learning. Instruction can be geared to shape students attitudes.

The development in recent years has proved that the teacher is the ultimate key to the educational change and improvement. The teacher behaviour, thus is a strong determinant of learner outcome. The strategies employed by teachers really motivate the students, develop interest in them and formulate proper attitude in their minds.

Since the investigator couldn't find an attitude scale which was meant for Indian sample, which measure the attitude of teacher educators towards modern instructional strategies, the investigator with the help of the supervising teacher, constructed a scale of attitude towards modern
instructional strategies applicable to teacher educators of Kerala state and standardised.

**Selection of statements**

After consultations with experts in the field of teacher education, owing to usability and practicability, it was decided to use the technique developed by Likert. The selection of statements was done as follows.

The investigator studied books, journals and other descriptive materials to select the statements for the attitude scale. Experts in the field were also consulted and their suggestions were taken into consideration. Although there are a number of strategies in education, the investigator decided to include twenty-one modern instructional strategies in the scale since all these strategies can be implemented in classroom conditions.

An initial pool of 55 statements was prepared and was given to ten experienced and qualified teachers. Before this the language was checked for ambiguity of wordings, if any. It was also ascertained that the vocabulary used was appropriate.

The panel of teachers were asked to evaluate the statements keeping in mind the following points.

a. Whether there were enough statements under each of the modern instructional strategies.

b. Clarity and relevancy of each statement.
c. The level of language used in each statement.

Based on their suggestions, the statements which were complex, vague, and/or not appropriate to measure the attitudinal construct were deleted. The remaining 35 statements formed the draft of the attitude scale. Out of the 35 statements, 17 were positive and the remaining 18 negative.

**Initial tryout**

The 35 statements were randomly arranged. To avoid any error or tendency to give a stereotyped response, items of positive and negative responses were evenly arranged. Directions for the respondents were also prepared. The teacher educators were asked to choose any one of the five responses after carefully reading the statement. The five responses were SA-Strongly Agree, A-Agree, U-Undecided, D-Disagree and SD-Strongly Disagree. After the administration of the scale, it was scored following the scoring procedure suggested by Likert (Edwards, 1957). For items of positive statement, scoring system was as follows:

<table>
<thead>
<tr>
<th>For every</th>
<th>SA response</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>response</td>
<td>4</td>
</tr>
<tr>
<td>U</td>
<td>response</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>response</td>
<td>2</td>
</tr>
<tr>
<td>SD</td>
<td>response</td>
<td>1</td>
</tr>
</tbody>
</table>
For every negative item, the scoring system was reversed. Appropriate response sheets were also prepared along with the draft form of the scale.

**Item Selection**

The draft scale was administered to a representative sample of 120 teacher educators. The sum of the scores of all the items constituted the total score of the scale. 14, incomplete entries were exempted and of the rest 6 entries were rejected at random to bring down the number to 100 for convenience.

The selection of items for the final form of scale, SATMIS was done as per the procedure suggested by Edwards (1957). The response sheets of the individuals were arranged in the descending order of the total scores. The highest 25% and the lowest 25% of the response sheets were separated \( N_H = 25 \) and \( N_L = 25 \). These were used as criterion groups to evaluate individual statements. In evaluating the responses of the high and low groups to the individual statements, the ratio was found using the formula,

\[
t = \frac{\bar{X}_H - \bar{X}_L}{\sqrt{\frac{\sum (X_H - \bar{X}_H)^2 + \sum (X_L - \bar{X}_L)^2}{n(n-1)}}}
\]

**Where** \( \bar{X}_H \) = the mean score of a given statement for the high group
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\[ \bar{X}_L = \text{the mean score of a given statement for} \]
\[ \text{the low group.} \]

\[ \sum (X_H - \bar{X}_H)^2 = \sum X_H^2 - \left( \frac{\sum X_H}{n} \right)^2 \]

\[ \sum (X_L - \bar{X}_L)^2 = \sum X_L^2 - \left( \frac{\sum X_L}{n} \right)^2 \]

Where \( \text{n} \) = the number of subjects in the upper and lower groups.

\( X_H \) = score for a given statement in the high group.

\( X_L \) = score for a given statement in the low group.

The 't' value for each item was calculated using the above formula. The statement for which 't' value is greater than or equal to 1.75 was regarded as an item, which possess internal consistency and hence discriminating power (Edwards, 1957). Items with 't' values from 3.88 to 1.75 were selected for the final form of the scale.

Thus 30 statements were selected for the final test. Out of the 30 statements, 15 were negative and 15 positive. Items with negative and positive statements were distributed in the decreasing order of means.
A specimen of finding t value is shown below:

<table>
<thead>
<tr>
<th>High Group</th>
<th>Low Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response</td>
<td>Response</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>$f_1$</td>
<td>$f_2$</td>
</tr>
<tr>
<td>$X_1$</td>
<td>$X_2$</td>
</tr>
<tr>
<td>$f_1X_1$</td>
<td>$f_2X_2$</td>
</tr>
<tr>
<td>$f_1X_1^2$</td>
<td>$f_2X_2^2$</td>
</tr>
<tr>
<td>$(X_H)$</td>
<td>$(X_L)$</td>
</tr>
<tr>
<td>$(X_H)^2$</td>
<td>$(X_L)^2$</td>
</tr>
<tr>
<td>SA</td>
<td>23</td>
</tr>
<tr>
<td>A</td>
<td>2</td>
</tr>
<tr>
<td>U</td>
<td>_</td>
</tr>
<tr>
<td>D</td>
<td>_</td>
</tr>
<tr>
<td>SD</td>
<td>_</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$\Sigma f_1 x_1 = 123 \times 5 = 607 \quad \Sigma f_2 x_2 = 65 \quad \Sigma f_2 x_2^2 = 195 \quad n = 25$

$\Sigma (X_H - \bar{X}_H)^2 = 607 - \left(\frac{123}{25}\right)^2 = 607 - 24.2 = 582.8$

$\Sigma (X_L - \bar{X}_L)^2 = 195 - \left(\frac{65}{25}\right)^2 = 195 - 6.76 = 188.24$

$\bar{X}_H - \bar{X}_L = \frac{123}{25} - \frac{65}{25} = 4.92 - 2.6 = 2.32$

$\therefore t = \frac{\bar{X}_H - \bar{X}_L}{\sqrt{\frac{\Sigma (X_H - \bar{X}_H)^2 + \Sigma (X_L - \bar{X}_L)^2}{n(n-1)}}}$

$= \frac{2.32}{\sqrt{\frac{582.8 + 188.24}{600}}}$

$= 1.84$
Final form

The final form of SATMIS contained 30 statements and specific directions were given to the respondents. An appropriate response sheet was also prepared. The maximum and minimum score which any student may score on SATMIS will be 150 and 30 respectively.

The empirical or statistical validity of SATMIS was estimated by using average marks obtained in B.Ed in the five theory papers for the first and terminal examination of pupils. The average marks in B.Ed theory papers were used for that purpose. The score obtained in the SATMIS was correlated with achievement. The coefficient of correlation was found to be 0.84.

Reliability of SATMIS was estimated using test retest method after two weeks and the reliability was found to be 0.81.

The draft form of the SATMIS and its response sheet are given in Appendices C and D. The details of item selection for SATMIS are given in Appendix E. The final form of the SATMIS and its response sheet are given in Appendices F and G respectively.

3. Modular Awareness Questionnaire.

Awareness of teacher educators on new methods, techniques and strategies is a pre-requisite for the effective implementation of any new strategy.
To assess the awareness of teacher educators on modular strategy, a modular awareness questionnaire was prepared and administered. Information on general, structural and functional characteristics of modules and modular strategy were included. Positive as well as negative statements were included. Content, components; advantages to students, teachers and institutions; evaluation measures; drawbacks of the strategy were also included. Respondents had to tick in 'Agree', 'Undecided', and 'Disagree' column against each item. The items were selected by scrutinizing the available literature on modules and modular strategy. This was administered among 30 teacher educators and necessary modifications were made on their suggestions and comments.

There were forty items in the questionnaire. The statements were positive and negative and the scoring scheme was that for each positive statement scores were assigned 3,2,1 and for negative statement scores in the reverse order of 1,2,3. Respondents had to tick on 'Agree', 'Undecided', or 'Disagree' column against each item.

The initial modular awareness questionnaire consisting of forty items was tried out on a sample of 40 teacher educators and necessary modifications were made and finalised. The modular Awareness questionnaire is given in Appendix H.
4. **Mastery Learning Awareness Questionnaire**

Mastery Learning is based on the philosophy that all students can and will learn what they should or must learn in order to be successful in the later stages of schooling and life. Anderson\textsuperscript{10} (1985) had identified six essential features of mastery learning. These features are:

a) Clearly specified learning objectives;
b) Short, highly valid assessment procedures;
c) Pre-test mastery performance standards;
d) a sequence of learning units each comprising of an integral set of facts, concepts, principles and skills;
e) Provision of feedback of learning progress to students;
f) Provision of additional time and help to correct specified errors and misunderstanding of student who are failing to achieve the present mastery learning standards.

Mastery learning approach has many advantages over previous strategies in two important respects. First, the feedback instruments were much improved. Second, this strategy employed a greater, variety of instructional correctives than previous approaches. Hence mastery-learning questionnaire were prepared to assess the awareness of teacher educators on mastery learning. This was administered at HM Training College, Randarkara and necessary modifications were made based on their suggestions and comments. There were forty items in the
questionnaire. The statements were positive and negative and the scoring scheme was that for each positive statement scores were assigned 3,2,1 and for negative statement scores in the reverse order 1,2,3. Respondents had to tick on 'Agree', 'Undecided', or 'Disagree' column against each item. The final Mastery Learning Awareness Questionnaire is given in Appendix I.

5. **Achievement Test on Individual Differences**

A teacher made achievement test on the module 'Individual Differences: Heredity and Environment' was prepared by the investigator. This topic was selected since it is a basis of a person of what he is and hence important. Details of the development of the test are described under the following heads:

I. Planning of the test

II. Design of the achievement test

III. Pilot Test

IV. Tryout

V. Item Analysis

VI. Preparation of the final test

VII. Standardisation of the test

VIII. Reliability

IX. Validity
Planning of the test

The initial step in the construction and standardization of a test is its planning. The main points to be taken into account are the coverage of the areas of content and the coverage of the expected behaviour changes implied by predetermined objectives. This was done in consultation with ten experts in the field of education and a thorough review of related literature.

Design of the Achievement Test

The test items were prepared from the content area of the B.Ed syllabus 'Individual Differences: Heredity and Environment' in Educational Psychology. This was selected because, of the six units in the syllabus of Educational Psychology this topic is of utmost importance in the present context. Hence the investigator selected this topic.

Weightage to content in the achievement test

The topic is 'Individual differences: Heredity and environment'. Of the three subtopics more marks were allotted to Heredity and environment. Ten experts in the field of education were also consulted.
Table 4.3
Weightage to Content in the Achievement Test

<table>
<thead>
<tr>
<th>Sl. No:</th>
<th>Content</th>
<th>Marks</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Individual Difference</td>
<td>15</td>
<td>37.5</td>
</tr>
<tr>
<td>2</td>
<td>Heredity and Environment</td>
<td>19</td>
<td>47.5</td>
</tr>
<tr>
<td>3</td>
<td>Illustrations of Heredity and environment</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>40</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

**Weightage to objectives in the achievement test**

The purpose of the test is mainly to test the achievement of the pupils in the cognitive domain. So the categories of objectives selected for the preparation of achievement test were:

(i) Knowledge

(ii) Understanding

(iii) Application

Of the 40 questions, 50% weightage was given to the 'understanding', 30% to and 20% to application levels in consultation with experts in the field of education.
Table 4.4
Weightage to Objectives in the Achievement Test

<table>
<thead>
<tr>
<th>SI No</th>
<th>Objectives</th>
<th>Marks</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Knowledge</td>
<td>12</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Understanding</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>Application</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>

Weightage to difficulty level of questions

Based on the difficulty level of questions, the items in the test were classified into three levels—easy, average, and difficult, and on consultation with ten experts in the field of education adequate weightage was given to each of the difficulty level of questions.

Since most of the students were of average ability, average level questions were included more. The weightage given to the difficulty level of questions in the achievement test is given in Table 4.5.

Table 4.5
Weightage to Difficulty Level of Questions in the Achievement Test

<table>
<thead>
<tr>
<th>SI No</th>
<th>Difficulty level of questions</th>
<th>Marks</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Easy</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>Average</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>Difficult</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>40</td>
<td>100</td>
</tr>
</tbody>
</table>
Blue Print

The blue print is a three dimensioned chart showing the weightage given to the objectives, contents and level of difficulty of questions in the achievement test. It gives all necessary information about the design of the test in summary form. The Blue print of the achievement test is given in Table 4.6.

**Table 4.6**

Blue print of Achievement Test

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Knowledge</th>
<th>Understanding</th>
<th>Application</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O  S  E</td>
<td>O  S  E</td>
<td>O  S  E</td>
<td></td>
</tr>
<tr>
<td>Individual Difference</td>
<td>7 - - 4 - 4 -</td>
<td>(1) (1) (1)</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Heredity and Environment</td>
<td>5 - 0 - 4 -</td>
<td>(1) (1) (1)</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Illustrations of Heredity and Environment</td>
<td>- - 6 - -</td>
<td>- - -</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>12 20 8</td>
<td>40</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*O – Objective type; S – Short answer type; E – Essay type*

The number inside the bracket indicates the number of questions and the number outside the bracket indicates the marks allotted.

The investigator reviewed books, periodicals and other descriptive materials to procure the material to construct the achievement test. After
Pilot test

The test was administered on a sample of 30 teacher trainees. They were informed about the significance of the test. Necessary instructions were given to them before the commencement of the test.

Analysing the answer scripts the investigator noticed that some items were ambiguous and some were too difficult for them. The defects were noticed and rectified. The pilot test helped the investigator to give the final test.

The Institutions of Teacher Education selected for the tryout of test was on the basis of (i) Locality of the college (ii) Type of management

Tryout

Tryout is an essential step in the construction and standardisation of a test. It helps to detect the difficulty and discriminating power of the test whereby the test items may be arranged in a sequential manner. The draft form of the Achievement test and its response sheet are given Appendices J and K respectively.

Item Analysis

The test was item analysed by estimating the indices of discrimination and difficulty based on the procedure suggested by Ebel (1966). Item analysis helps to detect the strength and weakness of test items. This involves a statistical technique to assess the difficulty level and
discriminating power of each test item. By this measure, the suitability of each item for inclusion in the final test can be determined.

All the 400 obtained answer sheets were checked and incomplete answer sheets were rejected. Finally 384 complete answer sheets were available. The number was further reduced to 370 since some were shabby, hence discarded. 100 score sheets with top scores were grouped together and considered as the high group.

Similarly 100 score sheets with low scores were grouped together to form the low group. The two extreme groups, the high and low 27 percent formed the criterion group for the calculation of difficulty and discrimination indices of the test items. The following formulae were used.

\[
\text{Difficulty index of an item} = \frac{U + L}{2N}
\]

\[
\text{Discrimination power of an item} = \frac{U - L}{N}
\]

Where

UNumber of right responses in the group achieving high in the test (top 27%)

LGroup achieving low in the test (bottom 27%)

NNumber in the high achieving or low achieving group.

Applying these criteria the items of the test were selected and given in Appendix L. Of the sixty questions prepared for the draft test, the items
with difficulty index more than 0.72 and discrimination power more than 0.23 were selected.

**Preparation of the final test**

The items selected under item analysis were put together and were presented in the increasing order of difficulty. It was observed during the tryout that the trainees could answer the complete test with 60 minutes. Taking into consideration the elimination of 20 items the time for the final test was proportionately fixed as 40 minutes. The items were reprinted in a booklet form together with all necessary instructions for answering the test. Total marks for the test was fixed as 40, each question carrying one mark. The final form of the Achievement test and its response sheet are given in Appendices M and N respectively.

**Standardisation of the test**

The test was administered on a sample of 240 teacher trainees of various training colleges of Kerala. Stratified sampling was adopted for giving due representation to sex, locality and type of management.
### Table 4.7
**Break-up of Sample of Colleges**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name of the college</th>
<th>No: of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Govt. College of Teacher Education, Trivandrum</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>Keyisahib Training College, Taliparampa</td>
<td>60</td>
</tr>
<tr>
<td>3</td>
<td>MCT Training College, Melmuri</td>
<td>60</td>
</tr>
<tr>
<td>4</td>
<td>University college of Teacher Education, Paippad.</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>240</strong></td>
</tr>
</tbody>
</table>

#### 4.5 Validity and Reliability of the Tools Used

The reliability of the tool was estimated by test-retest method. The tool was administered and repeated on the same group of 40 students after a time interval of 3 weeks. Coefficient of correlation was computed between the first and second set of scores. The reliability coefficient between two ratings was found to be 0.84.

Content validity of the test, which requires the determination of the adequacy of each item was ensured through careful planning of the test, satisfying the adequacy of sampling of test items models of the construct to be measured and the meticulous analysis of the test items of experts.

The statistical validity of the test was estimated by using average marks obtained in Psychology of the first and second terminal
examinations of B.Ed students treated as external criteria. The average marks of psychology of B.Ed was correlated with average scores in psychology. The coefficient of correlation was 0.87.

The validity and reliability coefficient reported here show that the achievement test used in the study is reasonably valid and reliable.

6. **Questionnaire showing the opinions regarding the present physical facilities and academic atmosphere in the Institutions of Teacher Education**

Opinions of teacher educators on the available physical and academic infrastructure of the institutions were to be collected through a questionnaire prepared for the purpose. Their suggestions for further improvements and better functioning of the institutions were also included in the questionnaire. The questionnaire has three parts: **Part one**: library facilities; **Part two**: laboratory facilities and **Part three**: audio-visual facilities. A copy of the opinionnaire is given in Appendix 0.

**Part1: Library**

Part 1 of the questionnaire deals with the opinion of teacher educators on the facilities of libraries in the Institutions of Teacher Education in Kerala.

Teachers were asked to mark their order of preference for the given eleven objectives of the library. Opinion on the system recommended to
run the libraries—central library with subject—wise classification class library with subject—wise classification, opinion on the library administration—DCE's office, Government or any other body are included in the questionnaire. Opinion of teacher educators about giving teachers a short-term library course—as a part of B.Ed, or as part of in-service were also included. Nine defects commonly found in the administration and organization of libraries were listed and teachers were asked to mark which they feel most important in regard to their institutions. Twelve proposals for improvement were given and teachers were asked to mark those, which they feel practicable.

Part 2: Laboratory

Part 2 of the questionnaire is intended to collect opinion of teacher educators on the facilities in laboratories in the institutions of Teacher Education in Kerala. Opinions of teacher educators on the physical and academic laboratory facilities in their institutions were collected through this part. Opinion on the location of the laboratory, number of students that can be accommodated at a time, area of laboratory, etc. were included. Teachers were asked to write the adequacy of furniture, equipments, apparatus, chemicals and additional requirements for each item. Comments on the stock facilities, replacement and repair provisions and difficulties in using the laboratory were also included in the questionnaire.
Part 3: Audio-Visual facilities

Part 3 of the questionnaire was used to collect the opinion of teacher educators on audio-visual aids, facilities in the institutions of Teacher Education in Kerala. Teacher educator’s opinion on audio-visual aids available in the institution and additional requirements needed were collected through this part. Adequacy of aids available, teacher improvised, student teacher made aids and college input were also enquired into. Comments on the storage facilities for audio-visual aids, replacement and repair provisions; difficulties in using audio-visual aids and suggestions for improving the use of audio visual aids were also included.

7. **Checklist to find out the Methods of Teaching adopted by Teacher Educators in the Institutions of Teacher Education**

The system of methods and principles used in a particular discipline is the methodology. Even the best curriculum and most perfect syllabus reminded unless quickened into life by the right methods of teaching and the right kind of a teacher. "Teachers constantly feel the need for a better mastery of teaching methods. There are many excellent teaching methods known to teacher educators. They are lecture method, demonstration method, individual laboratory method, project method, discussion method, modular approach, heuristic method and mastery learning. The teacher educators are asked to record their opinion in the order of preference for the eight methods listed."
Secondly difficulties faced by teacher educators in adopting the methods mentioned above are listed namely, lack of time, lack of training, lack of facilities and lack of reference material. The teacher educators are asked to record their opinion in the order of preference on five difficulties listed. A copy of the checklist is given in Appendix P.

8. **Module preparation**

Module is a self-learning package, which contains everything needed for self-instruction. Modular strategy uses module as the basic unit of instruction prepared by the investigator.

The Curriculum Development Committee for B.Ed. course (1989) prescribed five basic units in the preparation of modules. They are:

- Contents /specification
- Objectives
- Learning experiences
- Evaluation and
- Basic reading
- Further reading

**Contents for the modules**

The topic for the module was selected after examining the content of the B.Ed curriculum and discussion with teacher educators and subject experts. "Individual differences: Heredity and Environment" form Educational Psychology was selected for the preparation of a module.
Module

Individual Differences: Heredity and Environment


The topic was broken down into three subunits or capsules and the contents, objectives, instructional strategies and evaluation have been specified for each unit. A copy of the module is given in Appendix Q.

Subunit 1.1

The content for this sub-unit includes: Differences among living things-attributes-size, shape and appearance. Differences in conduct. Areas of differences; physical, personality, social and capacity-differences in abilities and educational implications

The instructional strategies include lecture, Buzz session, adjunct questioning, eliciting, discussion and reading assignment.

Evaluation procedure includes objective questions and evaluation on reading assignment.
Sub-Unit 1.2

The content covers causative factors of individual differences - Heredity and Environment. Heredity-concept-mechanism-cell-nucleus-chromosomes, genes, characteristics with reference to human beings. Influence of Heredity upon the development of the individual. Identical and fraternal twins and sex-linked characteristics.

The instructional strategies for this subunit includes lecture, discussion, students presentation and group assignment.

Evaluation procedure includes objective type questions, reading assignments and case study.

Sub-Unit 1.3

The content for this unit includes: Importance of Heredity and Environment, interaction of Heredity and Environment. Illustrations-Kellogg and Kellogg experiment; Wolf children study; Galton study; Dudgale study and Kallikak family study.

Lecture, illustrations and student presentation were the instructional strategies to be used.

Evaluation was to be done through objective type questions, group assignment and project study.

A flow chart of learning process of the module “Individual Differences Heredity and Environment” is given in Figure 4.1.
Figure 4.1: Flow chart of Learning Process of the Module: Individual Differences: Heredity and Environment
List of Readings Supplied for Experimental Group


Suggested basic and further readings were given for the module.

This list is as follows:

Basic Readings


Further Readings


Pre-testing of Module

The module prepared by the investigator on Individual Differences: Heredity and Environment was circulated among ten teacher educators of three different institutions of teacher education teaching psychology for their suggestions and comments.

Pilot Study

The pilot study using the module was done in order to determine its adequacy and feasibility. It was done on a sample of twenty teacher trainees. After the pilot study and based on suggestions from the experts the module was finalized and time was fixed as two hours.

Experimental Study

For this study Post-test only Control-group design was selected because it was not possible to locate a suitable pre-test and there is also the possibility that the pre-test may have an effect on the experimental treatment due to the age of the experimental group, particularly.

The experiment was based on the assumption on John Stuarts Mill's Law of single variable which states that if two concepts are similar in every respect and an element is added or subtracted from one, but not from the other, any difference that develops, is the result of the operation of that element added or subtracted.

The steps involved in the post-test only control group design are as follows:
1. randomly assign subjects to the experimental and control groups.

2. administer the treatment to the experimental group but not to the control group, and

3. administer the post-test to both groups was suggested by Borg and Gall\textsuperscript{12} (1963).

9. **Mastery learning lesson on 'Individual Difference'**

Mastery learning enables 75 to 90 percent of the students to achieve the same high level as the top 25 per cent learning under typical group based instructional methods.

The model proposed by Carroll\textsuperscript{13} (1963) makes it clear that if the students are normally distributed with respect to aptitude and all are provided with the same instruction, the end result will be a normal distribution. And, if the students are normally distributed with respect to aptitude but the kind and quality of instruction and the amount of time available for learning are made appropriate to the characteristics and needs of each student, the majority of students may be expected to achieve the mastery of the subject.

Carroll also proposed that, for any given objective, the degree of learning achieved by any student will be a function of time allowed, the perseverance of the student, the quality of instruction, the students' ability to understand instruction and his aptitude.
Bloom has formulated an effective working model for mastery learning based on the conceptual model of Carroll. It combines regular classroom instruction with feedback corrective techniques for overcoming individual learning errors. Additional learning time is provided for those students who need it. Bloom's approach uses regular group based instruction that is supplemented by carefully prescribed corrective study for those students who fail to achieve mastery during the group-based instruction. For attaining mastery, Bloom suggests the following steps.

(i) Subdivide the course into a series of learning units.
(ii) Identify and clearly specify the instructional objectives.
(iii) Set mastery standards for objectives in each learning unit.
(iv) Teach the learning tasks through regular methods.
(v) Give formative tests at the end of each learning unit.
(vi) Give specific procedures for correcting learning errors and additional time to those who need it.
(vii) Administer a summative test.
(viii) Evaluate and improve the instruction using the results of the formative and summative tests.

Following the above views of Bloom, the investigator prepared lesson plans and conducted the experiment for mastery learning strategy. The content unit selected for experimentation, viz., "Individual Differences" was then divided into small learning units, each one accompanied by its
own objectives. For mastery learning (experimental group) these units were further subdivided into a larger set of relatively small units and the respective objectives were also fixed.

Lesson plans were prepared for small units by fixing the objectives. Learning experiences were fixed to attain the pre-determined objectives. Altogether twenty lesson plans, ten for mastery learning and ten for conventional classroom instruction, were prepared, each meant for 45 minutes duration. A sample lesson plan is given in Appendix .R.

Even though the content area selected and the specific objectives for each learning unit was the same for the experimental and control groups, the two groups were treated differently with regard to learning materials, instructional strategy, time needed for learning, supporting materials and evaluation.

In Mastery Learning strategy, the content was subdivided by the researcher into small units accompanied by its own objectives. Learning experience were provided in order to achieve these objectives. The investigator gave chance to oral work and drill work. Oral work helped in for attracting and sustaining attention of students. Drill work was made more individualized and it provided a spirit of play. The investigator provided a number of concrete examples for each concept and this helped the students to attain mastery in the particular concept. Learning classes were such as to help the individual to master each learning point.
In the classes of Mastery learning strategy, the investigator used a number of methods for effective instruction. Heuristic method, problem solving method, question-answer method, review, group discussion, assignments and Independent study were some of them.

Time taken for instruction was also different for the two groups. In the conventional classroom teaching, each lesson plan was covered by the already mentioned time. In the Mastery learning, classroom, after each unit, a formative test was given, and on the basis of the results of the formative tests, supplementary instruction was given to them. The group based supplementary instruction was given first and then individual supplementary instruction for those who needed it. The investigator proceeded to the next unit only after ensuring mastery in that unit.

For the experimental group, charts and models were used. Since the measures of pupils' psychological aptitude were not available, examination marks in psychology were taken as the basis to know the level of pupils selected both in the experimental and control groups. After each sub-unit, a formative test was also given to the experimental group, to diagnose them, that is to find out whether the objectives has been realized or not. Whenever this was lacking, additional instruction and time were provided to master the units individually. Then assignments on these areas were given separately for the individuals. The investigator motivated the low achievers by giving special attention to them. After each lesson a number
of evaluation questions were given. A summative test was given at the end of the experiment.

**Lessons for Conventional Learning**

While the method of teaching in the experimental group varied from unit to unit, depending upon the nature of the unit, the method of teaching used in the control group was mainly the lecture method. In the conventional method of teaching, the investigator, adopted usual learning experiences. The control group was taught the same content, the same units each day, through conventional classroom techniques. A frequent formative tests and individual assignments were not given to the group, the investigator has also not given any formative tests to this group.

For the control group, normal teaching aids were used. The additional teaching aids and charts prepared for the experimental group were not used in the control group.

**Formative Tests in Psychology**

The investigator prepared formative tests for three subunits of the unit ‘Individual Differences’ Viz;

a) Individual differences – attributes

b) Heredity and Environment

c) Illustrations of Heredity and Environment

Formative tests were intended to find out how much a student has not been able to achieve and why. The main purpose of formative tests
was to give immediate feedback with a view to achieve mastery. For the student who lacks mastery of the unit, the formative test should reveal the particular points of difficulty. So the investigator got a clear picture of the student's achievement. It helped him to find out the exact area in which difficulties exist and the exact nature of the deficiencies. The instructor can provide further learning experiences or he can change the method of teaching in the light of formative test results.

Formative tests must be given with respect to group tested (group diagnosis) as well as for each individual student (individual diagnosis). Group diagnosis is meant to locate difficulties general for the group or a subgroup, while individual diagnosis aims at helping each individual to solve specific difficulties of his own.

The investigator analysed the unit thoroughly to include all possible points, all possible stages in each of the points and items of all difficulty level within the same stage. Then the investigator prepared test items representing all the minute steps arising out of the analysis and the items were arranged in the order of difficulty.

**Achievement test in Psychology**

The achievement test used in modular strategy was used here. The scores of this test were taken as the basis for Post-Exposure comparison. A classroom teacher is most concerned with the achievement of his pupils in his subject. The term achievement has to be understood in relation to
the objectives of instruction that are translated into behavioural changes. A student tries to master almost all items of knowledge. These components were learnt at different levels. Some of these may be remaining at the information level, while certain others might have gone deeper to the understanding or application level.

It was also determined that the groups selected for comparison for the conduct of the experiment should be comparable. According to the suggestion of college authority two optional groups reported to be comparable were selected. The group selected was identical.

From the previous achievement test and pre-diagnostic test, scores of each student were determined. The investigator applied proper statistical techniques and found that the groups were matched for mean and standard deviation. By matching the group based on this scores, almost all variables affecting achievement can be said to be controlled to some extent.

But all learners did not know all necessary and sufficient pre-requisites. Hence an intermediate and necessary feedback was provided and ensured that both the groups were ready to proceed to the next unit.

After teaching the topic providing alternative learning situations the teacher administered post diagnostic test to determine the level of mastery and difficulty level of students. Those students who were not able to
achieve a level of about 80 percent mastery were given special teaching and were allowed extra time to attain mastery.

The investigator took special care in imparting remedial instruction after administering diagnostic tests. The remediation strategy includes peer tutoring, individualized reading or small group instruction by the teacher.

Even the outside classroom hours such as the lunch interval time, free periods obtained in the classes selected were utilized to instil remedial measures to the needed pupils. Thus remediation above 80 percent of the students attain mastery criteria prescribed by the teacher.

During this experimentation the investigator also taught the control group the same lessons using conventional method of Textbook Approach. At the end of the experimentation the investigator administered the same achievement test for both the groups and found out the feasibility of Mastery Learning strategy by comparing the test scores using appropriate statistical techniques.

**Variables Selected**

"In experimental studies the condition that is varied is referred to as independent variable". "The variable that is being predicted is called dependent variable" Travers\(^1\) (1973). Here the new teaching strategies are the independent (experimental) variable and the achievement of teacher trainees is the dependent variable.
Administration of Treatment

The sample selected for the experimental study was matched for socio-economic status and academic achievement. The control group was taught through traditional method i.e., lecture method mainly supported by lecture notes and assignments. The experimental group was given treatment i.e., modular and mastery learning strategies.

Teacher variability was reduced to be minimum by teaching the experimental and control groups by the investigator himself. Experimental and control groups were taught on the same day and for the same duration. The experimental group was supplied with reading materials selected for the purpose.

Correlation Study

"Correlation studies include all those research projects in which an attempt is made to discover or clarify relationships through the use of correlation coefficients", observes Borg and Gall (1963). The purpose of correlation coefficient to express in mathematical terms the degree of relationship between any two variables or it tells how effectively person's scores on one variable.

The correlation approach is highly useful in studying problems in education and in other behavioural sciences. Its principal advantage is that it permits one to measure a great number of variables and their interrelationships simultaneously. Another advantage of correlation
approach is that it provides the information concerning the degree of relationship between the variables being studied. It also permits carrying out prediction studies and making close estimates of the probable accuracy of our predictions.

The degree of relationship between Modular and Mastery Learning Strategy Score and Socio-Economic status is calculated through correlation study. Similarly the degree of relationship between modular and mastery learning approach and academic achievement was also calculated.

**Administration of the test**

The achievement test prepared was administered to the experimental and control groups on the same day, at the same time. Both groups were informed of the test previously.

The scores obtained on the achievement test for the experimental and control groups are analysed using appropriate statistical techniques.

**4.6 Sample for the Study**

The sample for the study included 400 teacher educators from 50 Institutions of Teacher Education in Kerala. Survey of the physical facilities and academic atmosphere was done in all the 50 institutions. The questionnaire to collect the opinion of teacher educators on the facilities in the institutions were administered among the 400 teacher
educators of the 50 institutions. The break up of the sample of teacher educators in the five universities of Kerala is given in Table 4.8.

### Table 4.8
**Teacher Educators in the Five Universities of Kerala**

<table>
<thead>
<tr>
<th>Sl.No..</th>
<th>Name of University</th>
<th>Teacher educators</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Male</strong></td>
<td><strong>Female</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Kerala</td>
<td>65</td>
<td>108</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Calicut</td>
<td>75</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Mahatma Gandhi</td>
<td>78</td>
<td>154</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Sree sankaracharya</td>
<td>12</td>
<td>38</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Kannur</td>
<td>14</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>244</strong></td>
<td><strong>355</strong></td>
<td></td>
</tr>
</tbody>
</table>

In order to test the feasibility of modular and mastery learning strategies in Institutions of Teacher Education an experimental study was conducted. The sample for the experimental study included 240 teacher trainees from four types of Teacher Education Institutions was taken at random sampling method.

The samples from each institution were further divided into: Experimental and Control groups by keeping the proportion of males and females. One experimental group was to study the effectiveness of modular learning strategy and the other experimental group was for studying the effectiveness of mastery learning strategy. So ultimately the
sample consisted of 160 teacher trainees in experimental group and 80 teacher trainees in the control group.

4.7 **Statistical Techniques Used**

The data were statistically analysed by calculating arithmetic means, standard deviations, critical ratios, coefficient of correlation and analysis of variance. The following formulas were used to compute the various statistical values.

1. **Arithmetic Mean**
   \[ \bar{x} = \frac{\sum f x}{N} \]  
   Garrett (1985)

2. **Standard deviation**
   \[ \sigma = \sqrt{\frac{\sum f x^2}{N} - \left( \frac{\sum f x}{N} \right)^2} \]  
   Garrett (1985)

3. **Critical Ratio (C.R)**
   \[ \frac{M_1 - M_2}{\sigma_D} \]  
   Where \[ \sigma_D = \sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}} \]  
   Garrett (1985)

4. **z test**

5. **Coefficient of correlation**
   \[ r = \frac{\sum x'y'}{N - CX.CY} \]  
   Garrett (1985)

6. **Analysis of variance**
   Garrett (1985)

7. **Regression Analysis**
   Garrett (1985)
References


