Chapter IV

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4.1 Introduction

This chapter on methodology explains about research questions, objectives, variables, hypotheses, design of the study, research and experimental procedure, delimitations, limitations, sample, tools, reliability and validity of tools, data collection, scoring and method of analyzing the data using appropriate statistical techniques in the present investigation.

4.2 Restatement of the problem

Teachers are the pillars of any nation. It is imperative to make them technically sound and professionally confident to create knowledge society. This formidable task of nation building can be achieved only with the help of hybrid learning environments. It is the need of the hour to think of the various possibilities of integrating the conventional face to face class room environment with e learning environment. Hence the problem of the present study is stated thus “Development, Validation, and Effectiveness of Blended Learning on Teaching of Science at B.Ed Level.”

4.3 Research questions of the study

The world of education is fast expanding with the prominent role of alternative channels of delivery to meet out the expanding learner mass. Among the alternative modes blended learning is having the edge of catering to a huge number of learners with less per capita expenditure along with face to face interaction with peer and instructor. Blended learning strategies in teacher education may train the novice and strengthen the experienced teachers to play a purposeful role. Thus the researcher by this assumption made the following research questions.
1. Can blended learning modify the behaviour of student teachers?
2. Can blended learning give update knowledge to the student teachers?
3. Can blended learning create critical thinking in the learners?
4. Can blended learning promote mastery in learners?
5. Can blended learning nurture the quest of the learners?
6. Is it possible for the teacher to use the blended learning modules in all teaching learning process?
7. In this information era can the blended learning method act as a boom to the learners?
8. Can blended learning increase the ICT readiness of the student teachers?

4.4 Objectives of the study

The following are the objectives of the study.

1. To integrate the personal touch of conventional face to face learning and e-learning in teacher education.
2. To identify the level of achievements through blended learning modules in science subjects.
3. To analyse the achievement of student teachers with respect to personal variables through blended learning.
4. To evaluate the effectiveness of blended learning modules in science subjects.
5. To find out the e quest of student teachers learning science through blended learning.
6. To study the ICT readiness of student teachers learning through blended learning.
7. To find out the relationship between e quest and ICT readiness of student teachers learning through blended learning strategy.

4.5 Variables of the study

The independent variable of this study is the blended learning strategy. The dependent variable is the achievement of student teachers in science education. The other variables involved in this study are e quest and ICT readiness. These variables are studied with respect to owning a personal computer, computer courses attended and surfing habit.

4.6 Hypotheses of the study

The following hypotheses were formulated based on the objectives of the study

1. There is no significant difference in the post test achievement in science between the control and experimental group student teachers.

2. There is no significant difference in the post test achievement in science between the control and experimental group student teachers owning a personal computer.

3. There is no significant difference in the post test achievement in science between the control and experimental group student teachers not owning a personal computer.

4. There is no significant difference in the post test achievement in science between the control and experimental group student teachers who had already attended any computer course.

5. There is no significant difference in the post test achievement in science between the control and experimental group student teachers who had not already attended any computer course.
6. There is no significant difference in the post test achievement in science between the control and experimental group student teachers who are surfing regularly.

7. There is no significant difference in the post test achievement in science between the control and experimental group student teachers who are not surfing regularly.

8. There is no significant difference in the post test e-quest scores between the control and experimental group student teachers.

9. There is no significant difference in the post test e-quest scores between the control and experimental group student teachers owning a personal computer.

10. There is no significant difference in the post test e-quest scores between the control and experimental group student teachers not owning a personal computer.

11. There is no significant difference in the post test e-quest scores between the control and experimental group student teachers who had already attended any computer course.

12. There is no significant difference in the post test e-quest scores between the control and experimental group student teachers who had not already attended any computer course.

13. There is no significant difference in the post test e-quest scores between the control and experimental group student teachers who are surfing regularly.

14. There is no significant difference in the post test e-quest scores between the control and experimental group student teachers who are not surfing regularly.
15. There is no significant difference in the post test ICT readiness scores between the control and experimental group student teachers.

16. There is no significant difference in the post test ICT readiness scores between the control and experimental group student teachers owning a personal computer.

17. There is no significant difference in the post test ICT readiness scores between the control and experimental group student teachers not owning a personal computer.

18. There is no significant difference in the post test ICT readiness scores between the control and experimental group student teachers who had already attended any computer course.

19. There is no significant difference in the post test ICT readiness scores between the control and experimental group student teachers who had not already attended any computer course.

20. There is no significant difference in the post test ICT readiness scores between the control and experimental group student teachers who are surfing regularly.

21. There is no significant difference in the post test ICT readiness scores between the control and experimental group student teachers who are not surfing regularly.

22. The blended learning strategy is not effective in improving the post test achievement of student teachers in science.

23. The blended learning strategy is not effective in improving the post test equest scores of student teachers.
24. The blended learning strategy is not effective in improving the post test ICT readiness scores of student teachers.

25. There is no significant relationship between the achievement and e quest of student teachers.

26. There is no significant relationship between the achievement and ICT readiness of student teachers.

27. There is no significant relationship between the e quest and ICT readiness of student teachers.

4.7 Methodology

4.7.1 Design of the study

The present study is an experimental study. The research paradigm is given in table 4.1.

Table 4.1 - The research Paradigm

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sample</th>
<th>Tools</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent</td>
<td>Dependent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achievement in science, e- Quest and ICT readiness.</td>
<td>Control group 40 student teachers.</td>
<td>Pre test, Post test</td>
<td>Mean, S.D &amp; 't'</td>
</tr>
</tbody>
</table>

4.7.2 Method

To study the effectiveness of blended learning strategy, the Pre-test, Treatment, Post-test equivalent group experimental design was adopted in the study.
4.7.3 Sample

A sample of 40 B.Ed student teachers comprising Physical science, Biological science and Computer science optional subjects were selected for the study from MASS College of Education, Kumbakonam as the control group subjects and 40 B.Ed student teachers comprising Physical science, Biological science and Computer science optional subjects from School of Education, SASTRA University, Kumbakonam were selected as the experimental group subjects. They were selected through purposive sampling technique.

4.7.4 Tools

The following tools were used in the study

Tool 1: Achievement test in science education constructed and validated by the investigator.

Tool 2: e Quest scale constructed and validated by the investigator.

Tool 3: ICT readiness scale constructed and validated by the investigator.

4.8 Research procedure

The student teachers studying B.Ed in school of education, SASTRA University, Kumkakonam were treated as experimental group, and the student teachers studying B.Ed in Mass College of Education, Kumbakonam were treated as control group. Initially the scores secured by the students in their degree examination were analysed. Fifty students from each institution who secured an average range of marks were selected. Then an intelligence test of g culture fair scale 2, form B prepared by R.B. Cattel and K.S Cattel was administered to these students. Then forty students were selected for each control and experimental group with matched pair.
Fig. 4.1 Steps followed in the study

**Intelligence Test**

Selection of sample

Selection of variable

*Independent*: Blended learning strategy.

*Dependent*: Achievement in science, e-quest and ICT readiness.

**Control group**: 40 student teachers

- Pre test
- Conventional lecture method of learning

**Experimental group**: 40 student teachers

- Pre test
- Blended learning Strategy

Post test

Analysis of pre-test and post-test scores

Interpretation and Conclusion
The pre test was administrated to both the experimental and control groups and data were collected to assess the achievement, e quest and ICT readiness of the student teachers. The selected topics of B.Ed science education were taught to the control group with conventional method. For the experimental group the same topics were taught with blended learning strategy for thirty days. For the execution of blended learning strategy the investigator had created a blog sastrasiva @ blogspot. Com. The blog had been filled with lot of links related to topics in the form of word document, power point presentation video lectures, audio clippings, and on line test to check the progress of the learners along with face to face class room instruction of the teacher. After the treatment period the post test was administered and data were collected for achievement, e quest and ICT readiness of the student teachers.

4.9 Distribution of sample

Table 4.2  Distribution of Control group

<table>
<thead>
<tr>
<th>Personal Computer</th>
<th>Owning a PC</th>
<th>--</th>
<th>15</th>
<th>Not owning a PC</th>
<th>--</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer course attended</td>
<td>Attended</td>
<td>--</td>
<td>17</td>
<td>Not attended</td>
<td>--</td>
<td>23</td>
</tr>
<tr>
<td>Surfing habit</td>
<td>Regular</td>
<td>--</td>
<td>16</td>
<td>Rare</td>
<td>--</td>
<td>24</td>
</tr>
</tbody>
</table>

Table 4.3  Distribution of Experimental group

<table>
<thead>
<tr>
<th>Personal Computer</th>
<th>Owning a PC</th>
<th>--</th>
<th>16</th>
<th>Not owning a PC</th>
<th>--</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer course attended</td>
<td>Attended</td>
<td>--</td>
<td>21</td>
<td>Not attended</td>
<td>--</td>
<td>19</td>
</tr>
<tr>
<td>Surfing habit</td>
<td>Regular</td>
<td>--</td>
<td>16</td>
<td>Rare</td>
<td>--</td>
<td>24</td>
</tr>
</tbody>
</table>
4.10 Development of modules

Blended learning strategy is at it’s vogue in corporate world in general and in IT industry in particular. Though many of the educational experts are in favour of the Blended learning strategy, many of the teachers are not venturing with blended learning strategy anticipating that the initial cost may be high. This attempt is to make the teachers to feel convenient to utilize the no cost e media available in the internet and to develop some low cost customized media with out spending much for professional touch.

The modules in the study have been developed wherever necessary and pooled with the materials available in the internet. MS word documents, PDF documents, power point presentations, audio clippings, video clippings and on line test components have been rightly blended with face to face components to make balanced modules. Care was taken to ensure that the contents of the modules are matching with learners’ cognitive level and to offer them new and challenging learning experiences. Time tested text book information along with recent developments from research world is also provided. Word documents and PDF documents are provided to offer the learners in depth knowledge as well as a ready reckoner for verification. Power point slide shows with animation help to sustain the interest of the learners. Audio clippings with local accent will help the learner to listen while they are in move as well while they are not in mood or circumstances to study. Video clippings are provided for right orientation. Both audio and video clippings are home made with out any expensive presentation or studio software to encourage all teachers to make such low cost teaching learning materials.
4.11 Description of the tools

4.11.1 Construction of achievement test in Science education

The achievement test in science education was constructed by the investigator from the topics which he planned to teach the students using blended learning strategy.

4.11.2 Syllabus

The investigator reviewed the revised syllabus of Tamilnadu Teacher Education University syllabus and School of Education, SASTRA UNIVERSITY syllabus with his research supervisor, four experienced teacher educators and two principals of colleges of education and finalized the following topics for the blended learning strategy.
Module I: Micro Teaching


Table 4.4 Content of module: Micro Teaching

<table>
<thead>
<tr>
<th>No</th>
<th>Content</th>
<th>Mode</th>
<th>Preview</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Micro teaching</td>
<td>Face to face classroom</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Micro teaching skills</td>
<td>Document</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Selected micro teaching skills</td>
<td>Document</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Micro teaching session</td>
<td>Document</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Micro teaching presentation</td>
<td>Power Point</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Micro teaching needs</td>
<td>Document</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Micro teaching evolution</td>
<td>Document</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Micro teaching - Audio</td>
<td>Audio</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Micro teaching Video -1</td>
<td>Video</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>On line Test</td>
<td>Html</td>
<td></td>
</tr>
</tbody>
</table>
Module II: Bloom’s Taxonomy

Three domains – components - sub components – evolution - action verbs -new version of Bloom’s taxonomy.

Table 4.5  Content of module: Bloom’s Taxonomy

<table>
<thead>
<tr>
<th>No</th>
<th>Content</th>
<th>Mode</th>
<th>Preview</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bloom’s Taxonomy</td>
<td>Face to face classroom</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Bloom’s classifications</td>
<td>Document</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>New version of Bloom’s taxonomy</td>
<td>PDF</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Action verbs for objectives</td>
<td>PDF</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Questions to test objectives</td>
<td>Document</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Bloom’s Quiz</td>
<td>Power Point</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Three storey intellect</td>
<td>PDF</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Bloom’s Taxonomy - Audio</td>
<td>Audio</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Bloom’s Taxonomy - Video</td>
<td>Video</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>On line Test</td>
<td>Html</td>
<td></td>
</tr>
</tbody>
</table>
Module III: Writing Instructional Objectives

G.I.O – S.I.O - Planning - quality and principles of objectives - levels of objectives.

Table 4.6  Content of module: Writing Instructional Objectives

<table>
<thead>
<tr>
<th>No</th>
<th>Content</th>
<th>Mode</th>
<th>Preview</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Writing instruction objectives</td>
<td>Face to face classroom</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Objectives</td>
<td>Document</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Instructional Objectives</td>
<td>PDF</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Determining Learning Objectives</td>
<td>PDF</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Principles of Writing Objectives</td>
<td>PDF</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Writing-Instructional-Objectives</td>
<td>Power Point</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Writing Objectives</td>
<td>PDF</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Mager'sTips</td>
<td>Document</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Writing instruction objectives - Audio</td>
<td>Audio</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Writing instruction objectives - Video</td>
<td>Video</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>On line Test</td>
<td>Html</td>
<td></td>
</tr>
</tbody>
</table>
**Module IV: Co-curricular Activities**

Co-curricular activities in science – museum - science fair – aquarium - vivarium- terrarium- advantages of co-curricular activities.

**Table 4.7 Content of module: Co-curricular Activities**

<table>
<thead>
<tr>
<th>No</th>
<th>Content</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Co-Curricular activities</td>
<td>Face to face classroom</td>
</tr>
<tr>
<td>2</td>
<td>Co-curricular activities</td>
<td>Document</td>
</tr>
<tr>
<td>3</td>
<td>SIM on co-curricular</td>
<td>PDF</td>
</tr>
<tr>
<td>4</td>
<td>Science fair guide</td>
<td>PDF</td>
</tr>
<tr>
<td>5</td>
<td>Science fair guide lines</td>
<td>PDF</td>
</tr>
<tr>
<td>6</td>
<td>Rationale of museum</td>
<td>PDF</td>
</tr>
<tr>
<td>7</td>
<td>Aquarium</td>
<td>PDF</td>
</tr>
<tr>
<td>8</td>
<td>Vivarium</td>
<td>PDF</td>
</tr>
<tr>
<td>9</td>
<td>Terrarium</td>
<td>PDF</td>
</tr>
<tr>
<td>10</td>
<td>On line Test</td>
<td>Html</td>
</tr>
</tbody>
</table>
Module V: Constructing Objective test


<table>
<thead>
<tr>
<th>No</th>
<th>Content</th>
<th>Mode</th>
<th>Preview</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Objective Test</td>
<td>Face to face classroom</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Guide to objective test</td>
<td>PDF</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Designing effective objective test questions</td>
<td>PDF</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Test construction skills</td>
<td>PDF</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Test Construction Manual</td>
<td>PDF</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>MCQ</td>
<td>Power Point</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>MCQ handout</td>
<td>PDF</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Preparing better MCQ</td>
<td>PDF</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>On line Test</td>
<td>Html</td>
<td></td>
</tr>
</tbody>
</table>
4.11.3 Achievement test

An achievement test in science education was constructed and validated by the investigator to assess the achievement of student teachers. The test was constructed to cover five topics of science education of B.Ed curriculum, giving due weightage to objectives like knowledge, understanding and application as well as giving due representation to all five topics. The investigator had constructed 50 objective type test items for the duration of one hour as shown in table 4.4.

<table>
<thead>
<tr>
<th>Subject: Teaching of Science</th>
<th>marks: 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level: B.Ed</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.9 Blue print of achievement test.

<table>
<thead>
<tr>
<th></th>
<th>Knowledge</th>
<th>Understanding</th>
<th>Application</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Micro Teaching</strong></td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td><strong>Bloom’s Taxonomy</strong></td>
<td>3</td>
<td>7</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td><strong>Writing Instructional Objectives</strong></td>
<td>-</td>
<td>4</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td><strong>Co – Curricular Activities</strong></td>
<td>7</td>
<td>2</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td><strong>Constructing Objective Test</strong></td>
<td>2</td>
<td>8</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total number of Questions</strong></td>
<td>16</td>
<td>25</td>
<td>9</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total Marks</strong></td>
<td>16</td>
<td>25</td>
<td>9</td>
<td>50</td>
</tr>
</tbody>
</table>

Figures in the cells indicate number of questions. Each question carries one mark.
4.11.4 Expert opinion

The test items constructed were subjected to jury’s opinion consisting of research supervisor, two principals of colleges of education and four experienced teacher educators. The jury’s were requested to review each item and its validity with reference to the objectives, appropriateness and suitability to B.Ed students. The suggestions given by them were incorporated to finalize fifty test items with maximum of 50 marks.

4.11.5. Reliability

To establish the reliability of the test, the investigator adopted split – half method. The test is split in to two equivalent halves by pooling the odd numbered items for one score and the even numbered items for another score. This makes the two set of scores obtained from a single test reasonably equivalent. In this way these scores for each student are obtained, one on odd numbered items and the second on even numbered items. The correlation between the results of the two halves is determined and from these the reliability of the whole test is calculated by applying the Spearman- Brown formula which is given by \( \Gamma = 2\Gamma_2/(1+\Gamma_2) \) where ‘\( \Gamma \)’ is the reliability co-efficient of the whole test and \( \Gamma_2 \) is the reliability co-efficient of the half of the test. The investigator adopted the same procedure taking 25 percent of the total sample of 80 students. The reliability of the whole test is found to be 0.86 significant at 0.01 levels. Hence it is concluded that the test is highly reliable.

4.11.6 Validity

To establish the validity of the test the investigator attempted to find out the correlation co-efficient between the achievement scores in the test and scores they got in
their degree examination by product moment correlation co-efficient method by taking 25 percentage of the total sample of 80 students. The correlation co-efficient is found to be 0.831 significant at 0.01 level. Hence it is concluded that the test has high concurrent validity.

4.12 e Quest scale

The act of searching gives the rays of hope for learning. World Wide Web is a place where seekers and learners alike bonded together in search for knowledge. The unquenchable thirst of learning mass in search of information in the electronic media has been termed as e quest by the investigator. What for the individuals are searching or what skill that they feel will improve over browsing have been collectively named as e quest. The investigator intended to study the influence of blended learning strategy over e quest and to measure the relation ship. e quest was assessed by using e quest scale constructed by the investigator. There are various factors which makes the individual to surf the net. The investigator had identified ten such factors as ten dimensions of the tool and the test contains 50 statements with five point scale.

4.12.1 Test construction

The test items were generated based on opportunity to learn, ability to understand, chances for collaborative learning, Meta cognitive skills and social learning.

4.12.2 Ten dimensions of e quest

1. Content

Content refers to enormous amount of digital content that can be transmitted over a computer network such as internet. It includes text, audio, video, graphics, animation
and so on. Many seekers enter the web in anticipation that their search will end with internet.

2. Performance

Performance refers to the ability to carry out or the act of execution or sense of accomplishment or achievement. Those who assume that their performance increases through e media favour the dimension performance.

3. Simulation

The act or an instance of simulating with the assumption of false appearance, form or sequence is simulation. Facing the representation of a problem situation in order to estimate its characteristics or solve problem is simulation. Those who prefer a feign experience or an act of fictious assumption prefer this dimension.

4. Multi tasking

Multi tasking refers to the ability of an individual to perform more than one task or multiple tasks at the same time. In the field of human resources multi tasking is a popular term that is often used to describe how busy managers or business practitioners are able to accomplish a growing amount of work in a limited time period. e learner must also posses such multi tasking abilities.

5. Collective intelligence

Collective intelligence refers to shared or group intelligence that emerges from the collaboration and competition of many individuals and appears to be essential for decision making. In order to allow relatively large number of people to co operate in one process leading to a reliable action.
6. **Judgment**

Judgment refers to the cognitive process of reaching a decision or drawing conclusions. The capacity to assess situations or circumstances shrewdly and to draw sound conclusions. An opinion formed by judging something is essential for new age learning.

7. **Cross media navigation**

Cross media navigation is the advantage that the end users are getting by means of navigating from high reach base medium to interactive target media as one can switch from text to graphics then to animated and virtual media where the switch is attractive, rich in information and interaction.

8. **Cyber relationship**

Cyber relationship means a relationship that either was generated or continued solely through the internet as a medium for meeting or communication. The relationship anonymously connect the people to share experiences, get feedback, give comment, meet new friends and board in discussion forum.

9. **Group dynamics**

Group dynamics refers to the underlying features of group behaviour such as motives and attitudes. It is concerned with the flexibility in thinking rather than stability in thinking. The interactive process with in group about the changing patterns of tension, conflict, adjustment and cohesion.

10. **Research aptitude**

Research aptitude refers to an innately acquired or learned or developed component of a competency to do a kind of research work at certain level. Research
aptitude represents knowledge or ability that is gained through the internet learning environment

4.12.3 Expert opinion

The test items constructed were subjected to jury’s opinion consisting of research supervisor, two principals of colleges of education and four experienced teacher educators. The jury’s were requested to review each item and its validity with reference to the objectives, appropriateness and suitability to B.Ed students. The suggestions given by them were incorporated to finalize the test items.

4.12.4 Pilot study

The refined test items were administered to a sample of 25 students. The test items total correlation of each item was computed. The 50 items with significant ‘r’ values were selected and included in the final test.

4.12.5 Reliability

The reliability of the test was established by test re-test method. The test was administered after a gap of three weeks to 25 higher secondary students. The coefficient of correlation between the two set of scores was found to be 0.81. The reliability of the test was established by using split half method also. The coefficient of correlation between the scores of the odd and even items was calculated for 25 students. Split half reliability was found to be 0.76 and using Spearman- Brown formula for the full length of the test ‘r’ was estimated to be 0.78. Thus the e quest scale for blended learning strategy possesses adequate reliability.
4.12.6 Validity

The content validity and construct validity was established by the investigator. The construct validity was established by the investigator and it was 0.82 for e quest. The test items were constructed based on opportunity to learn, ability to understand, chances for collaborative learning, meta cognitive skills and social learning. Therefore the test possesses content, construct and face validity. This establishes the validity of the tool.

4.13 ICT Readiness Scale

ICT readiness was assessed by using ICT readiness scale constructed by the investigator. The test consists of 30 statements in five dimensions with five point scale. The scale measures five important ICT parameters a modern teacher must posses.

4.13.1 Test construction

The test items were generated based on welliver (1990) instructional transformational model for teaches; this model presumes that integration of ICT proceeds in a linear manner from the initial familiarization with the technology to the utilization of technology then more towards the manipulation and eventually to more innovative ICT usage by the teachers

This scale had been developed to assess the mental preparedness of the teachers to utilize the ICT revolution in their teaching learning process, and also evaluate the relationship between e quest and ICT readiness. It is also intended to evaluate any change in the ICT readiness of student teachers after blended learning strategy.

4.13.2 Five dimensions of ICT readiness

The following five dimensions of ICT readiness were considered for the present study
1. Data management skills

Data management refers to creation renaming and manipulation of folders and files. It also includes navigation between folders, zip and unzip data as well as making desirable changes in the existing data.

2. Word processing skills

Word processing skills refers to manipulation of text documents like saving, naming, taking printout, using menu options like files, edit, view, insert, format, tools, table and so on.

3. Presentation skills

Presentation skills refer to creating slide show using auto content wizard, design templates and blank presentation. It also includes making suitable changes like changing font, changing layout, adding sounds, Animation, slide transition and making hyper link between slides.

4. Mail management skills

Mail management refers to accessing mail, creating and attaching documents. It also includes using spam guard, group mail, forwarding and locating deleted messages.

5. Surfing skills

Surfing skill refers to use different browsers, Search engines, creating book marks, saving text and image from internet. It also includes using add on and plug in and to locate known and unknown websites to reach out needed information.

4.13.3 Expert opinion

The test items constructed were subjected to jury’s opinion consisting of research supervisor, two principals of colleges of education and four experienced teacher
educators. The jury’s were requested to review each item and its validity with reference to the objectives, appropriateness and suitability to B.Ed students. The suggestions given by them were incorporated to finalize the test items.

4.13.4 Pilot study

The refined test items were administered to a sample of 25 students. The test item total correlation of each item was computed. The 30 items with significant ‘r’ values were selected and included in the final test.

4.13.5 Reliability

The reliability of the test was established by test – retest method. The test was administered after a gap of three weeks to 25 higher secondary students. The co-efficient of correlation between the two set of scores was found to be 0.83. The reliability of the test was established by using split – half method also. The co-efficient of correlation between the scores of the odd and even items was calculated for 25 students. Split half reliability was found to be 0.74 and using Spearman - Brown formula for the full length of the test ‘r’ was estimated to be 0.79. Thus ICT readiness scale for blended learning strategy possesses adequate reliability.

4.13.6 Validity

The test items were constructed based on willier (1990) instructional transformational model for teachers. The content validity and construct validity was established by the investigator. The concurrent validity was established by the investigator and it was 0.84 for ICT readiness. Therefore the test possesses content, construct and face validity. This establishes the validity of the tool.
4.14 Internal validity of the experiment

Internal validity is concerned with the extent, to which the experiment is genuinely effective, that is the extent to which the manipulation in the independent variable bring about changes in the dependent variable. It is concerned with true variance in the dependent variable that has been brought about by the induced variations (treatment) in the independent variable.

Internal validity may be affected by a number of factors. The factors that may affect internal validity of this experiment are testing, measurement error, selection bias, and experimental mortality and interaction effects.

Testing

The experimental group and control group students in the study did not get any previous experience regarding blended learning strategy in taking test before the treatment. So there is no possibility for the pre-test effects which may work against the internal validity of the experiment.

Selection bias

The investigator adopted random sampling technique for this study. Initially the scores secured by the students in degree examination were analyzed. fifty students from each group who secured average range of marks were selected. Then an intelligence test of ‘g’ culture fair scale 2, from B prepared by R.B. Cattel and A.K.S.Cattell was administered to these students. Then forty students who secured average intelligence scores were selected for each control and experimental group with matched pair. Hence the sample, the investigator selected for this experiment was not biased.
Experimental mortality

There is no loss of subjects during the experimental period and this is not a long term experiment. So the randomness or equality of groups does not suffer during this experiment.

Interaction effect

In the present study the control group was selected from MASS college of Education, Kumbakonam and the experimental group was selected from School of Education, SASTRA University, Kumbakonam the distance between the two institutions is 10k.m. So there is no possibility for the students of control group and experimental group meet together and discuss the novelty of the treatment. Thus the interaction effect was eliminated in this study.

4.15 Elimination of Contamination

The investigator took care to eliminate the possible contamination of the experimental factor between the students of the control group and the experimental group. Considering the distance between one college and the other, the exchange of views regarding the experimental factor appeared to be remote.

4.16 Collection of data

The data were collected by administering pre test and post test of achievement, e quest and ICT readiness scale. The test materials were distributed to the students and clear instructions were given to them. e quest and ICT readiness scale had five point scales, the students were asked to put a tick mark in the relevant column to express their agreement. e quest scale and ICT readiness scale contained 50 and 30 statements respectively.
4.17 Scoring

4.17.1 Achievement

The answer books of the student teachers for achievement in Science were scored by giving one mark each for a right response of the objective type question, thus a range of 0 – 50 marks can be secured by the students.

4.17.2 e quest scale

There were 50 statements in e quest scale with five point Likert type. Each statement was assigned a weight age ranging from 4 (strongly agree) to 0 (strongly disagree). For each student a total score on the scale can be obtained by summating his score for the individual items. Thus a range of 0-200 scores can be obtained.

4.17.3 ICT readiness scale

There were 30 statements in ICT readiness scale with five point Likert type. Each statement was assigned a weight age ranging from 4 (strongly agree) to 0 (strongly disagree). For each student a total score in the scale can be obtained by summating his score for the individual items. Thus a range of 0-120 scores can be obtained.

4.18 Statistical techniques followed in this study

In differential analysis the significant difference between groups were studied by using mean, standard deviation and ‘t’ test. The co-efficient of correlation was determined by using Pearson product moment method. Also regression analysis was used in this study.
4.19 Conclusion

The research questions, objectives, variables, hypotheses, design of the study, research and experimental procedure, delimitations, limitations, sample, tools, reliability and validity of tools, data collection, scoring and statistical techniques followed in the present investigation were discussed in this chapter. The collected data were analysed by using appropriate statistical techniques and presented in the next chapter.