CHAPTER III

METHODOLOGY

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CHAPTER III

METHODOLOGY

Introduction

The success of a research depends on the methodology adopted for the study. Methodology can be defined as the principle of organized investigation, the norms by means of which procedures and techniques are selected and articulated. The methods are the customary ways in which investigators gather information and search for solutions to problems they have posed. The selection of the method and specific design within that method in investigating a research problem will depend on the nature of the problem and upon the kind of data that the problem entails.

In the present study, the investigator has made an attempt to develop Synthetic Model by blending Computer Assisted Instruction Model and Futures Wheel Method for teaching Population Education based on Blended Learning Strategy. The objectives of the study can be realized only through the right selection of method. The methodological frame work of the study has been presented in detail with the following headings:

3.1 Methods Adopted for the Study
3.2 Experimental Design of the Study
3.3 Variables Selected
3.4 Phases of the Study
3.5 Sample Selected for the Study
3.6 Tools Used for the Study
3.7 Execution of the Study
3.8 Statistical Techniques Employed
### 3.1 Methods Adopted for the Study

Considering the objectives of the present study and nature of data required for their realization, any method, or any combination of methods that leads to dependable generalization is automatically a good method. Since the main objective of the present study was to prepare and to test the effectiveness of Synthetic Model for Teaching Population Education at the secondary level based on Blended Learning Strategy, the survey cum experimental method was found to be appropriate.

The word survey indicates the gathering of data regarding current conditions. Surveys are particularly versatile and practical to identify the present conditions and needs. So it helps in understanding what exists and helps to plan for the improvement that may be expected through a worthwhile study. In other words it affords opportunities to gather data regarding the possibilities of making change in the prevailing conditions. The investigator conducted a needs analysis survey for gathering, analyzing and summarizing the information necessary to develop the synthetic model. It is the most sophisticated, exacting and powerful method for discovering an organized body of knowledge. Effectiveness of the Synthetic Model was examined by conducting an experiment among the secondary level students. After the experiment; the investigator conducted a receptivity analysis to examine the acceptance of Synthetic Model for teaching Population Education.

### 3.2. Experimental Design of the Study

The investigator conducted the present study by employing the experimental design. “Experimental design is the blue print of the procedures that enables the researcher to test the hypothesis by reaching valid conclusions about the relationship between independent and dependent variables” (Best & Khan, 2004).
In the present study, pre-test post-test non-equivalent group design was selected. Such types of experimental design uses two non-equivalent groups. In a school situation, it is sometimes practically not possible to upset class schedule and gather subjects for obtaining a sufficient large sample or to reorganize classes in order to employ randomization procedures for getting equivalent experimental and control group. Therefore in this design, the investigator decided to conduct the experiment with non-equivalent intact classroom groups. The design of the study is as follows. The non-equivalent pre-test post-test has been shown in figure 3.1.

![Diagram of Pre-test Post-test Non-Equivalent Group Design]

**Fig.3.1 Pre-test Post-test Non-Equivalent Group Design**
3.3 Variables Selected for the Study

Variables are the conditions or characteristic that experiment manipulates, controls or observes. The hypothesis may be judged to be probably true or probably false. If a hypothesis and its deduced consequences are well conceived two factors are precisely identified.

3.3.1 Independent Variable

“Independent variables are condition or characteristic that the experimenter manipulates or control in his or her attempt or ascertain a relationship to observed phenomenon” (Best, 2004). The independent variables used in the present study were the Computer Assisted Instruction Model, Futures Wheel Method, Synthetic Model and Existing Method.

3.3.2 Dependent Variable

“The dependent variables are the characteristic that appear, disappear or change as the experimenter introduces, removes or changes independent variable” (Best, 2004). Here the dependent variables are academic achievement and population awareness of secondary level students.

3.3.3 Intervening Variable

Among the variables, that can intervene in the experiment are the previous knowledge and intelligence of the students. But their effect is nullified by applying the statistical technique of the analysis of co-variance.

3.4 Phases of the Study

The present study has three phases. They are as follows.

The first phase: The needs analysis

The second phase: Experimental phase

The third phase: The receptivity analysis
3.4.1 First phase: The needs analysis of the study

This phase is concerned with needs analysis for gathering, analyzing and summarizing the information necessary to develop the synthetic model. For this, the investigator examined the prevailing practices of curriculum transaction in teaching Population Education at the secondary level by administering Population Education Prevailing Practices Questionnaire among 120 teachers. For assessing the awareness about blended learning strategies among the secondary level teachers, the investigator administered Blended Learning Strategy Awareness Inventory. Based on the results of needs analysis the investigator selected two methods i.e. Computer Assisted Instruction Model and Futures Wheel Method and analyzed its strengths and weaknesses. Combining the strengths of each of the methods and eliminating their weaknesses can lead to the development of a powerful and effective instructional system. By eliminating the weaknesses of the two methods, the investigator blended a new model Synthetic Model for teaching Population Education. The following Fig.3.2 gives the schematic design of needs analysis of the study.

Fig: 3.2 Schematic Design of First Phase: Needs Analysis of the Study
3.4.2 The Second phase: Experimental Phase of the study

Before the experiment, the total sample was given a pre-test to assess their entry behavior in Population Education. The total sample was divided into four groups. The first three groups were treated as experimental groups who were taught by Computer Assisted Instruction, Futures Wheel Method and Synthetic Model respectively. The fourth group was treated as the control group who was taught through Existing Method. After completing experimental teaching, the same achievement test in Population Education was repeated to all four groups. A population awareness test was also administered to both experimental and control groups before and after the experimental teaching.

Fig: 3.3 Schematic Design of the Second Phase: Experimental Phase of the Study
3.4.3 Third phase: The receptivity analysis of the synthetic model.

In this phase, the investigator examined the acceptance of Synthetic Model by receptivity analysis. The receptivity analysis is an essential part of model development process. The results of receptivity analysis help to establish the effectiveness of the proposed model as well as the agreement in accepting and appreciating the new model. Through a detailed survey the investigator examined the opinion regarding the effectiveness of the Synthetic Model with regard to availability of resources for learning Population Education, willingness of secondary level teachers to implement Synthetic Model for teaching population education, suitability of the model with regard to existing curricular factors and practical difficulties likely to be encountered while using the model.

To rate the effectiveness of the Synthetic Model with that of existing method in attaining, select educational outcomes included under Cognitive, Affective, Psychomotor, Process Skills and Social Dimensions a Judgment schedule was administered for Experts and Teachers. To analyze the receptivity of Synthetic Model for teaching Population Education, a questionnaire was administered among the experts and teachers. To get the opinion about the Synthetic Model with regard to the availability of resources for teaching population education, with regard to existing curricular factors and practical difficulties likely to be encountered while using the Synthetic Model, a Questionnaire was administered among the Teachers. To find out the willingness of secondary level teachers to implement Synthetic Model for teaching population education, a Willingness scale was administered among teachers.

The following Fig.3.4 gives the Schematic Design of The receptivity analysis of the study.
To rate the effectiveness of the synthetic model with that of existing method in attaining, select educational outcomes included under Cognitive, Affective, Psychomotor, Process Skills and Social Dimensions.

To analyze the receptivity of Synthetic Model for teaching Population Education

To get the opinion about the synthetic model with regard to the availability of resources for teaching population education, with regard to existing curricular factors and practical difficulties likely to be encountered while using the synthetic model.

To find out the willingness of secondary level teachers to implement synthetic model for teaching population education

Judgment Schedule for Experts and Teachers.

Teach N=120

Teachers

N=20

Receptivity Analysis Questionnaire for Experts And Teachers

Teachers

N=120

Experts

N=20

Questionnaire for Teachers

Teachers

N=120

Willingness Scale for Teachers

Teaches

N=30

Fig.3.4 Schematic Design of Phase III: The Receptivity Analysis
3.5 Sample Selected for the Study

The sample was selected on the basis of ‘Stratified Random Sampling Technique’. The experimental study has made use of 993 ninth standard students from different school in Thrissur district of Kerala. The sample for survey consists of Educational Experts (N=20) and secondary school teachers (N=120). In selecting the samples, care was taken to give due representation to factors like gender, locale and type of school management of schools. The details of schools selected for the study are given in Appendix-XV.

3.5.1 Sample Selected For the Experimental Study

In the experimental phase of the study, the sample consisted of 993 students from ninth standard. In selecting the samples, care was taken to give due representation to factors like gender, locale and type of school management. The details regarding sample selected for the experimental study are shown in the table 3.1

**Table 3.1 Details of the Secondary Level Students Selected For the Experimental Study**

<table>
<thead>
<tr>
<th>Selection Criteria</th>
<th>Number of Secondary level Students</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>498</td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>495</td>
<td></td>
</tr>
<tr>
<td><strong>Locality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>491</td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>502</td>
<td></td>
</tr>
<tr>
<td><strong>Type of Management</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government School</td>
<td>335</td>
<td></td>
</tr>
<tr>
<td>Government Aided Management School</td>
<td>326</td>
<td></td>
</tr>
<tr>
<td>Private School</td>
<td>332</td>
<td></td>
</tr>
</tbody>
</table>

71
Before the experiment, the secondary level students were given a pre-test to assess their entry behaviors in Population Education and awareness in population related aspects. The treatment groups were divided into three experimental and one control group. The experimental group consists of three groups. The three experimental groups were taught by Computer Assisted Instruction Model (N= 242), Futures Wheel Method (N= 250) and Synthetic Model (N=252) respectively. The fourth group was treated as the control group who was taught through Existing Method (N= 249). After completing experimental teaching, the same achievement test in Population Education was repeated to all the four groups. A population awareness test was also administered to both experimental and control groups before and after the experimental teaching. The classification of the sample selected for the three experimental groups and control groups are given in the table 3.2

Table 3.2 Details of the Secondary Level Students Selected For the Three Experimental and Control groups

<table>
<thead>
<tr>
<th>The three Experiment Groups</th>
<th>Models used For The Experimental Study</th>
<th>No. of Students</th>
<th>Total Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Assisted Instruction Model</td>
<td>242</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future Wheel Method</td>
<td>250</td>
<td></td>
<td>744</td>
</tr>
<tr>
<td>Synthetic Model</td>
<td>252</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One Control Group</td>
<td>Existing Method</td>
<td>249</td>
<td>249</td>
</tr>
<tr>
<td>Number of Total Sample</td>
<td></td>
<td>993</td>
<td></td>
</tr>
</tbody>
</table>
3.5.2 Sample Selected for the Survey

The sample for survey consists of Educational Experts (N=20) and Secondary level teachers (N=120). The details of the educational experts are given in Appendix-XIV. Table 3.3 gives the details of total sample selected for survey.

Table 3.3  Details of sample selected for Survey

<table>
<thead>
<tr>
<th>Sample selected for the survey</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Experts</td>
<td>20</td>
</tr>
<tr>
<td>2 Secondary level teachers</td>
<td>120</td>
</tr>
</tbody>
</table>

In selecting the sample of 120 secondary level teachers, care was taken to give due representation to factors like gender, locale and type of school management of schools.

3.6 Tools and Techniques used for the study

For the present study the investigator used the following tools:


3.6.2. Blended Learning Strategy Awareness Inventory For secondary level Teachers.

3.6.3. Achievement Test in Population Education for secondary level students.

3.6.4. Population Awareness Test for secondary level students [Prepared by Vasuki and Regi].
3.6.5. Lesson Designs in Population Education based on Synthetic Model.


3.6.7. Receptivity Analysis Questionnaire for experts and teachers to analyze the acceptance of Synthetic Model for teaching Population Education

3.6.8. Questionnaire for Experts and Teachers to rate the suitability of the Synthetic Model for teaching Population Education.

3.6.9. Willingness Scale for Secondary Level Teachers to Implement the Synthetic Model for Teaching Population Education. [Prepared by Passi and Sansanwal]

Detailed explanation of the tools used for the study is given below.

3.6.1. Population Education Prevailing Practices Questionnaire for Secondary Level Teachers

At the secondary level, Population Education is usually integrated into all the subjects and all the teachers need to be aware about the importance of teaching population education. In teaching population education, the development of appropriate methods and materials also posed a number of difficulties for teachers. The ultimate goal of Population Education is to reach all students at all levels about the problems of overpopulation we have to face in the near future, which is a gigantic task for our country. It has been one of the most challenging tasks.

In the present study, the investigator constructed ‘Population Education Prevailing Practices Questionnaire’ for collecting data from secondary level teachers to examine the prevailing practices exist in teaching Population Education. A research tool plays a major role in any worthwhile research. Since no research has been done in the area selected for the study, the investigator prepared a questionnaire for the purpose of examining
prevailing practices exists in teaching Population Education at the secondary level. While preparing the tool, the following steps were followed by the investigator.

As a preliminary step, investigator went through all the available literature in a detailed way. For the preparation of the items in the questionnaire the investigator analyzed the secondary school syllabus, text books, hand books, resource books, supplementary reading materials related to teaching models, methods of teaching and pedagogical theories.

After reviewing literature, in the next step, a list of items related to the present teaching methodologies of Population Education were prepared by consulting with teachers and experts in education. In the third step experts in the field of educational methodology were consulted for judging the relevance and significance of the items. A few modifications were suggested by the experts were incorporated in the tool. In the fourth step an experimental try out was conducted among twenty secondary level teachers to finalize the items in the questionnaire. Based on the experimental try out and suggestions given by the teachers, four items were eliminated as they were somewhat vague in nature. The final tool was submitted to get approval from educational experts. After getting their approval, the ‘Population Education Prevailing Practices Questionnaire’ was finalized.

Population Education Prevailing Practices Questionnaire consists of ten items that are related to the present teaching methodologies of population education. The Population Education Prevailing Practices Questionnaire was administered on a sample of 120 secondary level teachers. Population Education Prevailing Practices Questionnaire is given in Appendix-I.

3.6.2. Blended Learning Awareness Inventory for Secondary Level Teachers

Now days a new learning strategy i.e. Blended learning models are merging into the present day educational scenario. But
these technological changes and new innovations in blended learning models are totally ignored by most of the teachers who belong to Kerala. In the present study, the investigator constructed a Blended Learning Awareness inventory for collecting data from Secondary Level Teachers to know their awareness about Blended Learning Strategy in teaching Population Education.

3.6.2.1 Development of the Draft Form of ‘Blended Learning Awareness Inventory’

The draft form of blended learning awareness inventory for secondary level teachers was developed in three steps. In the first step a list of items were prepared by reviewing literature, consulting with experts in education and by visiting various progressive institutes in India. In the second step experts in the field of educational technology were consulted for judging the relevance and significance of the each item. A few modifications suggested by the experts were incorporated in the tool. Next, an experimental try out was conducted among secondary level teachers to examine the practicability of the tool. As per suggestions received, some items are removed and others are modified. Thus, the edited draft scale consisting of 94 items are selected for the draft scale in which both positive and negative statements are included and the draft form of the test was finalized. The draft form of the Blended Learning awareness inventory is given in Appendix-II.

3.6.2.2 Administration of the Draft Form of ‘Blended Learning Awareness Inventory’

As a part of the study, the investigator administered the draft form of Blended Learning awareness inventory on a representative sample of forty Secondary Level Teachers. The respondents were requested to answer each item in the Blended Learning awareness inventory in terms of their own favorableness or unfavourableness by entering a tick mark (√) in any one of the five boxes marked as Strongly Agree, Agree, Neutral, Disagree and Strongly Disagree. The answer sheets were collected separately.
3.6.2.3 Scoring Procedure

The arbitrary weighing method is used for scoring the inventory. The scores to the five alternatives for positive and negative statements are shown in the Table 3.4.

### Table 3.4 Scoring Procedure

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive Statements</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>5</td>
</tr>
<tr>
<td>Agree</td>
<td>4</td>
</tr>
<tr>
<td>Neutral</td>
<td>3</td>
</tr>
<tr>
<td>Disagree</td>
<td>2</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>1</td>
</tr>
</tbody>
</table>

3.6.2.4 Analysis of the Blended Learning Awareness Inventory.

Item analysis was done by taking 27 percentages of the subjects who scored highest total score and 27 percentage of the subjects who scored lowest. The rest are excluded from the analysis. The scores obtained for each item in these groups are used for calculating the discriminating power of each item.

3.6.2.5 Preparation of the Final Form of Blended Learning Awareness Inventory.

Having ascertained the ‘t’ values of all the statements in the blended learning awareness inventory, the item having ‘t’ value equal to or greater than 1.75 selected for inclusion in the final Blended Learning Awareness Inventory.
Table 3.5 Item Wise Analysis of the Draft Blended Learning Awareness Inventory.

<table>
<thead>
<tr>
<th>Item No</th>
<th>‘t’ value</th>
<th>Item No</th>
<th>‘t’ value</th>
<th>Item No</th>
<th>‘t’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.891*</td>
<td>33</td>
<td>0.452</td>
<td>65</td>
<td>3.256*</td>
</tr>
<tr>
<td>2</td>
<td>0.432</td>
<td>34</td>
<td>1.324</td>
<td>66</td>
<td>1.129</td>
</tr>
<tr>
<td>3</td>
<td>2.439*</td>
<td>35</td>
<td>2.156*</td>
<td>66</td>
<td>3.1456*</td>
</tr>
<tr>
<td>4</td>
<td>1.647</td>
<td>36</td>
<td>6.363*</td>
<td>67</td>
<td>0.241</td>
</tr>
<tr>
<td>5</td>
<td>5.293*</td>
<td>37</td>
<td>1.184</td>
<td>68</td>
<td>1.106</td>
</tr>
<tr>
<td>6</td>
<td>1.641</td>
<td>38</td>
<td>1.278</td>
<td>69</td>
<td>5.327*</td>
</tr>
<tr>
<td>7</td>
<td>2.658*</td>
<td>39</td>
<td>0.291</td>
<td>70</td>
<td>1.924*</td>
</tr>
<tr>
<td>8</td>
<td>1.231*</td>
<td>40</td>
<td>3.163*</td>
<td>71</td>
<td>3.321</td>
</tr>
<tr>
<td>9</td>
<td>8.746*</td>
<td>41</td>
<td>1.890*</td>
<td>72</td>
<td>1.231</td>
</tr>
<tr>
<td>10</td>
<td>3.534*</td>
<td>42</td>
<td>1.163</td>
<td>73</td>
<td>2.562*</td>
</tr>
<tr>
<td>11</td>
<td>0.163</td>
<td>434</td>
<td>1.072</td>
<td>74</td>
<td>1.157</td>
</tr>
<tr>
<td>12</td>
<td>4.327*</td>
<td>44</td>
<td>0.681</td>
<td>75</td>
<td>1.218</td>
</tr>
<tr>
<td>13</td>
<td>1.213</td>
<td>45</td>
<td>2.749*</td>
<td>76</td>
<td>5.853*</td>
</tr>
<tr>
<td>14</td>
<td>0.542</td>
<td>46</td>
<td>1.437</td>
<td>77</td>
<td>1.522</td>
</tr>
<tr>
<td>15</td>
<td>6.426*</td>
<td>47</td>
<td>5.326*</td>
<td>78</td>
<td>1.021</td>
</tr>
<tr>
<td>16</td>
<td>1.619</td>
<td>48</td>
<td>4.742*</td>
<td>79</td>
<td>2.153*</td>
</tr>
<tr>
<td>17</td>
<td>1.026</td>
<td>49</td>
<td>2.032*</td>
<td>80</td>
<td>3.432*</td>
</tr>
<tr>
<td>18</td>
<td>1.953*</td>
<td>50</td>
<td>1.245</td>
<td>81</td>
<td>1.510</td>
</tr>
<tr>
<td>19</td>
<td>1.208</td>
<td>51</td>
<td>0.312</td>
<td>82</td>
<td>7.842*</td>
</tr>
<tr>
<td>20</td>
<td>3.572*</td>
<td>52</td>
<td>2.591</td>
<td>83</td>
<td>0.674</td>
</tr>
<tr>
<td>21</td>
<td>2.639*</td>
<td>53</td>
<td>1.970*</td>
<td>84</td>
<td>1.213</td>
</tr>
<tr>
<td>22</td>
<td>0.162</td>
<td>54</td>
<td>4.268*</td>
<td>85</td>
<td>0.327</td>
</tr>
<tr>
<td>23</td>
<td>0.281</td>
<td>55</td>
<td>1.101</td>
<td>86</td>
<td>5.743*</td>
</tr>
<tr>
<td>24</td>
<td>2.361*</td>
<td>56</td>
<td>0.411</td>
<td>87</td>
<td>4.521*</td>
</tr>
<tr>
<td>25</td>
<td>0.196</td>
<td>57</td>
<td>3.186*</td>
<td>88</td>
<td>0.569</td>
</tr>
<tr>
<td>26</td>
<td>0.528</td>
<td>58</td>
<td>0.196</td>
<td>89</td>
<td>1.847</td>
</tr>
<tr>
<td>27</td>
<td>6.175*</td>
<td>59</td>
<td>1.570</td>
<td>90</td>
<td>3.538*</td>
</tr>
<tr>
<td>28</td>
<td>3.215*</td>
<td>60</td>
<td>5.961*</td>
<td>91</td>
<td>6.248*</td>
</tr>
<tr>
<td>29</td>
<td>1.327</td>
<td>61</td>
<td>3.759*</td>
<td>92</td>
<td>5.261*</td>
</tr>
<tr>
<td>30</td>
<td>2.782*</td>
<td>62</td>
<td>0.274</td>
<td>93</td>
<td>4.213*</td>
</tr>
<tr>
<td>32</td>
<td>1.672</td>
<td>63</td>
<td>1.152</td>
<td>94</td>
<td>3.850*</td>
</tr>
</tbody>
</table>
In the above Table 3.5 the symbol [*] indicates selected items for the final Blended Learning Awareness Inventory. Forty nine items are discarded and the final Blended Learning awareness inventory consists of 44 statements. The maximum score of inventory is 220 and minimum score is 44. The final form of the Blend Learning Awareness Inventory is given as Appendix –III. The manual of instructions for using Blended Learning awareness inventory for Secondary Level Teacher is given in Appendix-IV.

3.6.2.6 Validity of Blended Learning Awareness Inventory.

To construct Blended Learning awareness inventory for Secondary Level Teachers, the investigator had taken special attention to attain validity for the inventory. As described earlier, the Blended Learning awareness inventory for Secondary Level Teachers was developed through three steps. In the first step the investigator prepared a list of items by reviewing literature, consulting with senior teachers and experts in educational field and, by visiting various libraries in India. In the second step the investigator consulted with experts in the field of educational technology for judging the relevance and significance of the each items. A few modifications suggested by the experts were incorporated in the tool. In the third step the experimental try out was conducted and the test was finalized.

3.6.2.7 Reliability of Blended Learning Awareness Inventory.

A test is reliable to the extent that it measures whatever it is measuring consistently. Reliability of Blended Learning awareness inventory was established by using the split half method by using Spearman-Brown Formula. The reliability of the Blended Learning awareness inventory obtained is .64. It suggests that the Blended Learning awareness inventory is reliable.
3.6.3 Achievement Test in Population Education based on the topics selected for preparing the synthetic model

To test the effectiveness of the synthetic model, the investigator prepared an achievement test in Population Education on the topic “the population situation in India” selected from the prescribed syllabus of standard IX of Kerala State. The achievement test was prepared on the bases of taxonomy of educational objectives suggested by Bloom (1979). Adequate representations to the instructional objectives knowledge, understanding, application, and skill were given in the achievement test. The achievement test comprises of 50 items with a maximum mark of 25. All the questions were of the objective type. Each item carried ½ marks. The maximum time allotted for the achievement test was 45 minutes.

The content validity of the achievement test was achieved by the logical analysis of the content by the experts in Population Education and secondary level teachers. The same achievement test was administered as pre-test and post-test. The achievement test in Population Education with scoring key is given in Appendix -V.

3.6.4 Population Awareness Test (PAT) for secondary level students.

Student’s awareness on population related aspects plays an important role in understanding the effect of overpopulation on the welfare of the people. For the present study investigator adopted Population Awareness Test (PAT) prepared and standardized by Vasuki and Regi to understand the Population Awareness of secondary level students. The Test was modified after considering suggestions from experts in the concerned field. A comprehensive study of the review of related literature helped the investigator in selecting various population issues that are significant at present. Some items were deleted; some were re-edited in the light of expert opinion. To know the test clarity in the items, and the time needed
for answering the questions, a pilot test was administered to forty pupils comprising of twenty two boys and eighteen girls at the secondary level. All necessary instructions were given in details before administering the test. After the pilot test, some questions were re-edited in the light of expert opinion. The items were selected from the following major area of Population Education:

- Population and sustainable development.
- Socio-economic factors & quality of life.
- Health, hygiene and nutrition.
- Environmental and ecological issues.
- Population dynamics.

3.6.4.1 Scoring Procedure

In the Population Awareness Test all the questions were objective type questions. Half (½) mark is given to each correct answers. The time duration fixed for the test was forty five minute and the maximum marks for the test was 25. The items were printed along with necessary instructions. Separate response sheet was given to each student. A sincere effort was made to get correct data by administering the test. The investigator herself administered the test.

3.6.4.2 Validity and Reliability of the Test

The validity of the test was calculated by validating the final test scores with the class examination marks. The validity coefficient was computed by Karl Person’s product moment correlation coefficient method. The co-efficient of correlation was found to be 0.743. The Reliability of the Population Awareness Test was computed by Split Half Method. The reliability coefficient of the whole test was found to be 0.793 estimated by Spearman – Brown Prophecy formula (Garret, 1981).
All the response sheets are scored, according to the scoring key provided with the questionnaire for Population Awareness Test. Further analysis is made using the scores obtained from the population awareness test. The copies of the Population Awareness Test (PAT) with the scoring key are given in Appendix-VI.

3.6.5. Lesson Designs in Population Education

3.6.5.1 Preparation of lesson designs

For developing synthetic model, the investigator blended two learning strategies i.e. Computer Assisted Instruction model and Futures Wheel method. Before selecting the learning strategies, the investigator analyzed the syllabus prescribed for secondary schools in Kerala. Text Books, Hand Books, Resource Books, Supplementary Reading Materials, Reference Books related to content and method of teaching, Models of teaching and pedagogical principles were also analyzed. The learning strategies were selected on the basis of practical utility and relevance to the teaching of population education. To prove the effectiveness of the proposed Synthetic Model investigator compared the Synthetic Model with its two component learning methods i.e. Computer Assisted Instruction Model and Futures Wheel method as well as the existing method of teaching. For testing the effectiveness of Synthetic Model the investigator prepared lesson designs based on Futures Wheel Method, Computer Assisted Instruction Model, Synthetic Model and Existing Method for teaching Population Education among the ninth standard students.

The investigator prepared the lesson designs after consulting with experts in the field of education and teachers who are teaching at the secondary level. The investigator prepared a fact sheet contain all the relevant data related to the topic and attached to
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each of the lesson transcript so as to assist the teacher during the data gathering phase of the model. The draft lesson designs were given to two experts in the field of Population Education and two teachers from secondary level. Necessary corrections were made according to their feedbacks. After this, the lesson designs were administered to a small representative sample of ninth standard students. On the basis of this preliminary try out and from the suggestions of students, investigator made some changes in the lesson designs. After the modifications, the lesson designs were finalized for the study. The same topic “Overpopulation in India” selected for teaching all the four learning strategies. Population Education is an interdisciplinary subject. While preparing the lesson designs, the investigator considered this and selected content from Social Science, Chemistry, and Biology. Before planning the lesson designs, the investigator made a thorough analysis of topic selected. The topic “Overpopulation in India” is divided into eight sub units.

Sub unit 1: Population Situation in India
Sub unit 2: Effect of Overpopulation on Environment.
Sub unit 3: Food Problem in India
Sub unit 4: Overpopulation and Poverty
Sub unit 5: Unemployment problem in India
Sub unit 6: Relationship between Overpopulation and Social Problems
Sub unit 7: Overpopulation and Economic Development
Sub unit 8: Population Growth and Standard of Living

The details of preparation of lesson designs based on Computer Assisted Instruction Model, Futures Wheel Method, Synthetic Model and Existing Method are given in detail. The Table 3.6 shows a clear picture about the three experimental groups and control groups and the learning strategy adopted for each treatment group.
Table 3.6 Preparation of Lesson Designs for Experiment

<table>
<thead>
<tr>
<th>Treatment Groups</th>
<th>Models used for preparing lesson designs for experimental teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental group I</td>
<td>Futures Wheel Method</td>
</tr>
<tr>
<td>FWM Group</td>
<td></td>
</tr>
<tr>
<td>Experimental group II</td>
<td>Computer Assisted Instruction Model</td>
</tr>
<tr>
<td>CAI Group</td>
<td></td>
</tr>
<tr>
<td>Experimental Group III</td>
<td>Investigator developed a new model Synthetic Model by blending Futures Wheel method and Computer Assisted Instruction model.</td>
</tr>
<tr>
<td>SM Group</td>
<td></td>
</tr>
<tr>
<td>Control Group</td>
<td>Existing Method</td>
</tr>
<tr>
<td>EM Group</td>
<td></td>
</tr>
</tbody>
</table>

3.6.5.2 Lesson Designs based on Computer Assisted Instruction Model

For developing Synthetic Model investigator blended two learning strategies i.e. Computer Assisted Instruction Model and Futures Wheel Method. Before developing the Synthetic Model the investigator examined the effectiveness of Computer Assisted Instruction model for teaching Population Education.

Computer Assisted Instruction (CAI) encompasses a broad range of computer technologies that supplement the classroom learning environment and can dramatically increase a student’s access to information. The use of CAI is pedagogically effective and that currently available applications are easy to integrate into the student’s in-class experience. Students also benefit from the
immediate feedback provided by computers and most of them appreciate the self-paced learning environment. CAI motivates them to learn, and increases their personal responsibility for learning.

The investigator prepared lesson designs on the topic “Overpopulation in India” for teaching Population Education based on Computer Assisted Instruction Model. The detailed explanation of theory and preparation of lesson designs in Population Education based on Computer Assisted Instruction Model is given in the chapter IV.

3.6.5.3 Lesson Designs based on Futures Wheel Method

Futures Wheel Method is one of the futuristic learning strategies developed by Gerome C. Glenn. The Futures Wheel is a structured brainstorming method used to organize thinking about future events, issues, trends, and strategy. It is also called as Consequence Wheels. Futures Wheel is an important method of generation of likely consequences of a trend. In other words this is understood as a method of study of future consequences of certain existing trends. The trend can be identified as overpopulation, population growth, unemployment, poverty, pollution etc. The Consequence or Futures Wheel is most commonly used to:

- Develop multi-concepts
- Think through possible impacts of current trends or potential future events.
- Organize thoughts about future events trends
- Identify potential consequences of a strategy
- Show complex interrelationships.

The investigator prepared lesson designs on the topic “Overpopulation in India” for teaching Population Education based on Futures Wheel Method. The detailed explanation of theory and preparation of lesson designs in Population Education based on Futures Wheel Method is given in the chapter IV.
3.6.5.4 Development of synthetic model

In this technology based global scenario, the very nature of Population Education is in futuristic angle. It focuses on problem oriented and value laden strategies (Taylor and Hamal, 1974). There are a number of teaching methodologies, strategies and models of teaching which have been used to teach population education. They range from traditional expository method to modern computed based instruction strategies.

Before developing the model, investigator went through all the teaching methods, strategies and models which have been used to teach Population Education and analyzed it. The careful study of literature clearly reveals that, most of the learning strategies having its own inherent strengths and weaknesses. After the detailed analysis of the various teaching methods, strategies, and models and based on the results of needs analysis the investigator selected two models i.e. Computer Assisted Instruction Model and Futures Wheel Method and analyzed its strengths and weaknesses for effective blending. Combining the strengths of each of the methods and eliminating their weakness can lead to the development of a powerful and effective instructional system. By eliminating the weaknesses of the two methods, the investigator blended the strengths of both and developed a new model named Synthetic Model for teaching Population Education among the secondary level students.

According to Skuthorpe and Graham (2003), a truly blended solution “involves the strengths of each type of learning environment and none of the weakness”.

Osguthorpe and Graham identify six major advantages of blended learning. These advantages include: pedagogical richness, access to technology, social interaction, personal agency, cost effectiveness, and ease of revision. The methods can increase student interaction in the classroom, while providing students with a range of learning choices (Osguthorpe & Graham). An additional advantage of blended learning is its ability to address differing
learning styles with a variation of instructional methods (wiffin, 2002). The teaching of Population Education requires subject competence and mastery of non-traditional teaching methods. The students must be given opportunity to explore their own feelings, thinking and value structure regarding their reproduction behavior now and in the future. At present, teachers focusing only on cognitive aspect of population education. They are not aware of the affective aspect which promotes a greater understanding of the nature, causes, and consequences of population changes as they affect and are affected by individuals, families, communities and nations. In this context, the method used to teach Population Education must be appropriate enough to shape students' knowledge and attitudes so that they will make population related decisions based on scientific information in this context, the investigator intends to develop a new teaching model appropriate to create proper knowledge, awareness and attitudes regarding population related aspects in a futuristic perspective among the secondary level students.

The investigator prepared lesson designs on the topic “Overpopulation in India” for teaching Population Education based on proposed Synthetic Model. The detailed explanation of theory and preparation of lesson designs in Population Education based on the Proposed Synthetic Model is given in the chapter IV.

3.6.6 Judgment Schedule for Experts and Teachers to rate the comparative effectiveness of Synthetic Model and Existing Method for teaching Population Education

The investigator prepared a Judgment schedule to assess the effectiveness of the Synthetic Model with Existing Method, for teaching Population Education among the secondary level students. The Judgment Schedule contains thirty items covering different aspects of educational outcomes. The Judgment Schedule was administered to Experts (N= 20) and Secondary Level Teachers (N=120). For convenience the educational
outcomes included in the Judgment Schedule were classified under the following dimensions:

(i) Cognitive
(ii) Affective
(iii) Psychomotor skills
(iv) Process Skills
(v) Social skills

The Educational Outcomes were presented on a 5 point rating scale ranging from Very High to Very Low: Very High (VH), High (H), Medium (M), Low (L) and Very Low (VL). Judgment schedule for experts and teachers to rate the comparative effectiveness of Synthetic Model and existing method for teaching Population Education is given in Appendix-IX.

3.6.7. Questionnaire for experts and teachers to analyze the Receptivity of Synthetic Model for teaching Population Education

To analyze the receptivity of Synthetic Model for teaching Population Education, the investigator prepared The Receptivity Analysis Questionnaire for experts and teachers. To understand the possibility of acceptance and success of the Synthetic Model, the receptivity of the Synthetic Model was analyzed through administering the Receptivity Analysis Questionnaire among educational experts [n=20] and secondary level teachers [n=120]. The receptivity analysis focused on three major aspects of the new model i.e. Synthetic Model. They are:

- Relevance of Synthetic Model for teaching Population Education.
- Usability of Synthetic Model for teaching Population Education.
- Effectiveness of the Synthetic Model for teaching Population Education.
• General Perceptions of experts and teachers regarding the receptivity of Synthetic Model for teaching Population Education.

The Receptivity Analysis Questionnaire for secondary level teachers is given in Appendix-XI

3.6.8 Questionnaire for Teachers to rate the suitability of the Synthetic Model for teaching Population Education

A questionnaire was administered for teachers (N=120) to assess the availability of resources, suitability of existing curricular factors, practical difficulties likely to be encountered by teachers and suggestions of teachers for the successful implementation of the developed model. The questionnaire consists of three parts. The first part is meant to assess the availability of resources and suitability of existing curricular factors for teaching Population Education through synthetic model. Teachers were asked to rate their opinions by a (✓) mark in appropriate columns: Great Extent (GE), Some Extent (SE) and Not At All (NA).

(1) Availability of Resources for using the Synthetic Model

(2) Suitability of the model in terms of existing curricular factors:

(i) Syllabus
(ii) Time Table
(iii) Evaluation

The second part (Part B) is meant to examine the practical difficulties likely to be encountered by teachers while practicing the Synthetic Model for teaching Population Education. The third part (Part C) deals with the Suggestions for the modifications of the existing learning environment for implementing the Synthetic Model for teaching Population Education at the secondary level. The questionnaire for teachers to rate the suitability of the
Synthetic Model for teaching Population Education is given Appendix-XII.

3.6.9. Willingness Scale for Secondary Level Teachers to Implement the Synthetic Model for Teaching Population Education.

To study the willingness of secondary level teachers to implement the Synthetic Model for teaching population education, the investigator adopted the willingness scale developed by Passi and Sansanwal (1985). The original scale was a three point scale and consisted of twenty three items. Passi, et al., administered the scale after a training schedule for teacher educators in models of teaching. Hence the original scale was modified to suit the present study. A rough draft of twenty four items was prepared and a panel of judges examined its suitability and suggested a few modifications and they were incorporated. After the modifications, the Willingness Scale was finalized.

The final tool consists of eighteen items to be rated on a three point scale i.e. Agree, Neutral, Disagree. The positive statements were scored as three for agree, two for neutral, and one for disagree. The negative items were scored as three for disagree, two for neutral, and one for agree. The maximum score one could earn was fifty four and minimum score one could earn was eighteen. The reliability of the test was determined by split half method. The co-efficient of split half test was found to be 0.62 and the reliability co-efficient of the whole test was 0.74. The Willingness Scale for Secondary Level Teachers, to implement the Synthetic Model for Teaching Population Education is given in the Appendix-XIII.
3.7. Execution of the Study

The study consists of Experiment and survey. The details of the experiment and survey are given below.

3.7.1 Execution of the Experimental Study

Considering the objectives of the study and, the nature of data required for their realization, Survey cum Experimental method was selected for the present study. As the study focused on developing synthetic model, the study have three phases. The first phase is the needs analysis of the study, the second phase is experimental phase and the third phase is the receptivity analysis of the synthetic model. The first and third phases mainly focused on survey and the second phase is the experimental part. The details of experiment and survey are given below.

3.7.1.1 Execution of Pre – Tests

Prior the commencement of the experiment, both experimental and control group of each school were given the same pre-test in adjacent periods to measure the initial status of the secondary level students in terms of achievement in Population Education and population awareness. Adequate instructions were given for answering the questions before the administration of the pre tests.

3.7.1.2 Administration of Achievement Test

The investigator assessed the achievement in Population Education by administering an achievement test in Population Education for both the experimental and control groups before the experimental teaching. Adequate instructions in answering the questions were given before administering the test. A friendly atmosphere prevented in the classroom really motivated the students to respond naturally.
3.7.1.3 Administration of Population Awareness Test

After the administration of pre-test the investigator administered a population awareness test for both the experimental and control groups for assessing their awareness in population related issues.

3.7.1.4 Execution of the Experiment

The investigator contacted the heads of the schools which were selected for the study and fixed a time schedule for experimental teaching. The experiment which was executed includes conducting the pretest, application of treatment for both experimental and control groups and conducting post tests. The experimental design adopted in the present investigation is pre-test post test non-equivalent group design.

The experimental group contains three groups. The first experimental group was taught through Computer Assisted Instruction model (CAI Group). The second experimental group was taught through Futures Wheel method (FWM Group).

The third experimental group(SM Group) was taught through synthetic model. The Synthetic Model is developed by blending the Computer Assisted Instruction model and Futures Wheel method.

The control group (EM Group) of each school was taught by the existing method of teaching. Both the teaching of the experimental and control groups were done by the investigator herself.

The teaching units of Population Education were the same in the three experimental group and control group while the sample for each group were different and generally kept away from one another.

Fig.3.5 shows the exposition to experimental teaching by treatment groups.
3.7.1.5 Teaching of the Experimental and Control Groups

As the study intends to develop synthetic model, by blending computer instruction model and Futures Wheel method. The investigator prepared ‘lesson’ designs based on Computer Assisted Instruction model, Futures Wheel method, and Synthetic Model and existing method.

The experimental group consists of three groups. The three experimental groups were taught by using three models. After administering the pre-tests, the three experimental groups were taught by Computer Assisted Instruction, Futures Wheel
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Method and Synthetic Model respectively. The control group was taught by Existing Method.

3.7.1.6 Execution of Post – Test

After conducting the experimental teaching in all the schools, the same tests in terms of achievement in Population Education and awareness in population were administered to students in both the experimental and control groups.

3.7.1.7 Scoring and Consolidation of Data

All the response sheets were scored according to the scoring key and marking scheme provided in the achievement test. Scores on the achievement test in Population Education on both Pre-test and Post-test were tabulated for the experimental and control groups of both the schools. The pre and post test score of awareness in population were tabulated separately for the experimental and control groups. The scores obtained for the selected variable were then consolidated for the final analysis.

3.7.1.8 Precautions observed

Following precautions were taken during the experimental study for ensuring the effectiveness and high precision in experimental conditions which may have contributed to good results,

- The success of the experimental treatment was ensured by establishing rapport with the pupil in the learning environment, by maintaining a friendly learner centered atmosphere.
- No undue stress or control of any kind was imposed on the subjects at any time during the study and the experiment was conducted in a relaxed natural setting.
- Sufficient time and essential technological supports were ensured for the treatment.
- It was important to ensure that, the content of the treatment had not been taught previously to the students.
• Before the study, clear direction was given to the students about the purpose of the study to get correct results.

3.7.1.9 Constraints and Difficulties Faced During the Experiment

It is necessary to mention the difficulties faced by the investigator during the experiment for the knowledge of those who intended to conduct such research in the future. Such constraints of the experiment that need to be taken care of are follows,

• It was a difficult task to convince the school management regarding the purpose of the study.

• Due to unexpected frequent harthals, investigator faced many difficulties in data collection.

• Some of the difficulties were experienced in association with the computer facilities in schools i.e. lack of adequate number of computers and frequent power failure.

3.7.2 Data Collection Procedure for Survey

As the study focuses on developing Synthetic Model, the investigator conducted a detailed survey before and after developing the proposed Synthetic Model.

3.7.2.1 Prior arrangements before conducting the survey

The investigator made prior arrangements with the concerned schools selected for administering the tools for survey. The investigator contacted the educational experts and the authorities of concerned schools. According to their convenience, the investigator fixed the date for data collection. The investigator was able to get full co-operation from the Heads of Schools and particularly, the experts and teachers of the respective areas.

A uniform procedure is adopted in all schools for administering the tools. While administering the tools instructions
were given to teachers for filling the tools. Response sheets are collected after the marking their responses.

Before developing the Synthetic Model, the investigator conducted a detailed Need Analysis. After the experiment, investigator conducted a Receptivity Analysis to examine the acceptance and appreciation of academic circles. The surveys conducted are explained under two heads:

- Needs Analysis, and
- Receptivity Analysis

### 3.7.2.2 Data Collection through Needs Analysis

The investigator examined the prevailing practices of curriculum transaction in teaching Population Education at the secondary level by administering Population Education Prevailing Practices Questionnaire among 120 Secondary level teachers. For assessing the awareness about blended learning strategies among the secondary level teachers, investigator administered Blended Learning Strategy Awareness Inventory among the same group of secondary level teachers.

### 3.7.2.3 Data Collection through Receptivity Analysis

The investigator prepared a Judgment Schedule for teachers to rate the comparative effectiveness of Synthetic Model and Existing Method for teaching the Population Education in realizing certain select educational outcomes. The judgment schedule with the details of the model was given to the teachers \( n=120 \) and experts \( n=20 \), they are asked to rate the extent to which the listed educational outcomes were likely to be realized through, Synthetic Model and Existing method.

To understand the possibility of acceptance and success of the Synthetic Model, The Receptivity Of The Synthetic Model was analyzed through administering the Receptivity Analysis Questionnaire among educational experts \( n=20 \) and secondary level teachers \( n=120 \).
A Questionnaire was administered among the same secondary level teachers [n=120] to examine the availability of resources, suitability of existing curricular factors, practical difficulties likely to be encountered by teachers and suggestions of teachers for the successful implementation of Synthetic Model.

The willingness of secondary level teachers to implement Synthetic Model for teaching population was examined by administering a willingness scale. Thirty teachers from various subjects observed the experimental teaching done by the investigator for the experimental and control groups and they were asked to express their willingness to implement Synthetic Model for teaching population education. The willingness scale consisted of eighteen items to be rated on a three point scale.

3.7.2.4 Consolidation of Data

After the collection of data, the investigator examined the response sheets. The data relating to the sample was consolidated, coded, tabulated and used for analysis. The details of data, analysis, discussions of results and conclusions are given in the following chapters.

3.8 Statistical Techniques Employed for the Study

For the present study, the following statistical techniques were employed. They are:

(a) Test of significant difference between means for large and small independent sample: Test of significant difference between means for large and small independent sample is used to discover whether the two groups differ significantly in mean performance (Garrett, 1981).

(b) Paired‘t’ test

Paired‘t’ test of significance of difference of means when two samples are independent of each other is used to test the of a
group before and after the experimental treatment. It is used as a self pairing test. (Snedecor, 1956)

(c) Analysis of Covariance [ANCOVA].

ANCOVA represents the correlation between initial and final scores. To examine the effectiveness of the proposed synthetic model for teaching Population Education, the investigator applied ANCOVA. It is able to affect adjustment in the final scores which will allow for the difference in some initial variable. It helps in exercising proper statistical control over the uncontrolled covariates that have been left uncontrolled at the start of the experiment or study. (Garrett, 1981)

(d) Chi-square Test, which is a non–parametric test, was used to analyze the teacher’s willingness to implement the synthetic model for teaching Population Education.