CHAPTER-V

This chapter summarizes the details of the study taken up, presents the major findings under each of the research questions/Hypotheses, implications of the study and suggestions for further research.

5.1 NEED & CONTEXT:

Our need for environmental protection is no issue at all. It needs no debate. It is never secondary in its priority. So all educational institutions, starting from elementary schools should aim at developing concern towards environment & its protection. This is very clear when New Education Policy 1986 states that “There is a paramount need to create a consciousness of the environment. It must permeate all ages and all sections of society beginning with the child. Environmental consciousness should inform teaching in schools and colleges. This aspect will be integrated in the entire educational process”. But strangely we notice the younger generation misbehaving with the nature and its creatures. This reflects typically the kind of experiences they lack in schools and colleges. Indirectly this also tells the tale of such noncommittal and incompetent teachers who are otherwise expected to become the facilitators of apt learning experiences! Thus we are in urgent need of competent teachers who develop concern towards environment. After the declaration of ‘Education for all’ by NPE, the academicians, curriculum framers have woken up and realized the need for introducing environmental concepts ‘at all levels’ irrespective of the subjects. Therefore it becomes part and parcel of the programme in schools and colleges to provide such an education which results in the enhancement of students’ productive nature viz., to think productively, to learn worthy values, to lead eco-friendly life-styles etc. This indeed suggests the institutions to look out for competent teachers who can successfully develop these qualities. That’s the main reason why many universities are volunteering to make Environmental Education course, mandatory in teacher-education programme.
Opportunities for learning exist everywhere. Educational institutions are formal places, where deliberately learning atmosphere is created. The teacher is the key to the whole system. It is only through the initiative and innovativeness of the teacher, that any programme can be carried out successfully. There are many teacher support materials, handbooks on environmental education related aspects, with a number of different types of activities. The role of a teacher in performing these activities is not that of merely transferring information but rather, one of being a facilitator, a leader and a resource person in a learning process that is participatory. This type of role for an environmental education teacher has a very high significance. Each activity when presented to students with due stress (Weightage) given to it can provide students, an experience of a small part of the environment. And these small pieces of experiences build into a larger mosaic of understanding. The teacher should be competent enough not only in making the successful use of available readymade activities but also to design a number of such activities based on their local environment and available opportunities. Such activities encourage the students to observe and explore their environment, to understand relationships in nature between humans and nature and to learn better how humans are an integral part of the intricate web of life. A competent teacher will make this a joyful learning for students by providing activities based on real experiences and to help them to explore their environment with utmost sincerity by preparing their mindset for ‘Prevention is better than cure’

There are several reasons why especially competent teachers are required for teaching Environmental Education. This may require an analysis of the nature of the discipline and its objectives:

- The very objectives set forth for environmental education going from awareness to action (Tbilisi) – pose a challenge. The conventional classroom methods of teaching are not found effective in meeting different objectives to any great extent, which is why teachers have to explore fresh ways of teaching in order to become successful Environmental Education teachers.
Environment is all-encompassing multi-disciplinary and dynamic. It has scientific, social, economic, political and technological dimensions to it. An EE teacher has to bring in all these aspects to capture the true spirit of Environmental Education.

Environmental Education is meaningful, if it takes place in realistic and is generally oriented towards understanding and solving real-life problems. Practical activities and first hand experiences are essential for creating this understanding.

But most schools are not geared towards this. This is because most teachers are not equipped with the required abilities. This is precisely because generally it is not expected out of the schools teachers. The teacher training institutes also have remained complacent in this regard.

Whether the curriculum actually achieves this goal or not will be affected by many issues. While these often extend beyond the responsibilities of a single school or teacher, there are many things that schools and teachers can do, only that it demands attainment of such competencies by teachers.

Lastly, we should not forget, Mahatma Gandhi’s statement ‘Nature can provide for every man’s need but not for greed”. Competent-teachers play a dominant role in conveying this message to the mankind. If the teachers downplay their responsibilities now, it will be disastrous. Because, ‘forgoing responsibility’ is to force the inevitability and to forgo chance. We are all ultimately greater than the sum of our parts. There is no force greater than ‘human will’. So we must make RIGHT CHOICES by playing our responsibilities. WE ARE, WHAT WE CHOOSE. And if we so choose, we can thrust healthy environment upon mankind. Competent teachers surely make the students realize, how, ‘for the loss of a horse shoe nail, a kingdom was lost’ and assures the young minds that each one ‘is’ such a nail the favour of which certainly sustain us.

The task therefore is to train competent teachers who can transact environmental education successfully. This is not that easy since such a teacher should possess a set of extra competencies that NEED NOT / MAY NOT be present in a teacher teaching regular school subjects. This is because, Environmental Education demands special expertise to be effective in class rooms.
This detailed discussion probably forces us to conclude that competency-based training to transact Environmental Education should be a part of the course in teacher-training institutions. Such trained competent Environmental Education teachers alone can inculcate desirable values and attitudinal modifications among the future generation which can make conservation of environment – an ongoing cultural process.

5.2 TITLE OF THE STUDY:
EFFECT OF COMPETENCY-BASED TRAINING PROGRAMME IN ENVIRONMENTAL EDUCATION ON THE COMPETENCE OF PRE-SERVICE SECONDARY TEACHERS.

5.2.1 OBJECTIVES OF THE STUDY

The present study mainly aims at identification of the competencies required for pre-service teachers to transact the Environmental Education using infusion approach at the secondary level and development of those competencies among pre-service secondary teachers. It is also purported to provide alternative modes of CBT programme to pre-service teacher to develop the identified competencies and to study their relative effectiveness. The objectives of the study are specified as given below:

7. To identify the competencies required for the pre-service teachers to transact the Environmental Education through infusion approach at secondary level.
8. To design a competency-based training programme with alternative modes to foster the identified competencies viz. Content Competencies & Pedagogical Competencies.
9. To develop tools to assess the attainment of identified competencies among pre-service teachers.
10. To study the relative effectiveness of the alternative modes of Competency-Based Training programme (CBT) viz. Casual Approach (CA), Written Approach (WA) & Practical Orientation Approach (POA), on the competencies attainment of pre-service teachers.
11. To study the relationship between the Attitude towards EE and Competency Attainment of the pre-service teachers of treatment groups.
12. To study the difference in Competency Attainment between Science Methodology and Arts & Language Methodology pre-service teachers of treatment groups.
5.2.2 HYPOTHESES TO BE TESTED:
I. There is significant gain in the Competency Attainment of pre-service teachers of the different treatment groups (experimental groups) in the following categories of competencies after the intervention in terms of alternative modes of CBT:

3. **Content Competencies**: the three areas of content competencies viz.
   a. Environmental knowledge
   b. Environmental Awareness
   c. Environmental Action Behaviour

4. **Pedagogical Competencies** such as:
   a. Indoor competencies
   b. Outdoor Competencies
   c. Preparing Additional Resource Materials
   d. Making Environmental Pro-Decisions
   e. Executing Action Projects
   f. Constructing Evaluation Tools

II. There is no significant differential gain in the Competency Attainment of pre-service teachers between the treatment groups (experimental groups) and the control group in the following categories after the intervention in terms of CBT:

1. **Content Competencies**: the three areas of content competencies viz.
   j. Environmental knowledge
   k. Environmental Awareness
   l. Environmental Action Behaviour

2. **Pedagogical Competencies** such as:
   s. Indoor competencies
   t. Outdoor Competencies
   u. Preparing Additional Resource Materials
   v. Making Environmental Pro-Decisions
   w. Executing Action Projects
   x. Constructing Evaluation Tools
III. There is no significant relationship between the Attitude Towards Environmental Education (AEE) and Competency Attainment of pre-service teachers of treatment groups.

IV. There is no significant difference between the Pre-service teachers with Science method and Art & language method of treatment groups in their competency attainment.

5.2.3 RESEARCH QUESTIONS:

5. What are the Competencies & their components that are required to transact EE through infusion approach as secondary level?

6. To what extent the alternative modes of CBT are effective in developing the identified competencies among pre-service teachers at secondary level?

7. What components of different competencies required for EE teachers are displayed by Pre-service teachers after undergoing different modes of CBT?

8. What is the feasibility of implementing different modes of CBT programme to train EE teachers?

5.2.4 VARIABLES CONSIDERED FOR THE STUDY:

The following are the different variables considered for the present study:

- Dependent Variable: Content (EA, EK &EAB) and Pedagogical (Indoor, Outdoor, Making Environmental Pro-decisions, Executing Action projects, Preparing Additional resource materials, Preparing Evaluation tools) Competencies
- Independent Variable: Treatment
- Background Variables: Attitude towards EE & Subject Background

5.2.5 DELIMITATIONS OF THE STUDY:

- The competencies selected are delimited to only those which are felt 'essential and require training' by the secondary teachers.
- The study could make provision only for post-test in case of 'Executing Action Project' competence.
- The study is restricted to observation of lessons only in peer group setting for pre-tests of indoor competencies.
5.3 OPERATIONAL DEFINITIONS OF THE KEY TERMS

**Pre-service Teachers:** Teacher trainees who are undergoing B.Ed. training during the period of research.

**EE teacher:** is one who teaches about environment, its problems & solutions (by) infusing environmental aspects during the transaction of different school subjects.

In the present study EE teachers refer to pre-service teachers who transact EE at the secondary level during their practice teaching session.

**Environmental Education (EE):** Environmental Education is an attempt to reorient education so that environmental competence is resorted as one of us basic aims, along with personal and social competence. It is not just a subject of education but an expansion of its whole philosophy, recognizing our environmental as continuous with ourselves and in need of the same ease and understanding as we give to our personal and social well being” (Smyth 1995)

According to UNESCO-UNEP: Environmental education is regarded as a permanent process in which individuals and the community gain awareness of their environment and acquire the knowledge, values, skills, experience and also the determination which will enable them to act-individually and collectively-to solve present and future environmental problems.

In the present study,

a) At the secondary level: EE refers to the development of knowledge of environment, awareness of environmental problems & measures and right attitude towards the protection of environment through the secondary curriculum.

b) At the B.Ed. level: EE refers to the education leading to the development of content and pedagogical competencies required to transact environmental components at the secondary level.
**Attitude:**
An attitude is a dispositional readiness to respond to certain situations, persons, or objects in a consistent manner which has been learned and has become one’s typical mode of response. The degree or strength of a person’s attitude may vary from extremely positive through a gradation to extremely negative.

**Attitude towards EE:**
In this study it refers to the favourable disposition of pre-service teachers towards, a) Introducing EE at both B.Ed. level and Secondary level. b) Teaching EE at secondary level.

**Infusion:** is defined as “the process of integrating Environmental dimension or perspective into the contents of the existing courses in order to highlight its significance without jeopardizing the innate nature of the course/s”.

**Infusion approach:** An approach in the teaching of EE with a new focus to the subjects taught. This approach calls for a deliberate selection and inclusion of content, which will add to the students’ awareness and understanding of the environment.

**Infusion spots/Plug points:** These are the words/phrases, statements; sentences in the topics taught (secondary curriculum) where provision can be made for infusing environmental dimension without harming the continuity of the topics.

**Competency:** Report of DPEP on the activity of NCERT identifies that the meanings attributed to competency in literatures pertaining to teacher education, reveals certain common characteristics that are applicable to a competency. They are as follows:
5. A competency consists of one or more skills, whose mastery would influence the attainment of the competency.
6. A competency has its linkages with all the three domains under which performance can be assessed. It spans the domains of knowledge, skill and attitude. Even though the skilled performance of a teacher is closely associated with his competence, such a performance would have knowledge and experience based and a favourable attitude.

7. Competencies, since have a performance dimension to them, are observable and demonstrable.

Because the competencies are observable, they are also measurable. It is possible to assess a competency from the performance of a teacher. There may be competencies which have a layer part of it pertaining to knowledge than to skill and attitude. Some have referred to such competencies as cognitive competencies whereas, there may be competencies which skill/performance loaded.

In the present study Competency refers to the state of having and demonstrating, skills, abilities or aptitudes in the satisfactory execution of a learning task (Competency). It consists of one or more components. Here components are the tasks to be performed under the individual competency in order to attain it. Satisfactory execution of a Competency refers to the demonstration of all components of a Competency.

In this study, Competencies (to transact EE) that have a predominant part of skills have been considered along with the ones that are dominated by the knowledge. A reason being, such competencies are not devoid of knowledge and attitudinal dimensions and that they are more closely linked to the performance assessment of a teacher or to his job analysis.

Competencies are meaningfully categorized based on the purpose and common criteria as follows:

**Content Competency:** Refers to the following competencies viz.

**Environmental knowledge (EK):** Knowledge of basic environmental concepts/phenomena, its problems and its protection among pre-service teachers, in
order to infuse EE successfully at secondary level & it is represented by the total scores obtained on Environmental Knowledge Test (EKT) used in the present study.

**Environmental Awareness (EA):** In this study it is defined as "the state in which an individual is environmentally conscious regarding a number of environmental or ecological concepts and environmental problems" and it is represented by the total scores obtained on Environmental Awareness test (EAT) used in the study.

**Environmental Action Behaviour (EAB):** it is defined as mental and physical disposes of a Pre-service teacher towards solving the existing environmental problems and regarding future once through action. In other words it is the transformation value and Environmental Attitude into considerable actions towards securing environmental problems. It is represented by the total some obtained on Environmental Action Behaviour test (EABT) used in the study. In the Present study, Environmental Action Behaviour refers behaviours of Pre-service teachers to those ‘day to day’ actions, which by their frequency have the potential to affect environment, either adversely or beneficially.

**Pedagogical Competency:** In this study pedagogical competency is defined in terms of class room performance of teachers, which has direct bearing on content component (not assessed separately) & affective components (assessed separately).

In the present study Pedagogical Competencies refer to the following:

**Indoor competencies:** refers to the classroom competencies of an EE teacher which are to be performed only inside the classrooms in order to transact EE at the secondary level.

**Outdoor competencies:** refers to the class room competencies of an EE teacher, which are performed out side the classrooms preferably in the natural setting. The study considers two competencies under this category viz. Nature walk and Nature game.
Preparation of Additional resource materials:

- **Environmental album:** Arrangement of visuals from varied sources on varied environmental themes in the form of a photo album.

- **Environmental Scarp book:** Arrangement of paper clippings from varied sources on varied environmental themes on a used/unused book.

- **Learning aids:** preparation of learning aids that acts as a supplement in the transaction of EE, using waste/available at low cost ‘Thermo Coles’ on environmental themes.

- **Environmental Posters:** refers to the collage of visuals from varied sources related to an environmental theme on a single drawing sheet. It includes a relevant caption to catch the viewers.

**Action project:** it is a project, which involves some action (head, heart and muscle). In this context it refers to the execution of a project by pre-service teachers involving secondary students.

**Making environmental pro-decision:** refers to those potential abilities of pre-service teachers which help them mend their action behaviour pro-environment.

**Constructing Evaluation tools:** refers to the ability of the pre-service teachers to construct the tools such as rating scales, check lists & questionnaires (open type) in order to assess their students EK, EA & EAB.

**Competency-based training programme:** A package prepared to train and evaluate competencies to transact the curriculum in respect of specific disciplines. In this study, it refers to a package prepared to train (pre-service teachers) to transact the EE at the secondary level and evaluate attainment of those competencies.
**Competency Attainment:** “accomplishment or proficiency of performance in a given skill or body of knowledge.” (Good-1997)

In this study attainment refers to the achievement of specified competencies on which satisfactory execution is demonstrated by each pre-service teacher during the transaction at the secondary level.

Satisfactory execution refers to the execution of all the desirable components of identified competencies.

**Competency-based training programme:** a package consisting of the modules and procedures to train, assess the pre-service teachers in the competencies identified as necessary for pre-service teachers for the transaction of EE.

**Subject background of pre-service teachers:** refers to Science and Arts & language Content Cum Methodology subjects opted by Pre-service teachers at B. Ed. level. on this basis the pre-service teachers are categorized as those with Science method and those with Arts & language methods respectively.

**Treatment groups:** refers to three experimental groups which receive alternative modes of CBT in terms of Casual Approach (CA), Written Approach (WA) & Practical Orientation Approach (POA) to CBT

5.4 DESIGN & METHODOLOGY:

The present study is descriptive cum experimental in nature. The experimental part of the study involves ‘Parallel group pre-test & post-test design’. The whole study is carried out in the following three phases:

**Phase I:** Identification of competencies required for pre-service teachers to transact the Environmental Education through infusion approach at the secondary level

**Phase II:** Designing the Competency-Based Training (CBT) programme to develop the identified competencies of EE among pre-service teachers
Phase III: Study of the effectiveness of the designed CBT programme, Relationship between the Attitude of the pre-service teachers towards EE and their Competency Attainment.

Identification of competencies required for pre-service teachers to transact the Environmental Education through infusion approach at the secondary level:

The following steps were considered to identify the Competencies required for pre-service teachers to transact EE through infusion approach at Secondary level:

2) Preparation of draft list of competencies for EE teachers:

Study of existing lists
Curriculum of Teacher Education programme in the University of Mysore
C) Karnataka State Syllabus for Secondary School Education:
D) Face to face Interaction with Experts (Experienced Teacher-Educators, Senior Scientists & Environmentalists)
E) Observation of the Demonstration Lessons of Experienced Secondary Teachers & Face to face Interview with Them

Considering the outcome of all the above said procedures and a detailed discussion with the guide, a draft list of competencies for an EE teacher at secondary level was prepared by the investigator

(2) Finalization of the List of Competencies required for the EE Teachers:

a) Opinion Collection Regarding the Draft List
b) Checking of the individual competency for its essentiality and the need for training

The competencies identified were restructured wherever required and short-listed based on the opinion collected through opinionnaire & focused group discussion as detailed above, and a thorough discussion with the guide. These competencies were categorized under two headings: Essential competencies & Non-essential competencies. Discarding the non-essential ones, only those which are both essential and need training were selected and ‘modified list’ of competencies for EE teachers at secondary level was prepared.
c) **Expert's View on the Modified List of the Competencies**

Further, the opinion of the Experts who have worked in the field of 'Teacher Education' or 'Environmental Education' or 'Competency Areas', regarding the *essentiality, attainability and measurability* of competencies was also collected and the list of competencies was finalized.

The final list of competency for EE teachers to transact EE at secondary level is given below:

**CONTENT COMPETENCIES:** The pre-service teachers will be able to exhibit the following in the transaction of EE

1. **Environmental Knowledge (EK)**-Understanding of the different aspects of Environment.
2. **Environmental Awareness (EA)**-Awareness related to different problems/issues of Environment
3. **Environmental Action Behaviour (EAB)**-Pro-Environmental Action Behaviours

**PEDAGOGICAL COMPETENCIES:** The pre-service teachers will be able to execute the following in the transaction of EE.

1. **INDOOR COMPETENCIES**-
   - Identifying infusion spots in the teaching topics
   - Organizing Role play
   - Narrating environmental stories
   - Composing & Reciting simple poems
   - Organizing Brain Storming sessions

2. **OUTDOOR COMPETENCIES**-
   - Organizing nature walk
   - Organizing nature games

3. **EXECUTION OF ACTION PROJECTS**

4. **PREPARATION OF ADDITIONAL RESOURCES**-
   - Preparation of environmental albums
   - Preparation of environmental Scrap books
- Preparation of poster
- Preparation of learning aids

5. MAKING ENVIRONMENTAL PRE-DECISION

6. CONSTRUCTION OF EVALUATION TOOLS-
   - Preparation of items for a questionnaire (open ended)
   - Preparation of items for rating scales
   - Preparation of items for a check list.

**Designing the Competency-Based Training (CBT) programme to develop the identified competencies of EE among pre-service teachers**

In order to develop the Competencies the following *Alternative Modes of CBT* was designed:

- *Casual Approach to CBT (CA)*
- *Written Approach to CBT (WA)*
- *Practical Orientation Approach to CBT (POA)*

The details regarding the designs are given below:

**Casual Approach (CA) to CBT:** Provide written materials of the Content selected for the study to develop identified Content Competencies & list of identified pedagogical competencies that are used in the classroom transaction. Care to be taken to see that they go through the given materials & doubts raised regarding the same need be clarified. (The steps followed to select the content & to list the Pedagogical Competencies, are same as POA and details are given vide p-11)

**Written Approach (WA) to CBT:** Provide written materials of the Content selected for the study to develop identified Content Competencies, list of identified Pedagogical Competencies & written material on definitions, components, procedure/steps involved in the training of identified Pedagogical Competencies. Care to be taken to see that they go through the given materials & doubts raised regarding the same need be clarified. (The steps followed to select the content & procedure to train the Pedagogical Competencies, are same as POA and details are given vide p-11)
Practical Orientation Approach (POA) to CBT: Teach the selected Content using varied methods/techniques to develop Content Competencies. Provide training through Practical Orientation to develop identified Pedagogical Competencies. The procedure followed in designing this approach to CBT is given below:

The developed Competency-Based Training programme was subjected to experimentation on the sample selected for the study. The experimental design selected for the study is 'parallel group pre-test & post test design'. This design consisted of three experimental groups of differential treatment and one control group. Pre-& post-tests were given to all the four groups. The details of the procedure followed are schematically represented as given in the table below

**Procedure:** The procedure followed for the Experimentation is given below:

i) **Pre-test:** After designating the groups CG, EG1, EG2 & EG3, The EKT, EAT & EABT were administered as pre-tests for Content Competencies. Written tests were administered to assess their ability to Make Environmental Pro-Decisions as well as to their ability to Construct Evaluation Tools. After they were trained in the Conventional method of teaching in their respective methodologies, the pre-service teachers were instructed to give a lesson on any of their respective methodology subjects using any of the Competencies they think are required for an EE teacher at secondary level during their transaction of EE in peer group setting. Those lessons/activities (in both indoor & outdoor) were observed by the investigator and other resource persons (colleague teacher educators) using the tool developed for the purpose. This served as the pre-test for Pedagogical Competencies. The peer group setting was valid to assess their competence because competency is just what the teacher can do and does not bother about where & how.

ii) **Treatment:** The procedure followed in the treatment for all the four groups are detailed below:

The pre-service teachers of Control group (CG) were provided with the written material regarding the content selected for the study
The pre-service teachers of Experimental group (EG1) were provided with Casual Approach (CA) to CBT in terms of the list of identified Pedagogical Competencies that can be used in their transaction during practice teaching along with the written information regarding the content.

The pre-service teachers of Experimental group (EG2) were provided with the Written Approach (WA) to CBT in terms of Written Materials on the selected Content and written materials on definitions, components, procedures/steps involved in the training of the identified Pedagogical Competencies.

The pre-service teachers of Experimental group (EG3) were trained using the Practical Orientation approach (POA) to CBT Programme designed for the purpose.

5.4.1 SAMPLE OF THE STUDY:

The sample for the study was drawn by purposive sampling techniques. Of the eleven B.Ed colleges affiliated to University of Mysore with one year annual programme, four were located in Mysore city. Of these four B.Ed. colleges, one B.Ed. College with conducive atmosphere for experimentation was selected. All the ninety-six pre-service teachers in this college were randomly categorized into four groups of 24 each with due representation to science & arts background.

Out of these four groups one was considered as controlled group (CG) and the other three as experimental groups (EG1, EG2, EG3) for differential treatment.
### 5.4.2 TOOLS USED IN THE STUDY:

<table>
<thead>
<tr>
<th>Variables to be measured</th>
<th>Tools/techniques to be used for measurement</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content competency</td>
<td>Written tests; EKT, EABT &amp; EAT.</td>
<td>Developed by Dr. K. Yeshodhara</td>
</tr>
<tr>
<td>Pedagogical Competencies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Indoor competencies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Outdoor competencies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Preparing Additional resource materials</td>
<td>Rating Scales, Checklists &amp; both combined.</td>
<td>Developed by the investigator</td>
</tr>
<tr>
<td>d. Executing Action projects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Decision making Ability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Construction of Evaluation tools</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Affective Components of competencies</td>
<td></td>
<td>Developed by the investigator</td>
</tr>
<tr>
<td>Attitude towards Environmental Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>environmental scale (AEE)</td>
<td></td>
<td>Developed by the investigator</td>
</tr>
</tbody>
</table>
5.5 STATISTICAL TECHNIQUES USED FOR ANALYZING THE DATA:

The statistical techniques used to test the hypotheses formulated in the study, are given in the table:

Table-Schematic representation of the Statistical Techniques used

<table>
<thead>
<tr>
<th>HYPOTHESES TESTED</th>
<th>TECHNIQUES USED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 1</td>
<td>Descriptive Statistics</td>
</tr>
<tr>
<td></td>
<td>Paired Sample t-test</td>
</tr>
<tr>
<td>Hypothesis 2</td>
<td>Descriptive Statistics</td>
</tr>
<tr>
<td></td>
<td>Repeated measures ANOVA-general linear model</td>
</tr>
<tr>
<td>Hypothesis 2a</td>
<td>Descriptive Statistics</td>
</tr>
<tr>
<td></td>
<td>One-way ANOVA</td>
</tr>
<tr>
<td>Hypothesis 3</td>
<td>t test for independent means (for equality of means)</td>
</tr>
<tr>
<td>Hypothesis 4</td>
<td>Pearson's correlation &amp; Frequencies</td>
</tr>
</tbody>
</table>

5.6 MAJOR FINDINGS:

5.6.1 FINDINGS ON HYPOTHESES:

The following major findings of the present study can be listed:

**Hypothesis 1:** There is significant gain in the competency attainment of pre-service teachers of the different experimental groups (Treatment groups) in both Content and
Pedagogical categories of competencies after the intervention in terms of alternative modes of CBT:

There is significant gain in all the pre-service teachers of the Treatment groups in the Content Competency. But highest gain is found in only EG3 which received POA to CBT. The same is indicated even in the attainment of Pedagogical Competencies. EG2 has shown a better gain than the EG1 in the attainment of all the competencies.

**Hypothesis 2:** There is no significant differential gain in the Competency Attainment of pre-service teachers between the treatment groups (experimental groups) and the control) in both Content and Pedagogical categories of Competencies after the treatment with Alternative modes of CBT:

To test this hypothesis, Repeated measures ANOVA (General Linear Model) was adopted. There is significant differential gain in the Competency Attainment of pre-service teachers between the Treatment groups and the Control group in both Content and Pedagogical categories of Competencies after the treatment with Alternative modes of CBT.

Hypothesis 2a: There is no significant difference in the Competency attainment (indoor and outdoor) of Pre-service teachers who undergo POA to CBT, between peer group setting and actual class room setting.

To test this hypothesis, T-test for equality of means was adopted. The analysis indicated that there is not much difference in the mean scores between the two groups and the significance value does not indicate significant difference in competency attainment of pre-service teacher between peer group and actual classroom setting.

**Hypothesis 3.** There is no significant relationship between the attitude towards Environmental Education (AEE) and competency attainment of pre-service teachers who undergo practical orientation approach to CBT.

In order to find out the relationship between the competency attainment and attitude towards EE, Pearson’s correlation was used. The pre-service teachers although did not exhibit unfavourable disposition towards EE, were not influenced by it in their competency attainment.
Hypothesis 4: Pre-service teachers with Science methodology and Arts & language methodology who undergo practical orientation approach to CBT do not differ significantly in their competency attainment

The Hypothesis was tested using 't'-test for independent samples. There is not much difference in the attainment of competencies between the pre-service teachers with science and arts background. It is clear from the analysis of pre- and post-test results that pre-service teachers with arts background have benefited equally like their counterparts with science background. Significant difference is not found in the competency attainment between the different subject backgrounds except in the Content Competencies and Competency of Executing Action Projects.

5.6.2 FINDINGS ON RESEARCH QUESTIONS

1. What are the Competencies & their components that are required to transact EE through infusion approach as secondary level?

The competencies identified in the present study are under two main categories viz. Content Competencies, Pedagogical Competencies. They are as follows:

Content competencies: The pre-service teachers will be able to exhibit the following in the transaction of EE

- Environmental Knowledge (EK) - Understanding of the different aspects of Environment.
- Environmental Awareness (EA) - Awareness related to different problems/issues of Environment.
- Environmental Action Behaviour (EAB) - Pro-Environmental Action Behaviours.

Pedagogical Competencies: The pre-service teachers will be able to execute the following in the transaction of EE.

1. INDOOR COMPETENCIES-
   - Identifying infusion spots in the teaching topics
   - Organizing Role play
   - Narrating environmental stories
   - Composing & Reciting simple poems
   - Organizing Brain Storming sessions
2. OUTDOOR COMPETENCIES-
   • Organizing nature walk
   • Organizing nature games

3. EXECUTION OF ACTION PROJECTS

4. PREPARATION OF ADDITIONAL RESOURCES-
   • Preparation of environmental albums
   • Preparation of environmental Scrap books
   • Preparation of poster
   • Preparation of learning aids

5. MAKING ENVIRONMENTAL PRE-DECISION

6. CONSTRUCTION OF EVALUATION TOOLS-
   • Preparation of items for a questionnaire (open ended)
   • Preparation of items for rating scales
   • Preparation of items for a check list.

2. To what extent are the alternative modes of CBT effective in developing the identified competencies among pre-service teachers at secondary level?

   The pre-service teachers failed to display any aspects that are indicative of EE teacher during transaction before undergoing CBT. The pre-service teachers who underwent CA and WA to CBT did not indicate much gain in the competency attainment. Although the study showed high differential gain in the competency attainment after the intervention in terms of CBT, the highest gain was noticed only among the pre-service teachers who received the (POA) practical orientation approach to CBT. Therefore the following lines describe the extent of competency attainment among the pre-service teachers receiving POA to CBT.
The designed CBT was effective to the extent of successfully developing the competencies identified among the pre-service teachers of EG3 group who received Practical orientation to CBT as treatment.

The investigator analyses the following as the features POA of CBT that enhanced its effectiveness:

- The strategies/techniques involved group tasks which also allowed maximum individual exercises.
- The CBT provided good number of illustrations for most components of the competencies.
- Provision was made to avail additional information when needed, such as ‘more examples’, ‘alternative definitions’ etc.
- It consisted of complete step-by-step information regarding the procedure for executing action projects. Also it suggested the important features to be kept in mind while writing the project report. There are tips in the form of directions for ‘providing instructions’ as well as ‘providing variety of learning experiences’ in order to make the outdoor experiences more enriching & interesting. This provided them somewhat the guaranteed direction towards transaction. This was important since to accept any thing new is against to human nature. Pre-service teachers naturally have the hesitation to use these techniques. The tips given in the POA to CBT has helped them gain confidence and also to overcome the hesitation.
- The soft package containing POA is comparatively easy to use and to have smooth transition from slide to slide using hyperlinks. There exists provision for availing Additional information through the action buttons that has been hyperlinked with the related slides. Some of the presentations in the soft package have the additional benefits in terms of its use by teacher educators a) only to know the detailed description regarding how & what to train. b) Also for the actual training purpose itself. Eg. The preparation of additional resource materials, tools, Composing Cinquain, Creating story-board for role play and story narration etc can be used directly for training purposes to facilitate, ‘step-wise’ training of the competency. However the package provides for flexibility. The mild animation technique used in
the some of the presentations has made subtle things such as the procedures of ‘preparation of album and scarp book’ very clear. The package also provides an opportunity to view the formation of ‘food web’ to get clear picture of how the web is formed in the nature in terms of both

- Animated presentation
- Practical illustration by secondary students

- CBT provided sample examples that are both positive and negative in case of preparing evaluation tools. This helped them to have a clear cut distinction of the correct procedure of constructing tools.

- The pre-service teachers could get interesting exercises as ‘take home activity’. This was taken with full enthusiasm by them.

- The CBT provided a social unit of healthy network (through workshops and outdoor activities) in its implementation since it encouraged discussion ‘during’ & in ‘in-between’ sessions among themselves and with the investigator.

- The CBT gave platform for the group-wise training which indirectly promotes team teaching/learning. This is one of the key characteristics of EE.

- The activities gave scope for maximum individual participation using participatory approach.

- The suggested activities, the list of things/materials and the reference materials are easily available.

- It has built in flexibility in implementation, selection of learning experiences and in providing reinforcement to the pre-service teachers. Flexibility in it has reinforced the competence attainment by enhancing the needed attitude and interest for active participation.

- A list of ‘environment related situations’ from daily life experiences that can be used for developing decision making ability is available.

- The activities provided in CBT suited the pre-service teachers from both science and arts background.

- Group activities/discussions developed insight regarding the selection of learning experience by them in order to infuse EE.
First hand experiences lay impact on all domain of learning a competency.

5. What components of different competencies required for EE teachers are displayed by Pre-service teachers after undergoing different modes of CBT?

The following aspects indicative of a reasonably good EE teacher were displayed by the pre-service teachers after undergoing practical orientation approach to CBT in the present study:

- Their obvious search for infusion spots in most of the teaching during practice teaching session.
- The oral composition of ‘Cinquain’ & creation of story-board for role play/story narration every time they come across an environmental theme/concept.
- They indicated maximum enjoyment in organizing Brainstorming sessions. They opine that this helped the secondary students to haze their thinking process.
- Their obvious efforts for more information related to the environmental aspects, in order to provide authentic information through all the techniques they preferred to use. They indicated that environment related content hold is a pre-requisite for the transaction of EE through infusion approach.
- They indicated their decision making ability when many environment related issues were provided as challenge in general classes. At the same time they agreed that this helped them even in non-environmental situations such as making best options in conflict situations.
- They indicated their enthusiasm in providing ‘meaningful learning experiences’ suiting the nature walk by: a) getting ready a number of
such learning experiences in advance b) using at least more than two
learning experiences during the organization of nature walk.

- They indicated that nature game should not end only as a game instead
it has the potential to lay positive impact on the students’ environment
related ‘know-how’. The pre-service teachers were successful in this
by the following ways:

  ♦ Selecting a game that was of interest to both the pre-service
teacher & the secondary students.
  
  ♦ Well-Planned for execution with the entire materials ready, needed
for its execution.
  
  ♦ Provided the relevant background information
  
  ♦ Further they did link the outcome of the ‘gaming’ to the
environmental message it conveyed. These were further linked to
the relevant topic from school subject. They have indicated that
hidden message in a game if it is not linked properly with the
relevant content, becomes a waste of time & entertainment
dominates while EE takes a back seat. Pre-service teachers
indicated that the success of using ‘nature games’ lies in this aspect
of linking it.

- Finally the pre-service teachers indicated positive feelings (affective
components of the competencies) towards the pedagogical competencies
identified by the researcher.

The pre-service teachers’ positive ‘affect’ related to competencies,
plays an important role in their transaction. This is very much important
because just the attainment of a competency (what & how) will not be
considered as the attainment of the competency as whole. This is (as
mentioned earlier) precisely because any competency has 3 clear components
viz. knowledge aspect, skill aspect & one’s ‘affect’ aspects.
The pre-service teachers indicated that the important feature of infusion refers to the integration of both content (environmental dimension) & skills (techniques used to transact) into the existing courses in a manner as to focus on the content (environmental dimension) without jeopardizing the integrity of the courses themselves. The same has been said about in the ‘Essential readings in EE’, 2nd edition.

The pre-service teachers have indicated that the integration of new dimension (environmental) or perspective into the contents of the existing course & highlighting its (environmental dimension) significance can be done without harming the innate nature of the courses. The training manual in EE for DIETS by CEE has suggested the same.

In all these the main features that lie in the success of the transaction are:

a. The smooth link the teachers provided between the infusion spots & the environmental dimension.

b. The smooth ‘re-entry’ of the pre-service teacher, back to the teaching topic/content after environmental infusion, without harming its integrity.

The pre-service teachers after the POA to CBT have vindicated what UNESCO has recommended & illustrated ways in which education for a sustainable future can be integrated into & across 12 different school subject/areas of the curriculum. In all the school subjects the pre-service teachers have infused environmental dimension, there by transacting EE when there is no prescribed subject on it.

Thus the pre-service teachers identified that the infusion approach has the strong potential to become the ‘best, practical pedagogy’ to transact EE. They agreed that such an approach alone can provide holistic perspective of
EE. Therefore training pre-service teachers to transact EE in this regard becomes relevant & significant.

The Universities should revamp the curriculum with a view to make provision for the infusion of EE. But analyzing the basic nature of EE one can understand that environmental dimension is obviously present inherently in all the subjects of study. This makes it easy for the teacher educators to enable the pre-service teachers to transact through different school subjects.

6. What is the feasibility of implementing different modes of CBT programme to train EE teachers as well as implementing transaction of EE at secondary level?

Although pre-service teachers identified the benefits and inevitability of every teacher becoming an EE teacher, they also sensed that it is not a cake walk. They identified that there were barriers that constrained EE transaction both at Teacher Education & Secondary school level. The investigator at the same time realized that CBT programme though feasible to a great extent at the Teacher Education level, faced certain barriers as well.

Thus the barriers can be categorized separately under both levels.

The barriers in implementing CBT under Teacher Education the barriers are:

- The general training of the teachers should involve the ‘EE teacher competency’ aspects also. This requires flexible curriculum in order to include the EE competencies under the umbrella of training general competencies. In the present set up many Universities including University of Mysore do not make any provision for this.

- Even if the required changes are made, the 10-months’ course (for B.Ed.) is too short a period to achieve all the goals related to the training of an EE teacher without haste.
The pre-service teachers need some practical orientation in the real setting (i.e. class rooms) to exhibit the attained competency. Here the teacher training institutions have no hold. They totally depend on the ‘obliging secondary schools’. This is obviously because many practice teaching schools consider that the intervention of Pre-service teachers to schools for practice teaching is itself a nuisance and disturbance to the healthy, academic school activities, however good and sincere the pre-service teachers are in their teaching. They strictly believe that it is a waste of time to allow them to try some innovations like ‘infusion of EE’ in the regular teaching. Also regular teachers who are already teaching in such schools do not generally practice infusion approach & hence they do not become models to the pre-service teacher.

The teacher educators need special orientation in this regard as they are expected to train pre-service teachers to become successful EE teachers. However experienced a teacher educator may be, there is a possibility that he/she may not be having proper direction in this regard.

The barriers related to Secondary Schools include:

- The reality in schools may not provide a place which has an atmosphere conducive to use infusion approach. The senior teachers, who naturally resist any kind of change from routine, may have their negative influence on the freshers. This may make even the most enthusiastic teacher to remain complacent.

- The school curriculum has no goals as such that attainable through the transaction of EE using infusion approach. It prescribes environment related concepts/issues as a unit in most of the subjects in the secondary curriculum.

- There is always the fear of time constrain with regard to the covering of portions. The teachers have to hurry up (rush) through their portion in
order make provisions for a comfortable revision. The transaction of EE using different techniques may consume more time.

However the barriers mentioned appeared to be practical (relating to its implementation & not of any concerns about the theory of EE. The pre-service teachers identified the following solutions in order to overcome the barriers to implement EE.

- The general training can also get benefited if POA to CBT programme is used to train the teachers. Although the general Teacher Education programme does not have specific goal to train EE teachers, the goal certainly speaks about training teachers who have concern towards environment and work for its protection. Thus this can be beneficially extended to mean that all secondary teachers should also be EE teachers.

- The teacher educators must be made to get the feel of the need for training specifically EE teachers. They are to be suitably oriented and provided with an ‘educator-help’ manual or a multimedia package (CD ROM) on the procedures related to the training of the pre-service teachers.

- The goal of Teacher Education programme should be based on the need of the Secondary Schools. The schools should be made known the necessity of EE teachers in schools and their dearth at the moment. If this is done then schools will be forced to prioritize the need to make provisions for the transaction of EE during practice teaching for the pre-service teachers. The schools can comfortably and beneficially utilize the time allotted for Co-curricular activities to organize some of the EE activities. This only require meticulous planning on the part of the school authorities as well as a team spirit.

5.7. Implications of the present study

Implications emerge from this study for four different groups: researchers, teacher educators in EE, school teachers & curriculum planners and designers.
Environmental protection is a joint endeavor. Simultaneously it should be given prior importance at all level of education. This task can gain its momentum if idea is tapped from childhood. The best persons to tap them with right strength and right rhythm are the school teachers who teach them. This is where the role of Teacher Education comes into picture. After all, the quality performance by School teachers depend on the availability of pre-service experiences/courses/training etc during their training period in order to develop the competence of transacting EE even in the absence of a specified course in environmental education. Thus the pre-service teachers’ ability to infuse environmental dimension in their teaching without jeopardizing the innate nature of the subject or its smooth continuity, depends on the quality training they receive during their pre-service training. This suggests that the teacher educators who are expected to accept the responsibility of training the pre-service teachers, to undergo a thorough orientation to gain the required knowledge & ability to do so. They need to be suitably oriented in this regard & they should be provided with an ‘educator-help’ manual or a training package. The training package used in the present study may be of use in this regard.

Since 1993 up till 2004, EE was prescribed as an additional course in the University of Mysore. The additional subjects were optional & the pre-service teachers had all chances to opt any other additional subject other than EE. This precisely meant that all 100 pre-service teachers (upper limit of admissions to a teacher education institute) did not get to study the course EE. But in reality the present study has explored that all pre-service teachers irrespective of the subjects they teach, should have the potential of becoming EE teachers in schools. If it is made an optional subject then many will be deprived of this. Therefore even though EE is introduced (since 2005 December EE is introduced only as a unit in a compulsory subject paper) as a complete paper, there is a need for the teacher education programme to make compulsory for all who get admitted to the course irrespective of their background subjects. This alone can equip them with the required EE content to transact EE in schools.
The present curriculum in the Teacher Education course does not have any subject on environment. A unit on Environmental Education in one of the courses does not serve the real purpose of training EE teachers. So the curriculum planners should plan & design the Teacher Education curriculum in such a way that due Weightage is given to EE course at the Teacher Education level.

Curriculum planners of both EE & Secondary school education need to consider, ‘infusion approach’ as the best practice & provide for a more balanced approach to the transaction of EE. Subject curriculum need be made little more explicit in terms of the availability of more number of environmental plug points.

School administrators might consider the future benefits of using environment related ‘outdoor activities’ and nurture the same in both pre-service teachers who come for practice teaching as well as the class room teachers. Taking students out of schools involve an amount of risk and expenditure. The school administrators should cater to these. The teachers may need some extra time to make arrangement for organizing such activities, being aware of the implications of using such activities; the administrators need to be obliging in this regard. These little steps pave way for successful transaction of EE in schools.

School teachers cannot afford to remain complacent. Their transaction should lead to environmental pro-activities/decisions by their students. This becomes the duty of a responsible EE teacher. Therefore the teachers have to take it with utmost sincerity. The Heads of the schools & the administrators should encourage the teachers to involve the students in ‘action projects’ that provide them with the basic knowledge & skills needed for environmental protection.

A flexible training programme (CBT) should be utilized by the teacher training institutions with due modifications suiting their demands. Thus EE training, using the training package- one similar to the POA to CBT in the present study should become a part & parcel of the Teacher Education programme.

The CBT used in the present study has the potential to train even the in-service teachers who have not had similar experiences/exposure during their training.
5.8. Suggestions for further research:

- A study on ‘How well the Pre-service teachers who have undergone the CBT are performing in schools as EE teachers & what obstacle they face & what support they need’ would be extremely helpful to strengthen this line of action.

- A study of the effectiveness of the EE training using POA to CBT programme in different Teacher Education institutions can be taken up to know the feasibility of POA to CBT as one of the best approaches to EE transaction.

- A study on ‘the impact of CBT on the teaching performance of teachers’ may help modify the CBT suitably.