CHAPTER VI

SUMMARY, CONCLUSIONS AND SUGGESTIONS

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CHAPTER VI

SUMMARY, CONCLUSIONS AND SUGGESTIONS

6.0. Chapter preview

The concluding chapter contains the summary of the study conducted. It presents the study in retrospect and the major findings. The concluding part of the study included a discussion of the implications of the present study and suggestions for further research in the area of Experiential learning and Naturalistic Intelligence. There are five sections in this chapter.

6.1 Study in Retrospect

6.1.1 Significance of the problem

In this age of rapid environmental problems and issues, students need to develop awareness towards environmental problems, and natural threats. Many of the today’s debating problems such as lack of preservation and conservation of natural resources, different types of environmental pollutions, depletion of natural resources, loss of biodiversity, misuse of natural resources by man, are all as a result of the disasters made by the selfish attitude of the humans. Ever since man has been on this earth, there has been a constant interaction between him and the natural world. In the
beginning, man lived in harmony with nature, but later the scientific discoveries and technological inventions led him to exploitation and degradation. So it is high time to create a positive awareness in the people to realize the consequences of all these issues.

In schools Naturalistic Intelligence will help them to study biology in a better way, as biology is a science which is directly related to life and nature. But the question is how can we develop it in secondary students through biology teaching? Hence the investigator thinks experiential learning can contribute a lot in nurturing Naturalistic intelligence. It can be fostered only by providing sufficient experiences to students. Hence Experiential learning strategies helps a lot as it is the process of making meaning from direct experiences. These strategies can be highly effective in fostering nature awareness. It engages the learner at a more personal level by addressing the needs and wants of the individual. It is about creating an experience by yourself, might be called ‘nature’s way of learning’. So, through experiential learning strategies, we can foster naturalistic intelligence among secondary school students, thus making learning more reflective and meaningful.

6.1.2. Statement of the Problem

The study is entitled, “Experiential learning as a correlate of Naturalistic Intelligence of Secondary school Biology students”.

6.1.3. Hypotheses formulated for the study

1. Secondary level Biology curriculum has high potential for imparting experiential learning.

2. Experiential learning promotes pro-environmental behaviour of secondary students.

4. Experiential learning enhances the achievement in biology of secondary students.

5. Experiential learning is positively related to Naturalistic Intelligence of secondary school biology students.

6. Strategies enriched with experiential learning can foster naturalistic intelligence of students at secondary level.

6.1.4 **Objectives of the study**

1. To find out the potential of secondary biology curriculum for experiential learning.

2. To identify the extent of experiential learning at secondary level.

3. To find out the difficulties experienced by teachers while incorporating experiential learning strategies in teaching and learning of Biology.

4. To prepare an Experiential learning package in biology at secondary level.

5. To find out the effect of experiential learning on achievement in biology at secondary level.

6. To find out the effect of experiential learning on Environmental Experience of secondary level biology students.

7. To find out the effect of experiential learning on Pro-environmental behaviour of secondary level biology students.

8. To prepare and standardized an Inventory to assess Naturalistic intelligence among secondary level students.
9. To identify the level of Naturalistic intelligence among secondary students using the standardized inventory

10. To find out the relation between Achievement in Biology and Naturalistic Intelligence of secondary level students

11. To find interrelationship among Achievement in biology, environmental experience and pro-environmental behaviour of secondary level of biology students.

12. To prepare an action plan for fostering naturalistic intelligence in secondary level students.

6.1.5. Methods adopted for the study

The purpose of the present investigation is to study the correlation between experiential learning and naturalistic intelligence of secondary level biology students. To provide valid answers to specific research questions rose in the study, it was decided that Experimental cum Normative survey method should be adopted for the study. Normative survey was selected for collecting data relevant for the study, considering the objectives of the study and the nature of data required for their realization.

The methods and techniques used for collecting data are given below.

1. To find out the potential of secondary level biology curriculum for Experiential learning:

   Content analysis is used by the investigator to make an appraisal of the potential for experiential learning in the secondary level biology curriculum.
2. To find out the extent of usage of experiential learning and the difficulties faced by teachers while incorporating experiential learning strategies while teaching biology.

Survey is adopted for collecting information regarding the extent of Experiential learning at secondary level and also regarding the difficulties experienced by teachers in adopted experiential learning strategies while teaching secondary biology.

3. To study the effect of experiential learning in enhancing Naturalistic Intelligence.

Experiment method is used for determining the effectiveness of experiential learning strategies in teaching select topics through one group pre-test, post test design.

4. To evaluate the performance skills of the learner

Observation schedule for evaluation of skill based performance of students during select experiential learning activities. (Field based activities, ICT based lessons, Agriculture)

6.1.6 Sample for the study

A sample is the subset of the population in which the investigator intends to generalize the results. The population for the present study comprises of secondary school students of CBSE syllabus, in Kerala and teachers teaching biology in secondary level. The sample for the study consisted of 360 secondary students (standard IX) randomly selected and 50 secondary teachers teaching biology from three districts of Kerala selected from the population in such a way as to yield generalizable results for the study. The experimental part of the present study was
conducted on 60 secondary level students of Trivandrum district selected from among the 360 students.

6.1.7 Tools used for the study

The following Tools and Techniques were used for the study:

- Content Analysis of the secondary level biology syllabus
- Experiential learning package with lesson transcripts based on the select experiential learning activities prepared by the investigator
- Achievement test in biology
- A standardized scale to identify Pro environmental behaviour of secondary level students
- A standardized inventory for Environmental experience
- Naturalistic Intelligence Inventory prepared and standardized by the investigator
- Naturalistic intelligence checklist prepared and validated by the investigator
- Questionnaire to measure the extent of usage of experiential activities in secondary schools
- Questionnaire to measure the difficulties experienced by teachers while incorporating experiential learning strategies
- Observation schedule for evaluation of skill based performance of students during select experiential learning modes. (Field based activities, ICT based lessons, Agriculture)
6.2. Outcomes of the study

The outcomes of the study are presented below taking into consideration, all the aspects of the study.

6.2.1. Experiential Learning Package

Based on the analysis of the content of secondary level biology curriculum, the investigator developed an Experiential Learning package having seven phases of learning. The phases are given below:

Phases of Experiential Learning

Phase I - Preparatory Phase (what do you know?)

Phase II Procedure Action Phase (what is happening?)

Phase III Sharing phase (What happened?)

Phase IV Processing Stage (What’s Important?)

Phase V Generalization /Reflection Phase (So what?)

Phase VI- Application Stage (Now What?)

Phase VII Assessment Phase (How much experience achieved?)

An Experiential learning package with select learning strategies and separate lesson transcripts were administered to the select group of experimental learners. The package consists of seven phases, which are arranged in an integrated and sequential manner. Each phase has definite objectives, series of learning events, and evaluation procedures. Students were also given a theoretical background of what is to be
learned. They were then taken to the respective fields selected for the experiential activity where they experienced and learned concepts and aspects while observing, doing, recording, interacting and reflecting on the experiences gained. Thus the learners develop cognitive as well as performance skills. These activities are performed under the guidance of supervising teachers and staff members.

Hence the experiential learning package developed by the investigator proved to be effective in enhancing the naturalistic intelligence of secondary level biology learners.

6.2.2. Naturalistic Intelligence Inventory

A Naturalistic Intelligence Inventory was prepared by the investigator with 70 items related to naturalistic intelligence traits. After analyzing various literatures related to Multiple Intelligence theory and the work done by other educationalists and others in this field, it was found that there was no reliable tool to measure Naturalistic intelligence at any levels.

6.2.3. Action Plan

An action plan was developed by the investigator based on the findings of the study. The outcomes of the outdoor studies and experimental studies revealed two things: the revamping of the school curriculum in tune with the environmental education by incorporating new experiential methods and strategies of teaching and learning and a positive change in the attitude of administrators and teachers to include experiential strategies in teaching and learning process.

6.2.4. Naturalistic Checklist

The Naturalistic checklist developed by the investigator helps in assessing the naturalistic traits of the learner.
6.3 Major Conclusions

6.3.1 Conclusion I.

The secondary biology curriculum has immense potential for experiential learning.

From analyzing the secondary biology curriculum, it was found that, the curriculum has immense potential for selecting and providing experiential learning strategies, along with teaching process. The existing syllabus is enriched with units/topics which are conducive in providing rich outdoor experiences to students.

Units like ‘Our Environment’, ‘Diversity in organisms’, ‘Natural Resources’, ‘Biodiversity’. ‘Air and water pollution can give direct and first hand experiences to learners through experiential mode. So if experiential learning strategies/activities are selected, appropriate to content and packages are prepared based on it, we can provide rich experiences to learners, thereby promoting their environmental consciousness.

6.3.2 Conclusion II

The level of achievement of the experimental group learners is increased due to the administration of the experiential learning package.

From the analysis of the pre-test and post-test scores of achievement scores of biology of the experimental group it was found that there is increase in their achievement scores. The increase in the achievement scores is due to the effect of the experiential activities provided to learners through the experiential learning package. Agriculture, Field based activities and ICT (Information and Communication Technology) based activities are the strategies given to them. From this it is concluded that we can raise the achievement in biology of learners by providing
outdoor activities based on field work and field visits. Information and communication technology can also raise the achievement of learners, as technology is a powerful tool in transforming classrooms.

Thus the experiential learning strategies students received through the package was found to be effective in terms of the theoretical knowledge students gained and the performance skills they developed while constructing concepts related to biology and environment. The observations are recorded in the observation schedules/rubrics developed for recording the performance skills of the learners in these activities. The percentage of scores obtained from the analysis of these schedules also clearly shows that students are having a satisfactory level in the performing skills. The achievement scores also indicates that there is a significant difference between the pre-test and post test scores. Hence it is concluded that the experiential learning package developed is effective in enhancing the academic achievement as well as their performance skills of secondary biology learners.

Hence we can foster the performance skills in experiential activities as well as the biology achievement of learners by incorporating appropriate and adequate experiential learning strategies in the curriculum. For that structured and carefully planned experiential learning packages can be prepared based on select topics in the syllabus, depending upon the nature and availability of the outdoor resources.

6.3.3 Conclusion III

The Experiential learning package developed for the study was found to be effective in enhancing the Environmental experience of secondary students.
It was observed that there is an enhancement in the Environmental Experience of learners through Experiential learning. Learning package developed for the study was found to be effective in enhancing the Environmental experience of secondary students. The mean difference between the pre-test scores and post-test scores of environmental experience inventory was analyzed for the comparison before and after the administration of the experiential learning package.

Hence it is concluded that we can foster the environmental experience of learners by providing structured experiential learning activities through biology teaching. If environmental experiences are fostered, we can raise the ecological ego of the learners, thereby harmonizing scientific inquiry and eco-friendliness among them. So properly organized and wisely implemented learning strategies are the need of the present hour.

6.3.4 Conclusion IV

The Experiential learning package developed for the study was found to be effective in enhancing the Pro-environmental behavior of secondary students.

Ecological behavior is essential for developing positive attitude and nature consciousness among learners. From the analysis of the pro environmental behavior post-test and pre-test scores of the learners, it is evident that there is an increase in the pro-environmental behavior scores of the learners. So it is concluded that the experiential learning strategies developed in the learning package is effective in promoting the pro-environmental behaviour of students at secondary level.

So, we can design and implement appropriate experiential learning packages with suitable learning strategies, to foster the pro-environmental behavior of learners,
as this will lead towards ‘greening of minds’ which in turn helps in creating a future which lack ‘nature-deficit-disorders’.

6.3.5 **Conclusion V**

Correlation between Experiential learning and Naturalistic Intelligence among learners shows positive correlation.

Analysis of data for finding the correlation between Experiential learning and Naturalistic intelligence inventory shows that there exists a high level of positive correlation between the two variables among learners. The naturalistic inventory consists of personality traits related to naturalistic intelligence. Hence from the analysis results, it is concluded that the Experiential strategies provided helps in increasing the naturalistic personality traits of the experimental group of learners.

From this it is evident that we can enhance the Naturalistic intelligence traits in learners through providing appropriate structured outdoor learning strategies which are experiential in nature. By enhancing the naturalistic traits, we can foster their environmental consciousness also. So it is high time to structure our curriculum and syllabus in tune with Experiential learning, as it promotes the naturalistic traits.

6.3.6 **Conclusion VI**

There is an increase in the Naturalistic Intelligence traits due to the administration of the experiential learning package.

The difference between the mean pre-test scores and post test scores of Naturalistic Checklist shows that there is significant difference in the means scores. The naturalistic checklist is intended to check whether there is a significance difference between the naturalistic traits before and after administrating the
experiential learning package. The results of the analysis clearly show that there is an enhancement in the naturalistic intelligence traits of the experiential group of learners.

Hence it is concluded that the Experiential learning package developed by the investigator is effective in enhancing the Naturalistic Intelligence of learners. Naturalistic intelligence traits can be correlated with experiential learning activities and can be practiced by learners for developing better awareness of environmental conservation and eco friendly lifestyles.

6.3.7 Conclusion VII

There exists Multiple correlation between Experiential learning, Environmental Experience, Pro-environmental behavior and Naturalistic intelligence of secondary level biology learners.

It is concluded from the analysis that the variables, Achievement (experiential learning), Environmental experience, Pro environmental behaviour and Naturalistic intelligence of secondary level students are interrelated.

The results of the above analysis showed that experiential learning strategies applied in learners proved to be effective in enhancing the pro-environmental behaviour, environmental experience, achievement in biology and Naturalistic Intelligence of secondary level learners. Also correlation between experiential learning scores (achievement) and naturalistic intelligence inventory scores shows that there is high level of positive correlation between them. Hence it is concluded that the experiential learning activities in the learners proved effective in enhancing the naturalistic intelligence of learners. This finding throws light to the fact that, pro-environmental behaviour, environmental experience, achievement in biology and Naturalistic intelligence of the learners are inter-related.
6.5 Implications of the study

1. Since lot of provisions are there in the existing syllabus for providing experiential learning activities, sufficient number of learning /instructional packages can be developed for secondary level students to evoke environmental consciousness and thereby fostering Naturalistic intelligence.

2. One of the most important contributions of the study in addition to the wider theoretical and practical implications is that it comes out with a set of standardized and validated instruments (Naturalistic Intelligence Inventory & Naturalistic Intelligence checklist) for measuring the variable Naturalistic Intelligence. Thus it is possible for the effective assessment of Naturalistic Intelligence. Other aspects of Multiple Intelligence can also be assessed using proper strategies.

3. Another important implication of the study is the Experiential learning package developed by the investigator. The package and the tools can be further used widely in the field of education, particularly in research studies related with nature and environmental studies.

4. From the findings of the study it is evident that, secondary level students in Kerala possess average/high level of Naturalistic intelligence traits. So by providing sufficient experiential learning strategies in teaching, we can enhance their nature consciousness.

5. The light thrown by the present study in this area will have an implication for adopting enriched experiential learning strategies to learners in the form of outdoor education, field trips, field visits etc to augment the environmental
experience of students thereby facilitating the formation of positive attitude towards nature.

6. The findings of the study entails the importance of introducing outdoor/natural strategies early at the primary level of schooling itself in an informal way so as to enrich the experiences of children, which will develop the ecological-ego in later years of growth and development.

7. Teachers and administrators will be benefited from the outcomes and conclusions of the study as it pave way for selecting suitable methods and strategies to promote environmental education in our secondary schools.

8. The study also emphasizes the imparting of biology education ‘in’ and ‘through’ Nature. That is, using Nature s a powerful pedagogical tool to develop awareness towards environment.

9. By using experiential strategies for fostering the naturalistic intelligence traits in learners, it was noticed that discipline problems were significantly reduced. Students previously identified as having poor social and leadership skills were making their own important contributions to their groups.

10. The students developed and applied the new skills in other situations also. Once they developed skills (Both cognitive and performance ), it is easier for them to apply in real life situations especially in problems related to environment, such as pollutions, conservation of our rich biodiversity etc.

11. The students develop increased responsibility, self direction and independence over the course of the year. They became skilled at developing their own minor projects, gathering the necessary resources and materials and making well planned presentations of all kinds.
12. It is evident from the study that the Cooperative and collaborative learning skills are improved in students. They learned not only to respect each other, but also to appreciate and respect nature also.

13. It is noticed that Experiential learning strategies foster independent learning skills.

14. The learners develop unplanned learning from new experiences (hidden curriculum). The learners learn a number of concepts and ideas indirectly through experiential learning activities. That is, as they acquire skills in ICT, they started preparing e-content areas in academic subjects. Similarly, when they are involved in field based activities, they develop ecological consciousness and attitude towards environmental protection and eco-friendly life styles.

15. Interaction with social and physical environment develops constructivist skills in the learners.

16. Learners are motivated when experiential activities are employed, because the experiences are monitored, assessed and feedback is immediately given to the learners.

17. Safe Emotional Climate: Experiential learning methods provide safe and caring place for all learners, regardless of race, color, caste, aptitude and ability.

18. Creates a rich learning environment: An ideal classroom resembles a children’s room in which students are repeatedly and implicitly invited outdoor learning events to interact with the learning environment. In such a stimulus rich setting, explorations, investigations and inquiries are irresistible.
19. Teach the mind – tools and skills of life: Teaching the skills of life involves both mind and body ‘tools’ that range from communication and social skills to the micro skills of thinking and reflecting to the technological skills to be needed in the era of information.

20. Challenge through the experience of doing projects and assignments related to environmental protection and conservation.

21. Target multiple dimensions of intelligence: The multiple intelligence theory taps into the unique profile of intelligences of each learner.

22. Transfer learning through reflection: The reflective use of learning is the cornerstone of experiential learning strategies.

23. Experiential learning creates opportunity for students to engage and to apply academic understandings through hands-on experience, while simultaneously learning new information about the world around them.

24. Experiential learning is constructive learning, where students are active learners, constructing their own knowledge, rather than observing the demonstrative behavior of a teacher.

25. Since here learning is based on rich experiences, students readily understand what they are learning and thus retain the knowledge to a greater degree than when merely having information presented to them by traditional teaching.

26. Develops self-directed learning skills, self-confidence and independent decision making skills.

27. Experiential learning, when used for student learning, can help in providing a positive emotional platform which will respond positively and confidently to future learning. Moreover, it fosters Naturalistic Intelligence also.
6.6 Suggestions for further research

It is hoped that the present study would open new avenues for further research in the area selected for the present investigation. Some of the possible lines on which further studies can be undertaken are listed below:

1. More comprehensive study using wider variety of cognitive, affective and psychomotor variables may be used to reveal the correlation between experiential learning and Naturalistic intelligence.

2. The present study is confined to a representative sample of secondary school students of Kerala (360). It is therefore, suggested that similar studies can be replicated at other levels (primary or higher secondary level) or in a culturally different population.

3. Experiential learning packages can be developed in other select areas of biology topics also to provide experience to learners.

4. Only three experiential strategies are selected for the present study. A similar study can be undertaken by suing other experiential learning strategies also.

5. The study may be replicated for other curricular subjects also. Here experiential packages are prepared based on the select topics from biology only.

6. The same study can be extended to enhance the other types of intelligences also.

7. Further research can be done in developing experiential learning packages for developing the different types of intelligences.

8. Research can also be done to test the effectiveness of experiential learning packages in fostering naturalistic intelligence.