Environment-Based Teaching of Mathematical Concepts at Secondary Level

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Abstract

Environment based mathematics teaching can be a promise to bring about both mathematical competence and environmental awareness simultaneously among students. The main aim of this study was to explore the effect of environment based teaching of mathematical concepts at secondary level.For this a one group pre-test, post- test experimental design was adopted for collecting relevant data for the study from a sample of 50students studying in 9^{th} standard. The findings of the study indicated that Environment based teaching of mathematics is effective for enhancing awareness of environmental concepts.At the same time while integrating environmental concepts in mathematics , students get both the knowledge of the subject matter and the environment which they live.One among the major implication is that necessary modifications must be made while designing curricula, framing syllabi and developing text books in order to make provisions to infuse environmental topics in mathematics textbooks

Keywords : *Environment based, Environmental awareness, Mathematical concepts, Infuse*

Context of the study :-

Environmental education (EE) connects us to the world around us, teaching us about both natural and built environments. EE raises awareness of issues impacting the environment upon which we all depend, as well as actions we can take to improve and sustain it. Whether we bring nature into the classroom, take students outside to learn, or find appropriate teachable moments on a nature walk with our families, EE has many benefits for youth, educators, schools, and communities. Benefits of environmental education are, imagination and enthusiasm are heightened, learning transcends the classroom, critical and creative thinking skills are enhanced, tolerance and understanding are supported, state and national learning standards are met for multiple subjects, biophobia and nature deficit disorder decline, healthy lifestyles are encouraged, communities are strengthened, responsible action is taken to better the environment and the teachers and students are empowered. The National policy of Education(1986) emphasized the need to create awareness of environmental concerns by integrating it in the educational process at all stages of education and for all sections of society. Accordingly, the National Curriculum for Elementary and Secondary Education: A Framework _ 1988 presented the NCERT's view: "The school curriculum should highlight the measures for protection and care of the environment, prevention of pollution and conservation of energy." In consonance with these documents, Environmental Studies was introduced as a subject at the primary level. The topics related to environment were suitably infused with different school subjects at all school stages. Understanding of the environment in its totality, both natural and social, and their interactive processes, the environmental problems and the ways and means to preserve the environment was one of the General Objectives of Education as per National Curriculum Framework(2005).

Environment-based Mathematics Education:

Basically, in mathematics education, the teacher uses contextual problems as a means for the students to understand mathematics. Some studies stated that mathematics has a chance to be one field of study that talks about social issues including environment. By environment mathematics education, we can see two benefits such as: (1) it will be easier for the students to understand the environment because they will be helped by mathematics calculation; and (2) Through the context of environment, the students can develop their mathematics competence, such as: analyzing, representation, modelling, and interpreting data. From those two things, the students should be able to change their behavior as a pioneer of change in the world so that they are more critical and sensitive about social phenomenon and other things. Designing the environment-based learning, it was important to make a relation between the goal of mathematics learning and education learning, the Curriculum objectives are that the

Students will develop:

1. knowledge and understandings about: the nature and function of ecosystems and how they are interrelated; the impact of people on environments ;the role of the community, politics and market forces in environmental decision-making;the principles of ecologically sustainable development ;career opportunities associated with the environment
2. skills in: applying technical skills within an environmental context ; identifying and assessing environmental problems ; communicating environmental problems to others resolving environmental problems; adopting behaviours and practices that protect the environment ; evaluating the success of their actions ;
3. a respect for all life on Earth
4. an appreciation of their cultural heritage , and
5. a commitment to act for the environment by supporting long-term solutions to environmental problems .Some of the strategies that could be done in environment based teaching include using statistic data to give a better understanding about the environmental issues, calculating the hope of life, population, traffic, and global warming issues. The students can also be asked to investigate a problem by posing some questions and designing a plan to collect the data. The activities that are really possible to be done are: (1) counting and predicting the population; (2) finding the mathematics pattern related to the number of the calyx on a flower; (3) combining mathematical formula and nature; (4) surveying some schools; and (5) collecting the data and reporting the findings in order to determine the action that can be taken to minimize or repair some problems in the environment.Those activities aforementioned can also be integrated into an environment project, such as: (1) building a school park; (2) investigating local environment problems; (3) doing some surveys about the reaction the people can give about the environment issues; (4) investigating what happened behind the flood by mathematics approach; and (5) investigating the transportation .At the secondary level the investigator transacted the topic "compound interest" in the existing method of teaching .As the topic found application in the increasing rate of depletion of natural resources a discussion came about the various environmental issues that we are faced with. But it was shocking that many of the students were not aware of those environmental issues. As a teacher,the investigator had already

identified the lack of environmental concepts in the mathematics text book. Often Mathematics is considered by many students to be a very difficult subject in school. Maths in itself is an interesting subject and in fact, it's the way we teach maths that makes it difficult for the students. Math classes can be interesting if we implement the right techniques and make it more engaging by identifying what interests them and try and relate concepts to it. Thus the investigator decided to teach the same topic in a different way by incorporating environmental education concepts. That is to provide environmental concepts through the intended mathematics teaching. The two advantages of environment-based mathematics learning is that the students are able to understand the mathematics concepts easier at the same time the students will realize the importance of environment, so that they will find it is important to participate in maintaining the environment. Thus the present study is an attempt to investigate the effect of environment based teaching of mathematical concept at secondary level.

Objectives of the Study

- To compare the pre and post attainment of mathematical concepts of environment based teaching group.
- To compare pre and post attainment of environmental education concepts of environment based teaching group.

Hypotheses

The hypothesis formulated for the present study is

- There is significant difference in the pre and post test scores in the attainment of mathematical concepts of environment based teaching group.
- There is significant difference in the pre and post test scores in the attainment of environmental education concepts of environment based teaching group

Methodology in brief

Experimental design

The study aimed to find out the effect of environment based teaching of mathematical concept at secondary level. So a one group pre-test, post- test experimental design was adopted for collecting relevant data for the study.

Sample used for the study

The sample was selected from St;Stephens High School,Pathanapuram, Kollam,Kerala which follows State syllabus. The study was conducted on 50 students of standard IX

a) Tools used for the study

- Lesson plan based on Environment based teaching.
- A test on attainment of mathematical concepts.
- A test on attainment of environmental education concepts.

b) Statistical techniques used

- Mean**,** MedianMode**,** Standard deviation
- Test of significance for the difference between mean scores(critical ratio)

Variable:

The study was designed with the following variables:

- Independent variable:- Environment based teaching of mathematics concept
- Dependent variable:- 1.) Attainment of mathematical concepts
  2.) Attainment in environmental education concepts

Analysis and Interpretation

I Analysis of pre and post attainment scores

. 1 Analysis of scores of pre-test on attainment of mathematical concepts

Table 1

Sample	N	Mean	Median	Mode	SD
Pre-test	50	11.5667	3	2	1.81342

2Analysisof scores of post-test on attainment of mathematical concept

Table 2

Sample	N	Mean		Median	Mode	SD
post-test	50	17.4667		15.5	15	2.09652

The mean, median, mode and standard deviation of the pre-test and post-test scores of attainment of mathematical concepts have much differences. This indicates that the post test scores in a higher position than in the pre-test scores. By analyzing the measures of central tendency and dispersion, we can arrive at a conclusion that the performance of the students in the post test is higher than that of the pre test.

3 Analysis of scores of pre-test on attainment of environmental concept

Table 3

Sample	Mean	Median	Mode	SD
Pre-test N=50	5.8667	5	3	2.68756

4 Analysis of scores of post-test on attainment of environmental concepts

Table 4

Sample	Mean	Median	Mode	SD
Post-test N=50	14.8000	15	18	3.79110

The mean, median, mode and standard deviation of the pre-test , post-test scores of attainment of environmental concepts have much differences. This indicates that the post test scores in a higher position than in the pre-test scores. By analyzing the measures of central tendency and dispersion, we can arrive at a conclusion that the performance of the students in the post test is higher than that of the pre test.

II COMPARATIVE STUDIES

2.1 Comparison using t-test

2.1 Comparison of pre and post test for finding the attainment of mathematics concepts

Data and results of the test of significance of the difference between means of the pre-test and post-test of attainment of mathematical concept test scores of students.

Table 5

	Mean	N	SD	CR
Pre-test	11.5667	50	1.81342	19.136
Post-test	17.4667	50	2.09652	Significant

The table 5 shows that mean scores of the pre-test (11.5667) of attainment of mathematical concept in average. But the mean score (17.4667) of the post-test of achievement shows that will fall under very high score. It reveals that the model of teaching makes very improvement in the attainment of pupils. The obtained t-value (19.136) is greater than the value at 0.01(2.58) . So there is a high significant difference between the mean scores of pre-test and post-test at 0.01 level

2.2Comparison of pre and post test for finding the attainment of environmental concepts

Data and results of the test of significance of the difference between means of the pre-test and post-testtest of attainment of environmental concepts test scores of student

Table 6

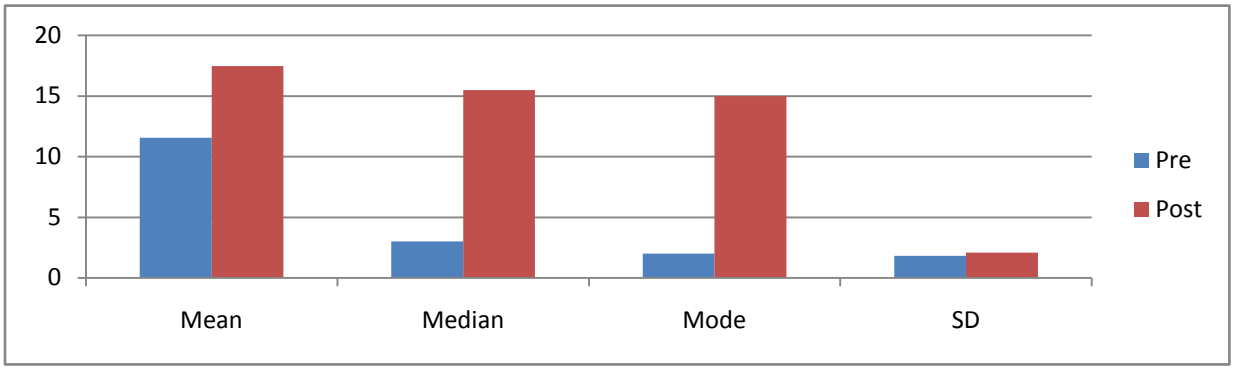
	Mean	N	SD	CR
Pre-test	5.8667	50	2.68756	13.591
Post-test	14.8000	50	3.79110	Significant

The table 6 shows that mean scores of the pre-test (5.8667) of attainment of environmental concepts in average. But the mean score (14.8000) of the post-test of attainment shows that will fall under very high score. It reveals that the teaching makes very improvement in the attainment of pupils. The obtained t-value (13.591) is greater than the value at 0.01(2.58) . so there is a high significant difference between the mean scores of pre-test and post-test at 0.01 level.

III Graphical Representation

3.1Graphical Representation of mean, median, mode and standard deviation of the Pre-test and Post-test mathematics attainment test Scores of 9th Standard Students

Figure 3.1



3.2Graphical Representation of mean, median, mode and standard deviation of the Pre-test and Post-test environmental awareness test Scores of 8th Students

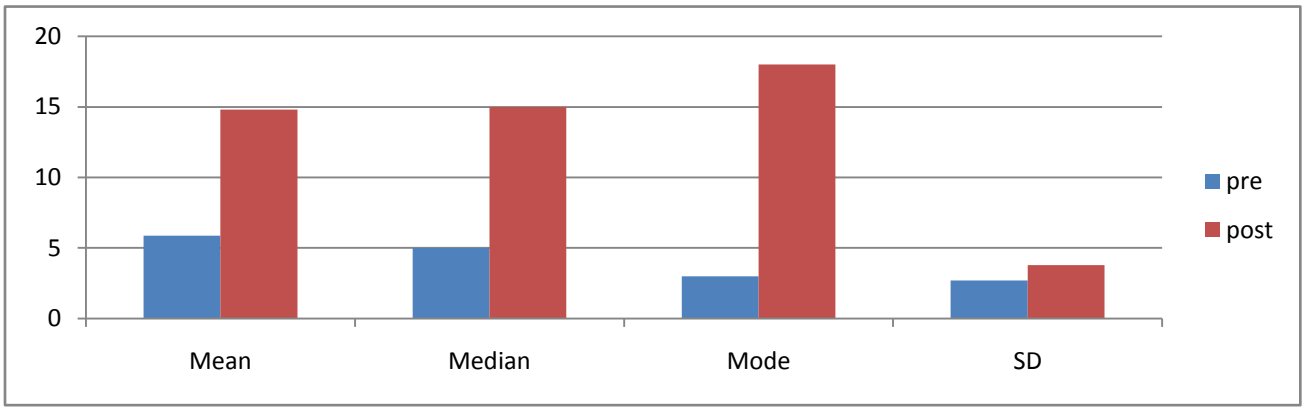


Figure 3.2

Findings of the Study

I Comparison of attainment of mathematical concepts test scores in environment based teaching.

- The mean of post test attainment scores (mean=17.4667) and pre-test attainment scores (mean=11.5667) showed the increase in the attainment of mathematical concept.
- The analysis of t-value of the pre-test and post-test attainment scores of mathematical concept showed there is a significant difference between the pre-test and post-test attainment scores (CR= 19.136)

II Comparison of attainment of environmental education concepts test score in environment based teaching.

- The mean of post attainment of environmental education concept test score (mean=14.8000) and pre attainment test score (mean=5.8667) showed the increase in the attainment of environmental concepts.
- The analysis of t-value of the pre-test and post-test attainmentof environmental education concepts test scores showed there is a significant difference between the pre-test and post-test attainment scores (CR=13.591)

Conclusion :

The environment based teaching of mathematics is a novel instructional strategy to develop environmental awareness along with mathematical concept. In such a method environmental dimensions are integrated into the existing curricular system with minimal demands. The emergence of Environmental Education as a compulsory and separate subject at school level is impracticable. The stress should be on interesting and meaningful treatment of selected themes rather than superficial & information-laden treatment of a multitude of topics, so that it does not burden the child. The results of the study recommends that necessary modifications must be made while designing curricula, framing syllabi and developing text books in order to make provisions to infuse environmental topics in various disciplines. Also the results of the study suggests that environment based teaching if utilized properly will empower the students to develop to learn and practice the skills necessary to protect , preserve and restore the environmental quality

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