

# A Study on the Attitude of Students towards Environment based Model for Teaching / Learning Botany at Higher Secondary Level

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**Abstract:** *Our land endowed with an abundance of environmental resources particularly plant life. Even though sufficient environmental resources are available in and around school premises, it is not adequately used by the teachers. We should provide direct experience to students which help in the interaction of the environment. The objective of the study is to compare the attitude of students of Environment based Model groups towards Environment based Model for teaching/learning Botany at Higher Secondary level (Plus one) for total and subsamples based on gender and type of management. The sample is 105 students (50 students from experimental group of GVH.S.S. Kulathummal and 55 students from Concordia Lourdes H.S.S. Kudappanakunnu) for the study. Normative survey cum Experimental method is used for the study. An attitude scale was used for comparing the attitude of students towards Environment based model for teaching/learning Botany at Higher Secondary level(plus one). Attitude scale was used to compare attitude of students towards EBM based on sub samples ie gender and type of management. The findings revealed that boys and girls of EBM groups have same attitude towards Environment in overall. Students of EBM groups in Aided school possess higher attitude towards Environment in overall compared to students of EBM groups in Govt. school. Boys and girls of EBM groups have same attitude towards Environment Based Model. Students of EBM groups in Aided school possess higher attitude towards Environment Based Model compared to students of EBM groups in Govt. school.*

**Keywords:** student, teaching, learning, higher secondary level, botany

## 1. Introduction

Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms. In the changing context of world and advances in science and technology teachers need to become conversant with international trends in the innovative methods and strategies of teaching.

According to the International Union for the Conservation of Nature and Natural Resources (1970), "Environment education is the process of recognising nature and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his biophysical surroundings. Environmental education also entails practice in decision making and self formulating of a code of behaviour about issues concerning environmental quality." Environment education is concerned with the dynamic relationships between man and nature. It aims at improving the environmental quality.

Environmental education may comprise three linked component:

- Education about the environment (knowledge)
- Education for the environment (Values, attitudes, positive action)
- Education in or through the environment (a resource).

The Ministry of Environment and Forest formulated the policy to create awareness among all sections of society through national environment awareness campaigns, setting up of paryavaranvahinis, eco-clubs, production of audio-visual and print materials, exhibitions, camps etc. A large number of NGOs, educational institution and other

organizations are actively involved in this programme through Padayatras, rallies, public meetings, folk dances, street plays, seminars, competitions and so on.

Outdoor learning provides chances for the active participation of children in the learning situation and permits scope for activity, freedom to move to explore and to experiment which in turn will contribute directly to the discovery learning and afford chances for grasping the true spirit of science.

### Need and Significance of the study

Our land endowed with an abundance of environmental resources particularly plant life. Even though sufficient environmental resources are available in and around school premises, it is not adequately used by the teachers. We should provide direct experience to students which help in the interaction of the environment.

Environment based learning follows the principles of learning by doing, learning by enjoying and learning by problem solving. Through this model, process skill, open mindedness, self learning, divergent thinking, independent thinking, curiosity, observation power, co-operative skill, problem solving skill and interest in inquiry can be developed among students.

The relationship between man and his environment is inevitable but complex. "Study indoors the things that are best studied indoor ; study outdoors the things that are best studied outdoors." This is an excellent percept to govern all field work. Within and around each school are hundreds of things worthy of study resources far more valuable than are available in the most expensively equipped laboratories.

Hence a systematic study of the Environment is necessary for students in schools and colleges.

### Statement of the Problem

A study on the Attitude of students towards Environment based model for teaching/learning Botany at Higher Secondary level

### Definition of terms

#### Attitude

Attitude is a way of feeling or acting toward a person, thing or situation.

#### Environment based

Environment is all the elements in an organism's; surroundings that can influence its behaviour reproduction or survival (Ehrlich, 1987).

Environment based means oriented towards Nature. Environment is totality of all the external conditions and influences affecting organisms.

In this study, the term denotes different types of plants and plant products which are available in the school premises for handling the select topics in Botany. It is student centered in which educational technology aids and the teachers are the resources available to the students. Students learn from his own interaction with a range of environment resources rather than from classroom exposition.

#### Model

A model of teaching is a description of learning environment (Joyce et al,2000).It specifies ways of teaching and learning that are intended to achieve certain kinds of goals (Weil & Joyce,1978).

#### Botany

Botany is a branch of Biology which deals with scientific study of plants (EncyclopaediaBrittanica,1970).

#### Higher Secondary Level

Tertiary education of an academic level higher than that attainable on completion of a full secondary education. It is the eleventh and twelfth year of schooling in the 10+2+3 pattern in Kerala which is controlled by Higher Secondary Directorate. It is also known as plus two. In this study Higher Secondary level refers to the students of plus one. They are in the group of 15<sup>+</sup>.

#### Objective of the study

- 1) To compare the attitude of students of Environment based Model groups towards Environment based Model for teaching/ learning Botany at Higher Secondary level (Plus one) for total and subsamples based on following variables:
  - a) Gender
  - b) Management

#### Hypothesis of the study

H1 The attitude of students of Environment Based Model (EBM) groups towards Environment based Model (EBM) in teaching / learning Botany

- 1) There will be significant difference between boys and girls of EBM groups with regard to overall attitude towards Environment
- 2) There will be significant difference between students of EBM groups in Govt. and Aided schools with regard to overall attitude towards Environment.
- 3) There will be significant difference between boys and girls of EBM groups with regard to attitude towards Environment based Model.
- 4) There will be significant difference between students of EBM groups in Govt. and Aided schools with regard to attitude towards Environment based Model.
- 5) There will be significant difference between boys and girls of EBM groups with regard to attitude towards outside classroom activities.
- 6) There will be significant difference between students of EBM groups in Govt. and Aided schools with regard to attitude towards outside classroom activities.
- 7) There will be significant difference between boys and girls of EBM groups with regard to attitude towards Environmental protection
- 8) There will be significant difference between students of EBM groups in Govt. and Aided schools with regard to attitude towards Environmental protection.
- 9) There will be significant difference between boys and girls of EBM groups with regard to attitude towards co- curricular activities related to Environment.
- 10) There will be significant difference between students of EBM groups in Govt. and Aided schools with regard to attitude towards co-curricular activities related to Environment.
- 11) There will be significant difference between boys and girls of EBM groups with regard to attitude towards development of qualities related to Environment.
- 12) There will be significant difference between students of EBM groups in Govt. and Aided schools with regard to attitude towards development of qualities related to Environment.

## 2. Scope and Delimitations of the study

#### Scope

Environment based model helps the students to retain what is learnt for a long time and permits earlier transfer of learning. Students should discover everything and learn from his own observation and experience from the environment. It is hoped that the findings of the study will help the teachers to understand the effectiveness and necessity of the application of Environment based model for teaching Botany. This study will help to improve the quality of teaching/learning process.

#### Delimitation of the study

The study conducted has been conceived in terms of a single level education viz, the Higher Secondary level. Due to practical difficulties involved in conducting the Experimental study, the experimental teaching was limited

to four Higher Secondary schools of Thiruvananthapuram district. The investigator could not include all the Botany topics at Higher Secondary Level due to time limit. The study was confined to only Plus One Students of Thiruvananthapuram district. The study was confined to schools which have good environmental resources.

### 3. Review of Related Literature and Studies

Linsky (1971) described the importance of Environmental education and developing programmes aimed at inculcating Environmental ethics.

Prakash (1976) in his study revealed that Discovery-oriented Approach was helpful in improving the process of learning science and inculcating positive scientific attitude both among the students and the teachers.

O' Connor (1977) developed a curriculum to explore students' own values and attitudes about Environmental issues. The curriculum attempts to foster positive attitudes and beliefs about the natural world. It revealed the in-depth case study of the development, the actual implementation and subsequent evaluation of this environmental curriculum and gives an in-depth view of life in this class.

Jaus (1978) conducted a study to ascertain the effectiveness of thirty hours of Environmental instruction on elementary and middle school teachers attitude towards teaching the subject in their classroom. Analysis of the results indicated that the group of elementary teachers who received training in Environmental education possessed significantly positive attitudes towards teaching in their classroom than their counterparts, which did not receive training.

Knimiller (1983) stated that Environmental education can play as important role for the development of environment.

Shahnawaj (1990) worked on the Environmental awareness and attitudes towards Environmental issues of Secondary and Higher Secondary School teachers and students at Udaipur. He found a very high level of awareness on the part of teachers and students regarding the environment and this were more in the urban than in the rural groups.

Disinger (1992) in his study discussed how Environmental education can provide opportunities for development of higher order thinking skills such as learning critically and creatively, and learning to think in an integrated manner in terms of identifying alternatives, using multiple sources, designing new approaches and identifying real and potential solutions.

Wilson (1994) conducted a study on Environmental education at the early childhood level. It presents an overview of an approach to Environmental education that is designed to foster positive attitudes and values about the world of nature and a sense of responsibility towards the natural development.

Parker (1997) studied the effectiveness of hypermedia program to increase student knowledge and positive attitudes toward the environment and Environmental education. The findings of the study indicated that the

hypermedia program was as effective as the teacher/naturalist for teaching about Environmental education material. Students who used the computer reported more Positive attitudes to learn Environmental education material.

Gambro and Switzky (1999) found that there was a significant relationship between the number of science classes a student had taken and the level of their knowledge about environmental issues. The study revealed that science education can be an influential factor in developing knowledge related to environmental issues. The school level factors can impact upon young people's environmental knowledge.

Verma (2006) studied the awareness and attitude of pre-service teachers, In-service teachers and teacher educators towards Environmental problems. The major findings were:

- The pre-service teachers, in-service teachers and teacher educators were below average in their awareness of environmental problem.
- The pre-service teachers, in-service teachers and teacher educators were neutral in their attitude towards environmental problem. The post graduate teachers surpassed graduate teachers in their awareness of environmental problem.
- The teacher educators holding Ph.D. Degree surpassed post graduate teachers educators in their awareness of environmental problem.

Raju (2007) studied Environmental ethics of Higher Secondary students of Tamilnadu. The findings were:

- a) Environmental ethics of Higher Secondary students is high.
- b) Rural Higher Secondary students have more environmental ethics than the urban Higher Secondary students.
- c) Girl students have more environmental ethics than the boy students.

Nagra and Jaswinder Singh Dhillon (2007) conducted a study on Environmental education Awareness among school teachers in relation to level and gender. The study revealed that the Secondary School teachers showed significant variation in Environmental education Awareness than Elementary School teachers. The male and female Secondary School teachers showed in significant variation in Environmental education Awareness highlighting that gender was not a factor affecting Environmental education Awareness among the school teachers.

Shiva Kumar. K. and Mangala S. Patil (2007) conducted a study on Influence of Environmental education on Environmental attitude of postgraduate students of Karnataka University. The study revealed that Environmental education students have moderately favorable attitude towards Environmental education, whereas non-Environmental education students have neutral attitude towards Environmental education. Environmental education at college and school level can help for favorable

attitude formation and also for high concern towards environment.

#### 4. Methodology

Normative survey cum Experimental method for the study.

##### Sample

105 students (50 students from experimental group of GVH. S. S. Kulathummal and 55 students from Concordia Lourdes H.S.S. Kudappanakunnu) of the study

##### Tool

##### Attitude scale

An Attitude scale was administered to compare the attitude of Higher secondary School students (plus one) towards Environment based Model for teaching/learning Botany at Higher Secondary level (N=105)

##### Methodology

The effectiveness of Environment based Model was tested by comparing the achievement scores (pre-test and post-test scores) of treatment groups based upon the instructional objectives knowledge, understanding, application and skill. The comparison of the attitude of students towards Environment based model for teaching/learning Botany at Higher Secondary level based on gender and type of management were assessed.

##### Design and procedure adopted

The experimental design adopted in the present investigation was pre-test post-test parallel group design. In this study, the methods of teaching were Environment based Model and Lecture method.

The investigator selected students of plus one from four Higher Secondary Schools in Thiruvananthapuram district. These schools were selected on the basis of availability of Environmental resources in and around the school premises. Out of four schools selected for the study, two schools were exposed to Environment based Model (one class from each school) while two schools were exposed to Lecture method. After selecting the schools for experimental study, the investigator made necessary arrangements with the authorities of the schools for conducting the experiments. The topic selected for the experimental study was plant families of Angiosperms such as Malvaceae, Fabaceae, Rubiaceae and Asteraceae. Care was taken to give due representation to variables like gender and management of schools. The groups were matched separately for the following variables viz, intelligence, pre-test, achievement scores, gender and type of management etc.

After administration of the pre-test, the control group was exposed to Lecture method and the experimental group was exposed to Environment based Model. While conducting classes, care was taken to give equal time for both the groups; twelve hours were required for completing the experimental procedure in each group, for the topic plant families.

##### Exposition to Environment based model

The investigator along with students of the Environment based group went to the school premises selected for observation and detailed study of plant families such as Malvaceae, Fabaceae, Rubiaceae and Asteraceae. Students were encouraged to observe and collect plants from the locality. Opportunity was given to classify the collected plants on the basis of observed differences and similarities. Students were encouraged to develop terms, concepts and principles from the collected data through observation, classification, identification, analysis and interpretation of data, discussion, reference etc. Suitable activities, questions, problem solving situations, clues were provided for the level of attainment of concepts. Opportunities were provided for direct learning experiences, discussion, activities, dissections of plants, draw diagrams, preparation of list of plants etc.

##### Exposition to Lecture method

The treatment group was exposed to Lecture method. The experimental topic, ie, plant families were taught by the investigator with the help of examples, illustrations, charts and drawings. At the end of each class follow-up activities were also given.

##### Attitude scale for Higher Secondary School students (plus one)

An attitude scale was prepared for comparing the attitude of students towards Environment based model for teaching/learning Botany at Higher Secondary level (plus one). Since there was no readymade tools available to measure the attitude of students towards the various aspects of Environment based Model, the investigator developed an attitude scale of the Likert type.

The Likert type of attitude scale was preferred as its construction is simple and easy. A list of 90 statements (favourable and unfavourable statements almost equal in number) were prepared and it was given to Experts for criticisms and suggestions. As per suggestions received, some items were deleted and others were modified. Thus an edited scale consisting of 80 items were selected in which 40 positive statements and 40 negative statements were included. The statements prepared were related to the following aspects:

- 1) Overall attitude towards Environment
- 2) Attitude towards Environment based model
- 3) Attitude towards outside classroom activities
- 4) Attitude towards Environmental protection
- 5) Attitude towards co-curricular activities related to Environment

The draft form was administered on a sample of 103 Higher Secondary School students (plus one). The respondents were requested to answer each item in the attitude scale in terms of their own agreement or disagreement by entering a (✓) mark in any one of the five columns marked as strongly agree (SA), agree (A), undecided (UD), disagree (DA) and strongly disagree (SDA). The scoring was done using conventional procedure, as indicated below:



Response	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Positive	5	4	3	2	1
Negative	1	2	3	4	5

Out of 103 response sheets, 100 were selected for item analysis. The total scores obtained for each student was calculated by summing the score for individual items. The 100 response sheets were arranged in the descending order of the total scores. The top 27 percent in the group and bottom 27 percent in the group were used for item analysis.

The scores obtained for each item in both the groups were used for calculating the discriminating power(t) of each item. An item with high discriminating power was selected for the final attitude scale. The item having 't' values equal or above 1.75 was selected for the final scale. Thus 68 items were selected for the final scale.

### Validity and Reliability of Attitude scale

The attitude scale was developed very carefully, following the principles of attitude scale. Besides this, the face validity of the attitude scale was ascertained by showing the prepared attitude scale to Experts for their assessment. The reliability of the final attitude scale was assessed using the split-half technique. The reliability of the test was 0.81, indicating that the attitude scale prepared has high reliability.

### Statistical techniques employed

The following statistical techniques were employed for the analysis of the data:

Attitude scale was used to compare attitude of students towards EBM based on sub samples i.e. gender and type of management

### Analysis and interpretation of data

Comparison of attitude of students towards Environment based model (EBM) in teaching/ learning Botany at Higher Secondary level

The details of analysis are given under the following heads:

- 1) Comparison of the **overall attitude towards Environment** of the samples based on gender and type of management
- 2) Comparison of the **attitude towards Environment based model** of the samples based on gender and type of management
- 3) Comparison of the **attitude towards outside classroom activities** of the samples based on gender and type of management
- 4) Comparison of the **attitude towards Environmental protection** of the samples based on gender and type of management
- 5) Comparison of the **attitude towards co-curricular activities related to Environment** of the samples based on gender and type of management

### Comparison of the overall attitude towards Environment of the samples based on gender and type of management

**Table 1:** Comparison of the overall attitude towards Environment of the samples based on gender and type of management

Groups	Sub samples	Statistical indices			Critical ratio	
		N	M	SD	t	p
Gender	Boys	47	268.8	21.9	0.66	0.509
	Girls	58	271.0	12.2		
Type of Management	Govt.	50	265.5	18.2	2.72**	0.008
	Aided	55	274.3	15.0		

(\*\* - significant at 0.01 level).

From Table 1, the critical ratio obtained for the gender groups are not differ significantly at 0.01 level showing that boys and girls of EBM groups are not significantly different in overall attitude towards environment(CR= 0.66;P> 0.01). This finding shows that boys and girls of EBM groups have same overall attitude towards Environment.

The critical ratio obtained for the type of management groups are significant at 0.01 level showing that students of EBM groups in Govt. school and Aided school differ significantly in the overall attitude towards Environment (CR= 2.72; P< 0.01). A close observation of the mean scores shows that students of EBM groups in Aided school possess higher overall attitude towards Environment compared to students of Govt. school. The above findings shows that the students of EBM groups in Aided school get better opportunities to acquire information about the environment from various sources.

### Tenability of hypothesis

The analysis revealed that there is no significant difference between the treatment groups (boys and girls of EBM groups) with regard to overall attitude towards Environment. Hence the hypothesis formulated in this context viz, H<sub>1(i)</sub> is rejected. The analysis revealed that there is significant difference between the treatment groups (students of EBM groups in Govt. and Aided schools) with regard to overall attitude towards Environment. Hence the hypothesis formulated in this context viz, H<sub>1(ii)</sub> is accepted.

### Comparison of the attitude towards Environment based model of the samples based on gender and type of management

**Table 2:** Comparison of the attitude towards Environment based model of the samples based on gender and type of management

Groups	Sub samples	Statistical indices			Critical ratio	
		N	M	SD	t	p
Gender	Boys	47	70.3	6.8	0.97	0.335
	Girls	58	71.5	5.4		
Type of Management	Govt.	50	68.8	5.0	3.85**	0.000
	Aided	55	73.0	6.3		

(\*\* - significant at 0.01 level).

From Table 2, the critical ratio obtained for the gender groups are not differ significantly at 0.01 level showing that boys and girls of EBM groups are not significantly in attitude towards Environment based model (CR=0.97, P> 0.01). This findings shows that attitude towards Environment based model is same as boys and girls of EBM groups.

The critical ratio obtained for the type of management groups are significant at 0.01 level showing that students of EBM groups in Govt. and Aided school differ significantly in attitude towards Environment based model (CR=3.85;  $P < 0.01$ ). It shows that students of Aided school possess higher attitude towards Environment based model compared to students of Govt. school. The above findings show that the students of Aided school get more exposure to environmental experiences compared to students of Govt. school.

#### Tenability of hypothesis

The analysis revealed that there is no significant difference between the treatment groups (boys and girls of EBM groups) with regard to attitude towards Environment based Model. Hence the hypothesis formulated in this context viz,  $H_{1(iii)}$  is rejected.

The analysis revealed that there is significant difference between the treatment groups (students of EBM groups in Govt. and Aided schools) with regard to attitude towards Environment based Model. Hence the hypothesis formulated in this context viz,  $H_{1(iv)}$  is accepted.

#### Comparison of the attitude towards outside classroom activities of the samples based on gender and type of management

**Table 3:** Comparison of the attitude towards outside classroom activities of the samples based on gender and type of management

Groups	Sub samples	Statistical indices			Critical ratio	
		N	M	SD	t	p
Gender	Boys	47	44.6	3.2	3.91**	0.000
	Girls	58	41.9	3.7		
Type of Management	Govt.	50	42.3	3.8	2.29*	0.024
	Aided	55	43.9	3.6		

(\*\* - significant at 0.01 level, \*- significant at 0.05 level)

From Table 3, the critical ratio obtained for the gender groups are significant at 0.01 level showing that boys and girls of EBM groups differ significantly in the attitude towards outside classroom activities (CR= 3.91;  $P < 0.01$ ). It shows that boys of EBM groups possess higher attitude towards outside classroom activities compared to girls of EBM groups. The above findings show that boys of EBM groups get more opportunities than girls of EBM groups in participating outside classroom activities.

The critical ratio obtained for the type of management groups are significant at 0.05 level showing that students of EBM groups in Govt. school and Aided school differ significantly in attitude towards outside classroom activities (CR = 2.29;  $P < 0.05$ ). It shows that students of EBM groups in Aided school possess higher attitude towards outside classroom activities compared to students of EBM groups in Govt. school. The above findings shows that the students of EBM groups in Aided school get more opportunities than students of EBM groups in Govt. school in participating outside classroom activities.

#### Tenability of hypothesis

The analysis revealed that there is no significant difference between the treatment groups (boys and girls of EBM

groups) with regard to attitude towards outside classroom activities. Hence the hypothesis formulated in this context viz,  $H_{1(v)}$  is rejected.

The analysis revealed that there is significant difference between the treatment groups (students of EBM groups in Govt. and Aided schools) with regard to attitude towards outside classroom activities. Hence the hypothesis formulated in this context viz,  $H_{1(vi)}$  is accepted.

#### Comparison of the attitude towards Environmental protection of the samples based on gender and type of management

**Table 4:** Comparison of the attitude towards Environmental protection of the samples based on gender and type of management

Groups	Sub samples	Statistical indices			Critical ratio	
		N	M	SD	t	p
Gender	Boys	47	46.0	5.7	2.5*	0.014
	Girls	58	48.1	2.8		
Type of Management	Govt.	50	46.7	5.4	0.97	0.334
	Aided	55	47.6	3.4		

(\* - significant at 0.05 level)

From Table 4, the critical ratio obtained for the gender groups are significant at 0.05 level showing that boys and girls of EBM groups differ significantly in the attitude towards Environmental protection (CR= 2.5,  $P < 0.05$ ). It shows that girls of EBM groups possess higher attitude towards Environmental protection compared to boys of EBM groups, the above findings shows that girls of EBM groups gave more importance towards Environmental protection than boys of EBM groups.

The critical ratio obtained for the type of management groups are not differ significantly at 0.01 level showing that students of EBM groups in Govt. and Aided schools do not differ significantly in the attitude towards Environmental protection (CR=0.97,  $P > 0.01$ ). It shows that students of EBM groups in Govt. and Aided school do not differ in the attitude towards Environmental protection.

#### Tenability of hypothesis

The analysis revealed that there is significant difference between the treatment groups (boys and girls of EBM groups) with regard to attitude towards Environmental protection. Hence the hypothesis formulated in this context viz,  $H_{1(vii)}$  is accepted.

The analysis revealed that there is no significant difference between the treatment groups (students of EBM groups in Govt. and Aided schools) with regard to attitude towards Environmental protection. Hence the hypothesis formulated in this context viz,  $H_{1(viii)}$  is rejected.

#### Comparison of the attitude towards co-curricular activities related to Environment of the samples based on gender and management

**Table 5:** Comparison of the attitude towards co-curricular activities related to Environment of the samples based on gender and type of management

Groups	Sub samples	Statistical indices			Critical ratio	
		N	M	SD	t	p
Gender	Boys	47	44.2	5.9	0.15	0.884
	Girls	58	44.3	2.7		
Type of Management	Govt.	50	43.9	5.5	0.86	0.391
	Aided	55	44.6	3.0		

From Table 5, the critical ratio obtained for the gender groups are not significantly at 0.01 level showing that boys and girls of EBM groups do not differ significantly in the attitude towards co-curricular activities related to Environment (CR= 0.15, P> 0.01). These findings shows that boys and girls of EBM groups have same attitude towards co-curricular activities related to Environment.

The critical ratio obtained for the type of management groups are not significant at 0.01 level showing that students of EBM groups in Govt. and Aided schools do not differ significantly in their attitude towards co-curricular activities related to Environment (CR=0.86; P> 0.01). It shows that students of EBM groups in Govt. and Aided schools have same attitude towards co-curricular activities related to Environment.

#### Tenability of hypothesis

The analysis revealed that there is no significant difference between the treatment groups (boys and girls of EBM groups) with regard to attitude towards co-curricular activities related to Environment. Hence the hypothesis formulated in this context viz,

$H_{1(ix)}$  is rejected.

The analysis revealed that there is no significant difference between the treatment groups (students of EBM groups in Govt. and Aided schools) with regard to attitude towards co-curricular activities related to Environment. Hence the hypothesis formulated in this context viz,  $H_{1(x)}$  is rejected.

#### Comparison of the attitude towards development of qualities related to Environment of the samples based on gender and type of management

**Table 6:** Comparison of the attitude towards development of qualities related to Environment of the samples based on gender and type of management

Groups	Sub samples	Statistical indices			Critical ratio	
		N	M	SD	t	p
Gender	Boys	47	63.6	8.2	1.28	0.204
	Girls	58	65.2	3.6		
Type of Management	Govt.	50	63.8	6.3	1.11	0.271
	Aided	55	65.1	5.9		

From table 6, the critical ratio obtained for the gender groups are not differ significantly at 0.01 level showing that boys and girls of EBM groups are not significantly in attitude towards development of qualities related to Environment (CR= 1.28, P> 0.01). It shows that boys and girls of EBM groups have same attitude towards development of qualities related to Environment.

The critical ratio obtained for the type of management groups are not significant at 0.01 level showing that students of EBM groups in Govt. and Aided schools do not differ significantly in their attitude towards development of qualities related to Environment (CR=1.11; P>0.01). It shows that students of Govt. and Aided schools have same attitude towards development of qualities related to Environment.

#### Tenability of hypothesis

The analysis revealed that there is no significant difference between the treatment groups (boys and girls of EBM groups) with regard to attitude towards development of qualities related to Environment. Hence the hypothesis formulated in this context viz,  $H_{1(xi)}$  is rejected.

The analysis revealed that there is no significant difference between the treatment groups (students of EBM groups in Govt. and Aided schools) with regard to attitude towards development of qualities related to Environment. Hence the hypothesis formulated in this context viz,  $H_{1(xii)}$  is rejected.

## 5. Summary, suggestion and conclusion

### 5.1 Main findings

#### Comparison of attitude of students towards Environment based model (EBM) in teaching/learning Botany at Higher Secondary level

#### Comparison of the overall attitude towards Environment of the samples based on gender and type of management

Boys and girls of EBM groups have same attitude towards Environment in overall. Students of EBM groups in Aided school possess higher attitude towards Environment in overall compared to students of EBM groups in Govt. school.

#### Comparison of the attitude towards Environment based model of the samples based on gender and type of management

Boys and girls of EBM groups have same attitude towards Environment Based Model. Students of EBM groups in Aided school possess higher attitude towards Environment Based Model compared to students of EBM groups in Govt. school.

#### Comparison of the attitude towards outside classroom activities of the samples based on gender and type of management

Boys of EBM groups possess higher attitude towards outside classroom activities compared to girls of EBM groups. Students of EBM groups in Aided school possess higher attitude towards outside classroom activities compared to students of EBM groups in Govt. school.

#### Comparison of the attitude towards Environmental protection of the samples based on gender and type of management

Girls of EBM groups possess higher attitude towards Environmental protection compared to boys of EBM groups. Students of EBM groups in Govt. and Aided schools have same attitude towards Environmental protection.

**Comparison of the attitude towards co-curricular activities related to Environment of the samples based on gender and type of management**

Boys and girls of EBM groups have same attitude towards co-curricular activities related to Environment. Students of EBM groups in Govt. school and Aided school have same attitude towards co-curricular activities related to Environment.

**Comparison of the attitude towards development of qualities related to Environment of the samples based on gender and type of management**

Boys and girls of EBM groups have same attitude towards development of qualities related to Environment. Students of EBM groups in Govt. and Aided schools have same attitude towards development of qualities related to Environment.

**5.2 Suggestions for further research**

Some suggestions for further research were presented below:

- 1) Similar studies can be conducted in other disciplines like Science, Languages, Social science etc to test the effectiveness of model.
- 2) The study was effective in learning plant families in Botany. Hence the similar studies can be conducted on other topics in Botany.
- 3) The study has been confined to Higher Secondary level (plus one) only. Hence similar studies can be conducted in Primary, Secondary, Vocational Higher Secondary and College level.

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