Effectiveness of Outdoor Environmental Education Programme for Enhancing Responsible Environmental Behaviour among Fifth Grade Students

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ABSTRACT

The present study was conducted to study the effect of outdoor environmental education programme for enhancing responsible environmental behaviour among fifth grade students of high, average and low intelligence. One hundred twenty fifth grade students belonged to two schools of Gurdaspur. The data were analysed with the help of 2-way Analysis of Variance. The major findings of the study were (a) Students taught environmental education by the outdoor environmental education programme exhibited better mean gains on responsible environmental behaviour and its dimensions as compared to students of control group who were taught environmental education by traditional method of instruction. (b) Students with high, average and low intelligence exhibited comparable mean gains on responsible environmental behaviour and its dimensions, locus of control, environmental attitude, beliefs and values related to the environment, environmental sensitivity, personal responsibility, environmental action strategies, and intention to act. (c) Students of high intelligence exhibited better mean gains on knowledge of ecological concepts and knowledge of environmental issues and problems than students with low and average intelligence.(d) Students of average intelligence group exhibited better mean gains on knowledge of environmental issues and problems as compared to students of lower intelligence. (e) There was significant interaction between treatment and levels of intelligence in relation to mean gains on knowledge of ecological concepts.

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Environment is the aggregate of external conditions that influence the life of an individual or the population, specifically the life of man (Shrivastava, 2004). A variety of environmental problems like acid rain, air pollution, global warming, hazardous waste, ozone depletion, smog, water pollution, overpopulation, and rain forest destruction, etc. now affect our entire world. As globalisation continues and the earth's natural processes transform local problems into international issues, few societies are being left untouched by major environmental problems. The real solution of environmental problems can be sought by educating people.

Environmental Education (EE) refers to organised efforts to teach about how natural environment functions and, particularly, how human beings can manage their behaviour and ecosystems in order to live sustainably. The term is often used to imply education within the school system, from primary to post-secondary. According to Ramsey, Hungerford and Volk (1992), Environmental Education can mean concepts in ecology, outdoor education, environmental science or instruction about issues. Megenity (1995) has defined, Environmental Education as a multidisciplinary approach to the study of humanity problems of maintaining a liveable earth.

Outdoor Education

There's no way that we can help children to learn to love and preserve this planet if we don't give them direct experiences with the miracles and blessings of nature (Olds, 2001).

Outdoor education is important to understand things which can be learned best outside the classroom. Outdoor education has been defined in a variety of ways throughout its history. Those who influenced the field earlier defined outdoor education with the needs of camping education in mind. Sharp (1943), one of the earliest advocates of camping education stresses on a proper division of learning processes to be undertaken inside and outside the school.

Outdoor education is a method for learning; is experiential; takes place primarily in the outdoors; but not exclusively, in the outdoor setting. Some aspects may occur indoors such as learning basic concepts before the field trip, preparation of materials for an ecology study, watching a nature slide show or lecture, and planning the logistics for an expedition. However, it is the outdoors which provides the setting and, ultimately, the inspiration for learning; requires use of all senses and domains; is based upon interdisciplinary curriculum matter; and is a matter of relationships involving people and natural

resources (Priest, 1986). According to Hammerman Hammerman, and Hammerman (2001) outdoor education is "education which takes place in the outdoors".

Students require a range of structured, sequenced, and developmentally appropriate learning opportunities in outdoor education. Health and Physical Education in the New Zealand Curriculum, Ministry of Education reported that "in developing outdoor education programmes, schools should make use of the school grounds and the immediate local environment and make the most of opportunities for direct experiences that can be completed in a school day". During the last half of 1999, Education Outdoors New Zealand (EONZ) had a contract with the Ministry of Education to develop learning materials and provide professional development for teachers. EONZ focused on three areas: First, development of units of work that was sequential from level 1 to level 5 of the curriculum, and in one topic area through level 6 to 7. Second, using the school and local environment to teach such activities. Third, writing learning activities that all teachers could use safely with students. The teachers realised that they had the ability to teach outdoor education, the students really enjoyed the learning opportunities they were able to experience, and all this without having to go on a hike or sleep in a tent (Periam, 2000).

Without continuous hands-on experience, it is impossible for children to acquire a deep intuitive understanding of the natural world that is the foundation of sustainable development. A critical aspect of the present-day crisis in education is that children are becoming separated from daily experience of the natural world. Experiences with natural world increased language and collaborative skills (Moore and Wong, 1997).

The concepts of environmental education could be better understood by providing the direct experiences at earlier grade levels. If one wishes learners to develop an understanding of layering in the forest, it is more effective to visit the oak-hickory forest nearby than to study about the exotic tropical rainforest thousands of miles away (Ballard and Pandya, 1990).

Spending time outdoors with a positive role model is the number one reason people begin to develop environmental sensitivity, or awareness and empathy towards the natural world (Sivek, 2002). In an era of extensive habitat loss and landscape suburbanisation, children face ever decreasing opportunities to spend time with nature. Even in rural areas, many children experience increasingly scheduled

lives, with discretionary time often spent in front of the television or computer while outdoor activities and positive experiences with natural world improves awareness, reasoning, and observational skills (Pyle, 2002).

Children have an innate, genetically predisposed tendency to explore and bond with the natural world known as biophilia, i.e. love of nature (Wilson, 1993 and 1996; Tilbury, 1994; Sobel, 1996 ; Kellert, 2005). For children's natural inclination of biophilia to develop they must be given developmentally appropriate opportunities to learn about the natural world based on sound principles of child development and learning (Kellert, 1997; Chawla, 2006). If children's natural attraction to nature is not given opportunities to flourish during their early years, biophobia, an aversion to nature may develop. Biophobia ranges from discomfort and fear in natural places to contempt for whatever is not man-made, managed or air-conditioned (Cohen, 1992; Cohen and Horm-Wingerg, 1993; Orr, 1993 and 1994; Bixler, Floyd and Hammutt, 1994; White, 2004).

Burroughs (1919) cautioned that, "Knowledge without love will not stick. But if love comes first, knowledge is sure to follow". The problem with most environmental education programmes is that they try to impart knowledge and responsibility before children have been allowed to develop a loving relationship with the natural world (Sobel, 1996; Wilson, 1997). Children's emotional and affective values of nature develop earlier than their abstract, logical and rational perspectives (Kellert, 2002). We need to allow children to develop their biophilia, their love for the Earth, before we ask them to academically learn about nature and become guardians of it (Olds, 2001; Sobel, 2008).

Responsible Environmental Behaviour

The term 'responsible environmental behaviour' refers to 'the variety of recognised approaches to environmental action available to individuals or groups for use in preventing or resolving environmental problems or issues'(Peyton, 1977; Marcinkowski, 1988). A change towards environmental responsible behaviour is generally considered a desired goal in environment education (UNESCO-UNEP, 1978; Hungerford and Volk, 1990; Newhouse, 1990).

Factors that contribute to Responsible Environmental Behaviour

Hines, Hungerford and Tomera (1987) conducted a meta analysis of research on responsible environmental behaviour, reviewing studies from a variety of fields and using statistical procedures to determine

the strength of the relationship between responsible environmental behaviour and associated variables. Positive correlations were found for verbal commitment, locus of control, attitude, personal responsibility, knowledge, educational level, income, and economic orientation.

While there is some discussion of how exactly these factors break down, there is agreement that they can be classified as cognitive and/or affective. Locus of control (internal and external, group and individual), knowledge of environmental issues, knowledge of and skills in environmental action strategies and knowledge of ecological concepts, personal responsibility, beliefs and values related to environmental issues, environmental sensitivity, and attitude have all been identified as factors related to responsible environmental behaviour (Ramsey and Hungerford, 1989; Sivek and Hungerford, 1989; Newhouse, 1990; Ramsey, 1993; Hwang, Kim, and Jeng , 2000)

According to Ramsey and Hungerford (2002), the research indicates that responsible environmental behaviour is associated with environmental sensitivity, knowledge of ecological concepts, knowledge of environmental problems and issues, skill in identifying, analysing and evaluating environmental problems and solutions, belief and values, knowledge of environmental action strategies, skill in using environmental action strategies, and internal locus of control.

Research Studies Related to Responsible Environmental Behaviour

Chawla (1988) reported that studies within natural settings are important if environmental educators are to understand how outdoor experiences formatively contribute to the development of environmental attitudes, sensitivity, and concerns. Howe, Disinger and John (1988) performed research related to environmental education. It had consistently indicated that many students and young adults attribute a large amount of their knowledge of environmental concepts, problems and issues to out-of-school (non-formal) education settings and experiences.

Dresner and Gill (1994) found that a two week nature camp experience increased levels of environmental concern in students and they showed better environmental behaviour than before.

Outdoor educators have conducted studies to assess the effect of environmental outdoor education programmes on knowledge and attitudinal change. The knowledge-attitude-behaviour change model described by Matthews and Riley (1995) holds that an increase in knowledge will lead to a change in attitude, which will in turn influence behaviour. Consequently, environmental knowledge and attitude have

been frequently evaluated when attempting to determine the effect of outdoor education programmes on the development of environmental responsibility (Matthews and Riley, 1995).

Tung, Huang and Kawata (2002) studied the effects of different environmental education programmes on the environmental behaviour of fifth-grade students and related factors and concluded that among the four schools that participated in this study, only experimental school III, which combined teaching and activities, had improvement in the area of environmental behaviour. Curriculum or school activities alone simply are not enough to change environmental behaviour.

Hsu (2004) assessed the effects of an environmental education programme on responsible environmental behaviour and associated environmental literacy variables in Taiwanese college students. The results indicated that the environment education course did significantly promote the students' responsible environmental behaviour, locus of control, environmental responsibility, intention to act, perceived knowledge of environmental issues, and perceived knowledge of and skills in using environmental action strategies.

Harjai (2007) studied the effect of experiential learning strategies for teaching environmental education to a sample of 120 students of two schools of Ropar. In 50 action-oriented lessons, students learnt by the use of media, outdoor experiences and fun-based hands-on activities. He concluded that students who were taught EVS by experiential learning strategies exhibited better environmental awareness and environmental sensitivity as compared to students of control group taught by traditional learning methods.

A problem with most young children's environmental education programmes is that they approach education from an adult's, rather than a child's perspective. Teaching nature abstractly in the classroom does not lead to pro-environmental behaviours in later life (Schultz, 2000). Research has substantiated that an empathy with and love of nature, along with later positive environmental behaviours and attitudes, grow out of children's regular contact with and play in the natural world. Children's understanding of humans' relationship to nature is both partially under development and complete during early childhood (Phenice and Griffore, 2003). Recent research strongly suggests that the opportunity for children younger than age 11 to explore in wild, natural environments is especially important for developing their biophilic tendencies and that the type of play should be child-nature play, such as catching frogs in a creek

or fireflies at night, versus only child-child play such as playing war games with walnuts. The best learning environments are informal and naturalistic outdoor nature-scapes where children have unmediated opportunities for adventure and self-initiated play, exploration and discovery. Such informal experiences stimulate genuine interest in and valuing of environmental knowledge that is provided in more structured environmental education programmes (Bunting and Cousins, 1985; Chawla, 1988 and 2006; Palmer, 1993; Bixler, 1997; Wilson, 1997; Corcoran,1999; Kals, Schumacher and Montada, 1999; Schultz, 2000; Bixler, Floyd and Hammutt, 2002; Kals and Ittner, 2003; Ewert, Place and Sibthorp, 2005; Wells and Lekies, 2006; Berenguer, 2007; Vadala, Bixler and Janes, 2007; Hinds and Sparks, 2008; Sobel, 2008; Thompson, Aspinall and Montarzino, 2008). Early childhood and grade schools have the opportunity to help and fill the void in children's lives of regular access to the natural world. With developmentally appropriate natural outdoor environments and programmes, schools can help our children develop to become responsible stewards of the Earth (Herrington and Studtmann, 1998; Sobel, 2004).

Intelligence

Intelligence is a capacity of an individual to understand the environment and the resourcefulness to cope with its challenges (Gerrow, Brothen and Newell, 1989). Intelligence, as measured by Intelligent Quotient (IQ) and other aptitude tests, is widely used in educational, business, and military settings due to its efficacy in predicting behaviour (Geary, 2004). In the present study intelligence was the classification variable.

Rationale of the Study

Today's environmental problems arise from the lifestyles humans lead. As a result of those lifestyles, public health has been endangered, and there has been a loss of ecological balance. Therefore, learning to respect nature and understanding how to coexist with and care for the environment are essential parts of lifelong learning tasks everyone must henceforward face. One of the most fundamental aspect in this process of lifelong learning is environmental education in schools (Tung, Hwang and Kwatta, 2002).

It has been reported that for students today the primary sources of information about environment are television and other mass media, not the classrooms (Disinger, 1990; Hausbeck, Enright and Milbrath, 1992). Students' knowledge of the environment is limited

and incomplete. The Shinno Environmental Education Research Survey Committee (1992) found that students are more concerned with global environmental issues than environmental phenomena experienced in daily life. In addition, the rate at which students practice environmental behaviour is rather low, for that reason there is a need to promote environmental education in schools.

Research by Wilson (1994) and Simmons (1994) (based on personal interviews with groups of children varying in age from pre-school to age nine) found that the attitudes children expressed towards various aspects of the natural environment (rain, wildflowers, trees, birds) included more expressions of fear and dislike than appreciation, care or enjoyment. Cohen and Horm-Wingerd (1993) contend that children's unfounded fears and misconceptions about the natural environment develop when they have very little actual contact with living things and obtain most of their attitudes through the electronic media.

The lives of children today are much more structured, supervised and scheduled with few opportunities to explore and interact with the natural outdoor environment. Children's physical boundaries have shrunk. Childhood and regular unsupervised play in the outdoor natural world are no longer synonymous (Francis, 1991; Pyle, 1993 and 2002; Moore and Wong, 1997; Kellert, 2002; Kuo, 2003; Brooks, 2004; Kyttä, 2004). Most children these days live what one play authority has referred to as a childhood of imprisonment (Francis, 1991). Children are disconnected from the natural world outside their doors and in children this condition is called nature-deficit disorder (Louv, 2005).

Investigator felt that there was need to study the effectiveness of environmental education programmes on students of different intelligence levels as intelligence is a general factor that runs through all types of performance. It is the capacity to learn or to profit by experience.

So, the present study was conducted to investigate the effectiveness of outdoor environmental education programme for enhancing responsible environmental behaviour among fifth grade students. Intelligence was studied at three levels high, average, and low.

Research Questions

The present research was designed to answer the following research questions:

- Does outdoor environmental education programme result in greater enhancement of responsible environmental behaviour

among fifth grade students as compared to traditional learning method?

- Is there any difference among the responsible environmental behaviour of students of high, average, and low intelligence?
- Is there interaction between the two instructional treatments and intelligence with regard to responsible environmental behaviour?

The study was delimited with respect to class, subject, content, place of study and intelligence as follows:

- The study was conducted on Class V students.
- The study was limited to Class V students of two schools, viz., Little Flower Convent School and HRA International School of Gurdaspur (Punjab).
- Students were taught topics of environmental studies from their syllabus for 50 working days.

Hypotheses of the Study

As discussed earlier, locus of control, knowledge of environmental issues, knowledge of and skills in environmental action strategies and knowledge of ecological concepts, personal responsibility, beliefs and values related to environmental issues, intention to act, environmental sensitivity, and attitude have all been identified as factors related to responsible environmental behaviour (Ramsey and Hungerford, 1989; Sivek and Hungerford, 1989; Newhouse, 1990; Ramsey, 1993; Hwang Kim and Jeng , 2000).

The study was designed to test the following set of null hypotheses:

H_1 The two instructional treatments yield equal mean gain scores on responsible environmental behaviour of the students

The two instructional treatments yield equal mean gain scores with respect to

$H_{1.1}$ Dimension I viz., Knowledge of ecological concepts

$H_{1.2}$ Dimension II viz., Knowledge of environmental issues and problems

$H_{1.3}$ Dimension III viz., Locus of control

$H_{1.4}$ Dimension IV viz., Environmental attitude

$H_{1.5}$ Dimension V viz., Beliefs and values related to the environment

$H_{1.6}$ Dimension VI viz., Environmental sensitivity

$H_{1.7}$ Dimension VII viz., Personal responsibility

$H_{1.8}$ Dimension VIII viz., Environmental action strategies

$H_{1.9}$ Dimension IX viz., Intention to act

H_2 There is no significant difference in mean gain scores on responsible environmental behaviour of the students of high, average and low intelligence.

There is no significant difference in mean gain scores of the students of high, average and low intelligence with respect to

$H_{2.1}$ Dimension I viz., Knowledge of ecological concepts

$H_{2.2}$ Dimension II viz., Knowledge of environmental issues and problems

$H_{2.3}$ Dimension III viz., Locus of control

$H_{2.4}$ Dimension IV viz., Environmental attitude

$H_{2.5}$ Dimension V viz., Beliefs and values related to the environment

$H_{2.6}$ Dimension VI viz., Environmental sensitivity

$H_{2.7}$ Dimension VII viz., Personal responsibility

$H_{2.8}$ Dimension VIII viz., Environmental action strategies

$H_{2.9}$ Dimension IX viz., Intention to act

H_3 There is no significant interaction between instructional treatment and intelligence with regard to responsible environmental behaviour of the students.

There is no significant interaction between instructional treatment and intelligence of the students with respect to

$H_{3.1}$ Dimension I viz., Knowledge of ecological concepts

$H_{3.2}$ Dimension II viz., Knowledge of environmental issues and problems

$H_{3.3}$ Dimension III viz., Locus of control

$H_{3.4}$ Dimension IV viz., Environmental attitude

$H_{3.5}$ Dimension V viz., Beliefs and values related to the environment

$H_{3.6}$ Dimension VI viz., Environmental sensitivity

$H_{3.7}$ Dimension VII viz., Personal responsibility

$H_{3.8}$ Dimension VIII viz., Environmental action strategies

$H_{3.9}$ Dimension IX viz., Intention to act

Sample

Firstly, principals of various schools of Gurdaspur were approached by the investigators. Principals of two schools Little Flower Convent School, Gurdaspur and HRA International School, Gurdaspur showed interest and promised to cooperate. Intelligence test (Coloured Progressive Matrices, 1995) was administered to 300 students of two schools.

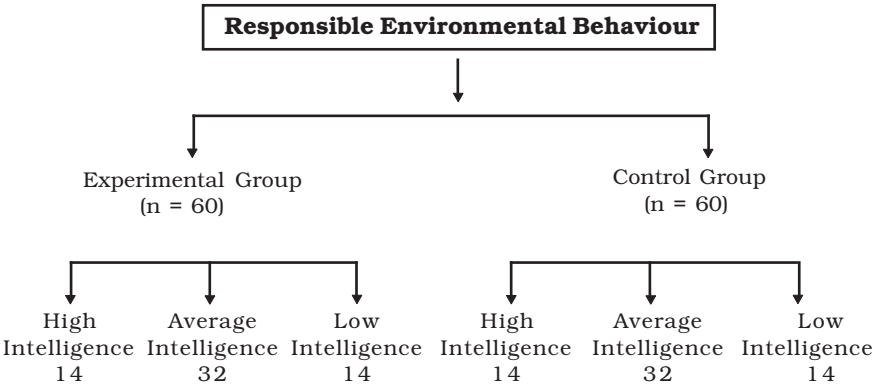


Fig. 1: Schematic layout of sample of study

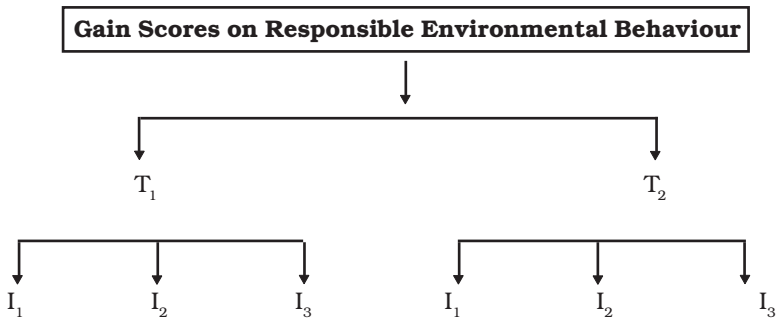
In accordance with the manual, students were divided into three groups, High Intelligence, Average Intelligence and Low Intelligence. Students which lie at or above the 75th percentile were placed in high intelligence group, students which lie between the 25th and 75th percentile were placed in average intelligence group, and students which lie at or below 25th percentile were placed in low intelligence group.

Thus, 28 students with High Intelligence, 28 students with Low Intelligence and 64 students with Average Intelligence were selected. Each of three groups of students were randomly allocated to two sub groups, i.e. experimental and control group (as shown in Figure 1). So, the final sample comprised of 120 students. In the present study, the number of boys and the number of girls in each group were approximately the same and they belonged to middle class socio-economic status.

Design of the Study

The 2×3 factorial design was computed by ANOVA for the mean gain scores on responsible environmental behaviour. Here, instructional treatment and intelligence were the independent variables. Gain on responsible environmental behaviour scores was the dependent variable which was calculated as the differences in post-test scores and pre-test scores for each subject. The variable of instructional treatment was studied at two levels namely experimental group (T_1), which was taught by outdoor environmental education and control group (T_2), which was taught by traditional learning methods. The variable intelligence was studied at three levels viz. High (I_1), Average

(I_2), and Low (I_3) levels. The schematic layout of the design has been presented in Figure 2.



T_1 - Experimental group
T_2 - Control group
I_1 - High Intelligence
I_2 - Average Intelligence
I_3 - Low Intelligence

Fig. 2 : Schematic layout of 2×3 factorial design for mean gain scores on responsible environmental behaviour

The Tools Used

For the present investigation following tools were used:

1. ***Instructional material for implementing outdoor environmental education***

- The content for the instructional plans was selected from the syllabus of Class V for Environmental Education.
- The entire content (environmental education for Class V) was scrutinised and divided into 50 sub units of related concepts
- The chapters included in the lesson plans were Unique features of trees; Importance of trees; Natural orchestra; Save the earth; Ecosystem; Soil Profile; Importance of sunlight for plants, Pollution, its types, causes and effects; Biodegradable and non-biodegradable material; Compost; Natural resources; Soil erosion, Terracing; Food web; Identification of native birds; Biotic and Abiotic components of environment; Adaptations; Protective colouring; Bird house; Bird feeders; Wild animals; Save animals;

Waste in School, Hazards of waste accumulation; Reduce, Reuse and Recycle waste; Greenhouse effect; Global warming and Environment-friendly practices.

- Related outdoor activities were also included.
- Instructional objectives were written for each sub unit.
- The instructional plans were developed with the help of activities included in prescribed books, search on internet and discussions with teachers of environmental education.
- Instructional plans were tried out on 50 students of Class V.
- Tryout of the instructional plans revealed their inadequacies and weak points which were revised and modified. Suggestions of students and teachers were incorporated, wherever necessary changes were made regarding presentation and clarity in the language. The suggestions of experts in the field of environmental science and environmental education regarding activities were incorporated and instructional plans were again reviewed.

2. *Responsible environmental behaviour test*

There were 94 items in nine dimensions viz. knowledge of ecological concepts (8 items), knowledge of environmental issues and problems (16 items), locus of control (8 items), environmental attitude (14 items), beliefs and values related to the environment (8 items), environmental sensitivity (10 items), personal responsibility (8 items), environmental action strategies (14 items), and intention to act (8 items).

Scale contained 24 multiple choice type items and 70 items in scale. There were 58 positive items {locus of control (8 items), environmental attitude (9 items), beliefs and values related to the environment (3 items), environmental sensitivity (8 items), personal responsibility (8 items), environmental action strategies (14 items), and intention to act (8 items)} and 12 negative items {environmental attitude (5 items), beliefs and values related to the environment (5 items), environmental sensitivity (2 items)}

The test retest reliabilities were calculated for all nine dimensions and the whole test. Reliabilities of nine dimensions were 0.75 (knowledge of ecological concepts), 0.76 (knowledge of environmental issues and problems), 0.69 (locus of control), 0.71 (environmental attitude), 0.74 (beliefs and values related to the environment), 0.82 (environmental sensitivity), 0.73 (personal responsibility), 0.71 (environmental action strategies), and 0.84 (intention to act).. Reliability of whole test was 0.92. The test possesses high validity as its content validity was found with the help of experts.

3. ***Coloured progressive matrices (1995) by J.C. Raven, J.H. Court and J. Raven. were used for classifying students according to their level of intelligence.***

Procedure

After the selection of sample and allocation of students to the two instructional treatments, the experiment was conducted in three phases as given below:

Phase I: Administration of the pretest

This phase involved the administration of the responsible environmental behaviour test to students of both the experimental group and control group.

Phase II: Conducting the instructional programme

Students of experimental group were exposed to outdoor environmental education programme for 50 days. Students learnt EVS by use of outdoor experiences (visit to factory, pond, polluted area, zoo, forested area) and activities (environmental rally, fancy dress show, poster making competition, planting samplings, cleaning the school campus) with lots of interest and enthusiasm. The students of control group were taught similar topics by traditional method of instruction by the second author.

Phase III: Administration of the post test

Immediately after the instructional treatment of 50 days was over, the subjects were assessed by administering the responsible environmental behaviour test on both the experimental and control groups.

Table 1
Data Schedule of the Experiment

Activity	Date
• Administration of intelligence test	20 March, 2008 –24 March, 2008
• Pre-test stage	26 March, 2008 –28 March, 2008
• Instructional programme	1 April, 2008 – 30 May, 2008
• Post test stage	1 June, 2008 – 3 June, 2008

Data Analysis

The gain scores as measured by the difference of post-test scores and pre-test scores were calculated for each student separately and were subjected to analysis of variance. Two-way analysis of variance was used for the gain scores.

Table 2
Means and Standard Deviations of Sub Samples of 2×3 Design for Mean Gain Scores of Responsible Environmental Behaviour (REB) and its Dimensions

T	I		Reb	Dimensions								
				I	II	III	IV	V	VI	VII	VIII	IX
T_1	I_1	N	14	14	14	14	14	14	14	14	14	14
		Mean	42.14	4.78	4.64	4.21	5.14	4.28	4.07	3.21	5.42	6.35
		SD	12.79	1.25	2.40	2.57	3.37	2.26	2.46	2.91	1.82	4.74
	I_2	N	32	32	32	32	32	32	32	32	32	32
		Mean	33.97	2.18	2.68	4.84	4.62	4.53	3.56	4.93	3.03	3.56
		SD	12.46	1.42	1.57	3.02	4.33	3.35	2.98	4.74	3.43	3.07
	I_3	N	14	14	14	14	14	14	14	14	14	14
		Mean	35.78	1.21	1.92	4.35	5.07	5.64	5.28	5.64	1.92	4.71
		SD	13.81	.974	2.70	3.47	4.44	3.69	4.02	6.51	1.77	4.33
	Total	N	60	60	60	60	60	60	60	60	60	60
		Mean	36.30	2.56	2.96	4.58	4.85	4.73	4.08	4.70	3.33	4.48
		SD	13.07	1.81	2.26	3.00	4.09	3.21	3.17	4.87	3.02	3.92
T_2	I_1	N	14	14	14	14	14	14	14	14	14	14
		Mean	14.92	1.00	2.21	1.71	.857	3.28	1.21	1.85	1.14	1.64
		SD	6.46	1.03	2.11	2.78	1.29	2.36	.974	1.46	2.47	2.09
	I_2	N	32	32	32	32	32	32	32	32	32	32
		Mean	14.96	.906	.468	2.56	1.81	2.43	1.96	2.03	1.37	1.40
		SD	6.22	1.05	.802	3.40	2.14	2.67	1.95	1.85	1.33	1.66
	I_3	N	14	14	14	14	14	14	14	14	14	14
		Mean	15.64	1.50	1.42	2.42	1.50	2.35	1.92	1.50	1.85	.714
		SD	4.61	2.27	2.10	3.03	2.27	2.61	1.38	1.82	1.23	1.72
	Total	N	60	60	60	60	60	60	60	60	60	60
		Mean	15.11	1.51	1.10	2.33	1.51	2.61	1.78	1.86	1.43	1.30
		SD	5.86	2.02	1.68	3.15	2.02	2.57	1.65	1.75	1.64	1.78

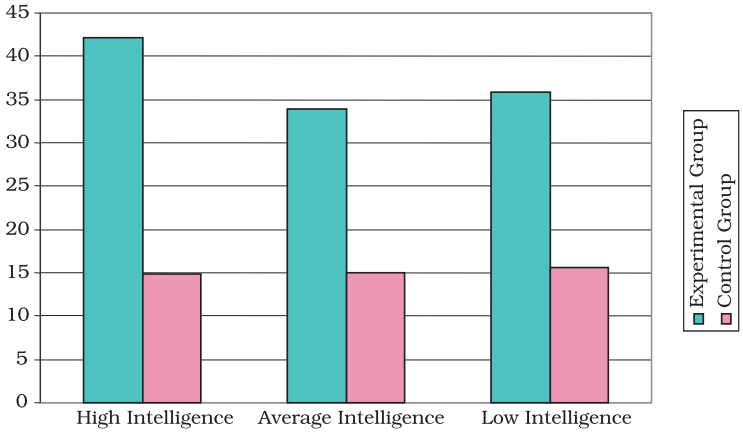


Fig. 3: Mean gain scores of three intelligence groups on responsible environmental behaviour

Table 3
Summary of 2×3 ANOVA for Mean Gain Scores on Responsible Environmental Behaviour and its Dimension (I-IV)

	Source of Variation	df	Type III Sum of Squares	Mean Square	F ratio	Level of Significance
Responsible Environmental Behaviour	T	1	12645.29	12645.29	125.94	S**
	I	2	322.176	161.088	1.604	NS
	T X I	2	338.456	169.228	1.685	NS
	Error	114	11446.15	100.405		
Dimension I Knowledge of Ecological Concepts	T	1	54.408	54.408	34.605	S**
	I	2	38.472	19.236	12.235	S**.
	T X I	2	71.358	35.679	22.693	S**
	Error	114	179.237	1.572		
Dimension II Knowledge of Environmental Issues and Problems	T	1	76.088	76.088	22.661	S**
	I	2	71.293	35.647	10.616	S**
	T X I	2	17.268	8.634	2.571	NS
	Error	114	382.772	3.358		
Dimension III Locus of Control	T	1	129.293	129.293	13.303	S**
	I	2	10.789	5.395	.555	NS
	T X I	2	1.176	.588	.061	NS
	Error	114	1107.951	9.719		
Dimension IV Environmental Attitude	T	1	326.929	326.929	30.593	S**
	I	2	1.351	.657	.062	NS
	T X I	2	11.086	5.543	.519	NS
	Error	114	1218.232	10.686		

S** Significant at 0.01 level of confidence; NS Not significant

Table 3 (continued)
Summary of 2×3 ANOVA for Mean Gain Scores on Dimensions (V-IX) of Responsible Environmental Behaviour

	Source of Variation	df	Type III Sum of Squares	Mean Square	F ratio	Level of Significance
Dimension V Beliefs and Values Related to the Environment	T	1	116.875	116.875	13.624	S**
	I	2	5.626	2.813	.328	NS
	T X I	2	18.304	9.152	1.067	NS
	Error	114	977.987	8.579		
Dimension VI Environmental Sensitivity	T	1	175.080	175.080	27.647	S**
	I	2	16.875	8.438	1.332	NS
	T X I	2	17.976	8.988	1.419	NS
	Error	114	721.915	6.333		
Dimension VII Personal Responsibility	T	1	202.935	202.935	15.046	S**
	I	2	20.561	10.280	.762	NS
	T X I	2	27.343	13.672	1.014	NS
	Error	114	1537.629	13.488		
Dimension VIII Environmental Action Strategies	T	1	103.847	103.847	19.592	S**
	I	2	31.614	15.807	2.982	NS
	T X I	2	64.198	32.099	6.056	NS
	Error	114	604.254	5.300		
Dimension IX Intention to Act	T	1	339.356	339.356	38.162	S**
	I	2	45.893	22.947	2.580	NS
	T X I	2	37.954	18.977	2.134	NS
	Error	114	1013.737	8.892		

S** Significant at 0.01 level of confidence; NS Not significant

Main Effects

Treatment (T)

F ratios for the difference between the two instructional treatments were found to be significant for total scores on responsible environmental behaviour and its dimensions at 0.01 level of confidence (Tables 2 and 3). Hence H_1, $H_{1.1}$, $H_{1.2}$, $H_{1.3}$, $H_{1.4}$, $H_{1.5}$, $H_{1.6}$, $H_{1.7}$, $H_{1.8}$, and $H_{1.9}$ were rejected as students taught environmental education by the outdoor environmental education programme exhibited better mean gains on responsible environmental behaviour and its dimensions, i.e. knowledge of ecological concepts, knowledge of environmental issues and problems, locus of control, environmental attitude, beliefs and values related to the environment, environmental sensitivity, personal responsibility, environmental action strategies, and intention to act.

Similar results were obtained by Ramsey, Hungerford and Tomera (1981); Ramsey and Hungerford, (1989) and Ramsey, (1993) on classroom educational interventions in the United States, which showed that environmental education emphasising issue investigation and action training did promote students' responsible environmental behaviour. A two week nature camp experience increased levels of environmental concern in students, which appeared to result in them showing more environmental behaviour than previously (Dresner and Gill, 1994).

Children can be taught environmental topics through the use of games and significantly improve their reported environmental behaviour (Hewitt, 1997). Harding (1997) concluded with the results that Outdoor Residential Environmental Education Program (OREEP) produced significantly better ecological knowledge of the students as well as developed their attitudes towards environment.

The cooperation of formal and non-formal environment education could present an appropriate social context in which an individual can gain reinforcement for responsible environmental behaviour (Hsu and Roth, 1998). Iozzi (1989a, 1989b) suggested that outdoor environmental education experiences were beneficial for students in many ways, including the development of environmental attitudes and values. Howe, Disinger and John (1988) performed research, which indicated that many students and young adults attribute a large amount of their knowledge of environmental concepts, problems and issues to out of school (non-formal) education settings and experiences. Tung, Huang and Kawata (2002) studied the effects of different environmental education programmes on the environmental behaviour of fifth-grade students and concluded that combining teaching and activities, made an improvement in the area of environmental behaviour.

Hoody (2002) reviewed that at the Huntington Middle School in Pennsylvania, environment based service learning not only enhanced environmental awareness but also made students more responsible towards environmental problems and their solutions. A study conducted by Hsu (2004) indicated that the EE course did significantly promote the students responsible environmental behaviour, locus of control, environmental responsibility, intention to act, perceived knowledge of environmental issues, and perceived knowledge of and skills in using environmental action strategies. Teaching nature

abstractly in the classroom does not lead to pro-environmental behaviours in later life (Schultz 2000). Research has substantiated that an empathy with and love of nature, along with later positive environmental behaviours and attitudes, grow out of children's regular contact with and play in the natural world (Phenice and Griffore, 2003). With developmentally appropriate natural outdoor environments and programmes, schools can help our children develop to become responsible stewards of the earth (Herrington and Studtmann, 1998; Sobel, 2004).

A study conducted by American Institute for Research (2005) concluded that children who participated in outdoor environmental education programme had significantly larger gains in environmental behaviours as compared to children who did not attend the programme.

Intelligence (I)

F ratios for the difference between the students with different levels of intelligence on responsible environmental behaviour and its dimensions, locus of control, environmental attitude, beliefs and values related to the environment, environmental sensitivity, personal responsibility, environmental action strategies, and intention to act were not significant even at 0.05 level of confidence. Hence H_2, $H_{2.3.}$ $H_{2.4}$ $H_{2.5,}$ $H_{2.6,}$ $H_{2.7}$ $H_{2.8}$ and $H_{2.9}$ were retained (Tables 2 and 3). However, F ratios for the difference between the students with different intelligence were found to be significant for the dimensions I and II viz., knowledge of ecological concepts and knowledge of environmental issues and problems at 0.01 level of confidence. Hence $H_{2.1}$ and $H_{2.2}$ were rejected. Students of high, average and low intelligence exhibited comparable gains in responsible environmental behaviour and its dimensions, locus of control, environmental attitude, beliefs and values related to the environment, environmental sensitivity, personal responsibility, environmental action strategies, and intention to act. Glance at Tables 4 and 5 reveals that students with high intelligence exhibited significantly higher mean gain scores on knowledge of ecological concepts and knowledge of environmental issues and problems than students with low and average intelligence. It is also evident that mean gain scores on knowledge of environmental issues and problems are significantly higher in average intelligence group as compared to lower intelligence group.

Table 4
Means and Standard Deviations of Three Intelligence Groups for Mean Gain Scores on Dimensions I and II of Responsible Environmental Behaviour

Variable	High Intelligence	Average Intelligence	Low Intelligence
Knowledge of Ecological Concepts	N 28 Mean 2.89 SD 2.23	N 64 Mean 1.55 SD 1.40	N 28 Mean 1.57 SD 1.37
Knowledge of Environmental Issues and Problems	N 28 Mean 3.43 SD 2.54	N 64 Mean 1.58 SD 1.67	N 28 Mean 1.68 SD 2.39

Table 5
t Values for Three Intelligence Groups for Mean Gain Scores on Dimensions I and II of Responsible Environmental Behaviour

Variable	High Intelligence and Average Intelligence	Average Intelligence and Low Intelligence	Low Intelligence and Average Intelligence
Knowledge of Ecological Concepts	3.50**	2.67**	0.78
Knowledge of Environmental Issues and Problems	4.13**	2.65**	2.32*

*p<.05 **p<.01

Interaction Effect

Treatment and Intelligence (T X I)

F ratios for the interaction between treatment and intelligence were found to be insignificant for mean gain scores on responsible environmental behaviour and its dimensions, knowledge of environmental issues and problems, locus of control, environmental attitude, beliefs and values related to the environment, environmental sensitivity, personal responsibility, environmental action strategies, and intention to act were not significant even at 0.05 level of confidence. Hence H_3, $H_{3.2,}$ $H_{3.3,}$ $H_{3.4}$ $H_{3.5,}$ $H_{3.6,}$ $H_{3.7,}$ $H_{3.8}$ and $H_{3.9}$ were retained (Tables 2 and 3 a & b). F ratio for the interaction between

treatment and intelligence was found to be significant for knowledge of ecological concepts at 0.01 level of confidence, hence $H_{3.1}$ was rejected. This reveals that there is no significant interaction between treatment and level of intelligence in relation to scores on responsible environmental behaviour and its dimensions, knowledge of environmental issues and problems, locus of control, environmental attitude, beliefs and values related to the environment, environmental sensitivity, personal responsibility, environmental action strategies, and intention to act, however there is significant interaction between treatment and level of intelligence in relation to mean gain scores on knowledge of ecological concepts.

Table 6
t Values for Different Combinations of Treatment and Intelligence (T x I) for Mean Gain Scores on Dimension I of Responsible Environmental Behaviour (Knowledge of Ecological Concepts)

Mean	T_1I_1	T_1I_2	T_1I_3	T_2I_1	T_2I_2	T_2I_3
T_1 I_1 4.78		6.24**	8.50**	8.79**	10.19**	5.18**
T_1 I_2 2.19			2.75**	3.21**	4.06**	.52
T_1 I_3 1.21				.55	.93	1.42
T_2 I_1 1.00					.28	1.8
T_2 I_2 0.906						2.14*
T_2 I_3 1.93						

** Significant at 0.01 level of confidence * Significant at 0.05 level of confidence

NS Not significant

The t ratios for different combinations of treatment and intelligence for mean gain scores on dimension I of responsible environmental behaviour i.e., knowledge of ecological concepts have been presented in Table 6. The table reveals that:

- Students of high intelligence exhibited better mean gains in knowledge of ecological concepts than students of average intelligence when taught by outdoor environmental education programme (t = 6.24).
- Students of high intelligence exhibited better mean gains in knowledge of ecological concepts than students of low intelligence when taught by outdoor environmental education programme (t = 8.50).
- Students of high intelligence taught by outdoor environmental education programme exhibited better mean gains in knowledge of ecological concepts than students of high intelligence taught by traditional method of instruction (t = 8.79).
- Students of high intelligence taught by outdoor environmental education programme exhibited better mean gains in knowledge of ecological concepts than students of average intelligence taught by traditional method of instruction (t = 10.19).
- Students of average intelligence taught by outdoor environmental education programme exhibited better mean gains in knowledge of ecological concepts than students of high intelligence taught by traditional method of instruction (t = 3.21).
- Students of average intelligence taught by outdoor environmental education programme exhibited better mean gains in knowledge of ecological concepts than their counterparts taught by traditional method of instruction (t = 4.06).
- Students of average intelligence taught by outdoor environmental education programme and students of low intelligence taught by traditional method of instruction exhibited comparable mean gains in knowledge of ecological concepts (t = 0.52).
- Students of low intelligence taught by outdoor environmental education programme and students of high intelligence taught by traditional method of instruction exhibited comparable mean gains in knowledge of ecological concepts (t = 0.55).
- Students of low intelligence and those of average intelligence when taught by traditional method of instruction exhibited comparable mean gains in knowledge of ecological concepts (t = 0.93).
- Students of low intelligence taught by outdoor environmental education programme and their counterparts taught by traditional method of instruction exhibited comparable mean gains in knowledge of ecological concepts (t = 1.42).

Educational Implications

In the present study, it was found that teaching environmental education by outdoor programme enhanced responsible environmental behaviour of Class V students. So, outdoor programmes should be used to teach environmental education especially to the primary classes as young children are active learners. Their best learning occurs with hands-on, interactive play and self-discovery rather than on trying to impart knowledge to them.

- Findings of the study reveal that outdoor environmental education is good for young children. This will be helpful in development of the values, attitudes, and basic orientation towards the world that they will carry with them throughout.
- The study has revealed that there is significant difference in responsible environmental behaviour of students taught environmental education by the outdoor environmental education programme, therefore, there is a dire need for the teachers and educators to review the syllabus on environmental education for children at different stages of school education and finalise, different spots for the essential field visits as educational excursion, identify them and list them comprehensively.
- The findings of the investigation will provide help to the teachers, educators, and parents to help their wards in channelising their energy as the way children learn is completely different than adults. To be effective, children's environmental education needs to be designed to match children's developmental needs, interests, abilities and learning styles.
- Outdoor environmental education programmes will provide children with regular and positive interactions within the nature, allow children to feel comfortable in it, develop empathy with it and grow to love it.
- Since environmental issues are often complicated, outdoor environmental education could provide varied opportunities and educational resources to help people gain and reinforce appropriate environmental behaviour.

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