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Impact of Teaching Environmental Science (ES) On the Knowledge and Attitude Of Bhutanese Higher Secondary Students Towards the Environment

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Abstract

Providing individuals with environmental awareness from a young age is important for a liveable and sustainable world. The aim of this study was to investigate the effect of teaching Environmental Science (ES) to classes IX-XII students. A convergent mixed method design guided by the pragmatism worldview was adopted for the study. Quantitative data were gathered from 130 participants and qualitative data from 5 students and 5 teachers from a higher secondary school. A descriptive and inferential statistics were used for quantitative data and the qualitative data were analysed through identification of themes. The results showed that students had a high degree of understanding and a positive attitude in environmental science and environment. Additionally, it was noted that there is little to no correlation between their knowledge and attitude about the environment. Thus, it was determined that students, particularly those in high schools, are being encouraged to develop their environmental literacy in order to promote the study of Environmental Science. Therefore, more efforts need be made to encourage ES at all levels of the schools to ensure effective implementation of the curriculum in the nation's sustainable development goals.

Keywords: Environmental Science, Sustainability, Awareness, Effects

Introduction

The advancement and rapid dissemination of science and technology rapidly changed the concept of dominating nature. This change leaves the environmental consciousness in the second place and creates a society that produces and consumes as much as possible (Cheng & Monroe, 2010). Such uncontrolled consumerist behaviour will deplete natural resources and pollute environment. Therefore, there is a need for individuals who are respectful and sensitive to nature. To meet this need, individuals, who are aware of environmental awareness, protection, and sensitivity, should be trained. According to Robinson (2013), an environmentally sensitive individual can be defined as a human who avoids harming the environment, consciously produces and consciously consumes, is aware of its being a part of this environment and sensitive to environmental problems. Such a human model emerges in cultures that are aware that the environmental problem occurring anywhere in the world affects the whole world equally. Environmental education is important for the formation of this culture. Environmental education has an important place in science education. It is also a must for a sustainable environment. In the 1970s, environmental education was first discussed at a higher education level (Yildiz & Budur, 2019). According to Ozden (2008), environmental education aims to make students aware of environmental problems and to act on the problems. Palmer (1998) pointed that there are three different approaches to environmental education. These are in the environment, about the environment, and for the environment. About the environment is giving environmental knowledge to students.

As envisioned in the Bhutan Vision 2020 document, environmental science was introduced in the Bhutanese schools as a subject and formed a major part of the curriculum diversification initiative (Royal Educational Curriculum [REC], 2012). Further, the environment science curriculum was formally launched in 2015 as an optional subject for class IX students with emphasis on raising public awareness and subsequently fostering a favourable attitude and conduct toward the environment. This subject provides the opportunities to both teachers and learners to incorporate effective educational approaches such as utilising current issues, connecting with community resources and engaging themselves in research and project-based learning. One of the challenges of the 21st century is going to be the issue of sustainability of natural resources. Thus, this study aimed to explore the effects of teaching environmental science, particularly students' knowledge and attitudes towards the environment.

Objectives of the Study

1. To investigate the impacts of teaching environmental science to class IX-XII students.
2. To assess students' level of environmental science knowledge.
3. To find out students' attitude towards learning environmental science.
4. To draw the essential perceptions and approaches to support students in learning of environment science.

Research questions

1. What are the teachers' perspectives of the impact of teaching environment science on knowledge and attitude of Bhutanese students towards the environment?
2. What is the environmental science students' level of knowledge towards the environment?
3. What is the attitude of the students towards the environment?
4. What is the relationship between the students' level of knowledge and their attitude towards the environment?

Student Perceptions on the Environmental Science

Environment has become so fragile due to the rapid human development. It has brought numerous changes to landscape and styles of human living. Students as future leaders need to learn how to balance the varied needs of human population (Mongar, 2022). The goal of Environmental Science is to build a cadre of young people equipped with knowledge, skills, and values to engage them in the conversation of natural heritage, promoting sustainable and equitable use of natural resources, preventing all forms of environmental degradation in the pursuit of Gross National Happiness (GNH) (REC, 2015, p. ii). Environmental science, on the other hand, is viewed as a process of incorporating environmental information into the educational system in order to raise public understanding of environmental issues at all educational levels. Moreover, environmental science aims to empower students to make right choice for sustainable future with global perspectives, and transform them to become responsible and productive citizens of the 21st century world (REC, 2015, p. vii).

Knowledge on the Environment

Students need to possess adequate knowledge towards the environment. Erhabor and Don (2015) posited that environment education students should have adequate knowledge of the environment. Similarly, another study reveals a project-based learning approach for environmental education. Students should be able to use their knowledge in their daily lives especially for environmental education (Keskin et al., 2020). Further, Erhabor and Don (2015) state that environmental education helps students acquire knowledge and skills which resulted in optimum utilisation of nature. In addition, a study by Mrema (2008) revealed that 80% of the students of faculty of social science in the University of Putra Malaysia had a high level of knowledge towards ES. Thus, students need to know about the environment and its sustainability.

Attitudes on the Environment

Students' behaviour and attitudes on the environment is important. According to Keskin et al. (2020), students who were exposed to specific environmental education programmes significantly developed an attitude towards the use of water. This literature shows that providing environmental education mostly gives rise to improvement in students' behaviour and attitude towards the environment. Their views show that they were motivated. Research has shown that project-based learning increases students' motivation towards protection of environment (Archie, 2003). Project-based learning was usually found effective especially for high school and university students. Yet, in the study of the environmental science, it has been concluded that it also works with students of class IX-XII. Similarly, Jekayinfa and Yusuf (2008) state that students had a positive attitude towards the teaching of environmental education at all levels of education in Nigeria. The positive attitude and high level of knowledge among the students signifies that environmental education has great prospects in actualising its goals and objectives in the country. However, a study by Aminrad et al. (2013) reported the relationship between knowledge and attitude towards environmental education among students in Malaysia motivates students in learning the subject.

Methodology

A pragmatic paradigm guided this study on the effect of teaching environmental science (ES) to students of classes IX-XII. This study employed convergent mixed methods. The use of this design provided an in-depth understanding of the subject matter through personal experiences, interviews, and surveys (Denzin & Lincoln, 2018). The data were collected through survey questionnaires and semi-structured interviews. Based on Cochran (1977) sample size of, 130 student participants participated in this study. The purposive sampling technique was used for both the qualitative and quantitative data since it allowed the researcher to describe the major impact their findings have on the population. Using a purposive sampling approach, the participants for this study were drawn from students in order to get better information. The sample ensured equal gender representations. Therefore, the study collected questionnaire data from 130 students (80 male and 50 female) at a higher secondary school. For one-on-one interview, there were 5 student and 5 teacher participants. Each data collection tool complemented the other, which enabled a greater depth of understanding of the issue under study. The survey items were expressed on a six-point Likert scale corresponding to Strongly Agree (6), Agree (5), Somewhat Agree (4), Disagree, disagree (3), Somewhat Disagree (2), and Strongly Disagree (1). Further, the scale on the level of the opinion and item were adapted from Erhabor and Don where the study was conducted in Nigeria in 2015 to study the similar topic on environment. The table below shows the level of opinion on the effect of teaching environmental science to students.

Table 1*: Scale on level of opinion*

Scale	Level of Opinion
1-1.50	Strongly disagree
1.51-2.50	Disagree
2.151-3.50	Somewhat disagree
3.51-4.50	Somewhat agree
4.51-5.00	Agree
5.51-6.00	Strongly agree

(Scale adapted from Erhabor and Don, 2015)

Adhering to research ethics, anonymity and confidentiality of participants was maintained by not revealing names and identities in the data collection and while reporting the findings. All participants were clearly briefed on the purpose of the research and their involvement. The participants signed an informed consent form before the interview to indicate their permission to be part of the study.

Data Analysis Approach

The analysis of data in a mixed methods design involves the analysis of both quantitative and qualitative data, which was analysed using appropriate methods of analysis (Creswell, 2013). The study analysed the survey questionnaires using descriptive statistics in the statistical package IBM SPSS V24. The data were analysed through features such as frequencies, mean, standard deviation, and correlation, which are represented in the form of tables. To determine the degree of correlation, the idea of Best and Khan (2006) was adapted (see Table 2). Interview data were analysed thematically as seen useful in investigating the various perspectives of research participants and as seen appropriate to the pragmatism paradigm. The interview data were developed into categories or themes, which became a unit of discussion.

Table 2: *Correlation and Coefficient Range*

Coefficient Interval	Coefficient level
0.00-0.199	Very low
0.20-0.399	Low
0.40-0.599	Middle
0.60-0.799	Strong
0.80-1.000	Very Strong

Adapted from Best and Khan (2006)

Results

Perceptions on the Environment

The analysis of data under Table 3 showed students' perceptions on the environment. The overall mean score of 4.90 which falls in the agree category reveals that students have good perceptions towards the environment. For instance, the item *Sustainable development is meeting the needs of only present situations* with the score mean of 5.31 indicates that students know about the sustainable use of the environment. The standard deviation 0.45 indicates that students have similar opinions. However, the mean of 4.36 (SD=0.45). It shows that environmental *science would make the students to understand environmental issues at all educational levels* slightly inclined to somewhat agree. This shows that environment education would substantiate other levels of education about the environment. Similarly, in the interview students expressed that environmental science helps them to develop skills, ideas and knowledge towards the environment. For instance, S1 said, "I gain a various knowledge about environment after exposing with the ES subject." Further, majority of teachers shared that environmental science had broadened the knowledge and ideas on the environment. This is exemplified in the quote by T3, "majority of the students show interest in environment science because they are eager to learn more about environment." In addition, S2 stated that this subject teaches us about the real-world situations and its consequences for human development. Overall, the finding indicates that students hold a high level of perceptions on environmental protections and sustainable usage.

Table 3: *Mean and standard deviation on students' perceptions on the Environment (n= 130)*

	Mean	Standard Deviation	Level of opinion
The environment science will equip young people with knowledge, skills and values in environment	4.88	1.05	Agree
Environmental science should focus on the present situations.	4.97	1.00	Agree
Sustainable development is meeting the needs of only the present situation.	5.31	0.04	Agree
Environment science broaden the knowledge and ideas on protection of environment.	4.80	0.17	Agree
Environmental science would make the students understand environmental issues at all educational levels.	4.36	1.18	Somewhat Agree
Overall Mean	4.90	0.45	Agree

Knowledge on the Environment

As shown in Table 4, the overall mean and standard deviation for the items on students' knowledge on the environment indicates that students agree that they have gained knowledge after learning the environment science. Further, analysis of the item *the human disturbance of the natural environment leads environment degradation* also indicates that students strengthened love and appreciation for nature. However, the item *gradual increase in the earth temperature is known as global warming* fall in "Somewhat Agree" category. This shows that students do not have much knowledge about global warming and its causes.

Table 4: *Mean and Standard deviation on knowledge on the environment (n=130)*

	Mean	Standard Deviation	Level of Opinion
Environmental education helps learners learn skills on how to destroy the environment.	4.65	1.18	Agree
The human disturbance of the natural environment leads to environmental degradation.	4.90	1.122	Agree
Conservation of nature helps to protect the environment from loss, waste and harm.	4.60	1.032	Agree
Gradual increase in the earth's temperature is known as global warming.	4.55	1.066	Somewhat Agree
Overall Mean	4.67	0.85	Somewhat Agree

Interview data shows that students gain a variety of knowledge and ideas from environment subjects, which ultimately helps in problem solving, and take action to improve the environment. For example, S4 elucidates that it helps to establish standards for a safe, clean and healthy natural ecosystem after knowing the facts about the environment. It is further echoed by T2, "it also develops a deeper understanding or environment issues and have the skills to make informed and responsible decisions." In the same vein, S3 said, "it helps me to understand important issues like safe and clean drinking water, hygienic living conditions and clean and fresh air, fertility of land, healthy food and development." Thus, the majority of participants expressed environmental issues such as global warming, depletion of the ozone layer, and dwindling forest energy resources, the loss of global biodiversity is understood from environmental science subjects.

Attitudes on the Environment

Overall mean scores of 5.03 revealed that students have the right attitudes towards the environment. For the item *the course has increased my love and appreciation for nature* showed that students have enhanced their love and appreciation for nature when they studied ES. Similarly, students seem to know

the importance of nature to cope with the impact of industrial nations. Moreover, the standard deviation (SD=1.05) is high, indicating that students have similar feelings towards the items. Further, interview data revealed that students demonstrate that they have a positive attitude about the environment. For instance, S5 expressed that plants and animals have rights like human beings because non-human animals deserve the ability to live as they wish, without being subjected to the desire of human beings. However, T4 shared that students cannot show their feelings and love for nature the way the ES teaches. A positive correlation was found between the knowledge and attitude towards the environment (r=.131; p=0.000) at p=< 0.01 (see Table 6). This presents an impression that knowledge of environment science highly impact attitude of the students towards the environment as S3 said, "Global environmental change is having a profound impact on ecosystems around the globe, with complex interactions at the interface of global change processes and ecological systems.

Table 5: *Mean and standard deviation on attitudes on the environment*

	Mean	Standard Deviation	Level of Opinion
The course has increased my love and appreciation for nature.	4.73	1.49	Agree
Environmental science helps to produce active and well-informed individuals.	4.45	1.05	Somewhat Agree
Humans have the right to modify the natural environment to suit their needs.	4.60	1.06	Somewhat Agree
Humans are severely abusing the environment.	5	.184	Agree
The earth has plenty of natural resources if we just learn to develop them.	4.66	1.142	Somewhat Agree
Plants and animals have as much right as humans to exist.	4.68	1.024	Agree
The balance of nature is strong enough to cope with the impacts of industrial nations.	4.50	0.991	Somewhat Agree
Overall Mean	5.03	1.05	Agree

Table 6: *Correlation between the items (Knowledge and Attitude)*

		Knowledge	Attitude
Knowledge	Pearson Correlation	1	.131**
			0.000
	N	130	130
Attitude	Pearson Correlation	.131**	1
		0.000	
	N	130	130

** Correlation is significant at the 0.01 level (2-tailed).

Discussion

One of the findings of this study revealed that students have a good level of understanding on ES. The current findings corroborated the vision of REC (2015, p. vii), "Environmental science aims to empower students to make the right choice for a sustainable future with global perspectives, and transform them to become responsible and productive citizens of the 21st century world." Moreover, findings from the interview data showed that environment science helps students to develop skills, ideas, and knowledge towards the environment. According to survey findings environmental science would make students understand environmental issues at all educational levels. This finding is congruent with the previous literature, which states that a process of incorporating environmental information into the educational system is to raise public understanding of environmental issues at all educational levels (Erhabor & Don, 2015). The findings indicated that students gain a variety of knowledge and ideas from environment subjects, which ultimately helps in problem solving, and take action to improve the environment. The finding aligns with the previous study that revealed that environment education students have adequate knowledge of the environment (Erhabor & Don, 2015). Another study showed that students should be able to use their knowledge in their daily lives especially for environmental education (Keskin et al., 2020). The finding implies that students derive positive knowledge towards the environment after learning ES.

The previous literature revealed that students who were exposed to specific environmental education programmes significantly developed an attitude towards the use of water (Keskin et al., 2020). The previous finding is supported by the current findings which stated that students have right attitudes towards the environment. A possible reason for this could be students grasping a wide range of environmental related knowledge and ideas. Additionally, it provides a significant statistical correlation between students' environmental knowledge and attitudes towards the environment. Thus, the students' upbeat attitudes and excellent levels of knowledge indicate that environmental science has a great chance of achieving its aims and objectives in the school enabling the development of a favourable environmental attitude among the students.

Recommendations

The findings of this study may be useful in establishing a framework for future ES programmes and incorporating nature-based education into the classroom. Similar study can be conducted on primary school pupils in the younger age groups. Correlation studies involving environmental awareness and other subjects such as geography and biology can be conducted as environmental awareness research is linked to environmental protection and is critical for environmental preservation. Moreover, study was conducted with only one higher secondary school in Bhutan using convergent mixed methods. Future research could explore the topic by employing sequential mixed methods. This method may allow the researcher to provide detailed analysis and in-depth information from interview participants (Creswell & Creswell, 2018). Longitudinal studies can be designed to observe the changes in students' behavior and attitudes.

Conclusion

Environmental science as a field of study has become a fundamental learning for students, particularly in higher secondary schools. This study found that classes IX-XII students studying environmental science have a high level of critical understanding of the environment as well as the components, purposes, and goals. Additionally, they have a favorable outlook on the environment. As a result, this optimistic outlook and high level of knowledge demonstrate the positive impact of teaching ES on. They also possess a positive attitude towards the natural environment. Thus, this positive attitude and high level of knowledge reveals that the human and material resources in the institution of study have a great impact on the students. Thus, this study demonstrates that environmental literacy is being fostered in students to support environmental education in the nation, although more needs to be done to motivate students and advertise the field of study in the school.

References

Aminrad, Z., Zakaria, S., Hadi., & M., Sakari (2012). Relationship between awareness, knowledge and attitudes towards environmental education among secondary school students in Malaysia. *World Applied Sciences Journal, 22*(9), 1326-1333.

Archie, M. (2003). *Advancing education through environmental literacy*. Association for Supervision and Curriculum Development.

Best, J. W., & Kahn, J. V. (2006). Research in education. *Learning Private Limited.*

Cheng, J. C. H., & Monroe, M. C. (2010). Connection to nature: Children's affective attitude toward Nature. *Environment and Behavior, 44* (2), 31-49.

Creswell, J. W., & Creswell, J. D. (2018). *Research design*: *Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.

Denzin, N. K., & Lincoln, Y. S. (2018). *The sage handbook of qualitative research*. Sage Publication.

Erhabor, N. I., & Don, J. U. (2015). Impact of environmental education on the knowledge and attitude of students towards the environment. *International Journal of Environmental and Science Education, 11*(12), 5367-5375.

Fisman, L. (2005). The effects of local learning on environmental awareness in children: An empirical investigation. *The Journal of Environmental Education, 36*(3), 39-50.

Jekayinfa, A. A, & Yusuf, A. R. (2008). Teachers' opinions on the incorporation of environmental education in the Nigerian primary school curriculum. *Educational Research and Review, 3*(11), 334-338

Keskin, C., Akcay, H., & Kapici, H, O. (2020). The effects of environmental science e-projects on middle school students' behaviours and attitudes. *International Journal of Technology in Education and Science, 4*(2), 160-167.

Mongar, K. (2022). Bhutanese teachers' and students' perceptions about environmental issues in Bhutan. *Interdisciplinary Journal of Environmental and Science Education, 18*(1). 3-10

Mrema, K. (2008). *An assessment of student's environmental attitude and behaviors and the effectiveness.* Their School Recycling Programs Master Dissertation, Dalhousie University,

School of Resource and Environmental Studies.

Özden, M. (2008). Environmental awareness and attitudes of student teachers: An empirical research. *International Research in Geographical and Environmental Education, 17*(I), 40-55.

Palmer J.A. (1998). *Towards progress and promise:* Environmental education in the 21st century. 240-244.

Royal Education Council. (2015). *A guide to action research: Enhancing professional practice of teachers in Bhutan.* Royal Educational Council.

Royal Education Council [REC] (2012). *The national education framework:* Shaping Bhutan's future

Robinson, J.O. (2013). Environmental education and sustainable development in Nigeria: Breaking the missing link. *International Journal of Education and Research, 1*(5), 1-6.

Yildiz, Y., & Budur, T. (2019). Introducing environmental awareness to college students with curricular and extracurricular activities. *International Journal of Academic Research in Business and Social Sciences, 9*(3), 667-675.