



Received: 14-09-2022

Accepted: 24-10-2022

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Environmental Knowledge, Sensitivity and Academic Performance of Students: Basis for Curriculum Enhancement

¹ John Mark E Abilo, ² MA Quincy D Dones, ³ Mary Ann Estandarte-Pet, ⁴ Atty Robert Estandarte

¹ Binalbagan National High School, Binalbagan, Negros Occidental, Philippines

² La Carlota City College, La Carlota City, Negros Occidental, Philippines

³ Secretary to the Sanggunian, Local Government Unit, Pontevedra, Negros Occidental, Philippines

⁴ Assistant City Prosecutor, Department of Justice, National Prosecution Service, Philippines

Corresponding Author: **John Mark E Abilo**

Abstract

This descriptive-correlational study aimed at determining the levels of environmental knowledge, sensitivity and academic performance in Environmental Science subject of special science students for school year 2020-2021. The relationship between these variables was likewise determined. The respondents were the 158 Grade 7 students classified according to their sexes, schools, and school site. This study utilized the “Environmental Knowledge Test”, “Environmental Sensitivity Questionnaire” and students’ first rating academic achievement in the environmental science subject. The descriptive statistical tool used was mean. Kruskal’s Gamma set at 0.05 was employed as

inferential statistical tool. The findings revealed that the Science, Technology and Engineering (STE) students had an average level of environmental knowledge. The students’ environment sensitivity was very high as a whole. In terms of the students’ academic performance, students have a very satisfactory rating. Furthermore, findings revealed that there was no significant relationship found between students’ environmental sensitivity and academic performance. A positive correlation was observed between environmental knowledge and academic performance and between students’ environmental knowledge and sensitivity.

Keywords: Environmental Knowledge, Sensitivity, Academic Performance, Students, Environmental Science

Introduction

Countries affiliated with the United Nations (UN) adopted a set of objectives in 2015 known as the Sustainable Development Goals (SDG). Many of these objectives relate to the environment (United Nations, 2016) ^[33]. In addition to being a challenge for society, sustainable development has become increasingly integrated into the educational process over the past 20 years (Terlevi, Isteni Stari, & Ubic Kova, 2015) ^[32].

To improve life, humanity has lost any regard for the environment. Environmental protection is not highly regarded in technological innovation; this is because the driving force behind it is primarily practical and profitable (Abilo & Linaugo, 2018) ^[2]. There is increasing evidence that man has had an impact on his life support system (Sibly, 2015) ^[29]. As a result, problems with environmental deterioration such as global warming, which is the main cause of climate change, occur (Dhillon & Von Wuehlisch, 2013) ^[9]. Both direct physiological stress caused by climate change and indirect effects such as changes in species relationships can have an impact on organisms (Harley, 2011) ^[15]. Air pollution, which is mostly a byproduct of energy production, is responsible for around 6.5 million premature deaths annually (International Energy Agency, 2016) ^[17]. Lastly, the Basel convention on shipments of hazardous waste was created as a result of images of toxic trash being dumped in low-income countries by wealthy nations (Press, 2012) ^[28].

In order to address these issues, Education for Sustainable Development (ESD), which places a strong emphasis on human welfare, equality, rights, and the equitable distribution of resources, proposed improving environmental education, which represents a significant departure from the environmental agreements already in place (Kopnina, 2012; Krasny & Delia, 2015). Environmental education programs often separated the world between “humans” and “environment.” This distribution makes people think that the environment is a supplement to humanity. Most likely, this interruption with nature is the cause of inefficiency of informal environmental education (Neaman, 2012; Damerell, Howe, & Milner-Gulland, 2013). Environmental conservation is every person’s sole responsibility at all time, depending on his/her life choices in minimizing an ecological

impact on earth (Meerah, Halim, & Nadeson, 2010; Ors, 2012).

The present curriculum strongly adheres to the integration of environmental education. It is apparently shown in the implementation of their programs like the DepEd Order No. 52, s. 2011 entitled "Strengthening Environmental Education in Public and Private Schools" which contains the mandate for the establishment of Youth for Environment in Schools Organization (YES-O) in public and private schools. In addition, DO 5, s. 2014 serves as the Implementing Guidelines on the Integration of Gulayan sa Paaralan, Solid Waste Management and Tree Planting Under the National Greening Program (NGP). These programs were only a few of the regulations which some schools under the Division of Negros Occidental failed to comply and advance.

This study aimed to determine the environmental knowledge, sensitivity and academic performance of the students studying under the Special Program in Science, Technology and Engineering (STE) Curriculum in the Division of Negros Occidental for the School Year 2020-2021. The sole purpose of this study is to address the common problem of the environment by measuring students' knowledge, sensitivity and academic performance and their relationships. Also, to enhance the curriculum instruction for Environmental Science subject that will allow them to understand things about the nature and for them to practice stewardship which was the niche they must perform in their full potential.

This study aimed at finding out the levels of environmental knowledge and environmental sensitivity among the Special Program in Science, Technology and Engineering (STE) Students of the Division of Negros Occidental in relation to their academic performances in environmental science subject. This study sought answers to the following questions: (1) What is the level of the students' environmental knowledge, sensitivity and academic performance in environmental science subject when taken as a whole and when grouped according to sex, school and school site? (2) Is there a significant relationship between the environmental sensitivity and academic performance in environmental science subject, environmental knowledge and academic performance and environmental knowledge and sensitivity of the students?

Framework of the study

This study was based on the Affective-Cognitive Experiences for Self-Integration Approach (ACES) which is premised on the simultaneous development of both the cognitive and the affective dimensions of the Learner and was anchored on the Confluent Theory of education. Francke & Erkens (1994) ^[14] held that the later model is presented as a method to bridge the gap between cognitive and affective domain. Attention focused on the integration of four overlapping areas in a learning process (readiness, the cognitive domain, the affective domain, and responsibility). Confluent education was introduced in the 1960s and 1970s as a "flowing together" of the cognitive and emotional domains but evolved into various dimensions of learning (Hackbarth, 1996; in Solomon, 2000 ^[30]).

Confluent educators have a rich 25-year tradition of developing theory and practice which recognize the centrality of the learner in the educational process. In a confluent model, deep learning is achieved by facilitating

self-awareness and personal responsibility and by understanding the dynamics of planned change (Cline, 1999) ^[5]. Both cognitive and affective goals can be attained through a choice of any number of instructional strategies in any subject area. The suitable approach focuses on discussion and problem-solving using reasoning in an atmosphere of openness, tolerance, and concern for others (Vare, 1979; Fitzmaurice & Jones, 1981) ^[34, 13].

Since the publication of Our Common Future (World Commission on Environment and Development, 1987) and Agenda 21 (United Nations Conference on Environment and Development, 1992), the thought of sustainable development has been part of people's daily lives and has been involved in many activities (Terlević *et al.*, 2015) ^[32].

Along with this line, the Division of Negros Occidental which advocates higher learning has highlighted in its curricular and co-curricular programs the value of environmental friendliness. One of the challenges concerning the system is to develop studies which may give concern, prudence, and sensitivity about the issues confronting nature.

Materials and methods

This section presents the research design, the subjects and respondents of the study, population and sample size, sampling techniques, data gathering instrument, validity and reliability of the research instrument, the data gathering procedure and data analyses.

Research design

This study employed the descriptive-correlational type of research. As concluded in a review, findings of this kind of research design can be used to determine prevalence and relationships among variables, and to project events from current data and knowledge. Despite its many uses, prudence is required when using the methodology and analyzing data. Important issues are sighted out for discussion and several options put forward for analyzing data. Implications for practice this research design is widely used (Curtis, Comiskey, & Dempsey, 2016) ^[6].

The researchers gathered data and information on the environmental knowledge, environmental sensitivity and academic performance of the special science curriculum students in their environmental science subject in the different implementing schools in the Division of Negros Occidental. This descriptive type of research is a fact-finding procedure concerned with the students' environmental knowledge and their environmental sensitivity as espoused by the school curricular and co-curricular activities.

Subjects and respondents of the study

The subjects and respondents of the study includes the Grade seven students of Special Program in Science, Technology and Engineering (STE) implementing schools in the Division of Negros Occidental in the school year 2020-2021. There are seven implementing schools that are included in this research coming from Southern Negros. The number of enrollees for the said school year reached the total of 260 students coming from these schools.

Population and sample size

The population of the STE students includes the 260 students coming from the seven schools. The sample size is

158 which was obtained by using the Slovin’s Formula.

Sampling techniques

To identify the schools included in this research, the purposive sampling technique was used. This sampling technique was used since not all science, technology and engineering curriculum implementers in Southern Negros were accessible due to the restrictions of the pandemic and some of the schools were used as quarantine facility during the time of the conduct of the study. The students in each school that were included in this research were identified using stratified random sampling technique. Simple random sampling or specifically fishbowl method was then utilized, and the researchers ensured that students in each school are given equal opportunity to be picked as respondents. These sampling techniques was employed to make sure that each member of the strata was given equal opportunity to be included as part of the research.

Using the Slovin’s formula, the researchers identified the number of respondents from a population of 260 students under the special science curriculum, by employing the stratified random sampling technique. This sampling procedure was drawn in such a way that there was a proportionate representation of each population subgroups or strata in a sample.

Data gathering instrument

Two quantitative instruments were used in the study: Test on Environmental Knowledge, designed to measure knowledge of environmental concepts, principles, as well as issues and problems, and Environment Sensitivity Questionnaire to measure the respondents’ sensitivity to the natural environment.

Test on Environmental Knowledge

The researchers utilized the test created by Abilo & Linaugo, (2018) [21]. The original test was consisted of 35 items. Each correct answer was given a score of one point, while a wrong answer was given a zero rating. The test scale against which the respondents’ level of knowledge was classified as follows:

Score Range	Description
28 - 35.00	Very High Level of Knowledge
21 - 27.99	High Level of Knowledge
14 - 20.99	Average Level of Knowledge
7 - 13.99	Low Level of Knowledge
0 - 6.99	Very Low Level of Knowledge

Environmental Sensitivity Questionnaire

The environmental sensitivity questionnaire by Abilo & Linaugo, (2018) [21] was also used for the present research. It originally consisted of 30 items intended to measure the level of students’ sensitivity to the natural environment. The respondents were presented with five responses as follows: (1) never, (2) seldom, (3) often, (4) very often, and (5) always.

The following scale of means with corresponding descriptions was used to interpret the scores of the respondents:

Scale	Description
4.20 – 5.00	Very High Level of Environmental Sensitivity
3.40 – 4.19	High Level of Environmental Sensitivity

2.60 – 3.39	Average Level of Environmental Sensitivity
1.80 – 2.59	Low Level of Environmental Sensitivity
1.00 – 1.79	Very Low Level of Environmental Sensitivity

Students’ Academic Performance

The interpretation for the students’ academic performance was based on DepEd order no. 8, series of 2015 which is known as Policy Guidelines on Classroom Assessment for the K to 12 Basic Education Program (Department of Education, 2015) [7]. The following grading scale and descriptions are listed below:

Grading Scale	Description
90-100	Outstanding
85-89	Very Satisfactory
80-84	Satisfactory
75-79	Fairly Satisfactory
Below 75	Did Not Meet Expectations

Validity and reliability of the research instrument

Validity is the degree to which a test measures what it purposes to measure. It deals with the relationship of the data obtained to nature. In concurrence with Validity, (Mohammed, 2019) [25] refers it to the extent in which the test serves its purpose with which it intends to measure.

Likewise, reliability is the degree to which an assessment tool produces stable and consistent results (Mohajan, 2017) [23]. Kothari, (2009) [22] asserts that reliability demonstrates that the data collection procedure can be repeated with the same outcome. Reliability will ensure that tools are able to capture all the information required to analyze data.

The instruments used in this study were standardized test and questionnaire which were used and conducted by several studies. With this, this secures that the instrument is already valid and reliable.

Data Gathering Procedure

The study was conducted after the approval of panel members following their suggestions and recommendations. An approval and official permissions were primarily taken from the Dean of the Graduate School, members of the panel and the Schools Division Superintendent. The researchers coordinated with the School Principals of each school. The participants were given thorough information about the nature of this study. The participants were also informed that their involvement in this study is voluntary and that they are free to withdraw at any stage if they are not comfortable. They were assured of anonymity in the research report.

Data analyses

The data was subjected to appropriate descriptive and inferential statistics. The following descriptive statistics was used:

To answer the first research question, mean was used. This is to determine the level of environmental knowledge, environmental sensitivity, and academic performance of the respondents from the different categories of the study.

Moreover, to answer statement of the problem number 2, Goodman’s and Kruskal’s Gamma were used. This inferential statistic is to measure the magnitude and significance of the relationship between environmental knowledge, environmental sensitivity and academic

performance of the students across sexes and schools when the distribution was assumed to be normal.

Results and discussion

This section presents the data, analyses, interpretation, and discussions about the study. The data were presented and arranged in tabular forms according to the sequence of the

specific problems of the study.

Level of Students’ Environmental Knowledge

Presented in Table 1 are the mean scores of students in the environmental knowledge test when they are taken as a whole and when grouped according to sex, school and school site are presented in the subsequent page.

Table 1: Level of Students’ Environmental Knowledge when taken as a Whole and when Grouped According to Sex, School and School Site

Variables	Categories	Score Range	f	Mean	Interpretation
Sex	Male	Very High	0	17.22	Average Level of Environmental Knowledge
		High	10		
		Average	31		
		Low	8		
	Female	Very Low	0	16.89	Average Level of Environmental Knowledge
		Very High	3		
		High	30		
		Average	58		
School	A	Low	16	16.04	Average Level of Environmental Knowledge
		Very Low	2		
		Very High	0		
		High	3		
		Average	17		
	B	Low	6	16.70	Average Level of Environmental Knowledge
		Very Low	0		
		Very High	0		
		High	5		
		Average	12		
	C	Low	3	17.00	Average Level of Environmental Knowledge
		Very Low	1		
		Very High	0		
		High	3		
		Average	4		
	D	Low	1	17.94	Average Level of Environmental Knowledge
		Very Low	0		
		Very High	0		
		High	5		
		Average	9		
	E	Low	2	16.67	Average Level of Environmental Knowledge
		Very Low	0		
		Very High	0		
		High	6		
		Average	5		
	F	Low	6	19.76	Average Level of Environmental Knowledge
		Very Low	1		
		Very High	3		
High		15			
Average		29			
G	Low	2	17.00	Average Level of Environmental Knowledge	
	Very Low	0			
	Very High	0			
	High	3			
	Average	13			
School Site	Rural	Low	4	17.04	Average Level of Environmental Knowledge
		Very Low	2		
		Very High	0		
		High	22		
		Average	43		
	Urban	Low	16	17.88	Average Level of Environmental Knowledge
		Very Low	0		
		Very High	3		
		High	18		
		Average	46		
As a Whole	Low	8	17.88	Average Level of Environmental Knowledge	
	Very Low	0			
	Very High	3			
	High	40			
	Average	89			

The environmental knowledge questionnaire comprised of different environmental topics such as pollution, resource management, population, ecological principles, as well as environmental issues and problems.

The results showed that the respondents had an average level of environmental knowledge (Mean=17.88) as a whole. When grouped according to their sexes, male students had an average level of knowledge (Mean=17.22) same as the female students (Mean=17.89). There was also an average level of environmental knowledge when students were grouped according to their schools; School A (Mean=16.04), B (Mean=16.70), C (Mean=17.00), D (Mean=17.94), E (Mean=16.67), F (Mean=19.76) and G (Mean=17.00). Lastly, when students are grouped according to their school site the results revealed that there was an average level of knowledge for both rural (Mean= 17.04) and urban schools (Mean=17.88).

The result of the study implies that the students do not know enough about the current issues that our environment is facing. These problems and their solutions have been the focus of many studies for a long time now, but as science gets more advanced and specific in showing how humans are hurting the planet, positive environmental beliefs and compliance appear to be diminishing. This suggests the need to focus on bridging the gap between environmental knowledge among students along with the different variables used in the study including their sex, school and their school sites. Educators have a significant role to play in enhancing the students' knowledge towards environmental issues and facts. Students' environmental knowledge were sought in this study because they can serve as useful foundations for educators, curriculum developers and policymakers in the design and implementation of an environmental education curriculum that would be appealing to students while being effective in encouraging pro-environmental attitudes and behavior.

The result proposes that there is a need for environmental education to receive more environmental knowledge in schools so that youths do not get discouraged by the overwhelming scale of environmental problems, especially global warming. This will contribute to the mitigation of global warming and other environmental problems, as well as improve the quality of life on earth.

To conform with the result of the present study, it was observed that environmental knowledge of students in overall is good (Abd Rahman *et al.*, 2014)^[1].

Various studies conducted at secondary institutions in Malaysia revealed that students, regardless of their education standards, generally had a good level of environmental knowledge (Mohamed Osman *et al.* 2011^[24]; Harun *et al.* 2011^[16]; Hassan *et al.* 2011; Janmaimool & Khajohnmanee, 2019^[18]) which do not agree to the result of this study. In addition, the result is also contrary to the findings of (Sultana & Hossen, 2017)^[31] which also revealed that the level of environmental knowledge of the secondary level student was high. This high level of knowledge was due to media and influenced by their education.

In contradiction, the study conducted by Janmaimool & Khajohnmanee (2019)^[18] suggested that environmental knowledge provided through a formal education could promote environmental attitudes, but it may not contribute to students' engagement in direct impact environmental behaviors. Also, students having higher knowledge scores had more favorable environmental attitudes.

Level of students' environmental sensitivity

The complete data for the students' level of environmental sensitivity when taken as a whole group and across sexes, schools and school sites were presented in Table 2 in the consequent page.

Table 2: Level of Students' Environmental Sensitivity when taken as a Whole and when Grouped According to Sex, School and School Site

Variables	Categories	Score Range	f	Mean	Interpretation
Sex	Male	Very High	31	4.24	Very High Level of Environmental Sensitivity
		High	11		
		Average	4		
		Low	3		
		Very Low	0		
	Female	Very High	65	4.24	Very High Level of Environmental Sensitivity
		High	31		
		Average	10		
		Low	1		
		Very Low	0		
School	A	Very High	14	4.16	High Level of Environmental Sensitivity
		High	9		
		Average	3		
		Low	0		
		Very Low	0		
	B	Very High	16	4.44	Very High Level of Environmental Sensitivity
		High	2		
		Average	1		
		Low	1		
		Very Low	0		
	C	Very High	6	4.26	Very High Level of Environmental Sensitivity
		High	1		
		Average	2		
		Low	0		
		Very Low	0		
	D	Very High	11	4.27	Very High Level of Environmental Sensitivity
High		4			

		Average	1	4.19	High Level of Environmental Sensitivity		
		Low	0				
		Very Low	0				
	E	Very High	11				
		High	3				
		Average	4				
		Low	0				
		Very Low	0				
		Overall	18				
	F	Very High	28			4.21	Very High Level of Environmental Sensitivity
		High	17				
		Average	3				
		Low	1				
		Very Low	0				
	G	Very High	12			4.25	Very High Level of Environmental Sensitivity
		High	6				
		Average	1				
		Low	1				
Very Low		0					
School Site	Rural	Very High	56	4.29	Very High Level of Environmental Sensitivity		
		High	16				
		Average	8				
		Low	3				
		Very Low	0				
	Urban	Very High	42	4.19	High Level of Environmental Sensitivity		
		High	26				
		Average	6				
		Low	1				
		Very Low	0				
As a Whole	Very High	98	4.24	Very High Level of Environmental Sensitivity			
	High	42					
	Average	14					
	Low	4					
	Very Low	0					

Results showed that the students reflected a very high level of environment sensitivity (Mean=4.24) when taken as a whole. When grouped according to sex, both male and female students showed a very high level of environmental sensitivity (Mean=4.24). When students are grouped according to their school, School B (Mean= 4.44), C (Mean= 4.26), D (Mean= 4.27), F (Mean= 4.21) and G (Mean= 4.25) got a very high level of environmental sensitivity while both School A (Mean= 4.16) and E (Mean= 4.19) got a high level. Finally, when students are clustered correspondingly to their school site the results revealed that rural schools (Mean= 4.29) got a very high level of sensitivity and urban school (Mean=4.19) got a high level. The result implied the students are very sensitive when it comes to our natural environment since there is a lot that is being done in the way of real ecological projects by high school students under the guidance of each of their schools. Generally, students are sensitive to happenings around them. They are keener in observing and learning things around, compared to grown-ups. It is up to the teachers, parents and others around to kindle their curiosity. Students are the most powerful stratum of the society who should know the importance of environment and nature sustainability. Nature has endowed us with all the resources to which maximum beneficiary is human beings. Nature has full proof system of protection of all the creatures and environment subject to check on excessive pollution and resources utilization. Students understand the need for protecting environment and they are prepared to fight against the contamination of

atmosphere as today’s student is tomorrow's citizen. They show the consciousness and save the various energy sources by going on foot or bicycle to schools and other places. With their efficient skills of interaction with other parts of the society, they communicate to the society about need for protecting environment. Students need to promote the plantation in surrounding areas. They should help the government and non-government organization in preventing pollution from the society by actively participating in programs and by giving the information of those who pollutes the environment. Students in all disciplines of education may contribute some from the knowledge in their expertise. They make creative contribution to arrest pollution and protect environment. It is not only industrial pollution but the pollution from various day to day operations that needs checking for protecting environment. Thus, student can play a pivotal role in changing the scenario that we have at present. The findings of this research are supported by the findings of Yılmaz & Sibel (2017) [35] which also revealed that on a 5-point Likert scale questionnaire, students’ environmental sensitivity level is higher. In addition, Fidan (2016) study revealed that there was a high level of sensitivity. Therefore, it can be argued that the participants were sensitive to the natural environment. It is important that students must have higher environmental sensitivity because previous research said that environmental sensitivity in students give effect to forming citizenship behavior (Nadiroh & Ananda, 2017) [26]. This study of Kim (2019) [20] added that providing students

activities that promotes the conservation and protection of environment environmental improves their sensitivity towards it. Moreover, their reflective journals reported

increased interest in everyday environments, enhanced knowledge about diverse environmental elements, and strengthened will to act pro-environmentally.

Table 3: Level of Students' Academic Performance when taken as a Whole and when Grouped According to Sex, School and School Site

Variables	Categories	Score Range	f	Mean	Interpretation
Sex	Male	Outstanding	33	89.51	Very Satisfactory
		Very Satisfactory	7		
		Satisfactory	9		
		Fairly Satisfactory	0		
		Did Not Meet Expectations	0		
	Female	Outstanding	70	89.69	Very Satisfactory
		Very Satisfactory	21		
		Satisfactory	18		
		Fairly Satisfactory	0		
		Did Not Meet Expectations	0		
School	A	Outstanding	25	93.85	Outstanding
		Very Satisfactory	1		
		Satisfactory	0		
		Fairly Satisfactory	0		
		Did Not Meet Expectations	0		
	B	Outstanding	3	82.9	Satisfactory
		Very Satisfactory	2		
		Satisfactory	15		
		Fairly Satisfactory	0		
		Did Not Meet Expectations	0		
	C	Outstanding	8	91.89	Outstanding
		Very Satisfactory	1		
		Satisfactory	0		
		Fairly Satisfactory	0		
		Did Not Meet Expectations	0		
	D	Outstanding	9	89.44	Very Satisfactory
		Very Satisfactory	4		
		Satisfactory	3		
		Fairly Satisfactory	0		
		Did Not Meet Expectations	0		
	E	Outstanding	14	91.61	Outstanding
		Very Satisfactory	4		
		Satisfactory	0		
		Fairly Satisfactory	0		
		Did Not Meet Expectations	0		
	F	Outstanding	32	89.63	Very Satisfactory
		Very Satisfactory	12		
		Satisfactory	5		
		Fairly Satisfactory	0		
		Did Not Meet Expectations	0		
G	Outstanding	7	88.25	Very Satisfactory	
	Very Satisfactory	9			
	Satisfactory	4			
	Fairly Satisfactory	0			
	Did Not Meet Expectations	0			
School Site	Rural	Outstanding	41	88.31	Very Satisfactory
		Very Satisfactory	20		
		Satisfactory	22		
		Fairly Satisfactory	0		
		Did Not Meet Expectations	0		
	Urban	Outstanding	57	91.09	Outstanding
		Very Satisfactory	13		
		Satisfactory	5		
		Fairly Satisfactory	0		
		Did Not Meet Expectations	0		
As a Whole	Outstanding	98	89.63	Very Satisfactory	
	Very Satisfactory	33			
	Satisfactory	27			
	Fairly Satisfactory	0			
	Did Not Meet Expectations	0			

Level of students’ academic performance in environmental science subject

The data for students’ level of academic performance in environmental science subject when they are taken as a whole and when grouped according to sex, school and school Site are presented in Table 3.

The results of the present study disclosed that students have a very satisfactory performance (Mean= 89.63) in academics when taken as a whole. Further, female students are better in terms of academic performance with mean score of 89.69 than male students (Mean= 89.51) but both scores were described as very satisfactory. When the students’ academic performance is grouped according to their schools, A (Mean= 93.85), C (Mean= 91.89) and E (Mean= 91.61) are outstanding. School D (M= 89.44), F (Mean= 89.63) and G (Mean= 88.25) are all very satisfactory and School B with the mean score of 82.90 is described as satisfactory in terms of academic performance in environmental science subject. The findings indicate that students perform well in their environmental science subject. Having very satisfactory performance means that providing environmental education to our students connects us to the world around us, teaching us about both natural and built environments. It indeed raises awareness of issues impacting the environment upon which we all depend, as well as actions we can take to improve and sustain it.

Whether we bring nature into the classroom, take students

outside to learn, or find impromptu teachable moments on a nature walk with our families, environmental education has many benefits for youth, educators, schools, and communities.

These findings were reinforced by the findings of Ebrahimi (2020) [10] that students’ academic achievement in environmental sciences is positively high. It is highly suggested that teachers put more efforts into teaching by means of technologies to Environmental Science students to help them improve their academic success. In contrast to this, Kiarie (2016) [19] results showed that students had a good level of academic achievement in environmental education (Kiarie, 2016) [19]. Furthermore, the descriptive analysis revealed that student achievement in environmental science is average (Dewi, 2018) [8] and some have higher marks (Ebrahimi, 2020) [10].

This study also aimed at determining the differences in the students’ level of environmental knowledge, sensitivity and academic performance according to their sex, school and school site as well as the significance of the relationship between the above-mentioned variables.

Relationship between the level of environmental sensitivity and academic performance

Table 4 presents the relationship of environmental sensitivity and academic performances of students in their environmental science subject.

Table 4: Relationship between the level of Environmental Sensitivity and Academic Performance

Level of Environmental Sensitivity	Academic Performance					Total
	Outstanding (90-100)	Very Satisfactory (85-89)	Satisfactory (80-84)	Fairly Satisfactory (75-79)	Did not Meet Expectation (75-below)	
Very High (4.20-5.00)	67	12	19	0	0	98
High (3.40-4.19)	22	15	5	0	0	42
Average (2.60-3.39)	9	4	1	0	0	14
Low (1.80-2.59)	0	2	2	0	0	4
Very Low (1.0-1.79)	0	0	0	0	0	0
Total	98	33	27	0	0	158

Computed (G) value: 0.110
 P- value: 0.078
 Decision: Accept Ho
 Interpretation: Not Significant at 0.05 level of significance

Goodman’s and Kruskal’s Gamma was used which revealed an r value of 0.078 magnitude of correlation. Moreover, there was no significant relationship found between environmental sensitivity and academic performances of students in their environmental science subject which means that the null hypothesis was accepted.

The result means that a good level of academic performance in environmental science subject among STE students do not instinctively lead them to become more sensitive in terms of their natural environment. It reveals that whatever the curriculum the school uses in teaching environmental science, it will not significantly affect how students act and respond when expose to environmental problems. Educators and curriculum planners should double their efforts in looking for activities and possible means that will awaken the sensitivity of the students. the value of stewardship must

be given importance in their curriculum. Exposing the students in the reals scenario by conducting fieldtrips in sites where efforts are given to enhance the quality of our environment.

It was found that, there is no statistically significant relationship between students’ environmental sensitivity and their academic performance in in Environmental Education (Kiarie, 2016) [19]. This finding conforms to the result of this study.

Within this decade of Education for Sustainable Development (ESD), educational institutions need to increase their efforts to educate their students for a sustainable future. Teachers are most influential in educating children and teenagers to be leaders of tomorrow in protecting the environment (Esa, 2010) [11].

Relationship between the level of environmental knowledge and academic performance

Presented in Table 5 below is the relationship of environmental sensitivity and academic performances of students in their environmental science subject.

Table 5: Relationship between the level of Environmental Knowledge and Academic Performance.

Level of Environmental Knowledge	Academic Performance					Total
	Outstanding (90-100)	Very Satisfactory (85-89)	Satisfactory (80-84)	Fairly Satisfactory (75-79)	Did not Meet Expectation (75-below)	
Very High (28-35.00)	3	0	0	0	0	3
High (21-27.99)	32	3	5	0	0	40
Average (14-20.99)	47	22	20	0	0	89
Low (7-13.99)	14	8	2	0	0	24
Very Low (0-6.99)	2	0	0	0	0	2
Total	98	33	27	0	0	158

Computed (G) value: 0.142
 P- value: 0.018
 Decision: Reject Ho
 Interpretation: Significant at 0.05 level of significance

Goodman’s and Kruskal’s Gamma was again used which revealed a p-value of 0.018 magnitude of correlation. This means that there was a significant relationship found between environmental knowledge and academic performances of students in their environmental science subject. With this result, the null hypothesis for the relationship between the academic performance in environmental science subject and environmental knowledge of STE students was rejected.

The relationship between environmental knowledge and students’ academic performance in environmental science was also investigated. The findings disclosed that the environmental knowledge had a significant effect on academic performance of the students. Given this fact, schools need to find solutions on how to improve the knowledge of the students about the environment to improve academic performance. Currently, STE schools have been implementing their own curriculum for environmental science, to improve their performance and obtain a sustainable competitive advantage. In this regard, the current study with serves as a guide to decision makers, who seek to

improve academic performance and capturing the environmental knowledge of the STE students. The findings indicate that STE implementing schools should emphasize greater attention to the key processes of acquiring knowledge like knowledge identification; knowledge acquisition; knowledge storage; knowledge sharing; and knowledge application. The researchers hoped that this study would encourage attention towards further research in domain area for more empirical studies.

In contrary, according to the results of the analyses, the environmental knowledge had positive influence on the secondary school students’ academic achievements as well as on their conceptual understanding (Artun & Özsevgeç, 2018) [4].

Students are reported to have their pro-environment behaviors as well as their pro-environment intentions, their explicit and implicit attitudes about the environment, and their knowledge about environmental issues. Intentions and knowledge significantly and independently predicted behavior. Environmental knowledge was not significantly related to attitudes (Levine & Strube, 2012).

Relationship between the level of environmental sensitivity and environmental knowledge

Table 6 below presents the relationship of environmental knowledge and environmental sensitivity of Science, Technology and Engineering students.

Table 6: Relationship between the level of Environmental Sensitivity and Environmental Knowledge

Level of Environmental Sensitivity	Level of Environmental Knowledge					Total
	Very High (28-35.00)	High (21-27.99)	Average (14-20.99)	Low (7-13.99)	Very Low (0-6.99)	
Very High (4.20-5.00)	3	30	52	11	2	98
High (3.40-4.19)	0	9	25	8	0	42
Average (2.60-3.39)	0	2	7	5	0	14
Low (1.80-2.59)	0	0	4	0	0	4
Very Low (1.0-1.79)	0	0	0	0	0	0
Total	3	41	88	24	2	158

Computed (G) value: 0.150
 P- value: 0.006
 Decision: Reject Ho
 Interpretation: Significant at 0.05 level of significance

Further, the null hypothesis for the relationship between environmental knowledge and sensitivity was rejected. Using the same statistical tool, the findings of the present research revealed a p-value of 0.006 magnitude of correlation. This means that there was a significant relationship found between environmental knowledge and sensitivity of students in their environmental science subject.

The researchers assumed that the increased knowledge about the environment can affect and change environmental sensitivity of the STE students. Both environmental knowledge and sensitivity are very important in influencing environmental policy implemented in schools and in the development of environmentally sound curriculum. However, little research has focused on public environmental knowledge or the relationship between knowledge and environmental attitudes. With the correlation of knowledge and sensitivity, the low level of environmental sensitivity has disturbing implications for environmental policy.

The environmental sensitivity being correlated environmental knowledge indicates that students who has high level of knowledge are more likely, for example, to have and gain more sensitivity through program participation than the other students or vice versa, as a causal relationship cannot be derived from the present study. In other words, students who refrain from making negative impact to the environment also seem to put more effort into improving their environmental knowledge and/or student who engage in learning about the environment will become less exploitative towards the environment.

The findings revealed significant positive correlation between environmental knowledge and environmental sensitivity (Faize & Akhtar, 2020) ^[12]. It can be concluded that connecting students with nature and then involvement in scientific argumentation helped in improving students' environmental knowledge and attitude.

Knowledge of the environment and environmental science is highly correlated with environmental attitudes; on the other hand, diverse environmental knowledge significantly correlated with pro-environmental behaviors. It was also suggested that environmental knowledge provided through a formal education could promote environmental attitudes including sensitivity, but it may not contribute to students' engagement in direct impact environmental behaviors (Janmaimool & Khajohnmanee, 2019) ^[18].

Also, students in general, have a good level of environmental knowledge. However, knowledge does not necessarily lead to practice. There was a weak relationship between students' level of knowledge and sustainable environment practices. Similarly, there was a weak relationship between students' attitude and sustainable environment practices. Hence, attitude is not a good predictor for sustainable environment practices. These findings highlight the complexity of the relationship between students' knowledge, attitude, and sustainable environment practice. The findings of this study also suggested that the internet is regarded as students preferred choice of media which can be utilized to disseminate environmental information (Ahmad *et al.*, 2015) ^[3].

Conclusions

Given the foregoing findings, the following conclusions were drawn:

1. The level of environmental knowledge of Science, Technology and Engineering (STE) students was average.
2. The students' environment sensitivity was very high.
3. The students' academic performance in their environmental science subject was very satisfactory.
4. Finally, there was no significant relationship found between students' environmental sensitivity and academic performance. There is a significant relationship between environmental knowledge and academic performance and students' environmental knowledge and sensitivity.

Recommendations

Based on the findings as mentioned above and conclusions, the following recommendations are advanced:

1. The students must acquire knowledge to help them understand to a certain extent the basic environmental concepts, theories, and laws, which is substantial for them to understand and analyze more complex

environmental principles and problems with the help of their teachers.

2. The students' score in the environmental sensitivity test indicates that students have appreciated the importance of environmental protection and conservation in the fullest sense as well as possessing the quality of environmental sensitivity. But even some of the scores were in high; the students seem to manifest a degree of environmental concern regarding some issues, like global warming, effects of smoking, and energy conservation which attained the highest mean score in the questionnaire. Thus, items achieving low scores were given importance in identifying the objectives in their subject.
3. Curriculum planners and school administrators may utilize the curriculum guide developed in this study to enhance the academic performance of the pupils in their environmental science subjects since the curriculum guide was carefully based on the improvement areas needed by the students.
4. The students' environmental knowledge will improve if they were more exposed to teaching strategies that could make them explore and appreciate the natural environment better. Students in the school that are active in environmental education program were found to possess skills needed to form judgments of their own on environmental issues, especially in the face of contradictory media messages about the environment.
5. The school must encourage field trips and other experiential approaches in teaching and must provide opportunities for the students to be exposed to programs whose primary concern is environmental protection and conservation for them to develop their sensitivity.
6. School administrators should conduct training programs, seminars, and workshops on varied teaching strategies for science teachers to be more efficient in choosing the most appropriate teaching methodology especially in their environmental science subject to enhance their academic performance. The administration should encourage curricular and co-curricular activities to include more opportunities for science learning as well as environmental awareness and commitment.
7. The significant relationship between environmental knowledge and academic performance means that schools should focus on providing an enhance curriculum and materials that included experiences with issue analysis, issue investigation, and working on real environmental issues and problems will be more successful in achieving environmental awareness. Lastly, the significant relationship between students' environmental knowledge and sensitivity means that schools should provide efforts in integrating the value of environmental friendliness in the schools' curricular and co-curricular programs, such being among the core values of the institution upholds may improve the students' environmental knowledge.

References

1. Abd Rahman N, Halim L, Ahmad AR. Environmental Knowledge among Aboriginal Students. Journal of Educational and Social Research, 2014. Doi: <https://doi.org/10.5901/jesr.2014.v4n6p279>
2. Abilo JME, Linaugo JD. Environmental knowledge and

- sensitivity of Senior High School Students. 2018; 2(1).
3. Ahmad J, Md. Noor S, Ismail N. Investigating students' environmental knowledge, attitude, practice and communication. *Asian Social Science*, 2015. Doi: <https://doi.org/10.5539/ass.v11n16p284>
 4. Artun H, Özsevgeç T. Influence of environmental education modular curriculum on academic achievement and conceptual understanding. *International Electronic Journal of Environmental Education*, 2018.
 5. Cline Z, *et al.* *Advances in Confluent Education, Volume 2: Multicultural Dynamics of Cultural Change*, 1999. Retrived: August 10, 2017. Available at: <http://www.cerd.org/bookseducation02.php>
 6. Curtis E, Comiskey C, Dempsey O. Importance and use of correlational research. *Nurse Researcher*. 2016; 23(6):20-25. Doi: <https://doi.org/10.7748/nr.2016.e1382>
 7. Department of Education. *Policy Guidelines on Classroom Assessment for the K to 12 Basic Education Program*, 2015.
 8. Dewi AS. Pengaruh Kurikulum, Lingkungan Pendidikan, Dan Sarana Prasarana Belajar Terhadap Prestasi Belajar Siswa Di Sekolah Menengah Pertama Negeri 1 Pagu Kabupaten Kediri. *Aplikasi Administrasi: Media Analisa Masalah Administrasi*, 2018. Doi: <https://doi.org/10.30649/aamama.v20i2.83>
 9. Dhillon RS, Von Wuehlisch G. Mitigation of global warming through renewable biomass. *Biomass and Bioenergy*, 2013.
 10. Ebrahimi SS. Environmental sciences students' achievements via conventional and technology-based instructions. *Journal of Environmental Treatment Techniques*. 2020; 8(1):437-441.
 11. Esa N. Environmental knowledge, attitude and practices of student teachers. *International Research in Geographical and Environmental Education*, 2010. Doi: <https://doi.org/10.1080/10382040903545534>
 12. Faize FA, Akhtar M. Addressing environmental knowledge and environmental attitude in undergraduate students through scientific argumentation. *Journal of Cleaner Production*, 2020. Doi: <https://doi.org/10.1016/j.jclepro.2019.119928>
 13. Fitzmaurice R, Jones R. *Confluent Activity Cards for Outdoor Education*. *Science Activities*. 1981; 18(3):21-24. Retrieved from: http://proxy.library.vcu.edu/login?url=http://search.proquest.com/docview/63548342?accountid=14780%5Cnhttp://vcu-alma-primo.hosted.exlibrisgroup.com/openurl/VCU/vcu_services_page?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&genre=article&s
 14. Francke AL, Erkens T. Confluent education: an integrative method for nursing (continuing) education. *Journal of Advanced Nursing*. 1994; 19(2):354-361. Doi: <http://doi.org/10.1111/j.1365-2648.1994.tb01092.x>
 15. Harley CDG. Climate Change, Keystone Predation, and Biodiversity Loss. *Science*. 2011; 334(6059):1124-1127. Doi: <https://doi.org/10.1126/science.1210199>
 16. Harun R, Hock LK, Othman F. Environmental knowledge and attitude among students in Sabah. *World Applied Sciences Journal*. 2011; 14(SPL1):83-87.
 17. International Energy Agency. *Energy and Air Pollution*. *World Energy Outlook - Special Report*, 2016, 266. Doi: <http://doi.org/10.1021/ac00256a010>
 18. Janmaimool P, Khajohnmanee S. Roles of environmental system knowledge in promoting university students' environmental attitudes and pro-environmental behaviors. *Sustainability (Switzerland)*, 2019. Doi: <https://doi.org/10.3390/su11164270>
 19. Kiarie SM. Effects of teachers' perceptions on students' perceptions and achievement in environmental education in secondary school biology in gilgil sub-county Nakuru county, Kenya. *International Journal of Environmental and Science Education*, 2016.
 20. Kim M. Fostering Environmental Sensitivity by Observing Everyday Environments. *Journal of Geography*, 2019. Doi: <https://doi.org/10.1080/00221341.2018.1564351>
 21. Kopnina H. Future Scenarios and Environmental Education. *The Journal of Environmental Education*. 2014; 45(4):217-231. Doi: <http://doi.org/10.1080/00958964.2014.941783>
 22. Kothari CR. *Research Methodology methods and Techniques*, New Delhi, 4th ed. New age international (P) ltd, 2009. ISBN (13): 978 -81- 224-2488-1. Retrieved May 6, 2014, from www.newagepublishers.com.
 23. Mohajan HK. Two Criteria for Good Measurements in Research: Validity and Reliability. *Annals of Spiru Haret University. Economic Series*. 2017; 17(4):59-82. Doi: <https://doi.org/10.26458/1746>
 24. Mohamed Osman M, Bachok S, Ibrahim AN. Chapter 7: The level of awareness towards environmental issues and concern among students in tertiary level: Case study of universities students in Kuala Lumpur and Klang Valley of Malaysia. In *Readers of Environmental Planning in Malaysia*. Batu Caves: IIUM Press, 2011, 59-73.
 25. Mohammed LA. Validity and reliability. In *Forensic Examination of Signatures*, 2019. Doi: <https://doi.org/10.1016/B978-0-12-813029-2.00009-8>
 26. Nadiroh N, Ananda R. Environmental Sensitivity Dan Hubungannya Dengan Perilaku Pelestarian Kearifan Lokal Pada Anak Usia Dini Masyarakat Suku Sasak. *Jpud - Jurnal Pendidikan Usia Dini*, 2017. Doi: <https://doi.org/10.21009/jpud.112.05>
 27. Ors F. Environmental Education and the Role of Media in Environmental Education in Turkey. *Procedia - Social and Behavioral Sciences*. 2012; 46:1339-1342. Doi: <http://doi.org/10.1016/j.sbspro.2012.05.298>
 28. Press A. University of Adelaide. *Nature*. 2012; 165(4185):60-60. Doi: <http://doi.org/10.1038/165060c0>
 29. Sibly H. ANU Press. 2015; 15(3):83-91.
 30. Solomon DL. *Confluent Education as a Metaphor*. Center for Educational Research and Development, 2000. Retrieved: August 8, 2017. Available at <http://www.cerd.org/bookseducation02.php>
 31. Sultana N, Md. Shahadat Hossen RK. Assessment of Environmental Knowledge and Attitude of Secondary Level Students of Tangail, Bangladesh. *International Journal of Research in Environmental Science*, 2017. Doi: <https://doi.org/10.20431/2454-9444.0302005>
 32. Terlević M, Istenič Starčič A, Šubic Kovač M. Sustainable spatial development in higher education. *Urbani Izziv*. 2015; 26(1):105-120. Doi: <http://doi.org/10.5379/urbani-izziv-en-2015-26-01-004>
 33. United Nations. *Sustainable Development GOALS - 17*

- Goals to transform our world. [http://doi.org/United Nations Development Program \(UNDP\), 2016](http://doi.org/United Nations Development Program (UNDP), 2016).
34. Vare JW. Moral Education for the Gifted: A Confluent Model. *Gifted Child Quarterly*, 23, 1979.
Doi: <http://doi.org/10.1177/001698627902300311>
35. Yılmaz N, Sibel E. Determining Undergraduate Students' Environmental Awareness and Environmental Sensitivity. *World Journal of Environmental Research*. 2017; 6(2):67. <https://doi.org/10.18844/wjer.v6i2.1631>