

# Effect of Environmental Knowledge and Awareness on Green Behavior: Testing Behavioral Intentions, Environmental Attitude, and Green Commitment as Mediators

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**Abstract** Schools have recognized the significance of incorporating sustainability into their curriculum to make a more visible societal and environmental impact. This causal research study determined the effect of environmental knowledge and awareness (EKA) on the green behavior (GB) of public elementary teachers. A simple random sampling technique is utilized to identify 89 study participants for the survey. For data analysis, regression and process mediation are employed. Results revealed that the more knowledgeable and aware the teachers are about the environment, the more they will participate in the environmentally friendly practices and programs of the schools. The relationship between EKA and GB is significantly and fully mediated by behavioral intentions (BI). Furthermore, this relationship is significant but partially mediated by environmental attitude (EA) and green commitment (GC). Therefore, this study suggests that the Department of Education develops the environmental knowledge and awareness of teachers through the practical application of Education for Sustainable Development with the help of project-based

learning competition, environmental education-focused modules, and the creation of school-based programs.

**Keywords:** *green commitment, environmental attitude, behavioral intentions, environmental knowledge and awareness, green behavior*

## Introduction

The Education for Sustainable Development (ESD) has been growing internationally as a fundamental element of quality education and a strategic enabler to sustainable development. It empowers learners with knowledge, skills, values, and attitudes in making educated decisions and responsible actions for environmental integrity, economic viability, and a just society (United Nations Educational, Scientific, and Cultural Organization [UNESCO], 2021). It is posited as Target 4.7, “By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles” (United Nations Development Programme [UNDP], 2022, Goal Target bullet 7). According to Shen and Wang (2022), environmental pollution has become more severe, and ecosystems have been steadily deteriorating. Such conditions not only restrict the growth of social production but have also affected the quality of life. Given the pressing global concerns and environmental issues, all public and private schools are urged by the government to steer environmental awareness. School administrators are expected to pursue effective school-based activities that will safeguard the environment (Bello, 2020). These administrators play key roles in education.

Education is considered a vital factor in achieving sustainable development (Valencia, 2018). In the Philippines, different government agencies work together in attaining

sustainable development in the country (Labog, 2017). Moreover, DepEd Order No. 52 s. 2011 was issued by former Secretary of Education, Bro. Armin Luistro to strengthen environmental education in schools (both public and private) to help deal with environmental problems. This is in pursuant of the Republic Act 9512 or the National Environmental Awareness and Education Act of 2008. Its main goal was to “urge all the public and private schools to lead the role on environmental awareness by enhancing environmental education and by pursuing effective school-based activities that seek to preserve and protect the environment” (DepEd, 2011, Item # 1).

Environmental issues are being faced around the world over the past few decades which have proliferated since the late 20<sup>th</sup> century and have caused negative environmental consequences (Joshi & Rahman, 2015). This change is brought about by the growing environmental problems caused by human activities (Steibl & Laforsch, 2019). Overpopulation, pollution, the use of fossil fuels, and deforestation are all effects of humans on the physical environment. Climate change, soil erosion, poor air quality, and undrinkable water have all resulted from these types of changes (National Geographic Society, 2022). According to Asadieh and Krakauer (2017), these scenarios will cause the destruction of many lives and properties but this can be prevented through the help of businesses, government, and non-government organizations which play a prime role in conserving the environment as society envisions sustainable development (Awuni & Du, 2016).

According to Abell (2016); Mohiuddin, Al Mamun, Syed, Masud, and Su (2018); and Safari, Salehzadeh, Panahi, and Abolghasemian (2018), training courses in environmental education can educate employees that will increase environmental knowledge and awareness (EKA). Furthermore, research-based environmental education

effectively creates environmentally-focused adults (Abell, 2016). Understanding the green behavior of the teachers as being affected by their knowledge and awareness of the environment can be used in leading a role for their students as protectors and preservers of the environment.

Most of the literature which links EKA to GB focused on industries such as manufacturing and hotels. The study of Safari et al. (2018) is one of the first studies to look at the various pathways from environmental knowledge and awareness to green behavior at the same time while focusing on the iron and steel industry in a developing country. They revealed that environmental knowledge and awareness have a significant direct impact on managers' green behavior.

Consequently, literature that focused on education considered the students as the respondents. Therefore, this study focused on determining the effect of environmental knowledge and awareness on the green behavior of public elementary teachers as mediated by behavioral intention (BI), environment attitude (EA), and green commitment (GC) in support of the Memorandum Order No. 52 s. 2011. Unfortunately, there were limited seminars, lectures, workshops, and conferences implemented and facilitated for the teachers focusing on environmental education. However, this study is beneficial in reviving the heart and focus on environmental education with the support of the management of the Department of Education. This study targeted recommending programs geared toward sustainability focusing on the environmental behavior of the teachers.

### **Environmental Knowledge and Awareness**

According to Joshi and Rahman (2016) and Taufique et al. (2016), environmental knowledge refers to the knowledge and awareness of environmental issues including the responsibility of an individual in the environment which

leads to sustainable development. The environmental attitude (EA) is related significantly to environmental behavior (EB) (Itasanmi et al., 2019; Pratiwi et al., 2018; Sugandini et al. 2019). It is supported by the study of Zheng et al. (2018) that there are positive correlations between environmental knowledge (EK) and environmental attitude (EA) and between environmental attitude (EA) and environmental behavior (EB). Thus, environmental attitude predicts environmentally friendly behavior (Arı & Yılmaz, 2016). Pro-environmental behavior is not always influenced by attitude and there are also other factors that affect and contribute to this kind of behavior (Harding, 2016; Sugandini et al., 2019). Furthermore, Martínez-Borreguero et al. (2020) confirmed that the teachers exhibit an adequate level of environmental awareness, specifically a high positive attitude by incorporating sustainable development in their workload.

The investigations which link EKA to GB provide positive feedback on their relationship with each other but there are also studies that contradict this significant relationship. The studies of Onel and Mukherjee (2016); and Arı and Yılmaz (2016) found that environmental knowledge has a non-significant impact on behavioral outcomes; while environmental awareness has an indirect effect on pro-environmental behavior. Sugandini et al. (2019) stated that positive intentions are not always followed by positive behavior. According to Fakhrudin et al. (2018), behavioral intentions and environmental attitude do not sufficiently promote environmentally friendly behavior and there is no significant link to environmental knowledge.

### **Green Behavior**

Green behavior (GB) of the employees is defined by Ones and Dilchert (cited by George & Jayakumar, 2017) “as any measurable individual behavior that contributes to environmental sustainability goals in the work context” (p. 119)

which is characterized by “working sustainably, conserving resources, influencing others, taking initiative, and avoiding harm” (p. 120). Recycling, reusing, conservation of energy, and minimization of waste are some of the green proceedings of green behavior (Safari et al., 2018). Furthermore, a positive behavior toward the environment can also be referred to as an environmentally friendly attitude or environmentally sustainable behavior, which is the same with GB.

Behavioral intention is “the possibility that a person’s perceived or subjective likelihood that he or she will engage in a certain behavior” (Mufidah et al., 2018, p. 6). Based on the study of Sugandini et al. (2019), environmental attitude (EA) is defined as one of the internal forces that have a strong effect on behavior by comprehending a set of beliefs, desires, emotions, and behavioral intentions concerning the environment while green commitment is defined as “a frame of mind denoting both a sense of attachment and responsibility to environmental concerns” (Raineri & Paillé, 2016, p. 5). One significant determinant of positive behavior is intention. As the intention increases, the knowledge and the engagement with environmentally responsible behavior will also increase (Mohiuddin et al., 2018). Environmental knowledge positively influences behavioral intentions positively (Najjarzadeh et al., 2018; Pan et al., 2018). The study of Mohiuddin et al. (2018) cited that in general there is no behavior without occurring an intention. The behavior of a human is being affected by its behavioral intention and unwise human behavior causes environmental problems (Fakhrudin, et al., 2018). Since behavior is confirmed to be affected by intention, behavioral intention can support environmentally friendly behavior (Fakhrudin et al., 2018).

On the other hand, Paillé et al. (2019) stated that environmental commitment has a positive effect on GB which implies that commitment to the environment leads to pro-environmental behavior. Commitment depends on behavior

(Qureshi, 2019). Hence, in predicting environmentally responsible behavior, the commitment to the environment should be considered (Safari et al., 2018; Wang, 2016). Teachers expressed a strong commitment to implementing sustainability principles in school (Abramovich & Loria, 2015), which implied that having a higher degree of pro-environmental behavior will have implications for environmental education (Mc Ewen et al., 2015).

### **Education for Sustainable Development**

Education for sustainable development (ESD) has been prioritized and pursued by different countries around the world, including the Philippines (Valencia, 2018). According to Fekih Zguir et al. (2021), the idea of ESD was developed to thoroughly understand and change education systems fostering and stimulating the sustainability of future generations. The learning process, which enhances the cognitive, social and emotional, and behavioral dimensions of learning, is constant and a fundamental element of quality education. It seeks to holistically transform the learning environment itself, including the learning content and outcomes and pedagogy (UNESCO, 2021). ESD brings a major contribution to all 17 Sustainable Development Goals (Lazarov & Semenescu, 2022).

Currently, a number of problems resulting from human development activities such as climate change, resource depletion, and poverty are being faced by the world. ESD fosters the builders of a sustainable society through learning and educational activities that target the development of transformative values and actions to realize a sustainable society by taking the responsibility for these problems in the immediate environment ensuring that human beings will be able to secure an abundant life for the future (Ministry of Education, Culture, Sports, Science, and Technology – Japan [MEXT], n.d.). In the Philippines, the government advanced

ESD in different sectors, including academic institutions. Republic Act (RA) No. 9512 or the National Environmental Awareness and Education Act of 2008 has been enacted to support such. This law directs all concerned agencies to integrate environmental education into public and private school curricula at all levels (Valencia, 2018).

The studies which link EKA to GB have gained attention from previous researchers, considering its relevance to the achievement of sustainable development, however, such provided contrasting results. This study targeted to extend through focusing on public elementary education with teachers as respondents. The end goal is to recommend programs geared toward sustainability focusing on the environmental behavior of the teachers.

### **Framework of the Study**

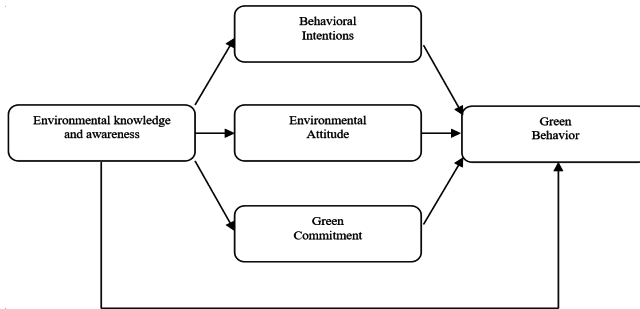
This study was anchored on Safari et al. (2018) that GB is a behavior of an individual in the workplace that helps in achieving a sustainable environment. This refers to the extent to which the employees go beyond their respective duties to be able to participate in pro-environmental activities such as pollution-reduction programs and recycling. Moreover, EKA is the comprehension of an individual on the issues and solutions to the environmental problems which affect their behavior in the workplace. On one hand, behavioral intentions as one of the mediators, refer to the intention of an individual that was influenced by knowledge and awareness which leads to GB. On the other hand, environmental attitude, as another mediator, was defined as an individual's beliefs in handling knowledge about eco-friendly activities such as habits of consumption, environmental education, and eco-friendly lifestyle which leads to green behavior (GB). Lastly, green commitment (GC) refers to the commitment of an individual



to the environment as influenced by their knowledge which predicts environmentally responsible behavior. Relationships among variables are presented in Figure 1.

**Figure 1**

*Conceptual Framework*



*Source: Multiple pathways linking EKA to employee's GB (Safari et al., 2018)*

The results of the study of Safari et al. (2018) revealed that there is a positive and significant correlation between all the variables. The aforementioned authors discovered that environmental knowledge has a significant direct effect on GB. Also, EKA has a significant indirect effect on GB as mediated by the mediating variables. Hence, the analysis of Safari et al. (2018) tells that the mediating role of variables BI, EA, and GC affects and has a positive impact between EKA and GB which indicates that as the intentions, attitude, and commitment increase, GB also increases.

Similar to the study of Safari, et al. (2018), this is one of the first studies to look at the various pathways from environmental knowledge and awareness to green behavior. While the study of Safari is conducted in Iran to iron steel industry, this current study is done in the Philippines focusing on the public elementary teachers as opposed with the studies focusing on students.

## **Purposes of the Research**

In general, this study investigated the pathways linking EKA and GB. Specifically, it seeks to achieve the following:

1. to determine the effect of EKA on GB;
2. to test the mediating effect of BI on the relationship between EKA and GB;
3. to test the mediating effect of EA on the relationship between EKA and GB; and
4. to test the mediating effect of GC on the relationship between EKA and GB.

## **Hypotheses of the Study**

This study tests the following hypotheses:

$H_{o1}$ : EKA has no significant effect on GB.

$H_{o2}$ : Relationship between EKA and GB is not significantly mediated by BI.

$H_{o3}$ : Relationship between EKA and GB is not significantly mediated by EA.

$H_{o4}$ : Relationship between EKA and GB is not significantly mediated by GC.

## **Methodology**

### **Research Design**

In this study, causal research design was employed in public elementary school teachers at the Division of Lipa City. They were chosen being known to be the key in the successful implementation of environmental education and literacy who are relevant in increasing knowledge and awareness about the

environment which turns into a pro-environmental behavior (Gkargkavouzi et al., 2018). It is important to possess green behavior because of their ability to set an example to their students in promoting positive behavior towards the environment at an early age (Alvarez-García et al., 2018).

### **Participants and Sampling Process**

Using G-power analysis with .15 effect size, .05 error probability, and .95 power level, the sample size for this study is 89. A simple random sampling technique was employed to determine the respondents in this research. Based on the list of public elementary teachers provided by the Department of Education in Lipa City, Batangas, a random number generator was used to identify the respondents.

### **Instrument**

This research used the 6-point likert scale survey questionnaire adapted from the study of Safari et al. in 2018 as published by Emerald Publishing Limited. The study of Zuell and Scholz (2016) stated that the use of even number response prompts the respondents to make a choice which will lead to different frequencies. In addition, eliminating the midpoint increases the use of categories because the middle category provides an ambiguous meaning which implies unwillingness to state an opinion (Willits et al., 2016). The reliability test results and the assessment on the variables of the study which consist of five parts are shown in Table 1.

The measurement items have a high degree of internal reliability as shown on its Cronbach's alpha and composite reliability which ranges from .93 to .96 based on the recommendation of Fornell & Larcker (1981) that should be  $\geq .70$ . In addition, the instrument is proven valid as shown on its computed average variance extracted that ranges from .731 to .799 (Lam, 2012).

**Table 1**

*Questionnaire Specifications*

<b>Variables</b>	<b>Question Number</b>	<b>Cronbach's Alpha</b>	<b>Avg. Var. Extract</b>
Environmental Knowledge and Awareness (EKA)	1-4	.95	.732
Behavioral Intentions (BI)	5-8	.93	.745
Environmental Attitude (EA)	9-12	.95	.799
Green Commitment (GC)	13-16	.93	.735
Green Behavior (GB)	17-21	.96	.731

### **Data Collection**

Full consent of the respondents was initially sought as part of the ethical consideration of the study. No participants were harmed in conducting this study. Lastly, all information and responses of the participants were kept confidential in compliance with the Republic Act No. 10173 or the Data Privacy Act.

In data gathering, a request letter was initially sent to the Schools Division Superintendent (SDS) and secured an approval and endorsement letter from their office directing to the School Heads in the Division of Lipa City. This formally informed the agency about the conduct of the study. Upon approval and endorsement, the questionnaires were distributed to the 89 randomly selected public elementary school teachers, accounting for 100%-retrieval rate.

### **Data Analysis**

A simple regression analysis was employed. For the mediation analysis, the process approach developed by Hayes (2012) was used. A p-value of  $\leq .05$  indicates the rejection of the null hypothesis (Cleophas et al., 2016).

## Results and Discussion

Table 2 reveals that the teachers have a high environmental knowledge and awareness with a mean ranging from 4.81 to 5.23. While this result may be considered as high, it indicates room for improvement. Further, standard deviation values show that responses do not greatly vary.

**Table 2**

*Descriptive Statistics of the Variables*

<b>Variables</b>	<b>Mean</b>	<b>Std. Deviation</b>
Environmental Knowledge and Awareness (EKA)	5.10	.782
Green Behavior (GB)	4.81	.812
Behavioral Intentions (BI)	5.03	.736
Environmental Attitude (EA)	5.23	.744
Green Commitment (GC)	5.02	.780

These current findings confirm the study of Padmanabhan et al. (2017), Martínez-Borreguero et al. (2020), and Abramovich and Loria (2015). Having a higher degree of pro-environmental behavior will have implications to environmental education (Mc Ewen et al., 2015). This environmental knowledge and awareness, and green behavior of public elementary teachers provides a good baseline data for the Department of Education in the assessment of their teachers. This result may be used in designing the environmental programs for public schools. Furthermore, this finding proves to be good data to advance in determining the relationship among variables.

### Effect of EKA on GB

This section provides the regression matrix indicating the effect of EKA on GB. The results in Table 3 reveal

that EKA explained 44% of the variance in GB,  $R^2=.442$ , ( $F$ -value = 68.924,  $p$ -value < .05). Furthermore, EKA was found to affect GB significantly and positively ( $\beta=.690$ ,  $t$ -value = 8.30,  $p$ -value < .05). This result may mean that the more knowledgeable and aware the teachers are about the environment, the more they will participate in the environmentally friendly practices and programs of the schools. As they gain environmental knowledge and awareness, they tend to act positively towards the environment. Moreover, increasing the knowledge and awareness of the teachers about the environment will result in a significant increase in their green behavior.

**Table 3**

*Effect of EKA on GB*

Model	Unstandardized Coefficients		Standardized Coefficients	t-value	p-value
	B	Std. Error	Beta		
1. (Constant)	1.293	.427		3.028	.003
Environmental Knowledge and Awareness (EKA)	.690	.083	.665	8.302	.000*
R2=.442	F-value= 68.924			P-value =.000	

a. Dependent Variable: Green Behavior

\* significant @  $p$ -value < .05

These results support the study of Kim et al. (2018) revealing a significant and positive association between knowledge and green behavior. Environmental knowledge is a strong contributor and predictor of pro-environmental behavior (Duan & Sheng, 2018; Harding, 2016). According to Abell (2016), Mohiuddin et al. (2018) and Safari et al. (2018), training courses about environmental education can educate employees that will increase environmental knowledge and awareness.

## **Mediating role of BI in the relationship between EKA and GB**

This section presents the role of BI as a mediator between EKA and GB. Model 1 in Table 4 presents that EKA contribution to GB is significant ( $\beta = .690, p\text{-value} < .05$ ). Model 2 indicates the actual effect of EKA on the mediator variable, BI. Results reveal that EKA has a positive effect on BI, which means that if the teachers acquire more knowledge and awareness about the environment, the more they will express their intention to perform eco-friendly practices. Furthermore, it was also found that EKA contribution to BI is significant ( $\beta = .766, p\text{-value} < .05$ ).

As seen in Model 3, when the BI was added in the model, the effect of EKA on GB became not significant ( $\beta = .204, p\text{-value} > .05$ ), however, BI significantly predicts GB ( $\beta = .633, p\text{-value} < .05$ ). Results found a .485 indirect effect of EKA on GB through BI. This result indicates that BI fully mediates the relationship between EKA and GB given a 70% mediation effect. The finding further implies that the teachers' behavioral intention is related to their environmental knowledge and awareness, and that their green behavior is being attained through their behavioral intentions.

These current findings conform to the studies of Pan et al. (2018) and Najjarzadeh et al. (2018) which revealed that knowledge about the environment has a significant positive effect on behavioral intentions. Additionally, the study of Mohiuddin et al., (2018) stated that there will be no occurrence of behavior without intention. As the knowledge increases, its intention will also increase which would lead to a high engagement to environmentally responsible behavior.

**Table 4**

*Mediating role of BI in the relationship between EKA and GB*

Unstandardized Coefficients						
Model	B	Std. Error	t-value	p-value	Indirect Effect	Percent of Mediation
1. (Constant)	1.293	.427	3.028	.003		
Environmental Knowledge and Awareness (EKA)	.690	.083	8.302	.000*		
<i>F-value= 68.9239</i>						
Dependent Variable: Green Behavior						
2. (Constant)	1.122	.310	3.615	.001		
Environmental Knowledge and Awareness (EKA)	.766	.060	12.689	.000*		
<i>F-value= 161.0105</i>						
Dependent Variable: Behavioral Intentions						
3. (Constant)	.582	.409	1.424	.158		
Environmental Knowledge and Awareness (EKA)	.204	.125	1.632	.106	.485	.703
Behavioral Intentions (BI)	.633	.132	4.809	.000*		
<i>F-value= 68.9239</i>						
Dependent Variable: Green Behavior						

\* significant @ *p-value* < .05



## **Mediating role of EA in the relationship between EKA and GB**

This section presents the role of EA as a mediator between EKA and GB. Model 1 in Table 5 presents that EKA contribution to GB is significant ( $\beta = .690, p\text{-value} < .05$ ). Model 2 reveals that EKA has a positive effect on EA, which means that if the teachers gain more environmental knowledge and awareness, they tend to act in a proper manner as per the environment is concerned. Further, it was also found that EKA contribution to EA is significant ( $\beta = .802, p\text{-value} < .05$ ).

As seen in Model 3, when EA was added in the model, the significant effect of EKA on GB remains as EA also significantly predicts GB. Results found a .328 indirect effect of EKA on GB through EA. Such findings show that EA partially mediates the relationship between EKA and GB given a 48% mediation effect. This result may also mean that when the level of EKA of the teachers is high, it may develop a proper environmental attitude. This condition may then lead to a better green behavior among them. At the same time, their environmental knowledge and awareness alone can positively affect their green behavior directly.

These current findings are supported by the study of Zheng et al. (2018), that environmental knowledge has a significant and positive relationship to environmental attitude and that environmental attitude has a significant and positive relationship with environmental behavior. Moreover, findings of Sugandini et al. (2019) and Pratiwi et al. (2018) cited the existence of a positive and significant effect between environmental knowledge and attitude. Also, the study of Itasanmi et al. (2019) noted that there is a significant relationship between environmental attitude and environmental behavior.

**Table 5**  
*Mediating role of EA in the relationship between EKA and GB*

Unstandardized Coefficients						
Model	B	Std. Error	t-value	p-value	Indirect Effect	Percent of Mediation
1. (Constant)	1.293	.427	3.028	.003		
Environmental Knowledge and Awareness (EKA)	.690	.083	8.302	.000*		
<i>F-value=68.9239</i>						
Dependent Variable: Green Behavior						
2. (Constant)	1.141	.324	3.519	.001		
Environmental Knowledge and Awareness (EKA)	.802	.063	12.725	.000*		
<i>F-value=161.9191</i>						
Dependent Variable: Environmental Attitude						
3. (Constant)	.827	.437	1.894	.062		
Environmental Knowledge and Awareness (EKA)	.362	.134	2.692	.009*	.328	.475
Environmental Attitude (EA)	.409	.135	3.027	.003*		
<i>F-value=42.2777</i>						
Dependent Variable: Green Behavior						

\* significant @ *p-value* < .05

## **Mediating role of GC in the relationship between EKA and GB**

The section presents the role of GC as a mediator between EKA and GB. Model 1 in Table 6 presents that EKA contribution to GB is significant ( $\beta = .690$ ,  $p\text{-value} < .05$ ). Model 2 revealed that EKA has a positive effect on GC, which means that as the teachers expand their knowledge and awareness about the environment, they develop a strong commitment in implementing eco-friendly practices in schools. Furthermore, it was also found that EKA contribution to GC is significant ( $\beta = .681$ ,  $p\text{-value} < .05$ ).

Moreover, as seen in Model 3, when GC was added in the model, the significant effect of EKA on GB remains as GC also significantly predicts GB. Results also found a  $.269$  indirect effect of EKA on GB through GC. Such result indicates that GC partially mediates the relationship between the EKA and GB given a 39% mediation effect. This finding implies that the commitment of the teachers towards the environment prompts their action towards its betterment. Furthermore, EKA also directly affects the GB of the teachers. Even without linking to GC, the level of the teachers' knowledge and awareness about the environment affects the way the teacher acts towards their environment.

These results are in line with the study of Paillé et al. (2019) which revealed that environmental commitment has a positive effect on GB which implies that commitment to the environment leads to pro-environmental behavior. Further Qureshi (2019) also noted that commitment depends on the behavior.

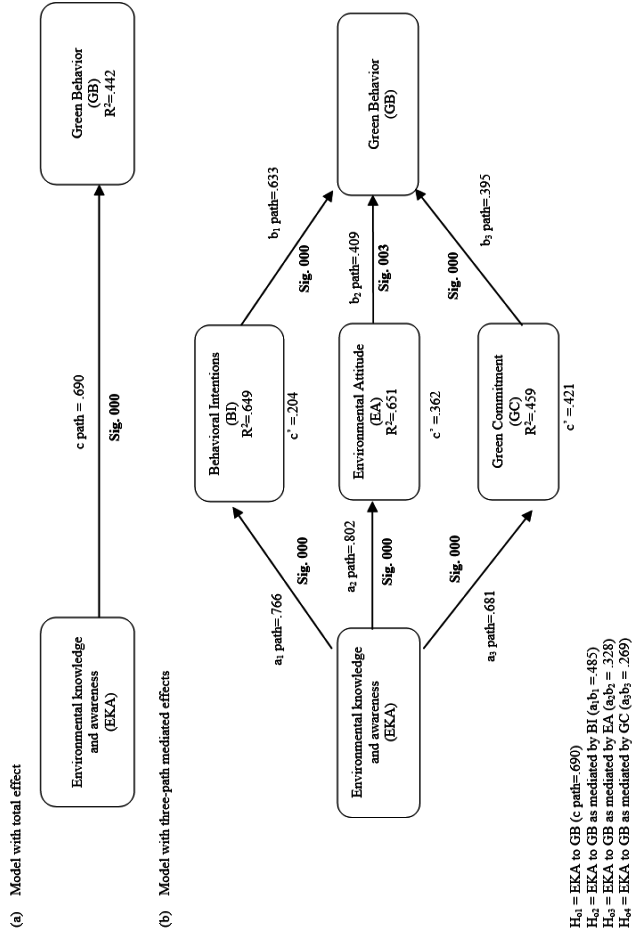
In summary, Figure 2 shows that (a), EKA has a significant total effect of  $.690$  on GB indicating that the higher the knowledge and awareness about the environment, the higher the green behavior that the teachers may possess

**Table 6**  
*Mediating role of GC in the relationship between EKA and GB*

Unstandardized Coefficients						
Model	B	Std. Error	t-value	p-value	Indirect Effect	Percent of Mediation
1. (Constant)	1.293	.427	3.028	.003		
Environmental Knowledge and Awareness (EKA)	.690	.083	8.302	.000*		
<i>F-value=68.9239</i>						
Dependent Variable: Green Behavior						
2. (Constant)	1.550	.407	3.808	.000		
Environmental Knowledge and Awareness (EKA)	.681	.079	8.598	.000*		
<i>F-value=73.9284</i>						
Dependent Variable: Green Commitment						
3. (Constant)	.680	.430	1.583	.117		
Environmental Knowledge and Awareness (EKA)	.421	.105	3.995	.000*	.269	.390
Green Commitment (GC)	.395	.105	3.772	.000*		
<i>F-value=46.8150</i>						
Dependent Variable: Green Behavior						

\* significant @ *p-value* < .05

**Figure 2**  
*Mediation Analysis*



( $R^2=.442$ ). The EKA, by itself, gives rise to GB, as revealed in the values of  $c'=.204$ ,  $c'=.362$  and  $c'=.421$  shown in Model b. However, EKA also has an indirect effect on GB as fully mediated by BI ( $a_1b_1=.485$ ) and partially mediated by EA ( $a_2b_2=.328$ ), and GC ( $a_3b_3=.269$ ). This finding means that if the teachers have a high level of knowledge and awareness, their intention to perform environmentally and friendly practices improve. They also develop a proper attitude and imply greater commitment in doing environmental actions which will then foster better green behavior. These results support Memorandum Order No. 52 s. 2011. It also implies the need to strengthen environmental education of teachers, as role models of students, towards a more sustainable future.

## **Conclusion and Recommendations**

This study investigated the pathways linking EKA and GB. This study concluded that the knowledge and awareness about the environment has a significant effect on the teachers' environmental behavior, therefore, the study rejects  $H_01$ . This means that knowledge and awareness about the environment is essential in having green behavior. School has a starring position in the implementation of environmental education. In the execution of this environmental education, teachers perform a crucial role fostering knowledge and awareness. Such provides a lifelong learning opportunity for the society to give importance to fighting the environmental problems. Providing knowledge and awareness to the teachers in relation to the environment helps them gain behavior that is favorable to the environment.

Moreover, it was found that the relationship between EKA and GB is significantly and fully mediated by behavioral intentions (BI), therefore, the study rejects  $H_02$ . This means that the green behavior of the teachers is associated with

their intention to facilitate environmentally friendly practices which come from their knowledge and awareness. With this, attaining knowledge and awareness of the teachers towards the environment leads to behavioral intentions that will improve their green behavior.

Furthermore, it was also discovered that the relationship between environmental knowledge and awareness (EKA) and green behavior (GB) were significantly and partially mediated by environmental attitude (EA) and green commitment (GC). Therefore, the study rejects  $H_{o3}$  and  $H_{o4}$ . This means that as the teachers obtain knowledge and awareness, their green behavior improves, though such an effect is partially mediated by their attitude and commitment towards the environment.

In conclusion, education enhances knowledge and awareness leading to better green behavior. Acting as models to their students, teachers are not to be left behind in environmental education. If this education is carried out efficiently, then the environmental problems that the world is facing at the present time may be reduced, thus creating a more sustainable and greener environment.

This study suggests to increase and deepen the environmental knowledge and awareness of the teachers through practical application of ESD of the management of the Department of Education as the policymakers. Supporting school policies may be created to ensure that teachers are enriched in their environmental knowledge and awareness. They are recommended to create school-based activities and programs like project-based learning competition and environmental education focused modules.

Project-based learning competition aims to gather project proposals of the teachers pertaining to innovative and sustainable ways of protecting the environment. Teachers

will gather ideas about building projects in relation to the environment through facilitation of fora with invited guest speakers who have executed an actual project in relation to environmental sustainability. The formulation of the project will follow through the help of mentorship from the experts from the other government agencies such as DENR, DA, DOE, DOH, DILG, DOST, and DOT. The winning project may be executed through the help of funding offered by leading companies in different industries in the country. The collaborative efforts of the teacher's learning, guidance from the experts, and funds from the partnered companies would have a great help in building a sustainable future.

Additionally, the management may also construct environmental education focused modules to be integrated in the In-Service Training (INSET) of the teachers. This may help teachers in gathering teaching techniques in relation to sustainability. The management may also create school-based activities and programs about the environment which must be included in the school calendar. This school-based program will be celebrated on a regular basis in different schools to be able to continually engage the schools in environmental awareness.

The research focused on the Philippine public schools. Future research directions could consist of studying private schools as they have different resources to pursue ESD. Moreover, qualitative approaches like focus group discussions and interviews may be useful in order to capture the subjective viewpoints of the students.





## References

- Abell, K. (2016). *Relationships among Environmental Attitudes, Environmental Knowledge, and Outdoor Recreational Habits of Upper Elementary School Students in Mississippi*. <https://scholarsjunction.msstate.edu/td/3769/>
- Abramovich, A., & Loria, Y. (2015). *The Long-Term Impact of an Education for Sustainability Course on Israeli Science and Technology Teachers' Pro-Environment Awareness, Commitment and Behaviour*, 31(2), 264–279.. <https://doi.org/10.1017/ae.2015.31>
- Alvarez-García, O., Sureda-Negre, J., & Comas-Forgas, R. (2018). Assessing environmental competencies of primary education pre-service teachers in Spain. *International Journal of Sustainability in Higher Education*, 19(1), 15-31. <https://doi.org/10.1108/ijsh-12-2016-0227>
- Ari, E., & Yilmaz, V. (2016). Effects of environmental illiteracy and environmental awareness among middle school students on environmental behavior. *Environment, Development and Sustainability*, 19(5), 1779-1793. <https://doi.org/10.1007/s10668-016-9826-3>
- Asadieh, B., & Krakauer, N. Y. (2017). Global change in streamflow extremes under climate change over the 21st century. *Hydrology and Earth System Sciences*, 21(11), 5863-5874. <https://doi.org/10.5194/hess-21-5863-2017>
- Awuni, J. A., & Du, J. (2015). Sustainable consumption in Chinese cities: Green purchasing intentions of young adults based on the theory of consumption values. *Sustainable Development*, 24(2), 124-135. <https://doi.org/10.1002/sd.1613>
- Bello, B. (2020). Evaluation on the implementation of environmental education activities among public

- secondary schools in south central Mindanao. *Global Scientific Journal*, 8(10), 665 - 675
- Cleophas, T. J., & Zwinderman, A. H. (2012). *Statistics applied to clinical studies*. Springer Science & Business Media.
- DepEd. (2011, July 5). *July 5, 2011 DO 52, S. 2011 – Strengthening environmental education in public and private schools*. Department of Education. <https://www.deped.gov.ph/2011/07/05/do-52-s-2011-strengthening-environmental-education-in-public-and-private-schools/>
- Duan, W., & Sheng, J. (2018). How can environmental knowledge transfer into pro-environmental behavior among Chinese individuals? *Journal of Public Health*, 6(3), 289–300. <https://doi.org/10.1007/s10389-017-0873->
- Fakhrudin, I. A., Karyanto, P., & Ramli, M. (2018). Behavioral intention and its relationship with gender: A study of green school students in Surakarta, Indonesia. *Journal of Physics: Conference Series*, 1022, 012043. <https://doi.org/10.1088/1742-6596/1022/1/012043>
- Fekih Zguir, M., Dubis, S., & Koç, M. (2021). Embedding education for sustainable development (ESD) and SDGs values in curriculum: A comparative review on Qatar, Singapore and New Zealand. *Journal of Cleaner Production*, 319, 128534. <https://doi.org/10.1016/j.jclepro.2021.128534>
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39. <https://doi.org/10.2307/3151312>
- George, J. S., & Jayakumar, K. N. (2017). Is it time to promote employee green behaviour? The need and scope. *Journal of Management Research and Analysis*. DOI: 10.18231/2394-2770.2017.0017

- Gkargkavouzi, A., Halkos, G., & Matsiori, S. (2018, February 11). *Teachers' environmental knowledge and pro-environmental behavior: An application of CNS and EID scales - Munich personal RePEc archive*. - Munich Personal RePEc Archive. <https://mpra.ub.uni-muenchen.de/84505/>
- Harding, B. A. (2016). Considering Efficacy of an Outdoor Environmental Education Program: Facilitating Elementary Students' Environmental Knowledge, Attitudes, and Behaviours. *ProQuest Dissertations and Theses*, 98. <https://search.proquest.com/docview/1823989094?accountid=40148>
- Hayes, A. F. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling [White paper]. Retrieved from <http://www.afhayes.com/public/process2012.pdf>
- Itasanmi, S. A., Akintolu, M., & O. Ojedeji, S. (2019). Effects of age and education on market women's environmental knowledge, attitude and behaviour. *Journal of Gender, Information and Development in Africa*, 8(2), 77-90. <https://doi.org/10.31920/2050-4284/2019/8n2a5>
- Joshi, Y., & Rahman, Z. (2015). Factors affecting green purchase behaviour and future research directions. *International Strategic Management Review*, 3(1-2), 128-143. <https://doi.org/10.1016/j.ism.2015.04.001>
- Joshi, Y., & Rahman, Z. (2016). Predictors of young consumer's green purchase behaviour. *Management of Environmental Quality: An International Journal*, 27(4), 452-472. <https://doi.org/10.1108/meq-05-2015-0091>
- Kim, M., Kim, J., & Thapa, B. (2018). Influence of environmental knowledge on affect, nature affiliation and pro-environmental behaviors among tourists.

*Sustainability*, 10(9), 3109. <https://doi.org/10.3390/su10093109>

Labog, R. S. (2017). Teachers' Integration of Environmental Awareness and Sustainable Development Practices. *Asia Pacific Journal of Multidisciplinary Research*, 5(3), 102–110. <http://www.apjmr.com/wp-content/uploads/2017/08/APJMR-2017.5.3.2.14.pdf>

Lam, L. W. (2012). Impact of competitiveness on salespeople's commitment and performance. *Journal of Business Research*, 65(9), 1328–1334. <https://doi.org/10.1016/j.jbusres.2011.10.026>

Lazarov, A. S., & Semenescu, A. (2022). Education for sustainable development (ESD) in Romanian higher education institutions (HEIs) within the SDGs framework. *International Journal of Environmental Research and Public Health*, 19(4), 1998. <https://doi.org/10.3390/ijerph19041998>

Martínez-Borreguero, G., Maestre-Jiménez, J., Mateos-Núñez, M., & Naranjo-Correa, F. L. (2020). Analysis of environmental awareness, emotions and level of self-efficacy of teachers in training within the framework of waste for the achievement of sustainable development. *Sustainability*, 12(6), 2563. <https://doi.org/10.3390/su12062563>

Mc Ewen, B., Clement, P., Gericke, N., Nyberg, E., Hagman, M., & Landström, J. (2015). Female and male teachers' pro-environmental behaviour, conceptions and attitudes towards nature and the environment do not differ: Ecofeminism put to the test. *Asia-Pacific Forum on Science Learning and Teaching*, 16(1), 1–31.

Ministry of Education, Culture, Sports, Science, and Technology – Japan [MEXT]. (n.d.). *MEXT : ESD (Education for sustainable development)*. 文部科学省.

<https://www.mext.go.jp/en/unesco/title04/detail04/sdetail04/1375695.htm>

- Mohiuddin, M., Al Mamun, A., Syed, F., Masud, M., & Su, Z. (2018). Environmental knowledge, awareness, and business school students' intentions to purchase green vehicles in emerging countries. *Sustainability (Switzerland)*, 10(5). <https://doi.org/10.3390/su10051534>
- Mufidah, I., Jiang, B., Lin, S., Chin, J., Rachmaniati, Y., & Persada, S. (2018). Understanding the consumers' behavior intention in using green Ecolabel product through pro-environmental planned behavior model in developing and developed regions: Lessons learned from Taiwan and Indonesia. *Sustainability*, 10(5), 1423. <https://doi.org/10.3390/su10051423>
- Najjarzadeh, M., Jafari, S., Jafari, N., & Rajabi, N. (2018). Tourist behavioral intentions in conservation of environment, environmental knowledge, tourist satisfaction, environmental attitude, perceived benefit. *Environmental Education and Sustainable Development*, 7(1), 127-142. doi: 10.30473/ee.2018.5064
- National Geographic Society (2022). Human Impacts on the Environment. Retrieved November 29, 2022 from <https://education.nationalgeographic.org/resource/resource-library-human-impacts-environment>
- Onel, N., & Mukherjee, A. (2016). Consumer knowledge in pro-environmental behavior. *World Journal of Science, Technology and Sustainable Development*, 13(4), 328-352. <https://doi.org/10.1108/wjstsd-01-2016-0004>
- Padmanabhan, J., Borthakur, J., & Mittal, K. (2017). Environmental Awareness among Teachers and Students of Higher Education. <https://doi.org/10.5958/2230-7311.2017.00126.X>

- Paillé, P., Mejía-Morelos, J. H., Raineri, N., & Stinglhamber, F. (2019). The influence of the immediate manager on the avoidance of non-green behaviors in the workplace: A three-wave moderated-mediation model. *Journal of Business Ethics*, *155*(3), 723–740. DOI 10.1007/s10551-017-3519-1
- Pan, S., Chou, J., Morrison, A., Huang, W., & Lin, M. (2018). Will the future be greener? The environmental behavioral intentions of University tourism students. *Sustainability*, *10*(3), 634. <https://doi.org/10.3390/su10030634>
- Pratiwi, N., & Rinuastuti, B. (2018). The effect of environmental knowledge, green advertising and environmental attitude toward green purchase intention. *Russian Journal of Agricultural and Socio-Economic Sciences*, *78*(6), 95-105. <https://doi.org/10.18551/rjoas.2018-06.10>
- Qureshi, T. M. (2019). Employee's Learning Commitment and Self-efficacy. *Academy of Strategic Management Journal*, *18*(3), 1–17. <https://www.abacademies.org/articles/employees-learning-commitment-and-selfefficacy-8196.html>
- Raineri, N., & Paillé, P. (2015). *Linking Corporate Policy and Supervisory Support with Environmental Citizenship Behaviors: The Role of Employee Environmental Beliefs and Commitment*. *Journal of Business Ethics*, *137*(1), 129–148. doi:10.1007/s10551-015-2548-x
- Safari, A., Salehzadeh, R., Panahi, R., & Abolghasemian, S. (2018). Multiple pathways linking environmental knowledge and awareness to employees' green behavior. *Corporate Governance: The International Journal of Business in Society*, *18*(1), 81-103. <https://doi.org/10.1108/cg-08-2016-0168>
- Shen, M., & Wang, J. (2022). The impact of pro-environmental awareness components on green consumption

- behavior: The moderation effect of consumer perceived cost, policy incentives, and face culture. *Front. Psychol.* 13:580823. doi: 10.3389/fpsyg.2022.580823
- Steibl, S., & Laforsch, C. (2019). Disentangling the environmental impact of different human disturbances: A case study on islands. *Scientific Reports*, 9(1). <https://doi.org/10.1038/s41598-019-49555-6>
- Sugandini, D., Effendi, M. I., Thamrin, H. M., Priyadi, U., & Muafi. (2019). From environmental knowledge to conservation behaviour. *Quality - Access to Success*, 20(172), 101–107.
- Taufique, K. M., Siwar, C., Chamhuri, N., & Sarah, F. H. (2016). Integrating general environmental knowledge and eco-label knowledge in understanding ecologically conscious consumer behavior. *Procedia Economics and Finance*, 37, 39-45. [https://doi.org/10.1016/s2212-5671\(16\)30090-9](https://doi.org/10.1016/s2212-5671(16)30090-9)
- United Nations Development Programme [UNDP], (2022). The SDGs in Action. Retrieved November 30, 2022 from <https://www.undp.org/sustainable-development-goals>
- United Nations Educational, Scientific, and Cultural Organization [UNESCO]. (2021, May 10). *What is education for sustainable development?* UNESCO. <https://en.unesco.org/themes/education-sustainable-development/what-is-esd>
- United Nations. (n.d.). *Transforming our world: The 2030 agenda for sustainable development*. Sustainable Development Knowledge Platform. <https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>
- Valencia, M. I. (2018). Introducing education for sustainable development (Esd) in the educational institutions in the Philippines. *Journal of Sustainable Develop-*

*ment Education and Research*, 2(1), 51. <https://doi.org/10.17509/jsder.v2i1.12358>

- Wang, Y. (2016). Modeling predictors of restaurant employees' green behavior: Comparison of six attitude-behavior models. *International Journal of Hospitality Management*, 58, 66-81. <https://doi.org/10.1016/j.ijhm.2016.07.007>
- Willits, F., Thedori, G., & Luloff, A. (2016). Another look at Likert scales. *Journal of Rural Social Sciences*, 31. <https://egrove.olemiss.edu/jrss/vol31/iss3/6/>
- Zheng, Q. J., Xu, A. X., Kong, D. Y., Deng, H. P., & Lin, Q. Q. (2018). Correlation between the environmental knowledge, environmental attitude, and behavioral intention of tourists for ecotourism in China. *Applied Ecology and Environmental Research*, 16(1), 51-62. [https://doi.org/10.15666/aeer/1601\\_051062](https://doi.org/10.15666/aeer/1601_051062)
- Zuell, C., & Scholz, E. (2016). 10 points versus 11 points? Effects of Left-right Scale Design in a Cross-national Perspective. *Social Science Open Access repository*. <https://www.ssoar.info/ssoar/handle/document/56779>