

RESEARCH ARTICLE

The Effectiveness of WWF-Philippines' Manual on Waste Management in Promoting Positive Environmental Behaviors Among Filipino 5th and 6th Graders

Concordia Marie Andres Lagasca-Hiloma,* Justine Bate, and Kathleen Faye A. Lagasca
Mapua University, Manila, Philippines
*cmalagasca-hiloma@mapua.edu.ph

Abstract: This study investigated one of the learning materials of the World Wildlife Fund for Nature-Philippines and its effectiveness in promoting positive environmental behaviors among 99 Filipino 5th and 6th graders. The study examined if there was a significant difference in the environmental knowledge, attitudes, subjective norms, and behavioral intentions (BI) of the students after they read and studied the manual. The study also determined the correlation between the participants' environmental knowledge-attitude, knowledge-norms, and knowledge BI. Lastly, this study measured how features of the manual—its language used, design, and content—influenced its effectiveness. Findings of the study show a significant increase in the students' knowledge; however, no significant increase was shown for their attitudes, subjective norms, and BI. Results also show a positive yet insignificant correlation for the participants' knowledge-attitude, knowledge-norms, and knowledge-BI. Additionally, regression analysis shows that none of the features of the manual significantly influenced the students' knowledge, whereas content was found to be the greatest predictor of attitude, norms, and BI. The design was found to be a significant predictor of attitude and norms, whereas language is found to be a negative coefficient of the participants' BI. Insights from the dyad interviews support these results.

Keywords: environmental education, waste management, Theory of Reasoned Action, Filipino students

Earth is experiencing an ecological crisis because of climate change, and its effects are severe and extensive. Aside from its damages to ecology and various ecosystems, climate change also has detrimental effects on global health (Butler, 2018), on global energy systems (Cronin et al., 2018) and electricity demands (Auffhammer et al., 2017), on the global society

(Mishra et al., 2010), and on the global economy (Tol, 2018). Unfortunately, while these effects are regarded as global issues, their severity is experienced more in developing countries than in developed ones (Chinowsky et al., 2011). For instance, in the 2019 Global Peace Index study, results showed that one of the developing countries that is most prone to the

effects of climate change is the Philippines (Institute for Economics & Peace, 2019). As a result, the Philippines is reported to be one of the countries in Asia with the highest risk of climate hazards (Institute for Economics & Peace, 2019).

Aside from human industrial activities, one of the problems contributing to and causes climate change is improper waste management and disposal. This is because wastes release waste dumps such as carbon dioxide and methane, which gradually warm the earth (Lackner & Jospe, 2017). Moreover, previous studies revealed that wastes produced in the country contaminate groundwater and soil and increases the risk of human health and exposure to other organisms (Galarpe, 2017). Therefore, practicing proper waste management is vital to mitigate detrimental effects to the environment. However, local government units (LGUs) in the Philippines still struggle to implement proper solid waste management. In an evaluation conducted by Pagunsan and Shimada (2012), this struggle may be due to several factors such as the population of the city or municipality, budget allocation, and land area, to name a few. As a result, the task and responsibility of proper waste disposal is often primarily delegated to households.

Citizens in developing countries such as the Philippines should be empowered with the necessary environmental information and knowledge through environmental education (EE) to mitigate the effects of climate change (Pradhan, 2014). It is believed that from environmental knowledge, positive environmental behaviors would commence. Given this, environmental educators are tasked to focus on promoting environmental knowledge along with environmental behaviors to students (Krasny et al., 2015).

The World Wide Fund for Nature (WWF), one of the environmental non-governmental organizations in the country, conducts various EE programs in the Philippines. These are administered in public and private schools and in outreach programs using learning and instructional materials (WWF, 2019). As waste management contributes to climate change and is one of the Philippines' prevailing environmental problems (Premakumara et al., 2018), the organization, through these EE programs, continues to address plastic use and solid waste management among individuals and groups. WWF-Philippines' EE program for primary school students uses a learning material titled "Manual

on Waste Management." The purpose of this material is to educate primary school students and equip them with the necessary environmental knowledge, particularly about various solid waste management concepts and practices.

Review of Related Literature

The literature is rich when it comes to EE and the investigation and understanding of environmental attitudes and behaviors. However, there is an evident conflict as to how EE should be approached and how environmental attitudes and behaviors should be promoted. Moffatt (2015) stated that there are three main aspects of EE: education about, education from, and education for the environment. Firstly, education about the environment is that element that produces a knowledge-based education (Moffatt, 2015). Secondly, education from the environment suggests that the environment should be used for learning. Lastly, education for the environment implies a change in environmental behavior. This learning and change of behavior have been explored in various studies. Bartosh (2003) investigated the impact of EE on students' achievement by measuring knowledge, attitudes, and behavior. Bartosh (2003) compared two groups of schools, namely those which had been implementing EE for years and those which did not have EE programs. Results of the study showed that students in schools with EE programs scored higher than those in non-EE schools. This is because, unlike the schools without EE programs, schools with such programs provide several benefits. These are EE opportunities, a team of teachers to help students develop their own knowledge, and a student body that constructs their own knowledge (Bartosh, 2003). Hence, the approach of EE in this instance is from a knowledge-based perspective.

In the study of Trumbo and O'Keefe (2005), they examined the intentions of their participants to conserve water. The findings of the study showed that respondents with pro-environmental values, consistent with these values, and past actions are more likely to seek information on water conservation. Information exposure is crucial and the foundation of respondents' orientation to conservation behavior (Trumbo & O'Keefe, 2005). The likelihood of behavioral change is linked to people who are already performing

conservation practices, but it can also be applied to those with less conservation involvement to motivate them with information exposure.

Similarly, Zheng et al. (2018) investigated the relationship among the environmental knowledge, attitude, and behavior of tourists in China. After conducting a survey and analyzing the data, there is a positive correlation between the participants' environmental knowledge and attitude, environmental attitude and behavior, and environmental knowledge and behavior. As a result, the researchers concluded that supplying students with the necessary environmental knowledge is likely to foster positive environmental attitudes among students.

On the other hand, the study of Mifsud (2011) showed that environmental education is indeed influential in improving the environmental attitudes and behaviors of students. However, Mifsud (2011) recommended that EE programs should not "just lead to an accumulation of knowledge, but also to improved pro-environmental behavior" (p. 421). In the study of Erhabor and Dona (2016), results showed "little or no relationship" between the environmental knowledge and the environmental attitude of students in Nigeria.

Similarly, Varoglu et al. (2017) found that the correlation between the environmental knowledge of students in North Cyprus with their environmental attitude is only moderate. Lastly, Geiger et al. (2019) showed that they only have an average positive environmental attitude, although the students have a high level of general and specific knowledge on environmental issues. As a result, the researchers support an EE approach that "goes beyond the transmission of environmental knowledge units aimed on specific environmental issues" (Geiger et al., 2019, p. 14). Hence, various studies found that environmental knowledge and information cannot foster positive environmental attitudes.

Pooley and O'Connor (2000) recommended that EE programs and materials ought to focus on the emotions and beliefs of people. In their study involving 92 participants whose ages range from 18 to 55 years old, Pooley and O'Connor (2000) examined whether it is the cognitive or the affective domain that better determines one's attitudes toward environmental issues. They administered an Environmental Attitude Survey consisting of five tasks involving (a) their attitudes to three environmental issues; (b) their most important beliefs with respect to each issue; (c) their

demographic information; (d) their reflection and their emotions with respect to each issue; and (e) what they think to be the most influential in determining their attitudes towards each issue.

By using a correlation and standard and hierarchical multiple regressions analyses, it was found that participants' affective domain has a significant contribution to their attitudes for each environmental issue in the survey. When the participants were asked to identify the most important to their attitudes, they significantly identified beliefs rather than affects and that there was no significant difference between cognition and affects. Furthermore, the results of the study showed that the participants' affective domain is independently significant as it contributes to 6% of the attitude prediction. Lastly, the participants themselves have reported that the most important contributor to their attitude was their emotions. Hence, Pooley and O'Connor (2000) recommended that it is meritorious for EE programs, both for young and old learners, to target students' emotions and beliefs more than simply environmental knowledge.

Given this, a literature gap exists with respect to EE approaches as well as the appropriate focus of EE programs and learning materials. This study examined the EE approach of WWF-Philippines through its learning materials. In particular, it investigated the effectiveness of WWF-Philippines' "Manual on Waste Management" in promoting positive environmental behaviors among Filipino 5th and 6th graders. This research determined if there is a significant difference in the environmental knowledge, attitudes, subjective norms, and behavioral intentions (BI) of Filipino Grades 5 and 6 students before and after reading the WWF-Philippines' EE material. Likewise, the study examined the correlation between knowledge-attitude, knowledge-norms, and knowledge-BI. Lastly, the study analyzed how the features of the manual, that is, its language used, content, and design, influenced its effectiveness in promoting positive environmental behavior among the participants.

Theoretical Framework

The theory of reasoned action was developed back in the 1960s by Martin Fishbein and later expanded by Fishbein and Ajzen (2010). This theory seeks to explore and predict behavioral intentions. However, TRA

started as an attitude theory where people's attitude towards an object is determined by their beliefs about the object (Ajzen, 2012). Attitude is automatically formed as people form beliefs about an object's attributes and consequences (Ajzen, 2012). Fishbein continued to improve the formation of attitude after several studies questioned how it can explain behavior, and he explored the attitude-behavior relation (Ajzen, 2012).

In the TRA, the behavioral beliefs and outcomes evaluation components influence an individual's attitude toward a behavior (Fishbein & Ajzen, 2010). The behavioral beliefs are a person's beliefs in performing the desired behavior, and the outcomes evaluation is a person's beliefs about the consequences of the behavior (Montaño & Kasprzyk, 2008). The components of the subjective norm include the normative beliefs and motivation to comply. On the one hand, the former is defined as a person's perception toward his or her peers' beliefs about a behavior, whereas the latter is their motivation to perform what their peers think they should do (Montaño & Kasprzyk, 2008).

The TRA presents another component that contributes to a person's behavior, that is, behavioral intent (Fishbein & Ajzen, 2010). It refers to the individual's capability to perform a behavior that shapes it and serves as a predictor of behavior that is likely to occur (Montaño & Kasprzyk, 2008). A person's intent is comprised of their attitude and perceived subjective norms (Fishbein & Ajzen, 2010). Figure 1 shows the relationship among the theory's components.

Trumbo and O'Keefe (2005) applied the TRA model in an augmented form in their study on water conservation behaviors. They used the TRA to analyze the intention of an individual to voluntarily conserve water in the home environment. In this study, Trumbo and O'Keefe (2005) used the TRA in an environmental communication research approach. Two variables have been augmented in their study, namely, the environmental values and the effect of information, which is composed of information seeking, exposure, and attention (Trumbo & O'Keefe, 2005). Figure 2 shows the augmented TRA used in the study of Trumbo and O'Keefe (2005).

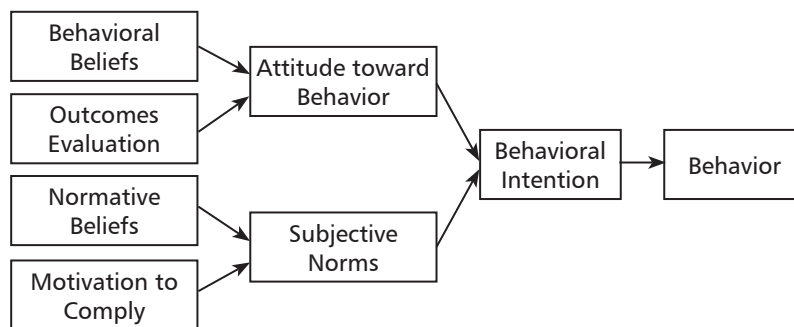


Figure 1. The Theory of Reasoned Action by Fishbein and Ajzen (2010)

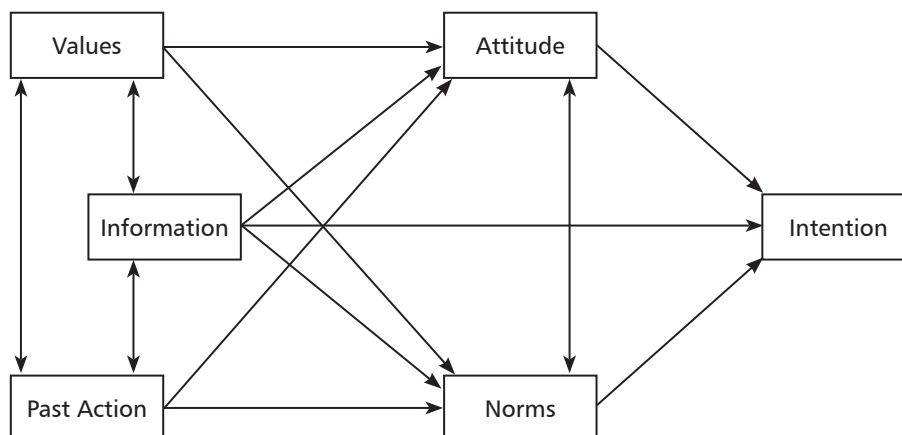


Figure 2. The Augmented TRA by Trumbo and O'Keefe (2005)

Methods

Research Paradigm

The focus of this study is to determine the effectiveness of WWF-Philippines' Manual on Waste Management in promoting positive environmental behaviors among Filipino 5th and 6th graders. Using the augmented TRA of Trumbo and O'Keefe (2005), the construct for "values" was conceptualized as "environmental values" that were consequently operationalized as the students' "waste management values." The construct for "past actions" was conceptualized as the students' "past environmental actions" that were consequently operationalized as their "past waste management actions."

The source of environmental information was operationalized as WWF-Philippines' Manual on Waste Management, particularly its language used, content, and design. From this source, their environmental knowledge was measured. The variables of attitude and subjective norms were operationalized in this study as their and their peers' waste management attitudes and beliefs. Lastly, their behavioral intentions were measured as their willingness to perform waste management practices. Figure 3 shows the paradigm used by the study using the augmented TRA of Trumbo and O'Keefe (2005).

Participants

Using purposive sampling, the study's respondents initially involved 100 participants comprised of 50 Grade 5 and 50 Grade 6 students. The age of Grade 5 students ranged from 9 to 11, whereas the age of Grade 6 students ranged from 11 to 13. Four percent of the participants were aged 9, 43% were aged 10, 45% were aged 11, 7% were aged 12, and 1% were aged 13. However, after encoding the results of the survey, one response was found to be invalid. Hence, only 99 valid responses were noted (n=99). Afterward, three survey participants from each grade level were invited for dyad interviews.

Methods

The study employed a quasi-experimental, sequential explanatory mixed methods research design. Phase 1 of the study employed quantitative methods with a pretest-posttest survey design. The pretest and posttest survey questionnaires measured the students' knowledge, attitude, subjective norms, and behavioral intentions before and after reading the manual. However, in the pretest questionnaire, sections measuring the students' values and past actions were included. In the posttest questionnaire, another section was added that allows the participants to evaluate the manual based on the language used, content, and design.

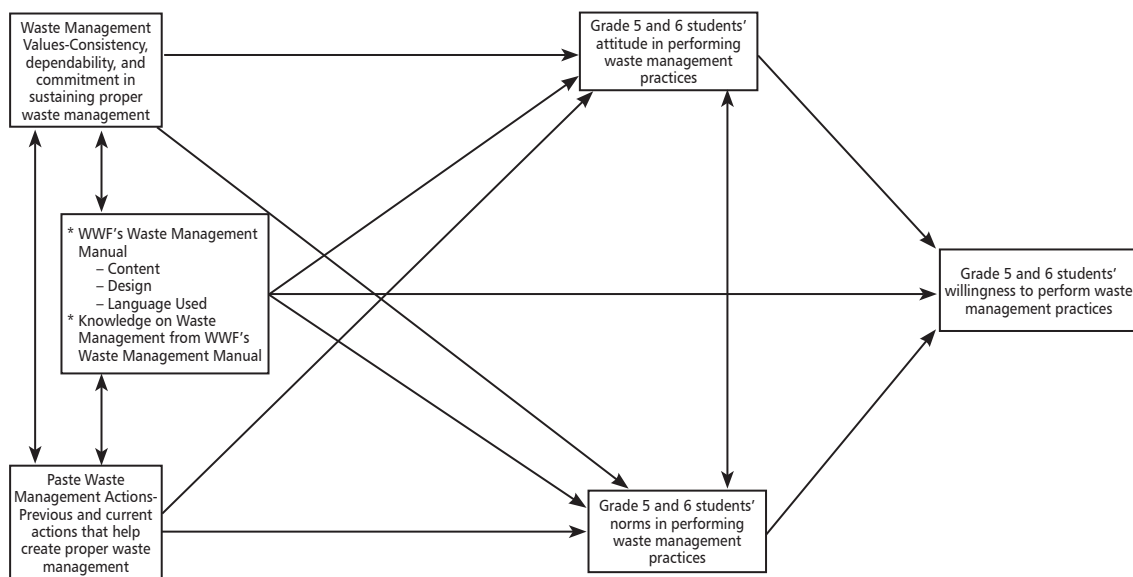


Figure 3. The Operational Framework

We coordinated with the school administration for the distribution of the survey questionnaires. Informed consent forms were provided and accomplished accordingly before the data gathering. After administering the pretest, the students were given a copy of the manual with the aid of the WWF-Philippines' Program Officer. They were instructed to read and study the material. After one week, we administered the posttest survey.

Phase 2 of the study involved qualitative methods. After conducting the posttest, we invited six survey participants (three from Grade 5 and three from Grade 6) for dyad interviews. A total of three dyad interviews were conducted. These interviews were performed to gather deeper insights from Grades 5 and 6 students with regard to the features of the manual, particularly its language used, content, and design.

Psychometric Properties

Two research instruments were used in this study: a survey questionnaire and a dyad interview guide. The survey questionnaire asks for the students' demographic information, values, and past actions (for pretest), knowledge, attitude, subjective norms, behavioral intentions, and manual evaluation (for posttest). Knowledge was measured using objective-type questions on topics included in the manual. Statements about the students' values, past actions, attitude, subjective norms, behavioral intentions, and manual evaluation were measured using a 5-point Likert Scale. Statement on values was measured based on the level of importance, whereas statement on past waste management actions was measured based on its level of frequency. Statements on attitude and subjective norms were measured based on the level of agreement; whereas statement on behavioral intentions was measured based on the level of likelihood.

Lastly, the section of the survey for manual evaluation included statements that were based on the study of Dickinson (2010). For the content, the statements included were as follows:

1. The topics of the manual are realistic and likely to appeal to me.
2. The topics are relevant and encourage me to express myself.
3. The topics encourage independent thinking and active learning.

4. The manual includes sufficient activities and tasks, which are interesting in themselves.
5. The suggested practices in the manual are learning- or learner-centered.

Statements for design include the following:

1. The layout and design are appropriate and clear.
2. The manual is clearly structured and sequenced.
3. The manual provides enough opportunities for independent study.
4. The illustrations are varied and attractive.
5. The manual cover is informative and attractive to me.
6. The font size and type used in the manual are appropriate for me.

Lastly, for the section language used, the statements measured were as follows:

1. The language used is at the right level for my current English ability.
2. There is a sufficient range of engaging, level-appropriate reading.
3. The language functions exemplify English that I will be interested in and likely to use.

A primary school teacher and a WWF-Philippines' Program Officer and Manager checked the validity of the questionnaire. This study measured the questionnaire's internal consistency for reliability. The instrument was deployed for pilot testing before the actual administration of the survey. As the study aimed to measure only a change in the participants' attitude, subjective norms, and behavioral intentions, only the Cronbach's alpha reliability coefficient for those sections was measured. The section on attitude reported a good internal consistency ($\alpha=0.805$). The section on subjective norms reported an acceptable internal consistency ($\alpha=0.745$). Lastly, the section on behavioral intentions reported a good internal consistency ($\alpha=0.859$).

Data Collection Procedure

We coordinated with WWF-Philippines' Program Manager and the school's Grade School Principal in August 2019. The students, which comprised of 5th graders ($n=50$) and 6th graders ($n=50$), who participated

in the survey were chosen by the school. In September 2019, we, together with WWF-Philippines, visited the school. WWF-Philippines conducted an orientation about the organization's environmental advocacies along with EE programs. Following the orientation was the administration of the pretest survey. After the pretest survey has been completed, we distributed the WWF-Philippines' Manual on Waste Management to the respondents. They were instructed to read and study the manual for one week.

After a week, we administered the posttest survey. The dyad interviews of Grade 5 ($n=3$) and Grade 6 ($n=3$) students were also conducted once the posttest survey had been completed. A total of three dyad interviews were conducted. The pair compositions are as follows: (a) two Grade 5 students (Student 1 and Student 2), (b) two Grade 6 students (Student 3 and Student 4), and (c) one Grade 5 and one Grade 6 students (Student 5 and Student 6). In the dyad interview, We again showed the manual to the students. Questions pertaining to the content, the images, and the language used in the manual were asked. In particular, the questions sought the thoughts, opinions, and understanding of the students about the manual and the emotions it elicited. A mood meter was used to aid the students to convey their emotions accurately. The emotions in the mood meter include (a) positive emotions such as happy, amused, proud, excited, love, and relieved; (b) negative emotions such as irritated, exhausted, afraid, confused, annoyed, sad, frustrated, angry, and disappointed; and (c) neutral emotions such as surprised and indifference. Visual aids comprising of facial expressions for each emotion were included in the mood meter as well. Lastly, the mood meter presented positive emotions in color green, negative emotions in red, and neutral emotions in yellow.

Results

For this study, it is assumed that the distribution is approximately normal. Although the scoring system per item is ordinal in nature (i.e., a Likert Scale), it is assumed that the calculated score per domain is continuous in nature. As stated by Norman (2010), parametric statistics are robust with respect to violations of normality. Moreover, taking the average or sum of two or more ordinal variables create an approximately continuous variable and has been used in several fields,

such as psychology and sociology (Sullivan & Artino, 2013; Zumbo & Zimmermann 1993).

Descriptive Statistics

The students rated the manual's language, design, and content relatively high. The average score per variable is close to its corresponding maximum points, which are 15, 30, and 30, respectively. This is shown in Table 1.

Table 1

Summary Statistics Describing the Students' Perception of the WWF Manual

	<i>N</i>	<i>Mean</i>	<i>SD</i>
Language	99	14.45	1.22
Design	99	28.69	2.54
Content	99	23.73	2.41

As for the posttest scores of each variable, it appears that students' knowledge of the concepts stated in the manual is borderline passing as the average score is equivalent to 74.06%. However, with respect to other constructs, the students scored highly as the maximum score for each is 50. This is shown in Table 2.

Table 2

Summary Statistics Describing the Variables of the Augmented TRA

	<i>N</i>	<i>Mean</i>	<i>SD</i>
Knowledge	99	11.11	2.40
Attitude	99	46.88	4.26
Subjective Norms	99	45.81	4.91
Behavioral Intention	99	45.20	5.63

Assessing the Effectiveness of the WWF Manual

Measuring the Effect of the Manual on the Variables of Interest

Knowledge. A paired-samples t-test was conducted to determine if the knowledge score after reading the manual was higher compared to the knowledge score before reading the manual. Results show that the post-test scores ($M = 11.11$, $SD = 2.40$) were significantly higher than the pretest scores ($M = 9.82$, $SD = 2.45$) ($t(98) = 3.881$, $p < .00$). However, the correlation of the

pretest and posttest knowledge scores is not statistically significant ($r = .08$, $p = .433$).

Attitude. A paired-samples t-test was conducted to determine if the attitude score after reading the manual was higher compared to the attitude score before reading the manual. Results show that the posttest scores ($M = 46.88$, $SD = 4.26$) were not significantly higher than the pretest scores ($M = 46.88$, $SD = 4.53$) ($t(98) = -0.019$, $p = .493$). These indicate that reading the manual did not increase attitude scores.

Subjective Norms. A paired-samples t-test was conducted to determine if the subjective norm score after reading the manual was higher compared to the subjective norm score before reading the manual. Results show that the posttest scores ($M = 45.81$, $SD = 4.91$) were not significantly higher than the pretest scores ($M = 45.90$, $SD = 5.55$) ($t(98) = -0.146$, $p = .442$). These indicate that reading the manual did not increase subjective norm scores.

Behavioral Intention. A paired-samples t-test was conducted to determine if the behavioral intention score after reading the manual was higher compared to the behavioral intention score before reading the manual. Results show that the posttest scores ($M = 45.20$, $SD = 5.63$) were not significantly higher than the pretest scores ($M = 45.42$, $SD = 8.19$) ($t(98) = -0.244$, $p = .404$). These indicate that reading the manual did not increase behavioral intention scores.

Measuring the Association of the Variables

Knowledge is positively and weakly correlated with subjective norms ($r = .199$, $p = .048$); however, borderline significance could be observed. This means that the linear association between the two must be taken with a degree of caution as there is a possibility that the correlation is due to chance. Furthermore, knowledge is not correlated with attitude and behavioral intention.

Behavioral intention is moderately correlated with attitude ($r = .656$, $p < .00$). It is also moderately correlated with subjective norms ($r = .794$, $p < .00$). Attitude and subjective norms is strongly correlated ($r = .831$, $p < .00$). These are shown in Table 3.

Predicting the Variables Using the Aspects of the Manual

Predicting Knowledge Using Language, Design, and Content

A multiple linear regression was calculated to predict knowledge based on language, design, and content. Results indicate that a collective significant effect was absent ($F(3, 95) = 0.595$, $p = .620$, $R^2 = .018$); and none of the three regressors—language ($t = -0.332$, $p = .740$), design ($t = -0.471$, $p = .639$), and content ($t = 1.292$, $p = .199$)—significantly affected the dependent variable. Table 4 shows the corresponding regression coefficients for each variable.

Table 3

Correlational Among Knowledge, Language, Design, and Content

	1	2	3	4
Behavioral Intention				
Attitude	.656**			
Subjective Norms	.794**	.831**		
Knowledge	.149	.156	.199*	

* $p < .05$. ** $p < .01$

Table 4

Results of Regressing Knowledge on Language, Design, and Content

Predictor	B	SE B	β
(Intercept)	10.368	2.925	
Language	-0.147	0.442	-0.075
Design	-0.113	0.239	-0.120
Content	0.257	0.199	0.258

Predicting Attitude Using Language, Design, and Content

A multiple linear regression was calculated to predict attitude based on language, design, and content. Results indicate that a collective significant effect was present ($F(3, 95) = 57.796, p < .000, R^2 = .646$); however, only design ($t = 3.645, p < .000$) and content ($t = 2.884, p < .05$) significantly affected the dependent variable, and that language ($t = -.552, p = .582$) did not contribute to the regression model. Furthermore, participants' attitude increased by .932 for every increase in design, and by .613 for every increase in content, *ceteris paribus*. Table 5 shows the corresponding regression coefficients for each variable.

Predicting Subjective Norms Using Language, Design, and Content

A multiple linear regression was calculated to predict subjective norms based on language, design, and content. Results indicate that a collective significant effect was present ($F(3, 95) = 25.796, p < .000, R^2 = .449$); however, only design ($t = 3.072, p < .05$) and content ($t = 2.581, p < .05$) significantly affected the dependent variable, and that language ($t = -1.882,$

$p = .063$) did not contribute to the regression model. Furthermore, participants' subjective norms increased by 1.128 for every increase in design, and by .788 for every increase in content, *ceteris paribus*. Table 6 shows the corresponding regression coefficients for each variable.

Predicting Behavioral Intention Using Language, Design, and Content

A multiple linear regression was calculated to predict subjective norms based on language, design, and content. Results indicate that a collective significant effect was present ($F(3, 95) = 8.517, p < .000, R^2 = .212$); however, only language ($t = -2.031, p < .05$) and content ($t = 2.203, p < .05$) significantly affected the dependent variable, and that design ($t = 1.826, p = .071$) did not contribute to the regression model. Furthermore, participants' behavioral intention decreased by 1.886 for every increase in language, and increased by .992 for every increase in content, *ceteris paribus*. Table 7 shows the corresponding regression coefficients for each variable.

Table 5

Results of Regressing Attitude on Language, Design, and Content

Predictor	<i>B</i>	<i>SE B</i>	β
(Intercept)	9.373	3.123	
Language	-.260	.471	-.075
Design	.932	.256	.555
Content	.613	.212	.346

Table 6

Results of Regressing Subjective Norms on Language, Design, and Content

Predictor	<i>B</i>	<i>SE B</i>	β
(Intercept)	13.182	4.485	
Language	-1.274	0.667	-0.317
Design	1.128	0.367	0.584
Content	0.788	0.305	0.386

Table 7*Results of Regressing Behavioral Intention on Language, Design, and Content*

Predictor	<i>B</i>	<i>SE B</i>	β
(Intercept)	24.223	6.149	
Language	-1.886	0.928	-0.410
Design	0.919	0.503	0.415
Content	0.922	0.418	0.394

Insights on the WWF-Philippines' Waste Management Manual

The data collected from the dyad interviews provided the researchers a deeper understanding of the quantitative results. After transcribing, coding, and analyzing the data, five relevant themes emerged.

The Role of Past Experiences and Knowledge

Through the dyad interviews, it was found that students were already knowledgeable of the concepts included in the manual. These concepts include compost and greenhouse gases. The students mentioned that they were already familiar with the concept as it was either taught in school during their 4th Grade or have read it somewhere prior to their exposure to the manual.

When asked what they felt after reading the manual's content on compost, Student 1 shared that she was relieved, whereas Student 2 shared that she was proud because they have been composting before she read the manual. When they were asked to read and explain through drawing a paragraph in the manual about greenhouse gases, most of them stated that greenhouse gases trap heat in the earth's surface causing climate change. This means they understood the manual's discussion on greenhouse gases.

Lastly, it was found during the interviews that the knowledge held by the students is more updated than the manual. Student 5 shared that she was excited about the manual as she can perform the 5Rs, namely reuse, reduce, recycle, replace and refuse, which is a waste management practice. However, the manual only presented 3Rs, which stands for reuse, reduce, and recycle.

Images Used in the Manual

The manual used unclear images based on dyad interviews. As a result, the students found certain

images in the manual that are confusing. To test whether an image is clear or unclear, the interviewer covered the texts and asked the students to guess the image. For instance, an image of chewing gum was unrecognizable for the students. Student 1 said it was a piece of chocolate, whereas Student 3 thought it was a piece of metal. Moreover, when asked about another image that supposedly shows old clothing, Students 1, 3, 4, and 5 thought that it was a candy wrapper. Lastly, students were asked about the images on the last page of the manual that show a list of items usually thrown away and waste contributors. The food wrapper image was not recognizable to the students as well. Student 1 said it was a plastic container, whereas Student 3 thought it was a piece of styrofoam.

Students' Suggestions and Recommendations

After the students were asked about the unclear images indicated in the manual, we sought suggestions from the students on how they can be improved. For instance, in the image for the chewing gum, Student 3 shared that it should be made clearer that the image represents chewing gum. Student 5 shared that she was indeed unable to understand the image. To improve on the image, Student 3 suggested that the manual could put a wrapper, whereas Student 1 recommended that an image of a gum that has been chewed should be placed. Some of the students expressed that their willingness to perform waste management practices could be affected because they are unable to understand the images in the manual.

Emotions Evoked by the Manual

Using the mood meter, the students expressed their emotions towards certain concepts, words, and images included in the manual. Firstly, when the researchers sought the students' first impressions of the manual, the

students expressed that they were happy and excited to learn more about the topic. However, when we asked the students about what they think to be the target audience of the manual after seeing it, they shared that it seems that the manual is intended for people of all ages.

In addition, the manual evoked positive emotions from the respondents. These positive emotions were primarily because of previous waste management knowledge and practices. The manual served as a confirmation of their previous knowledge and practices. Student 4 shared, "I feel proud because I know some steps to manage my waste." Likewise, Student 1 shared, "I am proud because we do it, and I just learned that it really helps the environment." Furthermore, the activities included in the manual also evoked excitement and inspiration from the students. Student 2 shared that she feels "excited because [they] can make it as [their] project," whereas Student 3 expressed that he was "inspired because so many people try to clean the environment."

Lastly, the manual elicited negative emotions from the students. The last page shows the waste items that are usually disposed of improperly, contributing to more waste in the environment. Most of the students expressed their concern toward the environment. Student 1 shared that she is annoyed "knowing that people just throw things, they are destroying their own environment." Student 3 expressed sadness as there are "a lot of things being thrown away," whereas Student 4 shared that he "feel disappointed because people just throw things." Lastly, Student 6 said that she is afraid because of the possibility that the Earth would be destroyed.

Perceived Effectiveness of the Manual

Towards the end of each dyad interview, students were asked whether they perceive the manual to be effective in promoting positive environmental behaviors among their peers. Four of the students expressed that they are uncertain if the manual could help in changing a person's behavior to perform waste management practices. They stated that change of behavior still depends on the individual. However, the other two students shared that they would still recommend the manual to people their age as they believe that the manual has the potential to change a person's behavior.

Discussion

Environmental Knowledge, Attitude, Subjective Norms, and BI After Reading the Manual

This study determined if there is a significant difference in the environmental knowledge, attitudes, subjective norms, and behavioral intentions of Filipino Grades 5 and 6 students before and after reading the WWF-Philippines' learning material for their EE program. After analyzing the data, results show that only the students' environmental knowledge increased after reading and studying the manual. Their attitudes, subjective norms, and behavioral intentions did not increase. Despite the significant increase, the pretest and posttest knowledge scores were not significantly correlated. This entails that the increase in the knowledge of the students could not be attributed to the WWF-Philippines' learning material.

With the aid of the results from the dyad interviews, this insignificant correlation of the students' pretest and posttest knowledge is likely due to the students' past knowledge and experiences. As discussed in the previous section, students shared that they were already aware and knowledgeable about the concepts and practices indicated in the manual even before they were asked to study it. This is because their subjects in their earlier grade levels discussed the environmental concepts presented in the manual. Likewise, the environmental information that the students possessed was more updated than what the manual provides. Mifsud (2011) found that for young individuals in Malta, their main source of environmental information is mass media, particularly the television. Aside from their subjects in school, the students in this study also refer to mass media and digital media as sources of their environmental information.

Correlation of Knowledge-Attitude, Knowledge-Norms, and Knowledge-BI

The study also examined the correlation between knowledge-attitude, knowledge-norms, and knowledge-BI. This is because, as stated by Trumbo and O'Keefe (2005), environmental information and knowledge are essential to motivate individuals to perform positive environmental behaviors. Likewise, in the study of Zheng et al. (2018), environmental knowledge-attitude, environmental knowledge-BI, and environmental attitude-BI are positively correlated. Lastly, the framework used in this study (TRA) argues

that attitude and subjective norms are correlated and predictive of a person's BI.

After the analysis, it was found that knowledge is only significantly correlated with subjective norms. However, the correlation is weak ($r = .199, p = .048$). In addition, knowledge is not correlated with attitude and behavioral intention. This refutes the results of Trumbo and O'Keefe (2005) and Zheng et al. (2018) as environmental knowledge in this study did not play a significant role in the environmental BI of the students. Consequently, this is consistent with the results of Erhabor and Dona (2016), Varoglu et al. (2017), and Geiger et al. (2019).

In addition, the results of this study support Fishbein and Ajzen's (2010) TRA because BI is moderately correlated with attitude ($r = .656, p < .00$) and with subjective norms ($r = .794, p < .00$). Furthermore, it offers additional insight into the theory as it was found that attitude and subjective norms are strongly correlated ($r = .831, p < .00$). This supports an aspect of Trumbo and O'Keefe's (2005) augmented TRA framework. In the original TRA, attitude and subjective norms were not presented with correlation. However, Trumbo and O'Keefe (2005) identified a correlation between attitude and subjective norms that is consistent with this study's findings. This correlation entails that an individual's attitude towards environmental issues is likely influenced by the attitudes of people in their lives, such as their family members, friends, and peers. Similarly, the environmental attitudes of individuals may influence the attitudes of people around them.

The Manual's Features as Predictor of Knowledge, Attitude, Subjective Norms, And BI

The study determined how the features of the manual, that is, language used, design, and content, influenced its effectiveness in promoting positive environmental behavior among the participants. The regression analysis was performed to predict knowledge, attitude, subjective norms, and BI using the features of the manual, namely, its language, design, and content. The results of the regression analysis are consistent with the correlation results. Despite a notable increase in the knowledge of the respondents, the manual did not contribute to such an increase. Moreover, none of the said features of the manual significantly influenced the participants' knowledge.

However, what was interesting was that despite the insignificant difference noted in the attitude, subjective norms, and BI of the participants before and after reading the manual, the regression analysis showed that some features of the manual indeed contributed to a change in these aspects of the participants. For attitude and subjective norms, the manual's design and content, but not the language, have a significant effect. It was found that the attitude would increase if design and content would increase as well. In the case of the participants' BI, the content was also a significant predictor. As in the results of the dyad interview, this is likely because the manual evoked both positive and negative emotions from the participants towards the environmental issues presented in the manual. It can be noted on the last page of the manual what was presented was only a list of common waste contributors. However, the participants were able to form inferences from these that led to their feelings of sadness, annoyance, disappointment, and fear.

This entails that the EE learning material tapped into the affective domain of the students that likely resulted in a change in their attitudes, subjective norms, and BI—albeit insignificant. This supports the study of Pooley and O'Connor (2000) that environmental attitudes and behaviors of individuals are influenced more by their emotions and beliefs rather than the environmental knowledge and information they possess. However, the manual did not maximize its potential to influence the affective domain of its target audience because it was initially written with the intent to contribute to environmental knowledge.

Aside from content, language played a significant effect on the participants' BI. However, the results of the regression show that language and BI are negative coefficients. The participants' behavioral intention decreased for every increase in language. This can be explained by the fact that the manual uses the English language that is not the students' mother tongue. Awopetu (2016) and Seid (2018) found that young learners learn better when taught using their mother tongue language. Likewise, in the study of Uyar and Ensar (2016), they found that Grade 5 to 8 students increased their environmental literacy (which includes their behaviors) using texts in Turkish, which is the participants' mother tongue language. Hence, creating EE materials in the mother tongue language of young learners has immense potential.

Conclusion

This study investigated the effectiveness of WWF-Philippines' Manual on Waste Management in promoting positive waste management behaviors among Filipino 5th and 6th graders. The study analyzed if there was a significant difference in the environmental knowledge, attitudes, subjective norms, and behavioral intentions (BI) of the participants after they read the manual. Findings show that it was only knowledge that had a significant increase after the participants read and studied the manual. However, there was no significant relationship between the participants' pretest and posttest knowledge. This entails that the increase in the environmental knowledge of the participants cannot be attributed to the EE material.

The study also examined the correlation between knowledge-attitude, knowledge-norms, and knowledge-BI. Findings show that only knowledge and subjective norms had a significant relationship with one another. However, such a correlation was found to be weak. These results suggest that the augmented version of the theory of reasoned action, which focuses on environmental information exposure and knowledge increase as primary components in changing the environmental behaviors of individuals, cannot be used as an effective and reliable framework for developing EE materials for young learners. Insights from the dyad interviews support these as the participants refer to their past experiences and affective domains when discussing the manual.

Furthermore, correlations of attitude-BI, norms-BI, and attitude-norms were also measured in the study. Analysis shows that there is a significant correlation among these variables that makes it consistent with the original version of the theory of reasoned action. This signifies that environmental attitudes and subjective norms remain vital contributors to an individuals' environmental behaviors. Hence, by influencing young learners' environmental attitudes and subjective norms, it is highly likely that their environmental BI and behaviors would also be influenced.

Lastly, the study determined how the features of the manual, that is, its language, design, and content, influenced its effectiveness in promoting positive environmental behavior among the participants. Results show that, among these components, it is the manual's content that is the main predictor of the participants' attitudes, subjective norms, and BI.

Additionally, the manual's design is found to be a coefficient of attitudes and subjective norms but not of BI. Lastly, the manual's language is found to be a coefficient, albeit negative, of BI.

Given the quantitative and qualitative findings of the study, we recommend environmental educators, such as WWF-Philippines, refrain from simply focusing on increasing learners' environmental knowledge through information exposure in developing EE materials for young learners. Rather, it is recommended that they focus on content and design that target the learners' affective domain. Lastly, evidence from this study suggests using the learners' mother tongue language as the medium of instruction for EE materials. Supported by previous literatures on mother tongue education, EE delivered using the learners' mother tongue language has immense potential in influencing their environmental attitude, subjective norms, and BI.

Declaration of ownership:

This report is our original work.

Conflict of interest:

None.

Ethical clearance:

This study was approved by the institution.

References

- Ajzen, I. (2012). Martin Fishbein's legacy: The reasoned action approach. *The ANNALS of the American Academy of Political and Social Science*, 640(1), 11–27. <https://doi.org/10.1177/0002716211423363>
- Auffhammer, M., Baylis, P., & Hausman, C. H. (2017). Climate change is projected to have severe impacts on the frequency and intensity of peak electricity demand across the United States. *Proceedings of the National Academy of Sciences of the United States of America*, 114(8), 1886–1891. <https://doi.org/10.1073/pnas.1613193114>
- Awopetu, A. V. (2016). Impact of mother tongue on children's learning abilities in early childhood classroom. *Procedia - Social and Behavioral Sciences*, 233, 58–63. <https://doi.org/10.1016/j.sbspro.2016.10.131>
- Bartosh, O. (2003). *Environmental education: Improving student achievement* [Master's Thesis, The Evergreen

- State College]. State Education and Environment Roundtable. <http://www.seer.org/pages/research/Bartosh2003.pdf>
- Butler, C. D. (2018). Climate change, health and existential risks to civilization: A comprehensive review (1989–2013). *International Journal of Environmental Research and Public Health*, 15(10). <https://doi.org/10.3390/ijerph15102266>
- Chinowsky, P., Hayles, C., Schweikert, A., Strzepek, N., Strzepek, K., & Schlosser, C. A. (2011). Climate change: Comparative impact on developing and developed countries. *Engineering Project Organization Journal*, 1(1), 67–80. <https://doi.org/10.1080/21573727.2010.549608>
- Cronin, J., Anandarajah, G., & Dessens, O. (2018). Climate change impacts on the energy system: A review of trends and gaps. *Climatic Change*, 151, 79–93. <https://doi.org/10.1007/s10584-018-2265-4>
- Dickinson, P. (2010). *Evaluating and adapting materials for young learners*. Centre for English Language Studies: The University of Birmingham.
- Erhabor, N. I., & Dona, J. U. (2016). Impact of environmental education on the knowledge and attitude of students towards the environment. *International Journal of Environment and Science Education*, 11(12), 5367–5375.
- Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The theory of reasoned action approach*. Psychology Press.
- Galarpe, V. (2017). Review on the impacts of waste disposal sites in the Philippines. *Science International (Lahore)*, 29(1), 379–385.
- Geiger, S. M., Geiger, M., & Wilhelm, O. (2019). Environment-specific vs. general knowledge and their role in pro-environmental behavior. *Frontiers in Psychology*, 10, 1–12. <https://doi.org/10.3389/fpsyg.2019.00718>
- Institute for Economics & Peace. (2019). *Global peace index 2019*. Vision of Humanity. <http://visionofhumanity.org/app/uploads/2019/06/GPI-2019-web003.pdf>
- Krasny, M., Carey, J., DuBois, B., Lewis, C., Fraser, J., Fulton, K., Spitzer, B., Leou, M., Braus, J., Ferguson, A. U., Marcos-Iga, J., & Price, A. (2015). *Climate change and environmental education: Framing perspectives*. Cornell University Civic Ecology Lab.
- Lackner, K., & Jospe, C. (2017). Climate change is a waste management problem. *Issues in Science and Technology*, 33(3).
- Mifsud, M. C. (2011). An investigation on the environmental knowledge, attitudes and behavior of Maltese youth. *US-China Education Review B* 1(3), 413–422.
- Mishra, A. K., Singh, V. P., & Jain, S. K. (2010). Impact of global warming and climate change on social development. *Journal of Comparative Social Welfare*, 26(2-3), 239–260. <https://doi.org/10.1080/17486831003687626>
- Moffatt, T. (2015). *Environmental education: One teacher's journey* [Master's Thesis, University of Manitoba]. University of Manitoba. https://mspace.lib.umanitoba.ca/bitstream/handle/1993/30383/Moffatt_Tannys.pdf?sequence=1
- Montaño, D. E., & Kasprzyk, D. (2008). Theory of reasoned action, theory of planned behavior, and the integrated behavioral model. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior and health education: Theory, research, and practice* (4th ed., pp. 67–96). Jossey-Bass.
- Norman, G. (2010). Likert scales, levels of measurement and the “laws” of statistics. *Advances in Health Sciences Education*, 15, 625–632. <https://doi.org/10.1007/s10459-010-9222-y>
- Pagunsan, J., & Shimada, K. (2012, September). *Efficiency evaluation of Philippines waste management sector: A two stage approach* [Conference presentation]. 17th Annual Conference of the Society for Environmental Economics and Policy Studies, Tohoku University, Sendai. https://www.researchgate.net/publication/242343111_Efficiency_Evaluation_of_Philippines_Waste_Management_Sector_A_Two_Stage_Approach
- Pooley, J. A., & O'Connor, M. (2000). Environmental education and attitudes: Emotions and beliefs are what is needed. *Environment and Behavior*, 32, 711–723. <https://doi.org/10.1177/0013916500325007>
- Pradhan, B. K. (2014). Environmental education: The tool for sustainable development. *Global Journal of Multidisciplinary Studies*, 3(10), 124–135.
- Premakumara, D. J., Menikpura, S., Singh, R. K., Hengesbaugh, M., Magalang, A. A., Ildefonso, E. T., Valdez, M. D. C. M., & Silva, L. C. (2018). Reduction of greenhouse gases (GHGs) and short-lived climate pollutants (SLCPs) from municipal solid waste management (MSWM) in the Philippines: Rapid review and assessment. *Waste Management*, 80, 397–405. <https://doi.org/10.1016/j.wasman.2018.09.036>
- Seid, Y. (2018). The impact of learning first in mother tongue: Evidence from a natural experiment in Ethiopia. *Applied Economics*, 51(6), 577–593. <https://doi.org/10.1080/00036846.2018.1497852>
- Sullivan, G. M., & Artino, A. R., Jr. (2013). Analyzing and interpreting data from Likert-type scales. *Journal of Graduate Medical Education*, 5(4), 541–542. <https://doi.org/10.4300/JGME-5-4-18>
- Tol, R. S. (2018). The economic impacts of climate change. *Review of Environmental Economics and Policy*, 12(1), 4–25. <https://doi.org/10.1093/reep/rex027>
- Trumbo, C., & O'Keefe, G. (2005). Intention to conserve water: Environmental values, reasoned action, and information effects across time. *Society & Natural Resource*, 18(6), 573–585. <https://doi.org/10.1080/08941920590948002>

- Uyar, Y., & Ensar, F. (2016). Does mother tongue education support development of environmental literacy in Turkey? An analysis of Turkish course books. *International Journal of Environmental & Science Education, 11*(1), 1–8. <https://doi.org/10.12973/ijese.2015.285a>
- Varoglu, L., Temel, S., & Yilmaz, A. (2017). Knowledge, attitudes & behaviours towards the environmental issues: Case of Northern Cyprus. *EURASIA Journal of Mathematics Science and Technology Education 14*(3), 997–1004. <https://doi.org/10.12973/ejmste/81153>
- World Wide Fund for Nature. (2019). *School sources: Education*. WWF - World Wide Fund For Nature. https://wwf.panda.org/knowledge_hub/teacher_resources/
- 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. http://dx.doi.org/10.15666/aeer/1601_051062
- Zumbo, B. D., & Zimmerman, D. W. (1993). Is the selection of statistical methods governed by level of measurement? *Canadian Psychology, 34*(4), 390–400. <https://doi.org/10.1037/h0078865>