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Environmental Awareness, Attitude, and Achievement through Nature-Based Learning

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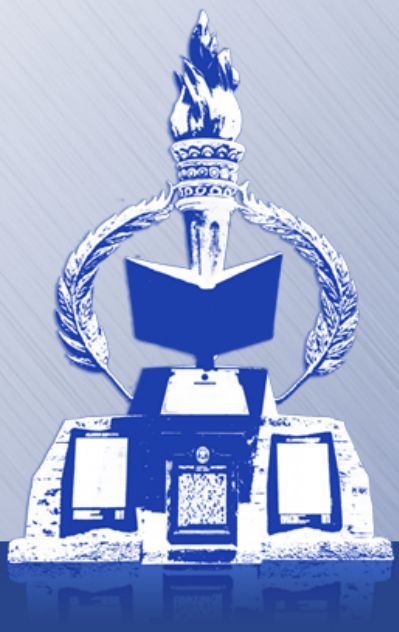

ENVIRONMENTAL AWARENESS, ATTITUDE, AND ACHIEVEMENT THROUGH NATURE-BASED LEARNING

A THESIS

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RYAN R. BAUTISTA
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May this research serve as blessings to all those who strive to protect and conserve the natural world.

Caritas Christi Urget Nos!

ABSTRACT

NAME:	**RYAN R. BAUTISTA**
TITLE:	**"ENVIRONMENTAL AWARENESS, ATTITUDE, AND ACHIEVEMENT THROUGH NATURE-BASED LEARNING"**
KEY POINTS:	Development, Evaluation, Try Out, Environmental Attitude, Environmental Awareness, Nature-Based Learning
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Environmental education is a long-term process of developing skills and behavior necessary to understand and accept the relationships between people, culture and the natural environment. This requires a good curriculum, competent teachers, and effective strategies to attain optimum learning of the students. The Science for Grade 10 of the K-12 Basic Education Program provides an opportunity for students to think of ways on how to minimize human impact to the environment which led the researcher to develop a Nature-Based Learning Module (NBLM) that aims to influence students' environmental awareness, attitude, and achievement.

The developed NBLM was used by 30 Grade 10 students of Masagana High School, Pandi, Bulacan and visited three (3) environmentally-threatened area in the nearby barangays of the the school. Another set of students, the control group, used the DepEd prescribed Science Learner's Manual. The Environmental Attitude Scale and Environmental Achievement Test were used to determine the pretest and posttest scores of the respondents. The pretests and posttest were analyzed using the Single Factor: Analysis of Variance. The developed NBLM's content and physical properties were

evaluated and validated by seven (7) experts and thirty (30) students who used the module. The NBLM was modified base on the recommendations of the expert evaluators.

The analysis of data revealed that the researcher developed NBLM greatly influenced the students to have positive responses toward providing solutions the prevailing environmental issues in the community. A significant improvement in achievement of students who used the NBLM was observed. Furthermore, the NBLM satisfactory complied with the DepEd's Textbook Style and Standard. These results show a high possibility of lessening the impact of human activities to the environment through its influence to the students' awareness, attitude, and achievement. The findings suggest the inclusion of misleading social values and subjective norms that negatively influences one's awareness, attitude, and behavior in the NBLM, use or develop suitable environmental activities, assessments on social values, feelings of ecological affection, subjective norms, informational social influence and their implication to environmental stewardship and behavior on the NBLM. It is recommended that future researches conduct a time-series study following the efficacy of the modified Kolb's Four-Stage Experiential Learning Cycle and its fusion to Nature-Based Learning, examining the potential changes in students' environmental awareness, attitude, and achievement. Students' learning styles can also be explored, determining the influence of the NBLM in enhancing students' learning styles leading them to a life-long learning experience. Finally, investigate how various strategies of student and teacher reflection are affected by the use of the NBLM.

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THE PROBLEM AND ITS BACKGROUND

Introduction

The continuous degradation of the environment highly affects all living things that dwell within it. Environment is defined as a condition that surrounds someone or something or simply the natural world (Merriam-Webster, 2015). This natural world houses a number of plants and animals that play an important role in sustaining life. Once a parcel is lost the rest of the community will be highly affected. Humans have a high contribution in the disturbance, destruction, and loss of suitable places that can sustain living things.

Massive disturbances caused by people have already altered, degraded, and destroyed the landscape on a vast scale, driving species and even communities to point of extinction (Primack, 2004). These alterations and degradations include the excessive and unreasonable use of resources whether living or non-living, habitat fragmentation due to building infrastructures, use of pesticides and herbicides in agriculture, and improper disposal of sewage. Lifestyle as defined by De Marco and Velardi (2014) is generally not becoming more sustainable, nor are changes in that direction easily made. Furthermore, lifestyle involves consumer and dietary choices, use of energy and transportation, political priorities, support for policy measures, and contribution to societal change as enumerated by Hedlund-de Witt (2012). This means that human lifestyle contributes to the destruction of the environment and increases environmental pollution. Environmental pollution as described by Fereidoun et al. (2007) is a worldwide problem and its potential to influence the health of human population is great (as cited in Khan & Ghouri, 2011). This just proves that human's negative impact to the environment can be detrimental not just to other living things but also to his health and existence.

Economic advancement, the protection of the environment, and responding to the needs of humans to survive can continue through sustainable development. Sustainable development is defined as the development that best meets present and future human

needs without damaging the environment and biological diversity (as cited in Primack, 2004). Ugulu et al. (2013) noted that if humans will continuously damage and exploit the environment, its non-living components and the living inhabitants will be lost. It is the future generation that will harvest the burden as result of the present generation's activities.

Environmental Awareness

Studies done locally and abroad have explicitly examined the factors affecting environmental awareness. Awareness encompasses incorporating knowledge of contemporary issues affecting nature locally and beyond, discovering which actions can make a difference in the surroundings, and self-awareness concerning personal environmental beliefs (Schmidth, 2007). Furthermore, it can be influenced by motivation, knowledge, skills, age, gender, educational attainment, income, living location, and political orientation (Milfont et. al., 2006; Xiao & Dunlap, 2007). These studies merely determined the factors that can affect environmental awareness but did not develop any intervention material that can positively influence environmental awareness and or sustain high awareness on existing environmental issues. This study considers the exigency of developing a module that can positively influence students' awareness that plays an important role in making environmental policy successful (Izuka, 2000).

Pro-Environmental Attitude and Behavior

The researches on pro-environmental attitude and behavior focused on the development of attitude which is frequently related to intentions, and behavior change. Attitude may be constructed either directly or indirectly from experience or from observations and interactions with others (Erwin, 2001; Jones, 2011; Ogunjinmi, Onadeko, & Adewumi, 2012). Many studies confirmed that knowledge itself is not enough to change individual's attitude or even to motivate them to adopt new behavior (Stern, 2000; Schultz, et. al., 2002). Furthermore, studies have shown that attitude can influence behavioral intentions that can lead to behavior change and can be influenced by environmental responsibility, beliefs, and values (Metin, 2010; Uitto, et. al. 2004).

Persons with a particular personal and social profile will be more likely to be concerned about the environment. Such persons are likely to have spent time in nature as a child, have accurate knowledge of the environment, its problems and potential solutions, to have an open, agreeable, and conscientious personality, to consider the future consequences of their actions, feel in control of their behaviors, liberal values and responsibility for environmental problems, are upper-middle class, hold personal and descriptive norms about pro-environmental actions, adhere to religion that teaches stewardship orientation to the earth, and spend time in non-consumptive nature activities (Gifford, 2014; Gordon, 2000). The literatures contain approaches defining what constitutes pro-environmental attitude and determine how it can affect behavioral intention which is essential to behavior change. In this study, a module that has behavior-related objectives aims to positively influence students' pro-environmental behavior, for behavior is the way in which an individual behaves or acts towards people, society, or object (Gordon, 2000). It is crucial to develop pro-environmental attitude which is essential in behavior change that can lead in solving existing environmental concerns on the immediate community.

Ciccareli & White (2010) presented three components of environmental attitudes: (1) Affect is a component of environmental attitude that pertains to the ways a person feels toward the object, person or situation; (2) behavior is the action that a person takes in regard to the person, object or feeling; and (3) cognitive is the way a person thinks about a person, object, or situation. These three components of environmental attitude that will be triggered by the researcher developed module through dynamic activities and exposure the natural environment.

Environmental Education

The goal of Environmental Education is to motivate citizens to act individually and collectively in an environmentally conscious manner that balances the social, economic, and ecological needs of today without compromising those of the future (Yorek et al. 2010). This implies that people specially the youth must have practical decision making to save the environment. Teaching and learning environmental biology

is a vital part of the curriculum to attain this aim of protecting and saving the future generation. Moreover, its goal is to make people sensitive about the environment and environmental protection by helping them develop positive attitudes, emotions, thoughts or behaviors about the environment as stated by Erol & Gezer (2006).

Schmidt (2007) emphasized that environmental education course should make environmental issues more accessible and relevant to students. She added that the activation of greater environmental awareness should also strengthen the link between pro-environmental attitudes and behavior.

Ugulu, Sahin, and Baslar (2013) in their study defined environmental education as a long-term process of developing the skills and behavior necessary to understand and accept the relationships between people, culture and the natural environment. They added that environmental education is a sequential process that attempts to increase understanding of the environment and promote pro-environmental values. This implies that it is not just mere understanding of environmental concept that makes environmental education effective and valuable part of a curriculum but in much consideration learner's positive attitude towards that environment can lessen environmental damage or even save the environment in any harm. UNESCO-UNEP (2010) reiterated that environmental education is crucially needed to prepare students who play an active role in protecting the environment through making informed decisions and taking environmental friendly behavior.

Norman, Jennings, & Wahl (2006) conducted a study on the impact of environmentally-related education on academic achievement and found that that study of natural areas combined with best teaching practices and teaching support can improve academic performance. It is essential to design environmental education programs that respond to changing knowledge of best teaching practices and support, reaching more students, and continuing to build understanding of the important factors that produce academic achievement through better evaluation and research. The contribution of environmental education to academic achievement can be strengthen by the use of

teaching practices and teacher support practices that have been associated with the positive outcomes documented by valid research. The environmental education program can be further strengthen and positively contribute to students' academic achievement by following the current educational research and incorporate best practices where its focuses on active and project-based learning, promote longer, integrated curriculum approaches to environmental study, maintain relevance to local environmental issues and culture of target audience, use constructivist, learner-centered methods that respond to the knowledge of the students, use inquiry and problem-solving experiences to promote critical thinking, and include cooperative and independent learning experiences.

Nature-Based Learning

Environmental education does not depend on the curriculum alone. Larijani & Yeshodhara (2008) explained that environmental education also depends on the quality of teachers in terms of knowledge, awareness, attitude and skills relating to environmental education. Many different strategies and methods exist for students to interact with nature in and outside the classroom (Gautheron, 2014). One of these strategies is the Nature-Based Learning (NBL), where students can have a direct interaction with nature or the environment. The learning process takes place outside the four corners of the classroom and students are exposed to the real world. This method proved to have increased in mastery of science concepts (American Institutes for research, 2005), improved creativity, affected emotions (Miller, 2007), decreased student alienation from school (Sobel, 2005), and recovered from attention fatigue. There are no literatures on NBL, that explored its influence to students' environmental attitude. Therefore this study enables to reveal the influence of NBL to students' attitude towards the environment.

Behavioral Interventions

In the review of Steg & Vlek, they concluded that behavioral interventions are generally more effective when they are systematically planned, implemented and evaluated. They addressed four key issues which included the following: (1) the identification of the behavior to be changed; (2) examination of the main factors underlying this behavior; (3) application of interventions to change the relevant behaviors

and their determinants; and (4) evaluation of intervention effects on the behavior itself, its main determinants, environmental quality, and human quality of life. An interdisciplinary collaboration is needed to effectively address the said issues, due to environmental problems are not just psychological problems; they are also ecological, technological, and socio-cultural problems. To successfully study the said issues, Steg and Vlek stated the following recommendations: measure actual behavior whenever possible and pay attention to the validity and reliability of self-reported behavior measures, interventions need to be evaluated following experimental research design. Changes in the relevant behavior, behavioral antecedents, environmental quality, and individual quality of life should be assessed before and after the implementation of an intervention, and treatment effects should be compared to those in a control group not exposed to the intervention. Finally, individuals can contribute significantly to achieving long-term environmental sustainability by adopting pro-environmental behavior patterns.

Synthesis

The enhancement of the Environmental Science curriculum has been the theme of the previously-discussed studies. Different programs, materials, and pedagogies were developed, validated, and pilot tested to improve students' mastery on environmental concepts and develop optimum awareness to different environmental problems which concern human interventions have destroyed the balance of nature. Previous researches showed that high environmental achievement, incorporation of contemporary issues can positively affect environmental awareness.

Pro-environmental attitude on different researches was found to have great influence to one's behavior towards the environment. Furthermore, researches showed that attitude have a direct relationship to behavioral intentions and behavioral change. That a change in attitude can influence a person's behavioral intentions and can lead to behavioral change. A number of studies were conducted on environmental programs, developed and validated scales in measuring environmental attitude and behavior but

there is none at present no intervention on environmental education that aims to improve students' pro-environmental attitude.

This study aims to fill the gap of Kolb's Experiential Learning Cycle. Researches enumerated and explained the weaknesses of Kolb's experiential learning cycle, which includes its contradiction to the interaction of between humans and the environment which will be addressed by this study through the use of nature-based learning. In the modified cycle in this study, activities in the NBLM provide opportunities to students to formulate hypothesis and test it in practice. Activities provide individual and group learning opportunities to address Kolb's focus on learning process for single learner. Finally, the exposure of the students to the different environmental concerns in the community would allow them to reflect by means of contrasting ideas from the responses of the people living in the community in dealing with the protection of the environment that is essential in providing long time solutions to the prevalent environmental concerns in the community.

Conceptual Framework

Kolb's Experiential Learning Cycle

David's Kolb (1978) theory of experiential learning is one of the great contributions to to the fast growing philosophy of experiential education. In his book titled *Experiential Learning* which focuses on individual development through reflection on its past experiences. Kolb's experiential learning describe learning as the process where knowledge is created through the transformation of experience. Furthermore, Kolb's model describe learning as a process not an outcome, is driven from experience, requires the learner to resolve conflict through dialect, carries a more holistic and integrated view, requires the individual to interact with its environment, and creates knowledge.

Kolb's four-stage experiential cycle starts with the acquisition of knowledge of a certain situation resulting into gaining of knowledge (concrete experience). The acquisition of knowledge is then followed by recalling or reflecting upon the experience

gained (Reflective Observation). After reflecting, learners will then breakdown knowledge acquired and previous experience into smaller chunk (conceptualization). And finally, learners interact with the environment (active experimentation). Once the process ends, it is again initiated through the results gained from the previous activity or experience and the learners can choose a different approach going through the four stages again.

Kolb's learning cycle lacks the inclusion of "here and now" the "immediate experience" of the learner and merely focuses on the past events (as cited by Mughal & Zafar, 2011). The cycle disregards the perception of the learner to incorporate the immediate experience triggering the event and the past experiences. The researcher then modified the Kolb's Model to address this concern by integrating on the fourth stage of active experimentation with transformation and extension of knowledge and experiences by fusing it with the present event with its past. Therefore, learners can compare and contrast the past and present leading them into the transformation of knowledge and extending what they have learned by coming into an effective conclusion.

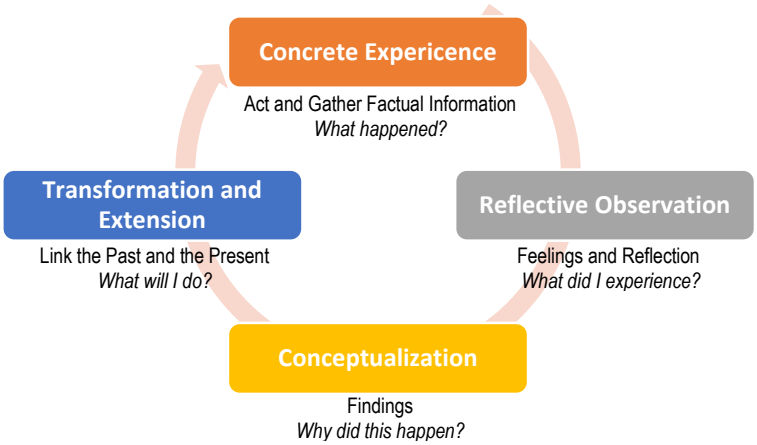


FIGURE 1.1: Modified Kolb's Four-Stage Experiential Learning Cycle

The modified Kolb's Four-Stage Experiential Learning Cycle serves as the backbone of the researcher developed NBLM. It was modified to fit the competencies set by the Department of Education in the Environmental Science topics in Grade 10. The cycle fully fits the set activities on the NBLM to reinforce and positively influence

students' environmental awareness, attitude, and achievement. In the modified model, students' observations serve as a starting point of experience, and then a disruptive experience occurs by means of their exposure to the environment which leads them in entering the stage of emotion inventory. In this stage, students become aware of their emotions in reaction to their experience. These emotions gained from their reflection lead the students to conceptualization or formulation of hypothesis. The pieces of information gathered would allow the students to test their hypothesis by performing reinforcing activities which led them to higher planning by means of using gathered information and tested hypothesis in solving environmental concerns in the community.

Nature-Based Learning

Nature-Based Learning is an education method that uses immersion of the learners into the natural environment as context for learning. It focuses on teaching in the environment but it does not necessarily teach about the environment. In this education method, the environment in which learning takes place must be natural, in environmental education, and learning can take place in natural or built environment.

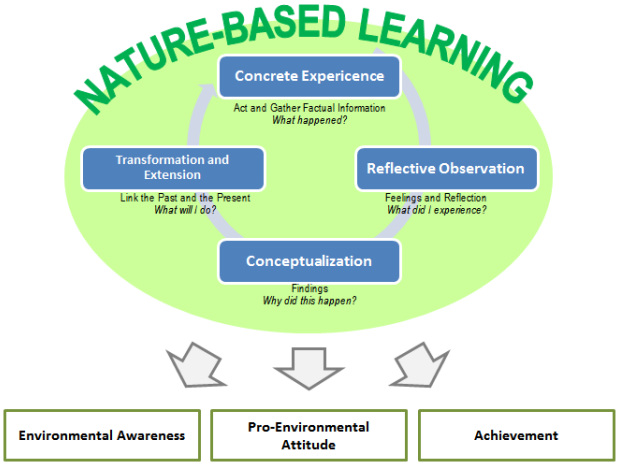


FIGURE 1.2: Nature-Based Learning and Modified Kolb's Four-Stage Experiential Learning Cycle

Figure 1.2 shows the modified Kolb's Four-Stage Experiential Learning with the Nature-Based Leaning. In this model, nature-based learning provides opportunities to the learners to acquire knowledge and experience about the environment which is an

immediate experience about it. Learners can also make reflective observations that will help them reflect on the knowledge gained and experience acquired. Finally, learners can link the present experience and observation to their past knowledge and experiences driving them to develop a wise judgment necessary for them to come into a conclusion. This model primarily focuses on augmenting learners' environmental awareness, pro-environmental attitude and their knowledge and understating of environmental concepts and phenomena.

Baker & Robinson (2012) analyzed Kolb's Experiential Learning Theory by comparing with to Dewey's point of view. Kolb asserted that "learning is the process whereby knowledge is created through the transformation of experience". This agues Dewey's perception that: "education must be conceived as a continuing reconstruction of experience". In this study of aligning Kolb's Experiential Learning Theory with Comprehensive Agricultural Model led the researchers to the following conclusions that educators must be careful to not over structure instruction to the point where concepts become completely irrelevant and are not retained by students. In addition, agricultural educators who engage students to learn by experience through authentic pedagogy will most likely see the fruits of higher intellectual achievements, not only in classrooms and school, but more importantly, in their roles as adults as contributing citizens of society.

Mollaei and Rahnama (2012) gave emphasis on the criticisms and weaknesses of the experiential learning theory created by Kolb and its contribution to language learning. In their study, the researchers stated the following weaknesses of the Kolb's theory. However, the most conspicuous weaknesses of Kolb's model are the vast difference between it and the ideas established by John Dewey. Dewey believed that observations of reality and nature were the starting point of knowledge acquisition. On the other hand, Kolb believes that experience is the starting point of knowledge acquisition and disregards the observations concerning the subjective reality of the learner. Kolb's model focuses on the learning process for a single learner and failed to determine how the individual fit into a social group. In their conclusion, experience needs to be structured to

some degree, relevant objective need to be specified and the conduct of the experience needs to be monitored.

Kolb did not give adequate interpretation of Dewey's concept of experience and reflective thought. For Dewey, there is no reflective thought without a disturbance in the habits and ways of doing things, without hypotheses and testing them in practice. In his thinking, experience includes the objective forms of interaction between humans and the environment (Miettinen 2000). Moreover, Kolb gave inadequate interpretation of Dewey's thought and that the very concept of immediate, concrete experience proposed by the experiential learning approach is epistemological.

Louv (2008) stated that Nature-Based Learning (NBL) is often associated with similar concepts as placed-based education, environmental education, outdoor education and environment-based education (as cited by Gautheron, 2014). NBL as described by Gautheron (2014) is an education method that uses immersion in a natural environment (which he refers to as the natural world) as context for learning. In his examples, NBL can take place in two ways. First, it can take place inside a typical classroom by bringing the natural world inside it. Learning to count can be aided by twigs, leaves or pebbles, learning to read can also be aided by plants or animals, and most especially the science process skills can be effectively acquired by this method. The second way of that NBL can be utilized is by bringing the students out of the classroom to the natural world to give them chance to be part of the natural world. Students can learn the parts of a plant by setting up a garden, learning and practicing to speak by describing what transpires in their environment or comfortably reading book under the shade of a tree. It is not necessary that the topic is all about environmental science, what is important is that; students manipulate, mingle, and become a part of the natural world. In addition, the results of Gautheron's study stated that integration of subjects into NBL is relevant to all ages as the responses of his teacher-respondents are unanimous.

Furthermore, Eaton defined NBL as all school-related academic education which takes place out-door (as cited in Fagerstam, 2012). NBL is closely linked with outdoor

education since it can be done outside the classroom. It is essential to consider that NBL requires the element of the natural world where students can observe, tinker, and be with nature. While in outdoor education, leaning may take place in a museum, sports stadium, zoo with minimal interaction with nature. Unlike NBL outdoor education merely occurs outside the classroom but in nature as previously described, the natural world can be brought inside the four corners of the room for learning to take place in any subject matter.

The NBLM fused Kolb's four-stage experiential learning cycle as its structure and the nature-based learning as reinforcing backbone. In the integration of the two pedagogies, students were exposed to the environmental concerns in their community and through the activities which fits the four stages of the Kolb's experiential learning which enabled them to test their hypothesis and make solutions to the existing environmental concerns in their immediate community.

Books, modules, and other learning materials developed must coincide and comply with the implemented curriculum. Based on the results of the evaluation of experts the content of the NBLM matches the content standard and learning competencies set by the Department of Education to Grade 10 Science under the K to 12 Basic Education Curriculum which is fully evident with substantial agreement among the evaluators. The Environmental topics, concepts, and activities reflected and reinforced the standards of the prevailing curriculum. Mahmood, Iqbal, & Saeed (2009) reiterated that the curriculum is the main course of action that can ensure the supply of effective and efficient human resource for the development of a nation and a progressive society. Textbooks are the visible, tangible and practical manifestation of the curriculum. Since the the NBLM garnered an overall evaluation for its Objectives, Alignment with the DepEd's Vision, Mission, Values, Contents, and Activities which entails that the NBLM can further contribute not just for the progress of the society but rather play an important role in revitalizing, protecting, and conserving the natural world, our environment.

The DepEd developed a manual of textbook style and standards to ensure quality of the manual layout of the textbook as cited by Mahmood, Iqbal, & Saeed (2009). The (1) general and technical standards which include the size, paper stock, cover stock, and binding; (2) cover specifications such as the font, font size, and general layout; and (3) printing specification that covers the font types and size suitable for the intended grade level.

Pro-Environmental Attitude as the main target of the NBLM to be positively influence must be scientifically measured. There are several tools that were developed to assess attitudes toward the environment are the Children's Environmental Attitude and Knowledge Scale or CHEAKS (Leeming, O'Dwyer, & Bracken, 1995) aims to measure children's environmental knowledge and attitude. The New Ecological Paradigm (NEP) scale, which is sometimes referred to as the revised NEP, is a survey-based metric devised by the US environmental sociologist Riley Dunlap and colleagues designed to measure the environmental concern of groups of people using a survey instrument constructed of fifteen statements. The NEP scale is considered a measure of environmental world view or paradigm (Anderson, 2012). The General Attitude Scale about Environmental Issues (GASE), developed by Metin (2010), is a 27-item survey that measures the five dimensions of environmental issues: (1) willingness to learn and inform about environmental issues; (2) disbelief in explanation related to environmental issues; (3) sensitivity towards environmental issues and saving the environment; (4) disbelief in environmental pollution; and (5) belief in protecting habitat.

The High School Environmental Attitude Scale was developed by Ugulu, Sahin, and Baslar (2013) that was modified and utilized in this study is an environmental attitude scale composed of four subscales: (1) issues related to environmental awareness; (2) issues related to recovery; (3) issues related to recycling; and (4) issues related to environmental consciousness.

Statement of the Problem

The primary concern of the study was to develop, evaluate, and validate a localized Nature-Based Learning Module in teaching Environmental Science topics in Grade 10 Science. The developed NBLM was used to determine its influence to students' environmental awareness, pro-environmental attitude, achievement, and seek answers to the following questions:

1. What Nature-Based Learning Module can be designed for the immediate community that is based on the K-12 Science competencies?
2. What are the students' attitudes toward their environment enhanced by the researcher designed NBLM?
3. Is there a significant difference between the pretest and posttest of the control and experimental group in terms of environmental awareness and achievement?
4. Is there a significant difference between the posttests of the control and experimental group in terms awareness and achievement?

Scope and Delimitation

The study covered the development NBLM which is an extension of the Grade 10 Science Learning Manual of the Department of Education that is being used by Grade 10 public school teachers and students. The material followed the principles of nature-based learning where the teaching and learning process occurs between the environment (or nature) and the learners alone with the teacher as the facilitator of the process. The the students were exposed to nature where they can observe organisms' habitat, movement and behavior. This process of Nature-Based Learning was facilitated in this study.

The structure of the module follows the modified four part process of David Kolb's Approach to Experiential Learning where students are to (1) engage in new experience; (2) reflect on that experience; (3) analyze and draw conclusion on that experience; and finally (4) integrate the new experience to their past experience and how to utilize it in the future (Beudin, n.d.). This structure allows the students to explore the different environments located into the community where they live in. The learning

process entails the students to perform scientific procedures; collect living specimens; and interview people living near the location.

The study was limited to the development and evaluation of a NBLM that aims to improve environmental awareness, to influence pro-environmental attitude, and to enhance achievement scores of Grade 10 students. This module does not include improvement of students' emotion and socialization. The teacher is mere a facilitator and students work in groups lead by a student facilitator. Attitude is shaped by many intervening factors, for this reason, future studies would benefit from examining various traits that may impact individual pro-environmental attitude.

Significance of the Study

This research following the David Kolb's Approach to Experiential Learning aimed to develop, to tryout, to evaluate, and to validate a community-based or localized Nature-Based Learning Material (NBLM) for Grade 10 Environmental Science lessons in a rural, public high school. That followed the modified David Kolb's Approach to Experiential Learning.

This study is very important in improving the students' environmental awareness, influence pro-environmental attitude, and enhance achievement scores that will lead them to fully understand the concept of sustainable development. Students do not just consider the present experience but rather recall their previous experiences and integrate it to their observations, reflections, and conclusions and even go beyond the future. The usual learning procedure will no longer be the same since the learning process does not occur inside the classroom but in familiar places in the community where they live.

Science teachers can develop skills in handling outdoor learning and scientific skills and community involvement. The preparations in using this module require the teachers to have an open communication with the community local officials, the residents, and the parents of the students. This will develop the teachers' communication

skills, increase their environmental awareness, and teach the community to use the resources in their environment without sacrificing the future generation.

Researchers can further explore the influence of different paradigm and learning theories to students' environmental awareness, attitude, and achievement. The integration of new and eclectic strategies in teaching in the NBLM in future researches can further fortified its goal of positively influencing students' environmental awareness, attitude and achievement leading them in formulating solutions to different environmental concerns.

Definition of Terms

The following terms were defined operationally to further understand the study.

Attitude: opinions and feelings often influenced by one's belief that predispose us to respond in a particular way to objects, people, and events (King, 2013).

Awareness: is a state of being aware or having knowledge about the external surroundings in which people live and work, and which tend to influence people's development and behavior. A high level of environmental awareness enables conscious choices to act in an environmentally friendly way (Autti, 2013).

Environment: very broadly as anything that affects an organism during its lifetime (Tillery, Enger & Ross, 2007); the circumstances and conditions that surround an organism or a group of organisms (Cunningham & Cunningham, 2008).

Environmental Attitude: learned belief which develops from an individual's knowledge and values about the environment and governs action to support or sustain the environment (Uitto, Juuti, Lavonen. & Meisalo, 2004). Attitude can also be defined as a favorable or unfavorable evaluations of, and reactions to object, people, or any aspect of the world, which enables us to predict and change people's behavior and may be derived from life experiences and education, markedly influenced behavior (as cited in Ugulu, Sahin, & Baslar, 2013).

Learning Material: is a tool used to aid and facilitate the learning process.

Nature-Based Learning: is an education method that uses the immersion in a natural environment.

Chapter 2
METHODOLOGY

Research Design

Development Research Design was used in developing the Nature-Based Learning Module (NBLM) and determining students' pro-environmental attitude. In this descriptive research design the researcher selected the content of the module based on the Environmental Science topics set on the Science 10 Curriculum Guide set by the Department of Education. The developed NBLM was evaluated and validated by experts in the field of Biology and selected first year Environmental Science students for its content and physical attributes. It includes questions that were intended to determine students' attitude toward backyard gardening, protecting aquatic environment, and sustainable development.

Two-Group with Pretest and Posttest Experimental Design was used as a secondary design to determine the effect of the Nature-Based Learning Module on students' environmental awareness and achievement (Figure 3.1). Pretest was taken by the students both by the control and experimental group. After which, students in the control group used the Manual prescribed by the Department of Education, while those in the experimental group used the NBLM. Then, after the experimental period, the groups were given the same pretest but in different form to avoid the effect of practice as the posttest. (Calderon & Gonzales, 2005).

FIGURE 2.1: The Two Groups Experimental Design with Pretest and Posttest

0_1	X	0_2	**Experimental Group**
0_1		0_2	**Control Group**

where:

0_1	Pretest
X	Use of NBLM
0_2	Posttest

Respondents

The respondents of this study were sixty (60) Grade 10 students of DepEd Masagana High School, SY 2015-2016. The respondents' ages range from 13 to 15 years. They were heterogeneous in terms of sex, attitudes, and socio-economic status, residence, and parents' educational attainment.

The students were evenly distributed into to two groups with their grade in science as its basis. The researcher considered the following steps in the selection and grouping of respondents. The respondents were ranked according to the mean of their first, second, and third quarter rating in Science. In the ranked list students who were frequently absent, home study, dropped or with sensitive health condition were removed from the list to ensure that all the respondents complete the scheduled activities all throughout the tryout.

The systematic random sampling technique was used by the researcher to ensure the heterogeneity of the control and experimental group and to determine the members of the control and experimental group. From the ranked roster of students, the researchers assigned numbers one and two alternately to the name of the students. All number ones were group A and all number twos were group B. A toss coin was done to determine the control and experimental group in the groups of students. The students who were not included in the control and experimental group due to the set number of respondents were named group neutral where they performed activities on the module prescribed by DepEd facilitated by a teacher.

Profile of Evaluators

The evaluation team is composed of seven (7) science teachers and professors with a minimum of five years teaching experience. See Appendix Q for the profile of the evaluators. They have been teaching science in the high school, tertiary and/or graduate level, or school administrator with specialization in science. Evaluators are at least master's degree holder with thesis which specialization in Biological Sciences.

Research Procedure

Nature-Based Learning offers immense opportunities for the students and is highly beneficial for community's sustainable development. But then researches on NBL gave more focus on students' academic achievement, emotion, and socialization, but none about students' environmental attitude and awareness. The development, validation, and integration of localized NBLM will help students develop a pro-environmental attitude, awareness, and improve their achievement which is essential in attaining sustainable development in the community where they belong.

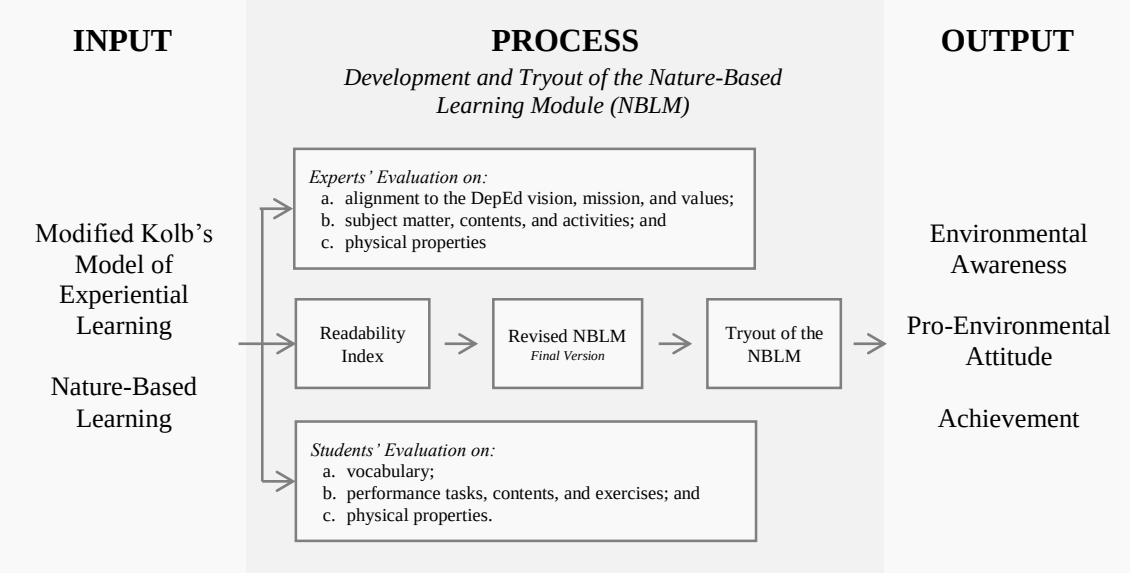


Figure 2.2: Input-Process-Output

The Input-Process-Output Research was used in this study. The basis of the study is the Kolb's Experiential Learning Cycle and Nature-Based Learning as its backbone. The researcher used these concepts in developing a nature-based learning module that undergone a series of procedures to validate its contents and physical attributes. The developed NBLM was evaluated by experts and students to ensure its content validity that was designed for Grade 10 students. The revised and final version of the NBLM was used by Grade 10 students; the module was intended to enhance their environmental awareness, pro-environmental attitude, and achievement as the expected output of the process.

The procedure of this study was divided into three phases namely the pre-experimental phase, experimental phase and the post experimental phase.

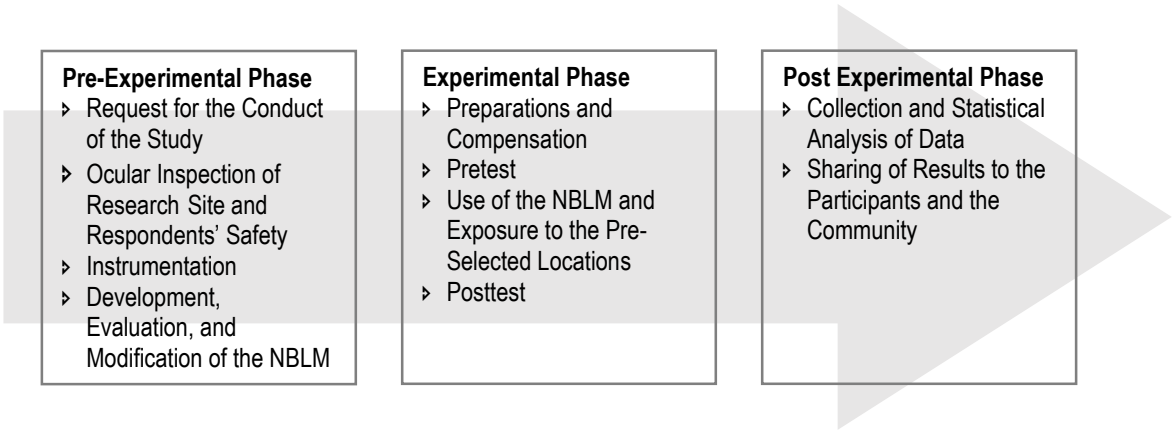


FIGURE 2.3: The Research Procedure

Pre-Experimental Phase

The pre-experiment phase includes procedures in requisition for permission of the conduct of the study to ensure that school officials and stakeholders were informed about the nature and procedure of the study. The inspection of the research site is necessary to ensure respondents' safety and the suitability of the area for the set activities. The development of instruments for the evaluation of the module and to assess its effectively and impact to the respondents. The development, evaluation, and modification of the Nature-Based Learning Module is the last stage of this phase.

Request for the Conduct of the Study

The researcher obtained permission from the office of the school principal and schools division superintendent for the implementation of the study in DepEd Masagana High School. See Appendix A. An Indorsement was issued by the office of the Schools Division Superintendent dated September 30, 2016 giving permission and guidelines in the conduct of the study. See Appendix B for the Indorsement. The following procedure was followed to ensure that the respondents were fully aware of the study that they participated in.

Letters were sent to parents/guardians of the respondents to ask for their permission to allow their child to be part of the study. See Appendix C. Only the respondents with a duly-signed letter of permission were allowed to join the Nature-Based Learning Activities. The students whose parent/guardian did not allow them to join the activity were included to the neutral group. An orientation was given to all the respondents both in the control and experimental group about the week-long activity that they were engaged in.

Ocular Inspection of Research Site and Respondents' Safety

The researcher coordinated to officials of the three (3) nearby Barangays that cover the area where the experiment was done. It was important to keep the respondents safe while they were engaged in the nature-based learning process. All respondents were required to submit a letter of permission duly signed by their parents allowing them to join the nature-based learning. No letter of permission turned in means that the respondent could not join the nature-based learning.

To ensure the safety of the respondents during the nature-based activities, letters were sent to the Barangay Captains obtaining permission for the research to conduct the research; coordinate with them; and request for security personnel to look after the participants during the conduct of the study. See Appendix D. The researcher rented a jeepney to send and fetch the students from the different sites.

An orientation was given to the respondents about the rules and regulations that they must follow before they engage in different activities on the module. Orientations were given to all respondents and teacher facilitator before going to the different sites. All participants were reminded to observe caution in all activities that would be asked to perform. The use of mask and gloves were observed in handling test chemicals. First aid kit was always made available to respond to minor accidents. All respondents were required to bring an umbrella, bottled water, and towel to protect them from the heat of

the sun and possible dehydration. The barangay patrol was readily available for use in case of accidents. A whistle was used to call the attention of the students while student leaders were given the contact number of the teacher facilitator to easily communicate untoward incidents during the nature-based learning.

Instrumentation

The High School Students' Environmental Attitude Scale (EAS) developed by Ugulu, Sahin, and Baslar (2013) was used to measure the respondent's environmental awareness and attitude. The translated EAS was evaluated by experts to ensure that the translation of English to Filipino text is reliable. See Appendix E. A four-point rating scale was used to determine the level of awareness and pro-environmental attitude of the students. The EAS was modified to ensure its suitability to the NBLM.

To measure the students' achievement, the researcher made a 50-item Science 10 Achievement Test of pre-selected Environmental Science topics. To test the content validity, a table of specification (TOS) was prepared and the number of items was based on the length of time found in the TOS. See Appendix G for the table of specifications. A pilot testing of the instrument was done and given to fifty (50) first year BS Environmental Science students of Bulacan State University. See Appendix F for the Letter requesting permission to conduct the pilot test. An item analysis was done to determine the level of difficulty and discriminatory power of each test item. See Appendix H. Out of fifty (50) items, thirty four (34) items had a good discrimination index and thirty (30) of which were included in the achievement test. See Appendix I for the result of the Item Analysis.

Development of Experts' and Students' Assessment and Evaluation Tool

The Nature-Based Evaluation Tool for the validity of the content and physical properties of the module was adapted from the Crystal Springs Book Development for Educators Textbook Evaluation Form and St. Paul College of Bocaue Text Book Evaluation. Both the evaluation tool for experts and students were adapted from the

aforementioned evaluation tools. See Appendix J. Another evaluation tool was made for students to assess the module's content and physical properties. See Appendix K.

Development, Evaluation, and Modification of the NBLM

The NBLM was developed based on the principles and pedagogical structure of Nature-Based Learning where students will work, analyze, observe, gather data, make reflections, and draw conclusion in the natural world or the environment. The researcher followed a three-staged procedure that includes the design stage, production stage, and evaluation and validation stage, and final revision stage.

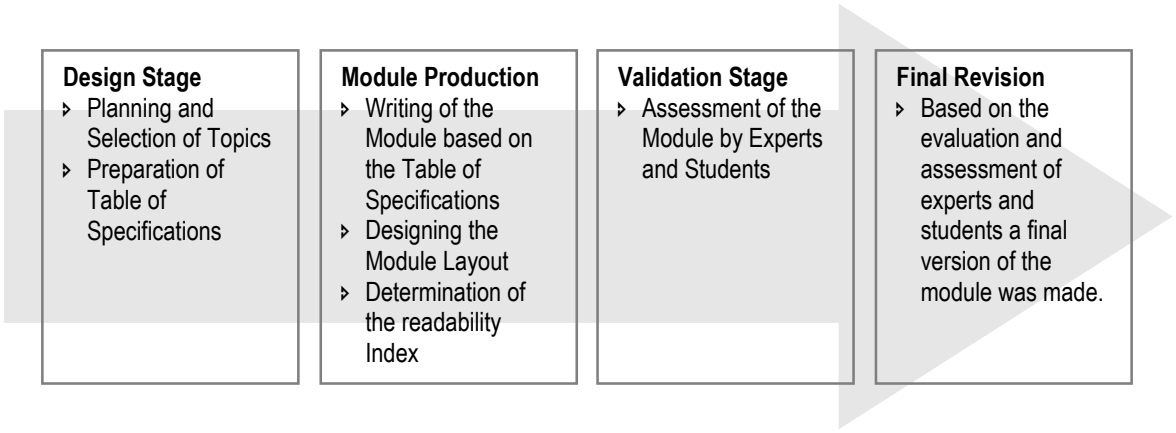


Figure 2.4: The Development, Evaluation, and Modification of the Nature-Based Learning Module

Design Stage

The content of the module was based on the enhanced K to 12 Basic Education Curriculum Guide – Science 10. All activities and concepts conformed to the competencies and content compliant to the curriculum. The module covered the following topics: (1) Environmental Resources, (2) Flow of energy in Ecosystem, Population Growth, and Carrying Capacity, (3) Fresh Water Ecosystem and Water Pollution, (4) Sustainable Development and Air Pollution, and (5) Environmental Awareness.

The structure of the module followed the David Kolb's Approach to Experiential Learning. The module is composed of the following parts in every topic use: (1) Objectives; (2) Environmental Check-up; (3) Procedure of the Activity; (4) Guide Questions; (5) Fusing and Linking New Observations to the Past Experiences; and think how to utilize it in the Future and (6) Commitment to the Environment.

Activities are nature-based where nature served as the facilitator of learning. It is the natural natural world that showed factual information and guided the students to make reflections, draw conclusions, and give solutions to existing environmental problems. A table of specifications was developed showing the topics covered by the NBLM. See Appendix G for the table of specifications.

Production Stage

The content of the module was taken from a number of internationally and locally published Biology and Environmental Science Books. Activities were designed appealing to the students that encouraged the students to be inquisitive and keen observers. The activities served as springboard for the students to define and explain phenomena that emerged in their community. To ensure the accuracy of all concepts and activities, experts proofread the manuscript of the module.

The layout of the module was developed in a manner that is appealing to Grade 10 Students following the principle of *less-is-more* rule where graphics do not crowd the page. The language was checked by experts to ensure that the NBLM was free from grammatical errors. The Readability Index was determined through MS Word 2010 Readability Statistics. See Appendix L for the Readability Index result.

Evaluation Stage

Prior the evaluation of the module by experts and students, a 4-point Likert scale was developed for the evaluation of the module. The Expert's NBLM Evaluation Form was divided into two parts. The first part includes the criteria on the module's objectives,

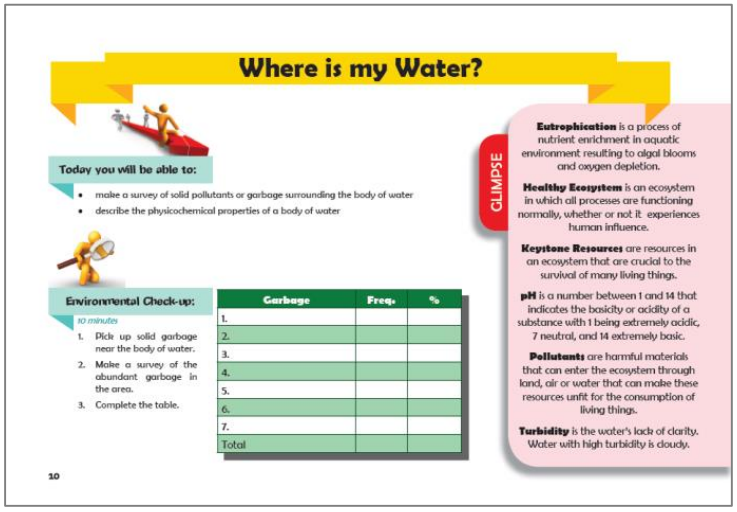
alignment with the DepEd vision and mission, contents, and activities while the second part of the form includes criteria on the physical properties of the module, it layout, and quality of materials used.

The researcher prepared a copy of the module, evaluation form, DepEd's K to 12 Curriculum Guide for Science 10, and DepEd's Vision, Mission, and Core Values which were all placed in a brown envelope and were sent to the evaluators together with a letter of request to evaluate the NBLM addressed to the evaluator. See Appendix N for the letter of request to the evaluators. A letter envelop was provided for the evaluator to enclose and seal the accomplished evaluation form.

Thirty (30) first year BS Environmental Science students evaluated the NBLM. Students were gathered on Biology Laboratory of Bulacan State University. Each Student was given a copy of the module. Students were asked to read the entire module and highlight the terms, descriptions, questions, instructions, and procedures that are unclear. After evaluating the content of the NBLM students performed the activities on the module. All materials were provided and a timer was used to determine how long the students accomplished the activities.

After performing the activities on the NBLM, the students evaluated the module using the Student's Evaluation Form on Appendix K. The evaluation questionnaires contained control number and basic information about the evaluators. The name of the student evaluators were not taken to protect their privacy and confidentiality of results.

FIGURE 2.5. The Nature-Based Learning Module



Where is my Water?

Today you will be able to:

- make a survey of solid pollutants or garbage surrounding the body of water
- describe the physicochemical properties of a body of water

Environmental Check-up:

10 minutes

1. Pick up solid garbage near the body of water.
2. Make a survey of the abundant garbage in the area.
3. Complete the table.

Garbage	Freq.	%
1.		
2.		
3.		
4.		
5.		
6.		
7.		
Total		

10

CLIMPSE

Eutrophication is a process of nutrient enrichment in aquatic environment resulting to algal blooms and oxygen depletion.

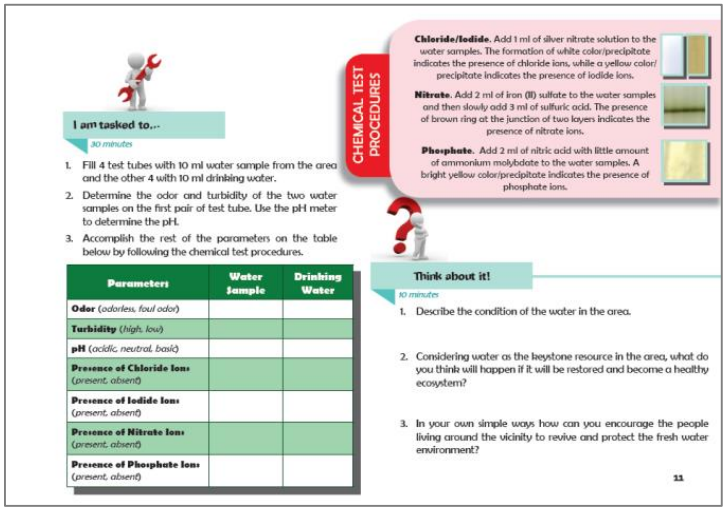
Healthy Ecosystem is an ecosystem in which all processes are functioning normally, whether or not it experiences human influence.

Keystone Resources are resources in an ecosystem that are crucial to the survival of many living things.

pH is a number between 1 and 14 that indicates the basicity or acidity of a substance with 1 being extremely acidic, 7 neutral, and 14 extremely basic.

Pollutants are harmful materials that can enter the ecosystem through land, air or water that can make these resources unfit for the consumption of living things.

Turbidity is the water's lack of clarity. Water with high turbidity is cloudy.



I am tasked to...

30 minutes

1. Fill 4 test tubes with 10 ml water sample from the area and the other 4 with 10 ml drinking water.
2. Determine the odor and turbidity of the two water samples on the first pair of test tube. Use the pH meter to determine the pH.
3. Accomplish the rest of the parameters on the table below by following the chemical test procedures.

Parameters	Water Sample	Drinking Water
Odor (*odorless, foul odor*)		
Turbidity (*high, low*)		
pH (*acidic, neutral, basic*)		
Presence of Chloride Ion: (*present, absent*)		
Presence of Iodide Ion: (*present, absent*)		
Presence of Nitrate Ion: (*present, absent*)		
Presence of Phosphate Ion: (*present, absent*)		

CHEMICAL TEST PROCEDURES

Chloride/Iodide. Add 1 ml of silver nitrate solution to the water samples. The formation of white color/precipitate indicates the presence of chloride ions, while a yellow color/precipitate indicates the presence of iodide ions.

Nitrate. Add 2 ml of iron (II) sulfate to the water samples and then slowly add 3 ml of sulfuric acid. The presence of brown ring at the junction of two layers indicates the presence of nitrate ions.

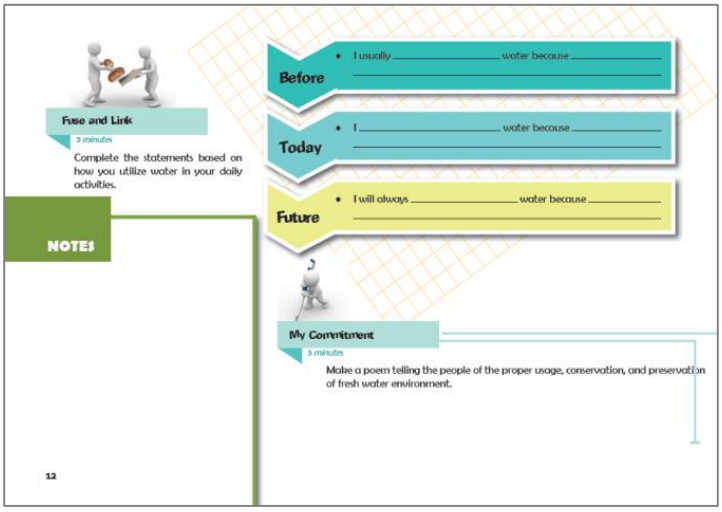
Phosphate. Add 2 ml of nitric acid with little amount of ammonium molybdate to the water samples. A bright yellow color/precipitate indicates the presence of phosphate ions.

Think about it!

10 minutes

1. Describe the condition of the water in the area.
2. Considering water as the keystone resource in the area, what do you think will happen if it will be restored and become a healthy ecosystem?
3. In your own simple ways how can you encourage the people living around the vicinity to revive and protect the fresh water environment?

11



Fuse and Link

5 minutes

Complete the statements based on how you utilize water in your daily activities.

Before

- I usually _____ water because _____

Today

- I _____ water because _____

Future

- I will always _____ water because _____

NOTES

My Commitment

5 minutes

Make a poem telling the people of the proper usage, conservation, and preservation of fresh water environment.

12

Experimental Phase

The experimental phase includes the following procedures. The materials needed in all activities were all prepared beforehand as well as the vehicle used to bring and fetch the participants into the preselected locations was also carefully planned. The procedures of NBLM tryout and administration of the pretest and posttest were all done in this phase of the experiment.

Preparations and Compensation

The respondents were under the supervision of the researcher during the study and to avoid any conflict of interest the science teachers facilitated the nature-based learning module in the experimental group and the control group. The training was conducted to three (3) science teachers of DepEd Masagana High School on how to use the NBLM and how to facilitate nature-based learning. See Appendix O for the school memorandum on the training of science teachers. The researcher served as mere observer while the teachers facilitated the learning process.

All materials, travel expenses, and related financial matters were funded by the researcher. The school, teachers, respondents were not required to contribute to any expenses in the study. The module, laboratory apparatus, and test reagents used by the respondents on the experimental group were provided by the researcher for free and were used for solely academic purposes.

Pretest

The developed, evaluated, and pilot tested EAS and achievement test was given to all grade ten students of Masagana High School. Results were recorded and analyzed. The results of the pretest of both experimental and control groups were compared to determine the homogeneity of the groups in terms of their average grade of the first, second, and third quarter grade in Science. The achievement test was administered early in the morning of March 2, 2016 and the Environmental Attitude Scale (EAS) followed.

The achievement test questionnaires, EAS, and questionnaires had a corresponding control number. All materials were sealed in a long brown brown envelope. The envelope containing the materials was opened only when the tests were administered. The respondents were given the achievement test questionnaire and answer sheet. They were not allowed to write anything on the test paper paper. Only the control number of the questionnaires appeared on the answer sheets to ensure the protection of privacy and confidentiality of the participants. All information needed and their answers were written on the answer sheet. The students were given one (1) hour to answer the achievement test. The Environmental Attitude Scale was administered right after the achievement test and the respondents were given thirty (30) minutes to answer the EAS. After all the respondents had answered the tests, corresponding envelopes for the Achievement test questionnaires, EAS, and answer sheet were provided. All materials were sealed in the envelope to ensure the privacy and confidentiality of the results.

Use of the NBLM and Exposure of Respondents to the Pre-Selected Locations

The experiment was conducted in the three pre-selected areas; see Appendix P in the communities where the following environmental issues can be observed: (1) Farmlands converted into a housing project that is located at Mapulang Lupa, Pandi, Bulacan. The area is far from the fast moving vehicles of the major roads of Pandi. Students can go from house to house, safe from fast moving vehicles. (2) River ecosystem dumped with garbage from illegal settlers and toxic wastes from industries that is located in Masuso, Pandi, Bulacan. The water is not deep and far from the major roads of the barangay. The respondents used gloves and mask when collecting and testing water samples. (3) Forested and Farmland areas converted into technological/industrial park located at Masagana, Pandi, Bulacan. All the factories and plants are all near the school. Very few vehicles pass by the road since it is a rural area. Respondents were required to bring umbrella, towel, and drinking water for them to be protected from the heat of the sun and dehydration.

The experimental group used the NBLM from Mach 3, 2016 to March 9, 2016. The respondents were given two hours (2) to accomplish a lesson on the NBLM. The time given includes the time to prepare for the activities, travel from school to the site, perform the activities in the module, gather data, and answer guide questions.

The Control Group

The respondents of the control group used the Science 10 Students' Manual (SMS) prescribed by the Department of Education. Respondents were given one (1) hour to accomplish all the activities on the module. The respondent worked in pairs or groups in accomplishing the activities.

Post Test

The respondents were gathered in the same classroom where they have taken the prettest to take the EAS and Achievement Test. Items were rearranged to avoid the effect of practice (Calderon & Gonzales, 2005). The procedures done during the pretest were strictly followed to ensure the privacy and confidentiality of of the respondents' information and results of the assessment administered.

Post Experimental Phase

The last phase of the research procedure is the post experimental phase. In this phase the procedures on data collection and analysis was presented.

Collection and Statistical Analysis of Data

The results of the pretest and posttest administered to the respondents were gathered and treated with utmost confidentiality. To ensure the confidentiality and veracity of the results the following procedures were followed by the researcher: (1) the sealed envelopes containing the results of the assessment done were opened after the experimental phase; (2) the achievement test's answer sheets were checked manually; and (3) the result analysis was aided by Microsoft Office Excel 2010 Data Analysis Tools.

The Single Factor Analysis of Variance was used to determine the difference between the pretest – posttest of the control and experimental group in their achievement test and EAS. See results on Appendix R. The One-Way Analysis of Covariance for Independent Factor was used to determine the difference between the posttests of the control and exponential group in their achievement test and EAS.

The result of the content and face evaluation of the NBLM was summarized using the mean of every criteria and were presented in table. Fleiss Kappa was used to determine the agreement of the raters (Gwet, 2014).

$$\hat{\kappa}_F = \frac{P_a - P_{eF}}{1 - P_{eF}}$$

The Landis and Koch-Kappa's Benchmark Scale was used to interpret the agreement of the rates.

Kappa Statistic	*Interpretation*
< 0.0	Poor
0.0 – 0.20	Slight
0.21 – 0.40	Fair
0.41 – 0.60	Moderate
0.61 – 0.80	Substantial
0.81 – 1.00	Almost Perfect

The following continuum was used to interpret the degree of students' awareness:

Mean	*Interpretation*
3.51 – 4.00	Highly Negative
2.51 – 3.50	Negative
1.51 – 2.50	Positive
1.00 – 1.50	Highly Positive

A rubric was used to interpret the degree of students' pro-environmental attitude based on their response on the essay question set at the end of every module:

Criteria	*Interpretation*
Student's response is pro-environmental.	Positive Response
Student's response is pro-environmental but with reservation.	Neutral Response
Student's response is not pro-environmental	Negative Response

Sharing of Results to the Participants and the Community

A post-experimental huddle was conducted to the respondents presenting to them the results of the study. The respondents shared their experiences during the nature-based learning, the information that they have learned about the community, and their reflections as they go along the program. The research was used as a Continuous Improvement Program (CIP) of the Science Department of DepEd Masagana High School to enhance Grade 10 students' environmental awareness, attitude, and achievement. A copy of the research was submitted to the DepEd Division of Bulacan as per requested by the office of the Schools Division

Chapter 3
PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA

This chapter presents the data gathered on the study about the development and evaluation of a nature-based module is aimed to enhance Grade 10 students' environmental awareness, attitude and achievement.

Problem No. 1: What Nature-Based Learning Module can be designed for the immediate community that is based on the K-12 Science competencies?

The researcher designed the Nature-Based Module "A Journey to the Natural World" based on the three prevalent environmental threats in areas near Masagana High School located in Pandi, Bulacan. These threats are the transformation rice fields into housing project, river ecosystem dumped with garbage, and forested and farmland areas converted into industrial parks. The concepts were selected based on the Science 10, K-12 Curriculum Guide. The module is composed of five lessons aligned with the enhanced learning competencies of Grade 10 Environmental Science topics. The following are the lessons included in the module lesson 1: Environmental Resources; Lesson 2: Flow of Energy in the Ecosystem; Lesson 3: Fresh Water Ecosystem and Water Pollution, Lesson 4: Sustainable Development and Air Pollution; and Lesson 5: Environmental Awareness. The activities and lessons included in the module were based on Grade 10 Science of the K-12 Basic Education Curriculum. The NBLM addressed the learning competencies on the Science 10 K to 12 Basic Education Curriculum. See Appendix U for the competencies addressed by the NBLM on the Curriculum Guide.

Module 1 is the introductory activity about the different resources that are essential to the survival of all living things. In this module students made a diagram on how these resources are interconnected and how one affects the others. They compared the natural resources: water, air, soil, plants, and animals before and in the present, they also inferred the condition of these resources in the future based on what is happening in

the community. The succeeding modules addressed the competencies stated on the Science 10 K to 12 Basic Education Curriculum Guide.

Module 2 allowed the students to explain how species diversity increases the probability of of adaptation and survival of organisms in changing environments. In this module students compared a vacant lot to a housing project. The students looked for organisms living in the vacant lot and classified them into producers and consumers, form there they made a food chain and food web showing the flow of energy and matters in the ecosystem. After which the nearby housing project was visited by the students to compare the number of residence and that land area that can support their needs. It is obvious that the area cannot support the needs of the residents so the students made a survey of sustaining a backyard garden in every house. This activity gave the students the opportunity to explain the relationship of population growth and carrying capacity. Students had the opportunity to infer how organisms in the vacant lot strive or adapt in the housing project that was a former vacant lot.

Module 3 allowed the students to suggest ways to minimize human impact on the aquatic ecosystem. In this module students identified the impact on human activities to the aquatic ecosystem. Students compared the water on the area to a commercially-sold drinking water. They performed chemical tests on both waters and compared it. Students made a survey of solid waste dumped into the water by the residents living nearby. At the end of the module students made a poem telling the people of the proper usage, conservation, and preservation of fresh water environment.

Module 4 is an extension of Biodiversity and Stability which allowed the students to understand sustainable development. In this module students visited the different commercial establishments. Students conducted a survey to the residents determine on positive and negative effect of the commercial establishments to their daily living. Module 5 allowed the students to reflect on their experience in their journey to the natural

world, their own community, their home. They were task to make a pact of commitment to Mother Nature to be her guardian.

Table 3.1: The Comparison of the Content of the NBLM to the K-12 Basic Education Curriculum Science 10

Nature-Based Module			K-12 Basic Education Curriculum Science 10		
Lesson Title	**Objectives**	**Activities**	**Content**	**Content Standards**	**Learning Competencies**
Where will I Belong?	Identify different resources and determine their importance to living things.	Students identify resources essential to life.	Preliminary activity or recall to reinforce the understanding of the succeeding topics and concepts.		
Houses Amidst the Natural World	Classify biotic components as producers and consumers create and food chain and food web, and compare the number of organisms to the available resources in an ecosystem.	Search for biotic and abiotic components. Make a survey about backyard gardening.	Flow of energy and matter in Ecosystems. Biodiversity and stability Population Growth and Carrying Capacity	The influence of biodiversity on the stability of ecosystems The ecosystem as being capable of supporting a limited number of organisms.	Explain how species diversity increases the probability of adaptation and survival of organisms in changing environment. Explain the relationship between population growth and carrying capacity. Suggest ways to minimize human impact on the environment.
Where is My Water?	Describe the physicochemical properties of water and determine pollutants in a fresh water ecosystem.	Perform physicochemical tests to determine the condition of water.			
Industries: Blessing or Curse	Think of ways on how to attain sustainable development.	Survey industrial plants and identify its advantage and disadvantage to the community.			

I am Nature's Guardian!	Develop pro-environmental attitude and behavior.	Make an environmental campaign to inform the community about the current status of their environment.	Wrap-up activity for students to suggest and make ways on how to minimize human impact to their community.	

Table 3.1 shows the comparison of the activities and lessons of the developed NBLM to the K-12 Basic Education Curriculum prescribed by the Department of Education. The lesson objectives and activities allowed the students to attain the competencies set by the curriculum. The table also shows that the first lesson was designed to prepare the students for lessons 2 to 4 while lesson 5 was designed to allow the students to describe the overall condition of environment and share what they learned to the school community. Lessons 2 - 4 contents and activities exposed the students to the different environmental threats in their community that gave them ideas on the current condition of the different resources and how other organisms are affected by human activities.

The core specifications of the developed NBLM and the three domains that the module were designed to enhance. See specification on Appendix T. The core content of the module is composed of Module 2: Houses Amidst the Natural World, Module 3: Where is my Water, and Module 4: Industries: Blessing or Curse. In these modules are activities that were carefully designed to improve Grade 10 students' environmental achievement, awareness and attitude.

Topics on the Flow of Energy and Matter in Ecosystems, Fresh Water Ecosystem, Biodiversity and Stability, and Carrying Capacity, related terms and concepts are discussed in every module to assist the students in their hands-on activities and accomplishments of guide questions. The table shows the activities in every module, the importance of these hands-on activities and students' exposure to the natural world reinforces the students' knowledge and understanding on the different environmental

topics and concepts. In this way students in group can answer questions that require high order thinking skills.

Students were exposed to different environmental concerns to enhance their awareness of what is going on in the environment where they live in. In Module 2, the exposure of the students to a vacant lot and housing project provided them the opportunity to see and compare the number of biotic and abiotic factors in the two different places. The housing project was once a grassland filled with different organisms. In this scenario the students became aware that in the transformation of the grassland to concrete houses and pavements, a number of species lost their habitat and eventually died due to the absence of food. Module 3 allowed the students to come near into a polluted river and test the presence of different pollutants. In their exposure to the dirty water, garbage, and foul smell, the students became aware on how aquatic organisms are affected by the pollutants which was caused by human activities. Lastly, Module 4 exposes the students to different industrial plants near the school and gave them the opportunity to determine the pollution caused by them. Students interviewed the residents and gave them the idea on how these plants benefit and cause burden their everyday living.

At the end of the modules, the students answered a written task that manifests their feelings and perceptions to the different environmental concerns. In Module 2, students wrote a letter addressed to the community encouraging them to maintain a backyard garden. This activity allowed the students to write what they feel about backyard gardening and its benefits. Their perception of backyard gardening as highly beneficial to sustain a living was observed on their outputs. Module 3 allowed that students to make a statement on the preservation, protection, and rehabilitation of fresh water ecosystem. Students wrote a poem or statement that tells the community to preserve and conserve the fresh water environment. Module 4 made the students write their ideas on how they can attain sustainable development.

The module followed the modified David Kolb's Approach to Experiential Learning. Each part of the module corresponds to the four-stage cycle of Kolb's Approach. The parts of the module are the following: (1) Environmental Check-Up allowed the students to use their senses to describe the condition of different environmental factors. The students were engaged into an experience by exploring the environment; (2) I am tasked to… is a list of procedure that the students must accomplish for them to make reflections that led them to answer questions under think about it. The experience gained from the Environmental Check-Up and outputs from this stage allowed the students to reflect on a new experience; (3) Think about it provided multi-leveled questions that the students must answer. The first questions covers broad ecological concept, followed by a question related to the community being studied, and finally a specific question allowing students to provide solution to an environmental problem. The reflection gained by the students from the first two stages together with the concepts defined on Glimpse helped them answer the questions under this stage; and (4) Fuse and Link contained graphic organizers that helped the students fuse the past condition of the area to its present and link it to its possible future fate. Students in this stage were given the opportunity to transform what they have learned to resolve possible future problem on the environment.

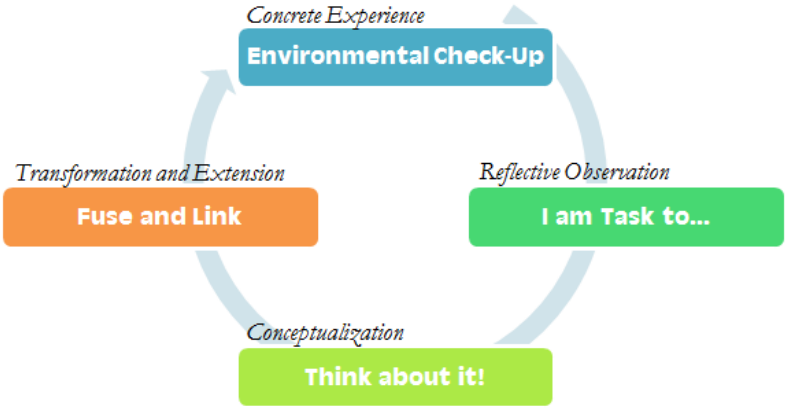


FIGURE 3.1: Parts of the Module and Kolb's Four-Stage Cycle Model of Experience

There were additional features added to aid the students to accomplish the cycle. These features include the *objectives* that tell the students the things that they need to accomplish. *Time allotment* was also included in every stage of the cycle so that students are challenged to use their time wisely. *Glimpse* provided concepts and terms briefly described based on how they were encountered in their journey. And finally, *"My Commitment"* allowed the students to make a promise of being nature's guardian or make ways on how to encourage the community on how to protect the environment.

To ensure the validity of the module, it was evaluated and assessed by seven (7) experts in the field of Biological Science and Curriculum Implementation. See Appendix Q for the information about the evaluators. Each evaluator was given a Module Evaluation Form, a copy of the module, Grade 10 Science Curriculum Guide, and DepEd Vision, Mission, and Values to help them assess the module. They were requested to write comments about the module and recommendations on how to improve it based on its purpose. See Appendix M for the summary of comments and suggestions of the evaluators and the implemented revisions of the module.

The Expert's Module Evaluation Form is composed of two domains. The first domain is about the objectives, alignment with the DepEd Vision, Mission, and Values, and Activities which is composed of ten (10) facets. On the other hand, the second domain contains facets on the physical properties of the module. Appendix V shows the Experts' Evaluation of the Module: Domain I: Objectives, Alignment with the DepEd's Vision, Mission, Values, Contents, and Activities. Results show the acceptability of each facet that was based on the computed mean and the agreement of the evaluator in every facet. In terms of acceptability all ten facets have an interpretation of fully evident based on the computed mean. The rating of the evaluators in this domain ranges from 3.57 to 4.00 with an overall rating of 3.81 which means that all facets are fully evident in the developed NBLM. In terms of agreement, the Fleiss Kappa index ranges from 0.39 to 1.00 with an overall index of 0.67 which gives substantial agreement among the seven evaluators.

Appendix V shows the Experts' Evaluation of the Module: Domain II: Domain II: Physical Properties. It shows the experts' evaluation on the second domain which contains facets on the physical properties of the module. The rating of the evaluators ranged from 3.71 to 4.00 with an overall rating of 3.80 which means that all standards necessary for the physical attributes of a module was fully evident in the developed NBLM. The agreement index ranges from 0.49 to 1.00 with an overall agreement index of 0.63 which means that the evaluators had a substantial agreement with regard to the physical attribute of the module.

Table 3.2: Experts' Evaluation of the Module: Summary

DOMAIN	ACCEPTABILITY				AGREEMENT	
	Mean	**SD**	**CV**	**Interpretation[a]**	**Index**	**Interpretation[b]**
Objectives, Alignment with the DepEd's Vision, Mission, and values, Contents, and Activities	3.81	3.86	1.01	Fully Evident	0.67	Substantial
Physical Properties	3.80	3.88	1.02	Fully Evident	0.63	Substantial
OVERALL	**3.81**	**3.85**	**1.01**	**Fully Evident**	**0.65**	**Substantial**

a. based on mean b. based on index

As as shown in table 3.2, Domain I had an overall rating of 3.81 which means that the facets under this domain were fully evident in the developed NBLM and the experts have a substantial agreement on rating Domain I. Domain II on the other hand had an overall rating of 3.81 which means that the facets for physical attributes were fully evident in the developed NBLM. Overall, the agreement of the evaluators on the NBLM in both domains was substantial. The students who used the module during the experimental phase of the research were asked to evaluate the module. The Students accomplished the Students' Module Evaluation Form which is divided into two domains. Domain I contains facets concerning the module's content and Domain II was for the physical properties of the module. On the previous review of literature, the evaluation of

the module complied with the standards set in the study Mahmood, Iqbal, & Saeed (2009).

In Appendix W, Domain I of the Students' Module Evaluation Form is composed of five facets. The mean scores ranged from 3.07 to 3.43 and an overall mean score of 3.29 which gives an interpretation that the students agreed on the facets on the ability to accomplish the objectives, understand concepts, perform the activities, answer guide questions, and make reflections based on the activities done and guide questions answered. The thirty (30) student evaluators have a moderate overall agreement in terms of the five facets based on the Fleiss Kappa Index of 0.51. It also shows that result of the students' evaluation of the module's physical properties. The student evaluators rated the physical properties of the module form 3.37 to 3.67 which gives an overall rating of 3.48 which means that they agree that the module's layout is acceptable, materials used are durable and of good quality, has enough space for answers and important notes and reasonably handy in size. The thirty (30) student respondents have an overall agreement of 0.45 which means they have a moderate agreement in evaluating the physical properties of the module.

Table 3.3: Students' Evaluation of the Module: Summary

DOMAIN	ACCEPTABILITY				AGREEMENT	
	Mean	SD	CV	Interpretation[a]	Index	Interpretation[b]
Objectives, Contents, and Activities	3.29	3.35	1.02	Agree	0.51	Moderate
Physical Properties	3.48	3.56	1.02	Agree	0.45	Moderate
OVERALL	**3.39**	**3.45**	**1.02**	**Agree**	**0.48**	**Moderate**

a. based on mean b. based on index

As shown in table 3.3, Domain I of the students' evaluation got a mean score of 3.29 where students agreed that the objective, contents, and activities are suitable to their level of understanding and interest. Domain II got a mean score of 3.48 which means that the module has a good quality in terms of its physical appearance and durability. The student respondents had moderate agreement in rating the module on both domains.

Problem 2: What are the students' attitudes toward their environment enhanced by the researcher designed NBLM?

Table 3.4: Students' Attitudes Toward their Environment

	Backyard Gardening		Preservation of Aquatic Ecosystem		Sustainable Development	
	Frequency	**%**	**Frequency**	**%**	**Frequency**	**%**
Positive	30	**100%**	30	**100%**	27	90%
Neutral	0	**0%**	0	**0%**	3	10%
Negative	0	**0%**	0	**0%**	0	0%

Table 3.4 shows the summary of the frequency and percentage of students' responses on the core modules of NBLM. In terms of attitude towards backyard gardening where students were exposed to grassland transformed into a government housing project. In module 2 activity students were expected to see solutions in the decreasing land area utilized to produce crops and habitat for a number of organisms. One of the solutions is the backyard gardening. All Students responded positively in encouraging the community in the housing project to maintain a backyard garden. They feel backyard gardening is necessary due to the following reasons: to help the environment and make it beautiful by making it more greener, plants produce food that can sustain the everyday need for food of the residence and provide fresh air, and earn a living and help the environment. Students' responses (See Appendix X) shows their concerns for the good of the environment and positive attitude towards maintaining a backyard garden and utmost concern for the environment for the future generation.

Module 3 activity deals with the preservation and protection of aquatic ecosystem. Students made a short poem telling the people of the proper usage, conservation, and preservation of fresh water environment. The gist of the students' responses on this concern are presented on Table 4.8. Notably, students considered water as a treasure that is important to life and must be conserved for the future generation to survive. They felt that water ecosystem must be maintained clean, protected and conserved for the use of

the future generation and perpetuation of life. The responses showed utmost concern for the protection of the fresh water ecosystem and the importance of water to life which shows positive attitude towards the preservation of the aquatic ecosystem.

In module 4, students' attitude towards sustainable development was solicited. Sustainable development as cited by Primack (2004) is an economic development that satisfies the present and future needs for both resources and employment while minimizing the impact on biological diversity. Students' responses were mostly on the protection of the rice fields and the environment and would not allow the transformation of rice fields into industrial park. There were three students or 10% of the students would allow few industrial parks to increase job opportunities. The rest of the students or 90% of them felt that rice fields must not be transformed into industrial parks because they will greatly affect food production, contribute to pollution, and for the sake of farmers and organisms living in the rice fields. Students' attitude towards environmental protection and allowing few industrial plants to be built manifest their concern to the environment.

Kolb's Experiential Learning Cycle and the exposure of the of the students to different environmental concerns allowed the students to make reflection of their action towards and the environment, the results of the activities on the NBLM, and responses of the residents on students' interview positively affects their attitude towards the protection of the environment.

Problem 3: Is there a significant difference between the pretest and posttest of the control and experimental group in terms of environmental awareness and achievement?

Table 3.5: Single Factor: Analysis of Variance of Pretest and Posttest of the Control Group on Students' Environmental Awareness

SOURCE OF VARIATION	SS	Df	MS	F	P-VALUE	F CRIT
Between Groups	0.14	1	0.14	0.844	0.362	4.007
Within Groups	9.63	58	0.17			
TOTAL	9.77					

Table 3.5 shows the result of computation using Single Factor Analysis of Variance with 0.05 as the level of significance in the pretest and posttest of the control group on students' environmental awareness. The computed value of F is equal to 0.844 is less than the critical value of F which is equal to 4.007. The null hypothesis must be accepted and the alternative hypothesis must be rejected. Therefore, there is no significant difference in the environmental awareness scores in the pretest and posttest of the control group.

Table 3.6: Single Factor: Analysis of Variance of Pretest and Posttest of the Experimental Group on Students' Environmental Awareness

SOURCE OF VARIATION	SS	Df	MS	F	P-VALUE	F CRIT
Between Groups	0.07	1	0.07	0.500	0.482	4.007
Within Groups	7.73	58	0.13			
TOTAL	7.80	59				

Table 3.6 shows the result of the computation using One-Way ANOVA using a 0.05 level of significance. The computed F value is equal to 0.500 which is less than the critical F values that is equal to 4.007. This means that there is no significant difference between the pretest and posttest of the experimental group's environmental awareness.

There is no significant difference between the pretest and posttest in both control and experimental groups but results showed positive environmental awareness in both groups. In the previous discussions, awareness can be affected by motivation, knowledge, and skills. In addition, the location where the students live as well as income can greatly

affect awareness. Students are well equipped with knowledge about the environment since the K to 12 Basic Education Curriculum covered environmental topics. In grade 8, students learned the impact of human activities to ecosystem, while in grade 9 they have identified the causes of species extinction. These previously learned lessons reinforced students' environmental awareness. Another factor that maintained students' environmental awareness is their living location. The students are residing nearby the sites which entail high environmental concerns. Their frequent observations and their experience on the effect of these environmental concerns have increased their environmental knowledge which have contributed to their positive environmental awareness. In addition, the students exposure to the real world which was Dewey's belief that observations of reality and nature were the starting point of knowledge acquisition though Nature-based learning that reinforced that awareness of the students of different environmental concerns in the community.

Table 3.7: Single Factor: Analysis of Variance of Pretest and Posttest of the Control Group on Students' Achievement

SOURCE OF VARIATION	SS	Df	MS	F	P-VALUE	F CRIT
Between Groups	0.07	1	0.07	0.002	0.963	4.007
Within Groups	1,807.87	58	31.17			
TOTAL	1,807.93	59				

Table 3.7 shows the results of the Single Factor ANOVA using a 0.05 level of significance of the pretest and posttest achievement test of the control group. The computed F value is equal to 0.002 which is less than the critical value of F that is equal to 4.007. Hence, there is no significant difference between the pretest and posttest of the control group in terms of students' achievement and the null hypothesis must be rejected and the alternative accepted.

Table 3.8: Single Factor: Analysis of Variance of Pretest and Posttest of the Experimental Group on Students' Achievement

SOURCE OF VARIATION	SS	Df	MS	F	P-VALUE	F CRIT
Between Groups	156.82	1	156.82	4.517	0.038	4.007
Within Groups	2,013.37	58	34.71			
TOTAL	2,170.18	59				

Table 3.8 shows the result of the Single Factor ANOVA of the experimental group's achievement pretest and posttest. The computed value of F is equal to 4.517 which is greater than the critical F value that is 4.007. Hence, the null hypothesis must be rejected and the alternative accepted. This shows that there is a significant increase the in the students achievement after using the NBLM.

The result shows that those students who used the DepEd-prescribed learning materials had no significant increase in their achievement. In contrary, students who used the NBLM had a significant increase in their achievement. In Illeris' (2009) David Kolb's Definition of Experience he explained that learning is the process whereby knowledge is created through the transformation of experience. Kolb further explained that immediate personal experience is the focal point for learning, giving life, texture, and subjective personal meaning to abstract concepts and that at the same time providing a concrete, publicly shared reference point for testing the implications and validity of ideas created during the learning process. This is the reason why students exposed to the natural world had an increase in their achievement compared to those students who stayed inside the classroom. The experience of the students reinforced their learning and performed better than those who were taught through the usual way.

The Kolb's Experiential Learning Cycle that was enhanced by means of the integration of Dewey's ideas on experiential learning and by addressing the weaknesses of the cycles from previous researches successfully enhanced students' environmental achievement. The NBLM successfully responded the necessary improvement of Kolb's

Experiential Learning Cycle and followed the ideas of Dewey for the students to attain optimum grasp of the different environmental concepts.

Problem 4: Is there a significant difference between the posttests of the control and experimental group in terms of environmental awareness and achievement?

Table 3.9: One-Way Analysis of Covariance for Independent Factor of the Posttests of the Control and Experimental Group on Students' Environmental Awareness

ANCOVA RESULTS (K=2) *Level of Significance = 0.05*

SOURCE	SS	Df	MS	F	P	F CRIT
Adjusted Means	0.02	1	0.02	0.249	0.619	4.007
Adjusted Error	4.78	57	0.08			
Adjusted Total	4.80	58				

Table 3.9 shows the result of the computation using One-Way Analysis of Covariance (ANCOVA) with the pretest as the covariate using a 0.05 level of significance. The computed F value is equal to 0.249 is less than the critical value of F which is equal to 4.007. This means that there is no significant between the posttests of the control and experimental groups and the null hypothesis must be accepted and the alternative hypothesis rejected.

Although results showed that there was no significant difference between the posttests of the control and experimental group in terms of students' environmental awareness after using the two modules, the mean score of both groups shows a positive environmental awareness. Surprisingly, among the ten (10) statements under environmental awareness, two (2) of which gained a negative response from the students. The students agreed that the government should give permission to construct building for tourisms purposes in national parks and forest and they believe that the media news about polluted seas, rivers, and lakes are exaggerated. These two statements can cause harm to the environment.

The agreement of the students to these two negative statements was due to the social values and subjective norms can affect one's environmental awareness. That one's awareness can be disregarded or neglected due to the prevailing social values and subjective norms. Today, Pandi, Bulacan is known as the waterpark capital of Bulacan where renowned waterparks are located. Students perceive these infrastructures beneficial to them to earn a living and alleviate poverty. This subjective norm has highly affected their awareness and somehow their attitude towards protecting the environment.

This is further supported by the Theory of Altruistic Behavior which states that social norms are adopted by individuals (as cited by Ibtissem, 2010). In addition, general values can influence environmental values, problem awareness, and personal norms and anthropocentrism had a negative effect on problem awareness as stated by Nordlund and Garvill (2002). Anthropocentric tendencies of rural residents seem consistent with their use of natural resources for human ends (Gifford, 2014). In Ogunjinmi, Onadeko, and Adewumi (2012) concluded that although people are aware of the assaults on the environment and the limit of nature, their economic activities and the need to satisfy their considerably large family as well as their low level of education might have been reasons for their continued degradation and unsustainable exploitation of these resources. This can be further elucidated by Elster's (2005) conclusion that poverty needs made environmental problems less significant and environmental issues were generally low priority. Moreover, wealthier persons better recognized environmental issues than poorer persons (as cited by Gifford, 2014.). Furthermore, Myers (2013) explains that informational social influence results from one's willingness to accept other's opinions about reality.

Table 3.10: One-Way Analysis of Covariance for Independent Factor of the Posttests of the Control and Experimental Group on Students' Achievement

ANCOVA RESULTS (K=2)

SOURCE	SS	Df	MS	F	P	F CRIT
Adjusted Means	151.58	1	151.58	7.329	0.009	4.007
Adjusted Error	1,178.85	57	20.68			
Adjusted Total	1,330,43	58				

Table 3.10 shows the One-Way ANCOVA for Independent Factor computation of the result of the achievement posttests of the control and experimental group with 0.05 as the level of significance with the control as the covariate. The computed value of F is equal to 7.329 which is greater than the critical value of F which is equal to 4.007. The result calls for the rejection of the null hypothesis and the acceptance of the alternative hypothesis. Hence, there is a significant difference between the posttest result of the control and experimental group. In Appendix R.5 students in the experimental group performed better than those in the control group. Therefore, the use of NBLM can enhance student's environmental achievement.

Students who used the NBLM had a better achievement than those who used the DepEd prescribed learning material in Science 10. This result is supported by the previous discussion that environmental education program that incorporates active learning, maintain relevance to local environmental issues and culture of target audience strengthen and positively contribute to students' academic achievement. The NBLM gave the students the opportunity to learn the contents of the curriculum in a more active manner since they personally encounter the concepts that were merely discussed inside the classroom. The integration of Kolb's Model of Experiential learning, community-based, learner-centered, and promoted cooperative and independent learning experiences as the students were able to critically analyze and think of ways on how to resolve the prevailing local environmental issues.

Chapter 4
SUMMARY OF FINDINGS, CONCLUSION, AND RECOMMENDATIONS

Summary of Findings

The main purpose of the study was to develop, evaluate, and validate a Nature-Based Learning Module patterned to Kolb's Cycle of Experiential Learning. The module was also designed to determine its influence to students' environmental awareness, attitude, and achievement which were compared to the prescribed Science 10 module of the Department of Education for Grade 10 students.

1. The developed Nature-Based Learning Model conforms to the Science 10 K to 12 Basic Education Curriculum following the modified Kolb's Four-Stage Cycle Model. The designed module content and activities of the NBLM were designed to provide students the opportunities to think critically in determining ways on how to solve the prevailing environmental issues and concerns in the community. The results of the experts' evaluation show that the module satisfactory complies with the DepEd's Textbook Style and Standard.

2. Students' responses on sustaining backyard gardening, preservation of aquatic ecosystem, and sustainable development showed positive responses or highly pro-environmental attitude.

3. Results indicated a non-significant difference in pretest and posttest of the control and experimental group in terms of awareness. Although no significance was observed, a positive environmental awareness was observed on the students mean scores. The students' environmental awareness was significantly positive prior the use of both modules due to several factors that highly affects it.

   There was no significant difference between the pretest and posttest in the control group in terms of achievement, hence, the experimental group showed a significant difference in pretest and posttest. The significant difference in the experimental

group's pretest and posttest indicates that the NLBM enhanced students' achievement.

4. No significant difference was observed on the posttests of the control and experimental groups in terms of environmental awareness. Although no significant difference was observed students' mean scores on both groups show positive environmental awareness. Furthermore, problem awareness can be affected by general values, norms, and economic activities.

   A significant difference was observed on the result of the posttests of the control and experimental groups. The students who used the NBLM had high achievement scores than those in the control group. The NBLM is successful in enhancing students' achievement through direct immersion to the environment, acknowledging human's impression, responsibility, and impact to the environment, and independently and cooperatively accomplish learning tasks.

Conclusion

The aim of this study was to develop, evaluate, and validate a localized Nature-Based Learning Module and determine its influence to Grade 10 students' environmental awareness, attitude, and achievement. The modification of Kolb's Experiential Learning Cycle by means of aligning it to Dewey's ideas on Experiential Learning and the integration of Nature-Based Learning as the basis for developing the NBLM led into conclusion that the NBLM can enhance students' achievement, positively develop environmental awareness, and influence students to have pro-environmental attitude based on their responses on the different activities contained in the module.

Recommendations

The researcher gives the following recommendations for future reference.

1. Integrate misleading social values and subjective norms that negatively influence one's awareness, attitude, and behavior in the NBLM.

2. Develop a suitable environmental awareness and attitude scale which is relevant to the environmental concerns in the community.
3. Develop NBLM in different grade levels that can lead students to think on ways on how to resolve environmental concerns in their community.
4. Add activities and assessments on social values, feelings of ecological affection, subjective norms, informational social influence, and their implications to environmental stewardship and behavior on the NBLM.
5. Use purposive or deliberate non-random sampling technique in selecting the respondents Nature-Based Leaning Program so that only those with low environmental awareness and attitude can be used on studies on environmental attitude, awareness, and behavior.
6. Use the NBLM in another area and consider the level of comprehension, social status and gender of the respondents.
7. Future researches conduct a time-series study following the efficacy of the modified Kolb's Four-Stage Experiential Learning Cycle and its fusion to Nature-Based Learning, examining the potential changes in students' environmental awareness, attitude, and achievement.
8. Students' learning styles can also be explored, determining the influence of the NBLM in enhancing students' learning styles leading them to a life-long learning experience.
9. Investigate how various strategies of students' and teachers' reflection are affected by the use of the NBLM.

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Appendix A
LETTER TO THE SCHOOLS DIVISION SUPERINTENDENT

Republic of the Philippines
Department of Education
Region III - Central Luzon
Schools Division of Bulacan
MASAGANA HIGH SCHOOL
Masagana, Pandi, Bulacan

DepED - Bulacan
RECEIVED
SEP 11 2015

10 September 2015

ROMEO M. ALIP, PH.D., CESO V
Schools Division Superintendent
DepEd Division of Bulacan
City of Malolos

Thru:
BERNADETTE F. TAMAYO
Asst. Schools Division Superintendent

Dear Dr. Alip:

I would like to request for your approval to allow me conduct my masteral thesis entitled: The Use of Localized Nature-Based Learning Material in Improving Grade 10 Students' Environmental Attitude.

This study aims to develop a localized or community-based teacher and learner's material designed for nature-based learning in environmental science topics which:

- is an extension of the currently used material in Science 10;
- can affect students' pro-environmental attitude; and
- can give students the opportunity to resolve environmental problems in the community where they live in.

One of the researches conducted abroad articulates that "people make an evaluative judgement based on their attitude in deciding among possible options of their action in the future", a sole and substantial reason for this study to a breakthrough. Furthermore, this study is an important requirement for me to attain the degree of Master of Arts in Science Education with specialization in Biology at the Philippine Normal University.

I am looking forward for a positive response about this request. Thank you and may the Lord Almighty bless and keep you always.

Respectfully,

RYAN R. BAUTISTA
Teacher I

Recommending Approval:

FE R. DIONISIO
School Principal I

Approved:

BERNADETTE F. TAMAYO
Asst. Schools Division Superintendent

ROMEO M. ALIP, PH.D., CESO V
Schools Division Superintendent

Appendix B
INDORSEMENT FROM THE SCHOOLS DIVISION SUPERINTENDENT

DepED - Bulacan
RELEASED
OCT 02 2015

Republic of the Philippines
Department of Education
Region III
SCHOOLS DIVISION OFFICE OF BULACAN
Capitol Compound, City of Malolos

1st Indorsement
September 30, 2015

Respectfully returned to Mr. RYAN R. BAUTISTA, Researcher of Philippine Normal University University, granting approval on the request to conduct thesis study entitled "**The Use of Localized Nature-Based Learning Material in Improving Grade 10 Students' Environmental Attitude** ", subject to the following conditions:

1. Proper coordination with the school head should be made;
2. Teacher-learners contact hours should not be affected;
3. No government fund should be used for this study;
4. Data gathered should be treated with utmost confidentiality and should be used solely for research purposes; and
5. Findings of the study should be furnished this office for reference.

For guidance and compliance.

ROMEO M. ALIP, PH.D, CESO V
Schools Division Superintendent

Arb

BUILDING UP FOR ULTIMATE LEARNERS' ADVANCEMENT THRU CAPABLE & ACTIVE NURTURING

Appendix C
LETTER TO THE PARENTS OF THE RESPONDENTS

Republic of the Philippines
Department of Education
Region III - Central Luzon
Schools Division of Bulacan
MASAGANA HIGH SCHOOL
Masagana, Pandi, Bulacan
SCHOOL ID: **300729**

2 Marso 2016

_____
_____
_____

Minamahal na Magulang:

Nais po naming ipabatid na ang inyo anak na si _____ ng _____ ay napili bilang isa sa mga mag-aral na sasailalim sa isang pag-aaral na naglalayong:

- mapaunlad ang kaalaman at magkaroon ng positibong pananaw ang mga kabataan tungkol sa kalikasan,
- maging maalam sila sa mga nangyayari sa ating kapaligiran, at
- maging bahagi ng solusyon sa paglutas ng mga kinahaharap na suliranin ng ating kalikasan.

Kaugnay po nito sila po bibisita sa kalapit barangay ng ating paaralan upang mangalap ng mga impormasyon na sa ikauunlad ng kanilang kaalaman. Ang mga lugar po na bibisitahin ng inyong anak ay ang

- Pabahay sa Brgy. Mapulang Lupa sa ika-4 ng Marso 2016
- Sapa sa Brgy. Masuso sa ika-7 ng Marso 2016, at
- Kalapit na mga Pabrika sa Brgy. Masagana sa ika-8 ng Marso 2016.

Sila po ay sasamahan ng dalawang guro mula sa ating paaralan. Makikipagtulungan din po kami sa mga opisyal ng mga nabanggit na barangay upang masiguro ang kaligtasan ng inyong anak. Mayroon pong sasakyan na gagamitin upang ihatid at sunduin sila sa mga nabanggit na mga lugar.

Wala po kayong kahit anong babayaran sa gawaing ito. Ang kinakailangan po lamang dalhin ng inyong anak ay payong, twalya, at inuming tubig.

Lubos po ang aming pasasalamat sa inyong patuloy na pagsuporta sa mga gawain ika-uunlad ng ating mag-aaral. Nawa ay patuloy po tayong gabayan at biyayaan ng ating Poong Maykapal.

Gumagalang,

RYAN R. BAUTISTA
Tagapagsaliksik - Guro sa Agham

Binigyang pansin:

FE R. DIONISIO
Punong Guro

---------- *Ibalik ang bahaging ito ng liham* ----------

G. Ryan R. Bautista,

☐ Pinapahintulutan ko po ang aking anak na si _____ ng Antas 10 - _____ na lumahok sa pagsasaliksik na nabanggit. Nauunawaan ko na gagawin ninyo ang lahat ng inyong makakaya upang mapanatiling ligtas ang aking anak sa mga nabanggit na mga gawain sa mga kalapit na barangay ng ating paaralan.

☐ Hindi ko po pinahihintulutang makilahok ang aking anak sa nabanggit na gawain.

_____ _____
Pangalan at Lagda ng Magulang *Petsa*

Appendix D
LETTER TO THE BARANGAY OFFICIALS

Republic of the Philippines
Department of Education
Region III - Central Luzon
Schools Division of Bulacan
MASAGANA HIGH SCHOOL
Masagana, Pandi, Bulacan
SCHOOL ID: **300729**

2 Marso 2016

KGG. ROGELIO LEONARDO
Punong Parangay,
Mapulang Lupa, Pandi, Bulacan

Minamahal na Punong Barangay,

Nais po naming ipabatid sa inyong tanggapan na magsasagawa ang aming paaralan ng pag-aaral na naglalayong

- mapaunlad ang kaalaman at magkaroon ng positibong pananaw ang mga kabataan tungkol sa kalikasan,
- maging maalam sila sa mga nangyayari sa ating kapaligiran, at
- maging bahagi ng solusyon sa paglutas ng mga kinahaharap na suliranin ng ating kalikasan.

Ito po ay lalahukan ng tatlongpu't limang (35) mag-aaral ng Masagana High School na gaganapin sa pabahay sa inyong nasasakupan, sa ika-4 ng Marso 2016 araw ng Martes. Kami po ay mananatili at magsasaliksik sa nabanggit ng lugar mula 8:30 hanggang 10:30 ng umaga.

Kaugnay po nito nais po naming hingin ang inyong tulong sa pamamagitan ng pag-kakaloob ng dalawang (2) tanod na magbabantay sa amin habang kami ay nakikihalubilo sa mga naninirahan sa nabanggit na lugar.

Lubos po ang aming pasasalamat sa inyon walang maliw na pagsuporta sa Gawain ng aming paaralan. Nawa suklian ng Poong Maykapal ang kabutihang ipagkakaloob nyo sa amin.

Gumagalang,

RYAN R. BAUTISTA
Tagapagsaliksk - Guro sa Agham

Binigyang pansin:

FE R. DIONISIO
Punong Guro

Inaprubahan:

KGG. ROGELIO LEONARDO
Punong Barangay

Appendix E
ENVIRONMENTAL ATTITUDE SCALE

POSTTEST

ENVIRONMENTAL ATTITUDE SCALE

(Adapted from Ugulu, Sahin, & Baslar, 2013)

Code: EG-001 School: _____ Date: _____
Grade and Section: _____ Age: _____ Gender: ☐ Male ☐ Female
Address: _____ Number of Sibling/s: _____
Father's Highest Academic Attainment: ☐ Elementary ☐ High School ☐ College
Mother's Highest Academic Attainment: ☐ Elementary ☐ High School ☐ College
Father's Occupation: _____ Mother's Occupation: _____

INSTRUCTION: Honestly express your thought or feeling on the following statements. **Check (✓)** the column that best describe your answer. There should be only one answer per statement.

I. ENVIRONMENTAL AWARENESS	**Strongly Agree** (4) *Lubos na sumasang-ayon*	**Agree** (3) *Sumasang-ayon*	**Disagree** (2) *Di Sumasang-ayon*	**Strongly Disagree** (1) *Lubos na Di Sumasang-ayon*
1.1. The media news about polluted seas, rivers, and lakes are exaggerated. *And mga balita ng midya tungkol sa mga maruruming dagat, ilog, at lawa ay labis sa katotohanan.*				
1.2. The best way to build houses is to dry up the wetlands and build there. *Ang pinakamainam na pagtatayo ng mga kabahayan, ay tuyuin muna ang mga sapa para dito itayo ang mga ito.*				
1.3. Money can be saved by buying drinks in plastic bottles since drinks in glass bottles are expensive. *Makakatipid ng pera kung bibili ng mga inuming nalagay sa boteng gawa sa plastik dahil mahal ang mga inuming nasa bote.*				
1.4. People have the right to make negative changes in nature for meeting their needs. *Ang mga tao ay may karapatang gumawa ng negatibong pagbabago sa kalikasan upang matugunan ang kanilang pangangailangan.*				
1.5. It is useless to use paper bags instead of plastic bags given free from the market. *Di makatutulong na gumamit ng sisidlang papel imbis na plastic na sisidlad na binigay ng libre sa mga pamilihan.*				
1.6. I think that recycling doesn't work as much as it is said. *Sa aking palagay ang paggamit muli nga mga patapon na mga bagay ay hindi makatutulong tulad ng pagsasabi nito.*				
1.7. The government should give permission to construct building, for tourism purposes in national parks and forest. *Ang gobyerno ay dapat magbigay ng pahintulot sa pagtatayo ng mga gusali para sa turismo sa mga pinangangalagaang lugar at kagubatan.*				
1.8. The extinction of the insects such as butterflies, bees and flies is useful for environment. *Ang tuluyang pagkawala ng mga insekto tulad ng paru-paro, bubuyog, at langaw ay kapaki-pakinabang sa kalikasan.*				
1.9. Since the environment can clean itself, human waste does not cause problem. *Dahil sa ang kalikasan ay may kakayahang linisin ang kanyang sarili ang kalat na nanggagalingsa tao ay hindi nagdudulot ng problema.*				
1.10. I don't care about the effects deforestation, burning of garbage, and mining. *Wala akong pakielam tungkol sa epekto ng pagsira sa kagubatan, pagsunog ng basura, at pagmimina.*				

Appendix F
LETTER TO THE DEAN OF COLLEGE OF SCIENCE BULACAN STATE UNIVERSITY

PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Taft Avenue, Manila

18 February 2016

EDGARDO M. SANTOS, PH.D.
Dean, College of Science
Bulacan State University
City of Malolos

Thru: **FRANCISCA M. CRUZ**
Science Chairperson

Dear Dr. Santos:

I would like to request your good office to allow me administer a content and face validation of a Nature-Based Learning Module and pilot test its corresponding 30-item achievement test on February 19, 2015. These materials will be used in gathering data for my master's degree thesis entitled: "Enhancing Environmental Awareness, Attitude, and Achievement Through Nature-Based Learning".

The evaluators of the said module as required by my colloquium panellists must be a graduate of master's degree with specialization in Biological Science with thesis. This qualifies Prof. Oliver A. Alaijos and Prof. Raymundo F. Javier as evaluators. The achievement test was recommended to be administered to first year college students of any specialization.

Rest assured that all information will be treated with utmost confidentiality and will be used for sole academic purpose.

I am looking forward for a positive response about the said matter. Thank you and may God our loving Father bless and keep you always.

Respectfully,

RYAN R. BAUTISTA
Researcher

Recommending Approval:

PROF. FRANCISCA M. CRUZ
Science Chairperson

Approved:

DR. EDGARDO M. SANTOS
Dean, College of Science

Appendix G
TABLE OF SPECIFICATIONS

PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Taft Avenue, Manila

TABLE OF SPECIFICATIONS
SCIENCE 10 - ECOSYSTEMS

LEARNING COMPETENCIES	OBJECTIVES	NO. OF DAYS	Remembering	Applying	Analizing	Creating	Evaluating	NO. OF ITEMS	%
Explain the relationship between population growth and carrying capacity Suggest ways to minimize human impact to the environment	Idetify different resources and determine their importance to living things.	1	1,2	11,12	19,20			10.00	20%
	Classify biotic factors as producers and consumers, create and food chain and food web, and compare the number of organisms to the available resources in an ecosystem.	1	3,4		21,22,23		28	10.00	20%
	Describe the physicochemical properties of water and determine pollutants in a fresh water ecosystem.	1	5,6	13	24,25		29	10.00	20%
	Think of ways on how to attain sustainable development.	1	7,8	14,15,16			30	10.00	20%
	Develop pro-environmental attitude and behavior.	1	9,10	17,18	26,27			10.00	20%
	TOTAL	**5**	**10**	**8**	**9**	**0**	**3**	**50**	**100%**

TEST ITEMS DISTRIBUTION

CONTENT	NO. OF DAYS	EASY (60%)	AVERAGE (30%)	DIFFICULT (10%)	NO. OF ITEMS
Idetify different resources and determine their importance to living things.	1	6	3	1	10
Classify biotic factors as producers and consumers, create and food chain	1	6	3	1	10
Describe the physicochemical properties of water and determine pollutants	1	6	3	1	10
Think of ways on how to attain sustainable development.	1	6	3	1	10
Develop pro-environmental attitude and behavior.	1	6	3	1	10
TOTAL	**5**	**30**	**15**	**5**	**50**

Appendix H
ACHIEVEMENT TEST

Questionnaire No: PT-001

INSTRUCTION: Shade the letter of your answer on the answer sheet.

1. – 2.
In the environment, different factors are interconnected with each other whether living organisms or non-living things. Living things are dependent to non-living things for shelter, respiration, or even for energy. Plants for example depend on nutrients from the soil, water, carbon dioxide, and energy from the sun to make their own food. Moreover, non-living things need to interact with each other to sustain a healthy environment. One example is the water cycle where water is affected by changing temperature to form clouds and precipitate. The interaction between living and non-living things is a continuous natural cycle.

1. What would happen if the sun will stop to exist or dies?
   A. Plants will be smaller than their usual size.
   B. Plants will fail to photosynthesize and die.
   C. Plants will adapt and become consumers.
   D. Plants will be fully dependent on the soil nutrients to survive.

2. What would happen if plants would not undergo the process of photosynthesis?
   A. Oxygen in the atmosphere would increase.
   B. Oxygen percentage in air would not change.
   C. Carbon dioxide would accumulate and will become toxic to all.
   D. Carbon dioxide would react to other gases forming oxygen.

3. – 4.
A certain factory dumps toxic materials in the middle of the forest. Rain comes and the toxic materials spread all throughout the forest.

3. What would possibly happen to the environment?
   A. Toxic materials will cause death to living things.
   B. Toxic materials will nourish plants to be productive.
   C. Toxic materials will attract animals to inhabit the area.
   D. Toxic materials will serve as food for soil dwelling animals.

4. What do you think would be the effect of improper disposal of waste materials to humans?
   A. The environment will clean itself to keep humans safe.
   B. The plants would consume toxins that will save humans from death.
   C. The toxins will reach resources consumed by humans and cause death.
   D. The soil will mix with the toxin and transform it into a substance useful to humans.

5. Which is true about the role of resources like air, water, and land in sustaining life?
   A. They serve as building blocks of an organisms' body.
   B. They serve as shelter to animals and plants.
   C. They serve as source of energy and nutrients that are essential to life.
   D. They serve as source of food for animals that is essential for survival.

6. Which of the following best defines the environment?
   A. It is composed of beneficial and harmful resources that support life.
   B. It is composed of living organisms and resources that sustain each other.
   C. It is composed of plants and animals living and interacting with their resources.
   D. It is composed of resources necessary for organisms to grow, live, and reproduce.

7. Which of the following helps preserve and conserve the natural resources?
   A. Mining and logging with limitation to minimize damage.
   B. Industries following environmental laws on proper disposal and recycling.
   C. Man-made lakes and land forms to conserve the resources and promote tourism.
   D. Recreational parks built on forests and lakes that can raise funds for the protection of natural resources.

Appendix I
ITEM ANALYSIS

PHILIPPINE NORMAL UNIVESITY
The National Center for Teacher Education and Research
College of Graduate Studies and Teacher Education Research
Taft Avenue, Manila

SCIENCE 10 - ECOSYSTEMS
POST ITEM ANALYSIS

Total Number of Examinees	**50**	**FT** = Fequency of Top 27%	**Df** = Difficulty Index
Top 27% Examinees	**14**	**PT** = Proportion of Top 27%	**Ds** = Discrimination Index
Bottom 27% Examininees	**14**	**FB** = Frequency of Bottom 27%	**I** = Interpretation
Total Test Items	**50**	**PB** - Frequency of Bottom 27%	

ITEM NO.	FT 27%	PT 27%	FB 27%	PB 27%	Df	I	Ds	I	REMARKS
1	14	1.00	12	0.86	0.93	Easy	0.14	Poor	REVISE
2	14	1.00	10	0.71	0.86	Easy	0.29	Moderate	**RETAIN**
3	14	1.00	13	0.93	0.96	Easy	0.07	Poor	REVISE
4	14	1.00	12	0.86	0.93	Easy	0.14	Poor	REVISE
5	11	0.79	9	0.64	0.71	Average	0.14	Poor	REVISE
6	3	0.21	3	0.21	0.21	Average	0.00	Poor	REVISE
7	10	0.71	10	0.71	0.71	Average	0.00	Poor	REVISE
8	14	1.00	9	0.64	0.82	Easy	0.36	Moderate	**RETAIN**
9	6	0.43	2	0.14	0.29	Average	0.29	Moderate	**RETAIN**
10	12	0.86	8	0.57	0.71	Average	0.29	Moderate	**RETAIN**
11	14	1.00	8	0.57	0.79	Average	0.43	Good	**RETAIN**
12	12	0.86	8	0.57	0.71	Average	0.29	Moderate	**RETAIN**
13	12	0.86	9	0.64	0.75	Average	0.21	Moderate	**RETAIN**
14	14	1.00	12	0.86	0.93	Easy	0.14	Poor	REVISE
15	1	0.07	2	0.14	0.11	Difficult	-0.07	Poor	REVISE
16	11	0.79	10	0.71	0.75	Average	0.07	Poor	REVISE
17	10	0.71	2	0.14	0.43	Average	0.57	Good	**RETAIN**
18	8	0.57	3	0.21	0.39	Average	0.36	Moderate	**RETAIN**
19	14	1.00	6	0.43	0.71	Average	0.57	Good	**RETAIN**
20	12	0.86	9	0.64	0.75	Average	0.21	Moderate	**RETAIN**
21	14	1.00	10	0.71	0.86	Easy	0.29	Moderate	**RETAIN**
22	11	0.79	6	0.43	0.61	Average	0.36	Moderate	**RETAIN**
23	8	0.57	5	0.36	0.46	Average	0.21	Moderate	**RETAIN**
24	6	0.43	4	0.29	0.36	Average	0.14	Poor	REVISE
25	14	1.00	7	0.50	0.75	Average	0.50	Good	**RETAIN**
26	14	1.00	7	0.50	0.75	Average	0.50	Good	**RETAIN**
27	14	1.00	10	0.71	0.86	Easy	0.29	Moderate	**RETAIN**
28	13	0.93	8	0.57	0.75	Average	0.36	Moderate	**RETAIN**
29	14	1.00	11	0.79	0.89	Easy	0.21	Moderate	**RETAIN**
30	8	0.57	2	0.14	0.36	Average	0.43	Good	**RETAIN**
31	14	1.00	11	0.79	0.89	Easy	0.21	Moderate	**RETAIN**
32	2	0.14	2	0.14	0.14	Difficult	0.00	Poor	REVISE
33	8	0.57	2	0.14	0.36	Average	0.43	Good	**RETAIN**
34	2	0.14	0	0.00	0.07	Difficult	0.14	Poor	REVISE
35	14	1.00	9	0.64	0.82	Easy	0.36	Moderate	**RETAIN**
36	14	1.00	6	0.43	0.71	Average	0.57	Good	**RETAIN**
37	14	1.00	8	0.57	0.79	Average	0.43	Good	**RETAIN**
38	7	0.50	5	0.36	0.43	Average	0.14	Poor	REVISE
39	14	1.00	7	0.50	0.75	Average	0.50	Good	**RETAIN**
40	13	0.93	5	0.36	0.64	Average	0.57	Good	**RETAIN**
41	2	0.14	1	0.07	0.11	Difficult	0.07	Poor	REVISE
42	14	1.00	9	0.64	0.82	Easy	0.36	Moderate	**RETAIN**
43	14	1.00	5	0.36	0.68	Average	0.64	Good	**RETAIN**
44	0	0.00	5	0.36	0.18	Difficult	-0.36	Poor	REVISE
45	13	0.93	10	0.71	0.82	Easy	0.21	Moderate	**RETAIN**
46	14	1.00	3	0.21	0.61	Average	0.79	Good	**RETAIN**
47	12	0.86	4	0.29	0.57	Average	0.57	Good	**RETAIN**
48	9	0.64	7	0.50	0.57	Average	0.14	Poor	REVISE
49	10	0.71	2	0.14	0.43	Average	0.57	Good	**RETAIN**
50	13	0.93	9	0.64	0.79	Average	0.29	Moderate	**RETAIN**

	EASY	AVERAGE	DIFFICULT	FREQ.	%
No. of items that should be retained	9	25	0	**34**	**68.00%**
No. of items that should be revised	5	0	0	**16**	**32.00%**

Appendix J
EXPERT'S NBLM EVALUATION FORM

PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Taft Avenue, Manila

NATURE-BASED LEARNING MODULE EVALUATION FORM

(Adapted from Crystal Springs Book Development for Educators Textbook Evaluation Form)

Name: _____ Date: _____
Address: _____ Age: _____ Gender: ☐ Male ☐ Female
School: _____ No. of Years Teaching Science: _____
Designation: _____

	Course/ Specialization	*Year Graduated/ No. of Units Earned*	*Thesis / Dissertation Title*
Bachelor's Degree			
Master's Degree			
Doctor's Degree			

Dear **Evaluator**,

Kindly express your thought or feeling on the following statements. **Check** the column that best describe your answer. There should be only one answer per statement. Thank you.

I. OBJECTIVES, ALIGNMENT WITH THE DEPED VISION, MISSION, AND VALUES, CONTENTS, AND ACTIVITIES	**Fully Evident (4)**	**Mostly Evident (3)**	**Partially Evident (2)**	**Not Evident (1)**
1.1. The contents conform to the vision, mission, and core values of the DepEd.				
1.2. It contains contents that are beneficial to the students and the environment and does not contain materials contrary to human dignity and morality.				
1.3. The objectives are stated simple, measurable, attainable, realistic, time-bound, effective, and reasonable.				
1.4. The objectives and subject matter match with the content standard and learning competencies of Grade 10 Science K to 12 Basic Education Curriculum.				
1.5. The questions make connections between the learned content, allow students to reflect, and extend critical thinking about the past, present, and future events.				
1.6. Questions are multi-levelled where students can answer by looking in a specific place in the module, look into several places to find answer, others require the reader to look for clues in what they have read and combine these with their prior experiences and their inferences of future events.				

Appendix K
STUDENT'S NBLM EVALUATION FORM

NATURE-BASED LEARNING MODULE EVALUATION & VALIDATION

(Adapted from Crystal Springs Book Development for Educators Textbook Evaluation Form)

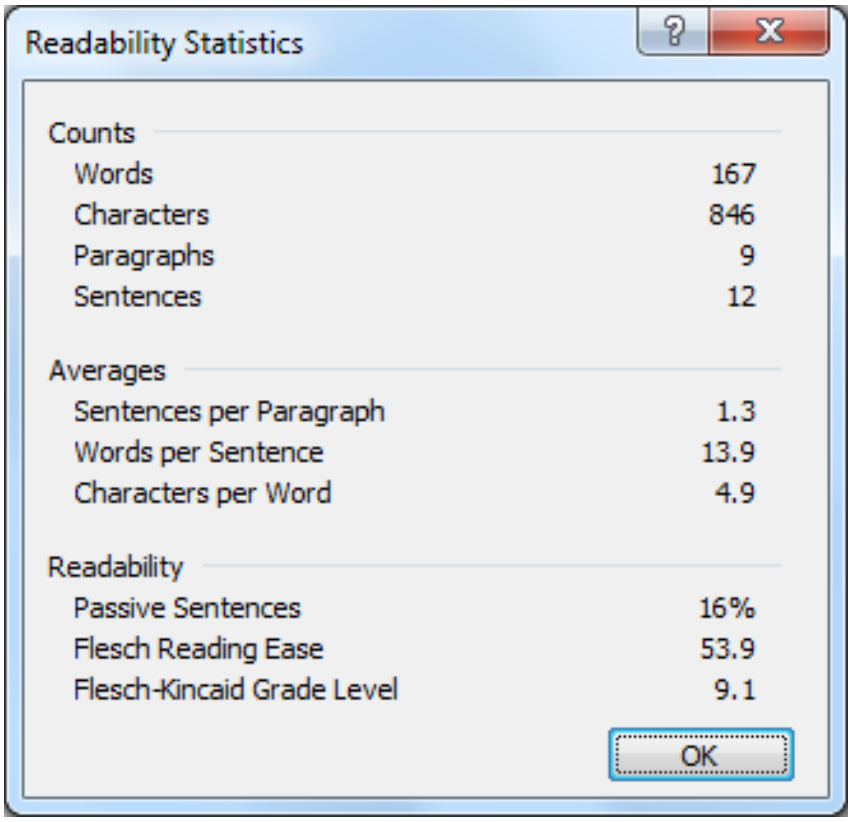
Code: _____ School: _____ Date: _____
Grade and Section: _____ Age: _____ Gender: ☐ Male ☐ Female

Dear **Student Evaluator**,

Kindly express your thought or feeling on the following statements. **Check** the column that best describe your answer. There should be only one answer per statement. Thank you.

I. OBJECTIVES, CONTENTS, AND ACTIVITIES	Strongly Agree (4)	Agree (3)	Disagree (2)	Strongly Disagree (1)
1. I can accomplish all the objectives in every lesson with ease because they are simple, attainable, and realistic. *Kaya kong gampanan ang lahat ng layunin ng bawat aralin ng may kadalian dahil ito ay simple, nagagawa, at makatotohanan.*				
2. I can easily understand concepts because the words used to define them are simple and easy to understand. *Madali kong nauunawaan ang mga konsepto dahil ang mga salitang ginamit upang ipaliwanag ang mga ito ay payak at madaling maintindihan.*				
3. I can perform the activities because the materials needed, instructions, and procedures are complete and easy to understand. *Kaya kong gawin ang mga gawain dahil ang mga gamit na kailangan, panuto, at pamamaraan ay kumpleto at madaling maintindihan.*				
4. I can answer the guide questions easily with the help of the activities and concepts defined. *Kaya kong sagutan ang mga tanong sa tulong ng mga gawain at mga konseptong may paliwanag.*				
5. I can make reflections based on the activities and guide questions that can help me positively improve my attitude towards the environment. *Kaya kong gumawa ng mga pagninilay base sa mga gawain at mga tanong na tutulungan akong positibong mapaunlad ang aking pag-uugali/pananaw ukol sa kalikasan.*				

Appendix L
MICROSOFT WORD 2010 READABILITY INDEX



Appendix M.1
EXPERTS' COMMENTS AND RECOMMENDATIONS

PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Taft Avenue, Manila

EXPERTS' COMMENTS AND SUGGESTIONS

Page No.	Evaluators' Comments and Suggestions							Action Taken
	Evaluator 1	Evaluator 2	Evaluator 3	Evaluator 4	Evaluator 5	Evaluator 6	Evaluator 7	
---				Add an introductory part that explains what the module intends to accomplish.				A **preface** was added to the module.
v			The title doesn't match to the content.	Should be in process, step by step discussion.				Change the title to **The Parts of the Module**.
vi				State the size of the materials.				Size of the materials was specifically stated.
vi	#3 remove the word beadle, be consistent with fulfill and fulfill. #6 bare							The word **beadle** was removed, used the word **fulfill**, and bear was replaced with **bare**.
1	Add direction to Environmental Check-up Revise the definition of water to "it is an abiotic component of the ecosystem that is necessary to sustain life".		Add direction to Environmental Check-up	Add direction to Environmental Check-up		Add direction to Environmental Check-up		**Instruction** was added to the Environmental Check-Up. Replaced factors with **components**.

PAGE 1 OF 3

Appendix M.2
EXPERTS' COMMENTS AND RECOMMENDATIONS

Page No.	Evaluators' Comments and Suggestions							Action Taken
	Evaluator 1	Evaluator 2	Evaluator 3	Evaluator 4	Evaluator 5	Evaluator 6	Evaluator 7	
3	#3 Replace "protect and preserve" to "conserve and protect" to be consistent with the succeeding statements.		Add more space for the answers of the students and revise the instruction of Fuse and Link.	Enhance the direction of Fuse and Link. Make questions more specific.				"Protect and preserve" was replaced with **"conserve and protect".** **Improved spaces** in questions that require it. Questions are designed to be **multi-leveled** from broad prospective, to community-based and to specific one.
5				Use biotic and abiotic components rather than factors. Be specific with the type of ecosystem. Change objective #2 List/ state rather than describe. Step 1 of Environmental Check-up seems not to use the senses.				The word "factors" was replaced with **"components"**. The ecosystem was changed into **"terrestrial ecosystem"** under the first objective. The word describe on the second objective was replaced with **"identify"**. Step 1 was not changed since **the students use their sense of sight** in determining the biotic and abiotic factors.
7			Do the students know what a vanity map?					"Vicinity Map" was replaced with the **"Map"**.

Appendix M.3
EXPERTS' COMMENTS AND RECOMMENDATIONS

Page No.	Evaluators' Comments and Suggestions							Action Taken
	Evaluator 1	Evaluator 2	Evaluator 3	Evaluator 4	Evaluator 5	Evaluator 6	Evaluator 7	
9				How will the students be able to know the conditions of the housing project before? My Commitment – Reconsider the task, it must be aligned to with the description of "My Commitment" on pg. v.				The **Fuse and Link instruction was improved** telling the students to ask information about the housing project to the residents living near it. **Additional description was added to page v under My Commitment** that the students must make ways on how to encourage the community to protect the environment.
13			Change the meaning of carbon dioxide.	Use Industries (or other appropriate word) instead of using the culture-bound, broad and western-conceptualized "development".				The meaning of carbon dioxide was not change since terms were described based on how students would encounter it on their journey. The word Development on the lesson title was replaced with **Industries**.
15				How can students assess the factories? What are the bases?				Students can assess the factories by asking the residents living near the factories.

Appendix N
LETTER TO THE EVALUATORS

PHILIPPINE NORMAL UNIVERSITY
The National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Taft Avenue, Manila

19 February 2016

DOMINADOR M. CABRERA, PH.D.
Science Education Program Supervisor
City Schools of Meycauayan
City of Meycauayan

Dear Dr. Cabrera:

Kindly evaluate the content and physical attributes of the Nature-Based Module enclosed with this letter. This module will be used to enhance grade 10 students' environmental awareness, attitude, and achievement through nature-based learning.

Together with this module is a 4-Point Likert Scale with categories of fully evident, mostly evident, partially evident, and not evident. Please feel free to write your comments and suggestions on a notepad and paste it to the pages of the module that concerns it. Enclose and seal the fully accomplished evaluation form in the envelope provided.

Your honest evaluation and suggestions would be of great help not just to the scholastic achievement of our youngsters but to the conservation and preservation of our deteriorating environment.

Thank you and may God our loving Father bless and keep us always.

Respectfully,

MR. RYAN R. BAUTISTA
Researcher

Noted:

PROF. BENILDA R. BUTRON
Research Adviser

Appendix O
SCHOOL MEMORANDUM ON THE CONDUCT OF SEMINAR-WORKSHOP ON NATURE-BASED LEARNING

Republic of the Philippines
Department of Education
Region III - Central Luzon
Schools Division of Bulacan
MASAGANA HIGH SCHOOL
Masagana, Pandi, Bulacan
SCHOOL ID: **300729**

23 February 2016

SCHOOL MEMORANDUM
No. 12, s. 2016

SCIENCE TEACHERS' SEMINAR-WORKSHOP ON NATURE-BASED LEARNING

To: Science Teachers
All Others Concerned

1. The Science Department will be having a workshop-seminar on nature-based learning on the 1st day of March 2016. In line with this activity science classes will still resume with the aid of substitute teachers who will take care of the science classes left by the teacher participants.

2. The seminar-workshop aims to
   a. equip science teachers will knowledge and skill on how to facilitate learning through nature-based approach;
   b. recall basic concepts and principles of preselected environmental science topics;
   c. enhance science teacher's science process skills;
   d. improve science laboratory skills and know the hazards of different test reagents; and
   e. utilize a nature-based module that aims to improve students' environmental awareness, attitude, and achievement.

3. The seminar-workshop will be facilitated by the
   a. Core Committee
      Chairman: Fe R. Dionisio
      Resource Speaker: Ryan R. Bautista

   b. Technical Working Committee
      Documentation: Shiena S. de Belen
      Food: Rizza C. Martin
      Sound System: Richard O. dela Cruz

4. Favorable support is highly appreciated.

Respectfully,

RYAN R. BAUTISTA
Science Teacher

Noted:

FE R. DIONISIO
School Principal I

Encl: *Action Plan & Prevention of Activities*

Appendix P
RESEARCH SITES

Appendix Q
PROFILE OF THE EVALUATORS

Name	Highest Educational Attainment	Designation, Institution
Oliver A. Alaijos	Master of Science in Biology	Professor, Bulacan State University
Dominador M. Cabrera	Doctor of Philosophy in Educational Management	Chief, Curriculum Implementation Division, DepEd City Schools of Meycauayan
Leah Amor S. Cortez	Doctor of Philosophy in Biology (CAR)	Professor, Faculty of Science, Technology, and Mathematics, PNU
Ramiro F. Plopino	Doctor of Philosophy in Environmental Science	Dean, Graduate School, Baliuag University
Ma. Lourdes C. Valondo	Master of Arts in Education	Science Coordinator, DepEd Schools Division of Bulacan
Raymund F. Javier	Master of Science in Biological Sciences	Professor, Bulacan State University
Eden V. Evangelista	Doctor of Philosophy in Biology	Professor, College of Graduate Studies and Teacher Research, PNU

Appendix R.1
ENVIRONMENTAL AWARENESS AND ACHIEVEMENT RAW SCORES (CONTROL GROUP)

CONTROL GROUP

ENVIRONMENTAL AWARENESS PRETEST

ITEM NO.	CG-001	CG-002	CG-003	CG-004	CG-005	CG-006	CG-007	CG-009	CG-010	CG-011	CG-012	CG-013	CG-014	CG-015	CG-016	CG-017	CG-018	CG-019	CG-020	CG-021	CG-022	CG-023	CG-024	CG-025	CG-026	CG-027	CG-028	CG-029	CG-030	CG-031	MEAN	INTERPRETATION
1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	2	1	1	1	2	1	2	3	3	1	3	4	1	1	2	4	1.60	Positive
2	1	1	4	4	4	1	4	4	4	4	3	4	4	4	3	2	2	4	4	3	3	4	4	4	3	3	3	3	3	2	3.20	Negative
3	2	2	3	4	3	4	4	3	4	3	3	4	4	3	3	4	4	3	2	3	3	4	3	4	3	4	3	2	3	2	3.20	Negative
4	1	1	2	1	1	1	2	1	2	1	3	1	2	3	3	2	3	1	1	2	2	3	2	1	2	2	1	2	2	2	1.80	Positive
5	1	1	2	1	1	1	1	1	1	1	3	2	2	2	2	1	2	1	1	1	1	3	1	1	2	2	2	1	2	1	1.53	Positive
6	1	2	1	1	1	2	1	2	1	1	2	1	2	2	2	1	2	1	2	1	2	4	2	3	2	2	2	1	2	2	1.70	Positive
7	1	1	1	2	1	2	1	1	2	1	1	1	3	2	2	2	1	1	2	2	1	3	2	2	2	2	2	1	2	3	1.67	Positive
8	1	1	2	1	1	2	1	2	2	1	2	1	1	1	1	2	2	1	2	2	2	3	2	1	2	4	3	1	2	4	1.67	Positive
9	2	3	2	2	1	3	2	3	3	1	2	1	3	2	3	3	3	3	2	3	2	3	3	2	3	2	3	1	2	4	2.40	Positive
10	1	1	1	1	1	1	1	2	1	1	1	1	2	1	1	1	2	1	2	2	1	1	1	1	1	1	1	1	2	1	1.20	Highly Positive
SCORE	12	14	19	18	15	18	18	20	21	15	21	17	25	22	23	19	21	18	20	22	22	27	23	22	23	26	21	14	21	25	599	
MEAN	1.20	1.40	1.90	1.80	1.50	1.80	1.80	2.00	2.10	1.50	2.10	1.70	2.50	2.20	2.30	1.90	2.10	1.80	1.90	2.00	2.20	2.70	2.30	2.20	2.30	2.60	2.10	1.40	2.10	2.50	2.00	Positive
INTERPRETATION	Highly Positive	Highly Positive	Positive	Positive	Highly Positive	Positive	Positive	Positive	Positive	Highly Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Negative	Positive	Positive	Positive	Negative	Positive	Highly Positive	Positive	Positive		

ENVIRONMENTAL AWARENESS POSTTEST

ITEM NO.	CG-001	CG-002	CG-003	CG-004	CG-005	CG-006	CG-007	CG-009	CG-010	CG-011	CG-012	CG-013	CG-014	CG-015	CG-016	CG-017	CG-018	CG-019	CG-020	CG-021	CG-022	CG-023	CG-024	CG-025	CG-026	CG-027	CG-028	CG-029	CG-030	CG-031	MEAN	INTERPRETATION
1	3	3	3	3	3	4	3	3	2	3	1	3	3	3	3	3	4	3	3	3	3	4	3	3	3	4	4	2	3	3	3.07	Negative
2	1	2	1	2	1	1	2	1	1	1	2	1	1	2	2	1	2	1	1	1	4	4	2	1	2	3	1	1	2	1	1.63	Positive
3	3	3	2	3	2	3	2	2	3	3	4	2	2	3	3	2	3	3	2	3	4	3	2	1	2	3	2	3	2	2	2.60	Negative
4	1	1	2	1	1	2	1	2	2	1	2	1	2	2	1	1	2	1	2	2	2	3	2	2	3	3	1	3	1	2	1.80	Positive
5	1	1	4	2	1	3	1	2	3	1	2	1	4	2	2	1	1	1	4	1	2	4	2	3	3	3	4	1	2	3	2.27	Positive
6	1	1	1	1	1	3	1	2	2	1	2	1	3	2	2	1	2	1	2	2	2	2	2	2	2	3	1	2	2	2	1.73	Positive
7	1	1	4	3	1	1	1	4	4	3	3	4	3	4	3	2	4	2	2	3	2	4	3	4	3	3	4	3	3	2	2.87	Negative
8	1	1	1	2	1	1	1	2	1	1	3	1	1	2	3	2	3	1	2	2	2	4	3	3	3	3	1	2	2	3	1.90	Positive
9	1	1	1	2	1	1	1	2	1	1	2	1	3	2	2	1	1	1	2	2	2	3	2	1	2	3	1	2	2	3	1.67	Positive
10	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	2	1	3	3	2	1	2	4	2	2	2	1	1.40	Highly Positive
SCORE	14	16	20	20	13	20	14	22	20	17	22	18	24	22	25	20	23	16	21	19	26	32	22	21	25	32	21	19	23	21	628	
MEAN	1.40	1.60	2.00	2.00	1.30	2.00	1.40	2.20	2.00	1.70	2.20	1.80	2.40	2.20	2.50	2.00	2.30	1.60	2.10	1.90	2.60	3.20	2.20	2.10	2.50	3.20	2.10	1.90	2.30	2.10	2.09	Positive
INTERPRETATION	Highly Positive	Positive	Positive	Positive	Highly Positive	Positive	Highly Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Negative	Negative	Positive	Positive	Positive	Negative	Positive	Positive	Positive	Positive		

SUMMARY

GROUP	TEST	Highly Positive	Positive	Negative	Highly Negetaive	TOTAL
CONTROL	Pretest	5	23	2	0	30
	Posttest	3	24	3	0	30

APPENDIX R.2
ENVIRONMENTAL AWARENESS AND ACHIEVEMENT RAW SCORES (EXPERIMENTAL GROUP)

EXPERIMENTAL GROUP
ENVIRONMENTAL AWARENESS PRETEST

ITEM NO.	CG-001	CG-002	CG-003	CG-004	CG-005	CG-006	CG-007	CG-008	CG-009	CG-010	CG-011	CG-012	CG-013	CG-014	CG-016	CG-017	CG-018	CG-019	CG-020	CG-021	CG-022	CG-024	CG-026	CG-027	CG-028	CG-030	CG-031	CG-032	CG-033	CG-034	MEAN	INTERPRETATION
1	3	1	1	1	1	1	3	1	2	2	1	1	4	1	1	1	1	1	1	1	2	1	1	2	3	1	1	1	1	2	1.47	Highly Positive
2	4	1	1	4	1	4	4	4	2	2	2	4	1	3	4	1	3	3	1	4	3	4	3	4	4	1	4	4	4	4	3.03	Negative
3	3	1	2	4	4	3	3	3	3	1	2	4	1	3	3	2	3	3	4	4	2	3	3	1	4	2	3	4	4	3	2.93	Negative
4	2	1	1	3	3	1	2	2	3	1	1	2	3	1	2	1	2	1	1	2	1	2	3	3	2	2	2	2	4	3	1.93	Positive
5	1	1	1	2	1	1	1	1	1	1	1	2	2	1	1	1	1	2	4	1	1	1	4	2	1	3	2	1	1	2	1.40	Highly Positive
6	1	2	2	1	1	1	1	1	1	1	1	4	2	1	2	1	3	2	2	1	1	3	3	2	1	3	2	2	3	2	1.77	Positive
7	1	3	2	1	1	1	1	3	2	1	2	2	2	1	1	1	2	2	2	4	1	3	3	3	2	2	2	2	4	2	1.97	Positive
8	2	2	2	1	4	1	2	2	1	1	1	2	3	2	1	1	2	1	3	1	2	1	3	3	3	1	1	1	1	2	1.83	Positive
9	2	2	3	3	1	3	1	2	1	1	1	3	2	2	2	1	2	2	3	3	3	2	4	3	3	2	2	3	2	3	2.23	Positive
10	1	2	2	1	1	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	2	2	1	1	1	1	1	1	1	1.17	Highly Positive
SCORE	20	16	17	21	18	17	19	21	19	12	13	23	24	17	15	13	21	16	25	21	18	20	26	25	25	19	21	27	24		592	
MEAN	2.00	1.60	1.70	2.10	1.80	1.70	1.90	2.10	1.90	1.20	1.30	2.30	2.40	1.70	1.50	1.30	2.10	1.60	2.50	2.10	1.80	2.00	2.60	2.50	2.50	1.90	1.90	2.10	2.70	2.40	1.97	Positive
INTERPRETATION	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Highly Positive	Highly Positive	Positive	Positive	Positive	Highly Positive	Highly Positive	Positive	Positive	Positive	Positive	Positive	Positive	Negative	Positive	Positive	Positive	Positive	Positive	Positive	Negative	Positive		

ENVIRONMENTAL AWARENESS POSTTEST

ITEM NO.	CG-001	CG-002	CG-003	CG-004	CG-005	CG-006	CG-007	CG-008	CG-009	CG-010	CG-011	CG-012	CG-013	CG-014	CG-016	CG-017	CG-018	CG-019	CG-020	CG-021	CG-022	CG-024	CG-026	CG-027	CG-028	CG-030	CG-031	CG-032	CG-033	CG-034	MEAN	INTERPRETATION
1	3	3	3	4	4	3	3	3	4	1	3	4	3	4	3	3	3	3	4	4	3	3	3	3	1	4	3	4	3	4	3.20	Negative
2	1	1	2	1	1	1	1	2	1	1	1	2	1	1	2	1	1	2	2	2	1	1	2	1	3	2	3	1	1	3	1.50	Highly Positive
3	2	2	3	3	1	2	1	2	3	2	1	2	3	3	3	2	2	4	2	2	3	3	1	3	2	2	3	3	2	3	2.27	Positive
4	2	2	2	2	1	2	1	2	1	1	2	2	3	3	2	1	2	1	1	1	2	2	3	4	2	1	2	2	2	2	1.90	Positive
5	2	2	2	2	1	2	1	2	2	2	1	2	2	1	2	1	2	2	2	3	2	1	3	2	3	2	2	3	1	2	1.97	Positive
6	1	2	3	2	1	2	4	2	1	2	2	1	1	2	2	1	2	2	3	2	1	3	2	2	2	2	2	3	3	2	2.00	Positive
7	2	3	3	3	1	3	1	3	4	2	1	3	3	4	2	4	2	4	4	4	2	3	3	3	4	3	3	4	4	2	2.90	Negative
8	2	1	1	2	1	2	1	1	2	2	1	2	1	1	2	2	2	1	4	1	2	3	2	3	2	2	2	2	3	2	1.83	Positive
9	1	1	1	2	1	2	1	2	1	2	1	2	2	1	2	1	2	4	2	1	2	2	2	1	1	1	1	1	2	1	1.53	Positive
10	2	2	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	2	2	2	1	1	1	2	1	1	1.30	Highly Positive
SCORE	18	20	20	23	13	21	15	20	20	16	13	21	20	22	21	17	18	25	25	21	19	25	22	25	21	20	22	25	22	22	612	
MEAN	1.80	2.00	2.00	2.30	1.30	2.10	1.50	2.00	2.00	1.60	1.30	2.10	2.00	2.20	2.10	1.70	1.80	2.50	2.50	2.10	1.90	2.50	2.20	2.50	2.10	2.00	2.20	2.50	2.20	2.20	2.04	Positive
INTERPRETATION	Positive	Positive	Positive	Positive	Highly Positive	Positive	Highly Positive	Positive	Positive	Positive	Highly Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive		

SUMMARY

GROUP	TEST	Highly Positive	Positive	Negative	Highly Negative	TOTAL
EXPERIMENTAL	Pretest	4	24	2	0	30
	Posttest	3	27	0	0	30

APPENDIX R.3
ENVIRONMENTAL AWARENESS AND ACHIEVEMENT RAW SCORES

ACHIEVEMENT TEST

CONTROL GROUP

STUDENT NO.	PRETEST	POTTEST
CG-001	21	25
CG-002	23	25
CG-003	22	23
CG-004	18	15
CG-005	24	23
CG-006	23	25
CG-007	15	8
CG-009	19	23
CG-010	20	24
CG-011	20	23
CG-012	20	19
CG-013	14	13
CG-014	11	7
CG-015	15	18
CG-016	16	14
CG-017	15	12
CG-018	13	17
CG-019	16	17
CG-020	15	17
CG-021	23	16
CG-022	17	13
CG-023	16	13
CG-024	17	20
CG-025	9	9
CG-026	10	18
CG-027	8	5
CG-028	8	12
CG-029	6	10
CG-030	13	9
CG-031	11	7
TOTAL	**478**	**480**
MEAN	**15.93**	**16.00**

EXPERIMENTAL GROUP

STUDENT NO.	PRETEST	POTTEST
EG-001	28	30
EG-002	22	25
EG-003	20	24
EG-004	25	24
EG-005	16	26
EG-006	12	22
EG-007	11	13
EG-008	19	17
EG-009	12	24
EG-010	23	24
EG-011	20	20
EG-012	13	15
EG-013	14	30
EG-014	17	25
EG-016	21	26
EG-017	22	18
EG-018	11	28
EG-019	17	23
EG-020	22	20
EG-021	14	13
EG-022	15	15
EG-024	13	13
EG-026	2	7
EG-027	11	15
EG-028	13	13
EG-030	13	11
EG-031	11	10
EG-032	19	17
EG-033	12	14
EG-034	12	15
TOTAL	**480**	**577**
MEAN	**16.00**	**19.23**

Appendix S
ANTI-PLAGIARISM AUTHENTICITY RESULT

Philippine Normal University
College of Graduate Studies and Teacher Education Research
PUBLICATION OFFICE

AUTHENTICITY RESULT

Date of Release: April 19, 2016
Result Code: 2016-0124
Submission ID: 661834036
Title of Output: Enhancing Environmental Awareness, Attitude, and achievement Through Nature-Based Learning
Author(s): Ryan R. Bautista

Authenticity Report:

- ***Similarity Report: 14%***
- ***Interpretation***: A similarity report of 14% means that 14% of the whole paper is similar to sources in Turnitin's (authenticity software) online repository. The colored bibliographical references denote the sources of similarity to previously published work which maybe from internet sources (11%), publications (6%) and student papers (10%) for the remaining similarity percentage.
- ***Highlighted text in the Manuscript***:
  - Red marks and highlights are set of texts directly or exactly copied from online sources
  - Other color marks and highlights are set of text exactly copied from other sources (student papers and publications).

Recommendations:

- Use of quotations for exactly copied text is suggested.
- For assumed to be cited parts of the manuscript but highlighted, it is recommended that authors rephrase these portions.

Rio Anne R. Maño
(Authenticity Administrator)

Noted by:

Dr. Marie Paz E. Morales
Director, Publications Office

PUBLICATION publications.office@pnu.edu.ph
(Taft Avenue, Manila, 1000, Philippines

Appendix T
CORE SPECIFICATIONS OF THE NATURE-BASE LEARNING MODULE

Lesson Title	Knowledge	Awareness	Attitude
Houses Amidst the Natural World	Flow of Energy and matter in ecosystems - Population Growth and Carrying Capacity ‣ classify biotic components as producers and consumers; ‣ create and food chain and food web; and ‣ compare the number of organisms to the available resources in an ecosystem.	Awareness of Habitat Degradation ‣ compare a vacant lot rich with biotic and abiotic factors to a government housing project	Attitude Towards Backyard Gardening ‣ write a letter addressed to the community encouraging them to maintain a backyard garden.
Where is My Water?	Fresh Water Ecosystem ‣ describe the physicochemical properties of water and ‣ determine pollutants in a fresh water ecosystem.	Awareness of the Extent of Water Pollution ‣ observe the physical and chemical condition of a body of water and its effect to the community.	Attitude Towards the Preservation and Rehabilitation of Fresh Water Ecosystem ‣ make a statement telling the community to save, conserve and preserve the freshwater environment.
Industries: Blessing or Curse	Biodiversity and Stability – Sustainable Development ‣ determine factors affecting Biodiversity ‣ think of ways on how to attain sustainable development.	Awareness of Air and Land Pollution Caused by Industrial Plants ‣ visit nearby industrial plants ‣ conduct interview to the residents for the benefits and dilemmas caused by these plants.	Attitude Towards Sustainable Development ‣ make a plane on how to attain sustainable development.

Appendix U

SCIENCE 10 – K TO 12 BASIC EDUCATION CURRICULUM GUIDE

K to 12 BASIC EDUCATION CURRICULUM

CONTENT	CONTENT STANDARDS	PERFORMANCE STANDARDS	LEARNING COMPETENCY	CODE	LEARNING MATERIALS
	molecule may cause changes in its product 3. mutations that occur in sex cells as being heritable		6. explain how mutations may cause changes in the structure and function of a protein;	**S10LT-IIIe-38**	Genetics
3. Biodiversity and Evolution	how evolution through natural selection can result in biodiversity	write an essay on the importance of adaptation as a mechanism for the survival of a species	7. explain how fossil records, comparative anatomy, and genetic information provide evidence for evolution;	**S10LT-IIIf-39**	• APEXBiology Unit 7 Evolution Lessons 1-4
			8. explain the occurrence of evolution;	**S10LT-IIIg-40**	
4. Ecosystems **4.1 Flow of Energy and Matter in Ecosystems** **4.2 Biodiversity and Stability** **4.3 Population Growth and Carrying Capacity**	1. the influence of biodiversity on the stability of ecosystems 2. an ecosystem as being capable of supporting a limited number of organisms		9. explain how species diversity increases the probability of adaptation and survival of organisms in changing environments;	**S10LT-IIIh-41**	
			10. explain the relationship between population growth and carrying capacity; and	**S10LT-IIIi-42**	
			11. suggest ways to minimize human impact on the environment.	**S10LT-IIIj-43**	
Grade 10 – Matter **FOURTH QUARTER/FOURTH GRADING PERIOD**					

Appendix V
EXPERTS' EVALUATION OF THE MODULE

Domain I: Objectives, Alignment with the DepEd's Vision, Mission, Values, Contents, and Activities

FACETS	ACCEPTABILITY				AGREEMENT	
	Mean	SD	CV	Interpretation[a]	Index	Interpretation[b]
. The contents conform to the vision, mission, and core values of the DepEd.	4.00	4.00	1.00	Fully Evident	1.00	Almost Perfect
. It contains contents that are beneficial to the students and the environment and does not contain materials contrary to human dignity and morality.	4.00	4.32	1.08	Fully Evident	1.00	Almost Perfect
. The objectives are stated simple, measurable, attainable, realistic, time-bound, effective, and reasonable.	3.71	4.04	1.09	Fully Evident	0.49	Moderate
. The objectives and subject matter match the content standard and learning competencies of Grade 10 Science K to 12 Basic Education Curriculum.	3.86	4.18	1.08	Fully Evident	0.70	Substantial
. The questions make connections between the learned content, allow students to reflect, and extend critical thinking about the past, present, and future events.	4.00	4.32	1.08	Fully Evident	1.00	Almost Perfect
. Questions are multi-leveled where students can answer by looking in a specific place in the module, look into several places to find answer, others require the reader to look for clues in what they have read and combine these with their prior experiences and their inferences of future events.	3.71	4.04	1.09	Fully Evident	0.48	Moderate
. Vocabulary consists of words that are both familiar and challenging to Grade 10 students, and words that the students may not know are clearly defined. The main ideas are explicit and embedded in the concepts and activities.	3.57	3.89	1.09	Fully Evident	0.39	Fair
. Instructions are stated in a clear and concise manner that provides a step-by-step procedure allowing the students to gather correct and accurate data and avoids confusion that may lead them to misunderstanding of concepts.	3.83	3.85	1.00	Fully Evident	0.64	Substantial
. Activities are relevant to the concepts and topics on a certain lesson that provide students with opportunities to integrate skills and concepts in which triggers them to work actively.	3.71	4.04	1.09	Fully Evident	0.49	Moderate
. Graphic organizers such as tables and charts reinforce understanding concepts and allow students to present gathered data in an orderly manner that allows them to draw conclusions, give reasonable answer to the guide questions, and in-depth reflections.	3.71	4.04	1.09	Fully Evident	0.49	Moderate
OVERALL	**3.81**	**3.86**	**1.01**	**Fully Evident**	**0.67**	**Substantial**

a. based on mean b. based on index

Domain II: Physical Properties

FACETS	ACCEPTABILITY				AGREEMENT	
	Mean	**SD**	**CV**	**Interpretation[a]**	**Index**	**Interpretation[b]**
. The organizational properties of the module assist in the understanding and content processing of the students.	3.86	4.18	1.08	Fully Evident	0.70	Substantial
. The font size, color, and type, length of the line, and space between each line all work together, producing a page that is not only visually appealing but also readable and accessible.	3.71	4.04	1.09	Fully Evident	0.49	Moderate
. The activities are complemented/supported with graphic organizers that follow the less-is-more rule: they do not crowd the page or overwhelm the students with too much textual or visual information.	3.71	4.04	1.09	Fully Evident	0.49	Moderate
. It has ample eye rest areas or spaces where students' notes can be written. It also has enough space to answer guide questions.	3.71	4.04	1.09	Fully Evident	0.49	Moderate
. The materials used are in good quality, durable enough to withstand normal wear and tear. It is reasonably handy in size, weight, thickness considering the content.	4.00	4.32	1.08	Fully Evident	1.00	Almost Perfect
OVERALL	**3.80**	**3.88**	**1.02**	**Fully Evident**	**0.63**	**Substantial**

a. based on mean b. based on index

Appendix W
STUDENTS' EVALUATION OF THE MODULE

Domain I: Objectives, Contents, and Activities

FACETS	ACCEPTABILITY				AGREEMENT	
	Mean	SD	CV	Interpretation[a]	Index	Interpretation[b]
. I can accomplish all the objectives in every lesson with ease because they are simple, attainable, and realistic.	3.07	3.18	1.04	Agree	0.42	Moderate
. I can easily understand concepts because the the words used to define them are simple and easy to understand.	3.30	3.39	1.03	Agree	0.57	Moderate
. I can perform the activities because the materials needed, instructions, and procedures are complete and easy to understand.	3.43	3.53	1.03	Agree	0.49	Moderate
. I can answer the guide questions easily with the help of the activities and concepts defined.	3.50	3.60	1.03	Strongly Agree	0.48	Moderate
. I can make reflections based on the activities and guide questions that can help me positively improve my attitude towards the environment.	3.17	3.25	1.03	Agree	0.62	Substantial
OVERALL	**3.29**	**3.35**	**1.02**	**Agree**	**0.51**	**Moderate**

a. based on mean b. based on index

Domain II: Physical Properties

FACETS	ACCEPTABILITY				AGREEMENT	
	Mean	SD	CV	Interpretation[a]	Index	Interpretation[b]
. I can easily read the words because it has appropriate font size, colors are comfortable to the eye, and font styles used are not boring.	3.40	3.52	1.04	Agree	0.40	Fair
. I am confident that the module will not easily get damaged because the paper used is durable, the cover is thick, and the binding is strong enough to withstand frequent browsing.	3.43	3.57	1.04	Agree	0.43	Moderate
. I appreciate the graphics and layout used because it is uniform in all lessons, appealing, and interesting.	3.67	3.76	1.03	Strongly Agree	0.54	Moderate
. I have enough space to write my important notes and it is no longer necessary for me to bring extra paper or notebook.	3.37	3.51	1.04	Agree	0.40	Fair
. I can comfortably bring the module because it is handy in size, weight, and thickness.	3.53	3.68	1.04	Strongly Agree	0.49	Moderate
OVERALL	**3.48**	**3.56**	**1.02**	**Agree**	**0.45**	**Moderate**

a. based on mean b. based on index

Appendix X
STUDENTS' ENVIRONMENTAL ATTITUDE RESPONSES

Respondents	MODULE 2 Attitude Towards Backyard Gardening	MODULE 3 Attitude Towards the Preservation of Aquatic Ecosystem	MODULE 4 Attitude Towards Sustainable Development
1	We want to maintain the cleanliness and encourage you to plant to your backyard to help our environment.	Water is important to us, we cannot live without it. Let's maintain the cleanliness of bodies of water for the future.	I will not approve the transformation of rice fields into industrial park because the rice production will be affected.
2	I would like to encourage all of you to plant in your backyard because plants use carbon dioxide to produce oxygen.	Maintain the fresh bodies of water clean to be useful in the future.	I will not approve… rice fields will be smaller and no more soil to be planted with rice.
3	We would like you to maintain a backyard garden and maintain the surroundings clean for the future of Mother Nature.	Let us work hand in hand to stop wasting our resources and preserve our fresh water environment.	No, because our industry may develop but rice fields will be gone which provides food to many organisms including us.
4	To all residents of the housing project let us maintain a backyard garden to sustain our daily need for food.	Let us make ways on how to preserve the rivers.	No, because industrial plants destroy the environment and contributes to global warming.
5	Let us maintain a backyard garden to sustain our daily need for food.	Water is our treasure. It is important for our future. Let us manage to conserve it.	Rice fields are very few and if industrial plants will be built it will greatly affect rice production and the environment.
6	Maintain a backyard garden because it provides food to us and gives us fresh air.	We need to conserve water for our future and in its absence we will die.	Yes, I will allow the construction of industrial parks but not all the rice fields will be turned into industrial plants.
7	Please maintain a backyard garden for you to have fresh food and help Mother Nature.	Water is our treasure. It is important for our future. Let us manage to conserve it.	Yes, I will allow few industrial parks to be constructed.
8	We would like you to maintain a backyard garden and maintain the surroundings clean for the future of Mother Nature.	Water is our treasure. It is important for our future. Let us manage to conserve it.	No, because rice production will be greatly affected.
9	Let us maintain a backyard garden that will provide foods for your family.	Let us clean and preserve our bodies of water for our future.	No, because the production of food will be badly affected.
10	Let us be a good example to everyone, plant and maintain a backyard garden.	Protect the bodies of water.	No, because it contributes to pollution.
11	Maintain a backyard garden for free food and makes the environment beautiful.	In the absence of water many organisms will die.	No, we need to protect the environment and its inhabitants.
12	Let us maintain a backyard garden to supply our need for foods.	The water is very polluted let us save it.	No, because it will destroy the environment.
13	Maintain a garden for vegetables for food, earn a living, and help the environment.	Protect the bodies of water for our sake.	No, because the environment will be destroyed.
14	Backyard gardening is very important and it will benefit you a lot.	Preserve water for the future.	Because rice fields are getting few I will not allow the construction of industrial plants.
15	We encourage you to maintain a backyard garden which will give food to your table and help the environment.	Preserve water because it is our treasure.	No, because it will destroy the environment.
16	Maintain a backyard garden for free food and makes the environment beautiful.	Conserve water, in the absence of water, we will die.	No, the constructions of industrial plants cause destruction to the environment.
17	Let us maintain a backyard garden to supply our need for foods.	Do not throw trash into the river and make the environment clean.	No, because the environment will be destroyed.

18	Please plant vegetables and plants in your backyard to provide you with food and help nature.	Water is very important, protect it for our future.	No, for the sake of the farmers and organisms living in the rice field.
19	To all residents of the housing project let us maintain a backyard garden to sustain our daily need for food.	Conserve water, in the absence of water, we will die.	No, because it contributes to pollution.
20	Let us maintain a backyard garden to supply our need for foods.	Preserve water for the future.	No, because it will destroy the environment.
21	Let us maintain a backyard garden to sustain our daily need for food.	In the absence of water many organisms will die.	No, because the production of food will be badly affected.
22	Maintain a vegetable garden and benefit a lot from it.	Be a role model to protect the rivers and save our future.	No, because of the bad smell the factories and farms produce.
23	Maintain a backyard garden for free food and makes the environment beautiful.	Let us clean and preserve our bodies of water for our future.	Rice fields are very few and if industrial plants will be built it will greatly affect rice production and the environment.
24	Backyard Gardening can help produce food.	We need to manage the usage of water for goodness sake.	Do not destroy the rice fields but protect it.
25	I would like to encourage all of you to plant in your backyard because plants use carbon dioxide to produce oxygen.	Do not throw dirt to the water and protect it.	Yes, I will allow few industrial parks to be constructed.
26	I want to be a good example to everyone by maintaining a background garden.	Protect the bodies of water and save the future.	No, because it will destroy the environment.
27	Backyard gardening is a great help to us and to the environment.	Preserve water for the future generation.	Because rice fields are getting few I will not allow the construction of industrial plants.
28	To all residents of the housing project let us maintain a backyard garden to sustain our daily need for food.	Clean water for the future generation.	No, we need to protect the environment and its inhabitants.
29	Please plants that can provide food and help make fresh air.	Let us not throw garbage to the river, protect it.	The environment will be destroyed in building these industrial plants.
30	Make a backyard garden and get food from it.	Water is a treasure, preserve it and protect from being destroyed.	No, because rice fields will become few and would destroy the habitat of several organisms.

LEGEND:

Positive Response
Neutral Response
Negative Response

Appendix Y
CERTIFICATE OF COPYRIGHT REGISTRATION AND DEPOSIT

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NATIONAL LIBRARY OF THE PHILIPPINES
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Class of Work: A Published : _____ Unpublished: X

Date of Creation: February 01, 2016 Date of Publication: _____

Date Registered/Deposited: February 03, 2016 Registration No. A2016-221

Term of Protection: _____ Lifetime of the author and for fifty (50) years after his/her death. _____

Issued this 17th day of FEBRUARY, **2016,** in the City of Manila, Philippines.

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Copyright Examiner

YOLANDA E. JACINTO
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