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Developing Environmental Attitude and Internalization among Pre-Service Teachers through Climate Change Integration

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ABSTRACT

This study investigated the development of environmental attitude and internalization of the Pre-Service Teachers (PSTs) through climate change (CC) integration of Climate Change Strategies and Techniques in Developing Environmental Attitude (CC STDEA) Training Modules. This study was conducted at Bukidnon State University, Malaybalay City during the School Year 2016-2017. Instructional Development (ID) Model was used in the study. The adopted theories were interwoven with Seels and Glasgow (1998) Model of Instructional Development which followed the Analysis, Design, Development, Implementation and Evaluation (ADDIE) phases. Fifty-two Music, Arts, Physical Education, and Health (MAPEH) majors were the participants of the training conducted on May 18-22, 2016. The pre-test and post-test were conducted using the Environmental Attitude Scale (Ugulu and Erkol 2013) to the PSTs. The Climate Change integration training using CC STDEA training modules was evaluated using Kirkpatrick's (1994) Four Level Model. The mean, standard deviation, and t-test at 0.05 level of significance were used to treat the data.From the study, the following findings were drawn: The CC STDEA Training Modules integrating climate change had developed PSTs environmental attitude and internalization. The features in clarity, appropriateness, and content and content accuracy of the developed training modules, were provided very adequately on the level of reaction, learning, transfer and result in the Climate Change integration training. There was no significant difference in the gain scores of the training participants in the environmental awareness, attitude towards recovery, attitude towards recycling as well as in the environmental consciousness and behavior.

***Keywords*:** Climate change, Integration, Environmental attitude, Internalization

INTRODUCTION

People all over the world have to face the reality of global climate change. Coastal areas, especially heavily populated megadelta regions in Southeast Asia is at greatest risk due to the increased flooding from both the sea and rivers. The whole world is affected by rising sea level, change in weather and climate particularly fisher folks and coastal communities. When there is too little or too much rainfall during growing seasons, agricultural productivity will suffer, thus affecting food security (IPCC, 2014). The Philippines belong to the second group of countries highly vulnerable to extreme weather events. The nation is threatened by typhoons, tropical storms, floods, and landslides. The urgency for adopting responsive policies and programs to be prepared for severe and more frequent occurrences of disasters is needed (Global Climate Risk Index 2016).

Humans continue to engage with unfriendly environment behaviors at the individual, corporate, governmental, and societal levels (Ugulu and Erkol 2013). These behaviors have contributed to the creation of several environmental problems that could pose serious threats to the well-being of humans and all living species. Individuals with the negative attitude towards the environment would be inconsiderate and would continue to pose problems (Uzun and Saglam 2006). Former US Vice President Al Gore articulated that Solar and Wind renewable energies are solutions to address the issues and challenges of climate change. He emphasized the primary cause of global warming is man-induced coming from carbon emission which he termed, "The Cost of Carbon" (TED Talk, 2016).

Reyes (2014) claimed that educational attainment is the only consistent and significant predictor of attitude and behavior. This finding provides an understanding of Filipino attitude towards the environment and improvement of attitude may be achieved further with the integration of environmental education.

Environmental education (EE) is a long-term process of developing the skills and behavior necessary to understand and accept the relationships between people, culture and the natural environment. It is a sequential process that attempts to increase understanding of the environment and promote pro-environmental values. Its ultimate aim 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 (Hungerford

et al. 1980; Yorek et al. 2010).

Republic Act 9512 is one of the Philippines concrete expressions of support to the United Nations Decade of Education for Sustainable Development and ASEAN Environmental Education Action Plan (AEEAP). RA 9512 or the Environmental Awareness and Education Act of 2008 mandates the integration of environmental education in school curricula at all levels whether private or public and the implementation of the awareness program on environmental protection and conservation in the context of sustainable development. The Climate Change Commission (CCC) by RA 9729 or the Climate Change Act of 2009, is the policy making body task to coordinate, monitor, and evaluate its program and action plans regarding climate change.

Raising public awareness and improving education about natural disasters are strategies to help vulnerable populations cope with risk. As United Nations Educational, Scientific, and Cultural Organization or UNESCO's Director-General, Koichiro Matsuura, emphasized to the organization's General Conference in 2005 saying, "Again, education – whether formal, non-formal or informal – can save lives." (UNESCO 2007). Colleges and universities recognize the need to educate students to be global citizens (Parker et al. 1999) since many of society's most pressing issues transcend national boundaries (Falk et al. 1993; Parker et al. 1999; Kirkwood 2001).

One of the initiatives of the Commission on Higher Education (CHED) was to enjoin all higher education institution (HEIs) to integrate EE focused on Climate Change in the curriculum as stipulated in the CMO 33 s. 2009, in realization of the need for the individual to have proper training on the environment including the PSTs. The Bukidnon State University integrates climate change in Environmental Science (ES) 101 which focuses on Science, Technology, and Society (STS), a required subject of all PSTs before their practice teaching.

Schooling, even at primary level, can play a significant role in the formation of environmental attitude and internalization (Strong 1998, Kahriman-Ozturk et al. 2012). Teachers could significantly influence students' environmental attitude and internalization. Internationalization of the curriculum is vital in today's globalized environment, with the increasingly interdisciplinary nature of complex issues such as climate change.

Integrating climate change is necessary to prepare environmentally literate students who, as future citizens, would play an active role in protecting the environment through making informed decisions and taking environmental

friendly actions (UNESCO-UNEP 1991). Shemdoe et al. (2011) contend that knowledge and understanding of climate change issues need to be enhanced otherwise; the ability of the local government to help residents cope with the calamities will be limited.

Current literatures uphold that Climate Change Integration intends to encourage pro-environmental attitude among students could offer a variety of strategies and techniques (Farmer et al. 2007). The reform in the instructional practices of higher education must begin with faculty members' efforts. An excellent first step is to select strategies promoting active learning that one can feel comfortable with (Cotton 2006). Alsharif and Atweh (2010) claimed that productive pedagogies as the framework to improve pre-service practices had been the focus of numerous educational reforms. Dimensions such as intellectual quality with elements e.g. knowledge integration are appropriate approaches of climate change.

Two studies had been conducted involving PSTs as implementers of Climate Change Lessons. One study integrated CC Lessons (Micayabas 2015), and the other study was in collaboration among PSTs in integrating Climate Change through lesson study process (Micayabas, Balansag, and Barroso 2015). The participants were students of Bukidnon State University– Secondary Laboratory School. The result showed that both Grade 7 and Grade 8 students from the experimental groups obtained the level of achievement as Approaching Proficiency (AP). This indicates that the students have developed basic knowledge and skills but cannot transfer learning independently. Competence levels along the five climate change concepts were also determined. Data suggest students show great difficulty in understanding or learning creatively in producing products or performance especially on the concepts of biodiversity and population for Grade 7, and biodiversity for Grade 8.

Based on the results of the two researches, academic performances of the students in CC integration are low. One of the gaps could be the limited exposure of PSTs to CC concepts in college. The researcher also determined PSTs internalization using Krathwohl's (2002) taxonomy of affective domain. Based on the result, 85% of the PSTs were categorized as responding. Results suggest PSTs are committed in some small measure to the ideas, materials or phenomena. PSTs are more of spectators and followers but not implementers nor models. This could be another gap hence; PSTs must reach characterization value to be able to act consistently by the values he or she has internalized. Internalization occurs as a result of self-improvement in which individual change their norms (Cooter

2000).

Teacher Education Institutions (TEIs) could enhance the teaching of population and biodiversity concepts in the pre-service curriculum. Likewise, employing strategies further develop environmental attitude and internalization. PST education for CC has the potential to prepare and enable future citizens particularly the students to enact mitigation and adaptation activities. Teachers usually teach the way they were taught. PSTs as future teachers are expected to help the society implement more responsive strategies in the classroom for Climate Change (CC) integration.

Robinson and Kay (2010) challenged PSTs of the 21st century to master environmental concepts to be able to integrate climate change. Preparing PSTs for practical decision making and develop positive environmental attitude and internalization, CC integration be a fundamental and integral part of the Pre-Service Curriculum. EE materials could be prepared so as to help achieve these aims (Grodzinska-Jurczak et al. 2006).

Climate change as a global issue has been addressed by different agencies, including education in a multidisciplinary manner, but there are very limited materials or resources that can be utilized by teachers. To ensure successful PST education for climate change integration, the researcher designed, developed, implemented and evaluated training modules entitled Climate Change Strategies and Techniques in Developing Environmental Attitude (CC STDEA) for Pre-Service Teachers. Five CC concepts from Valdez et al. (2010) were selected for integration as follows: 1) population, 2) pollution, 3) biodiversity, 4) environmental factors and phenomena and 5) environmental ethics.

FRAMEWORK

The theoretical underpinnings that guided the researcher included the theories of Constructivism (Bruner 1966; Vygotsky 1978), the theory of Experience by Dewey (1897) and the Social Development Theory or Social Learning Theory of Bandura (1977). Jerome Bruner's theory of constructivism (1966) expressed that students create their knowledge based on the things they presently know and have learned in the past. Theory of Vygotsky is nested within Dewey's theory of progressivism in instruction (Schunk 2012). Social Development Theory values the significance of social interaction in learning while Social Learning Theory values learning through observing other's behavior, attitude and the outcomes of these behaviors.

Education and awareness in environmental protection and conservation require knowledge, understanding, and the change of attitude. It is the process of solving environmental problems within the context of education. Pragmatists believe that knowledge can be acquired in the relation between human and nature.

On the other hand, based on realism epistemology, knowledge is a process to discover a thing and new phenomenon and the process should relate with the physical environment. It focuses on the development of PSTs' potency as well as encourages the PSTs towards rational thought. In addition, this gives PSTs an opportunity learning to nurture nature and avoid exploiting them.

Finally, from the aspect of idealism, the element of moral is very important in producing a balanced individual with the attitude to love nature and be concerned with others and their surroundings. From the aspects of different philosophies, PSTs are getting more opportunity to view the importance of the environment.

The theories support the concepts in developing PSTs environmental attitude and internalization through climate change integration. The cited theories are interwoven with Seels and Glasgow (1998) Model of Instructional Design. The concepts included: the Pre-Service Teachers prior knowledge of the environment is crucial in gaining new knowledge; exposure to real-life problem-solving activities through modeling could lead to the formation of attitude and Seels and Glasgow's (1998) ADDIE Model of Instructional Design, which follows analysis, design, development, implementation and evaluation.

Bruner (1966) advanced that the outcome of cognitive development is thinking. Learners build their knowledge actively based on the things they learned from the past and present, check new knowledge with the old rules then revising rules that no longer work. Children, as they grow, must acquire a way of representing the recurrent regularities in their environment. Important outcomes of learning include not just the concepts, categories, and problem-solving procedures invented previously by the culture, but also the ability to discover these things for ones' self. For the learner to completely understand the concepts, the lesson should always emphasize the basic ideas and recurrently build upon these ideas (Slavin, 2003).

Vygotsky (1978) maintained that learners need to construct their understanding of each CC concept. The primary role of teaching is to create situations for learners that foster mental constructions. The theory also emphasizes the manner in which ideas or analysis and thinking possessed by the learners are used to discover new information and experiences.

Progressivists contend that education should focus on the whole child rather than the content or the teacher. The learner is a problem solver and thinker who make meaning through his or her individual experiences in the physical and cultural context. Dewey (1897; 1938) earlier asserted that experience is a natural occurrence; it is an integral part of an individual. Experience always consists of the actual life experience of individual of their respective environs. Dewey uphold that for education to be most effective, content must be presented in a way that allows learners to relate the information to prior experiences, thus deepening the connection with his new knowledge. Notwithstanding, in a person's daily experience, it influences the formation of the attitude of desire and purpose.

A person learns through observing other's behavior, attitude, and outcomes of those behaviors. Most human behavior is learned observationally through modeling; from observing others, one forms an idea of how new behaviors are performed, and on later occasions, this coded information serves as a guide for action (Bandura 1986; 1977). Human behavior is a continuous reciprocal interaction between cognitive, behavioral and environmental influences. People acquire knowledge of rules, skills, strategies, beliefs, and attitude by observing others.

Ajzen and Fishbein (1980) developed a theoretical framework for the evaluation of environmentally responsible behavior. In the theory of reasoned action, there are four basic concepts posited: beliefs, attitude, intentions, and behavior. They postulated a specific pattern of effect relations among these four components. In their view, actual behavior is, first, a function of behavioral intentions and second, one of the attitudes that in turn is affected by knowledge. A critical assumption in their theory is that knowledge and attitude influence actual behavior.

The aforecited theories were the bases in developing the CC STDEA training modules. Crafting instructional materials for climate change integration for PSTs has been a great challenge. CC STDEA followed suggested activities such as environmental restoration increasing participants' ownership (Hartig et al. 2001) and multi-sensory learning promoting engagement (Smeesters et al. 2004). It also made use of constructivism theory of Bruner (1966) and Vygotsky (1978) which develop critical thinking and problem solving (Brooks and Brooks 1993). Constructivist teaching behaviors emphasize that teachers must motivate students to search for links through independence and creativity amidst differences in opinions or thoughts. Cognitive terms like classify, analyze, predict and create must be used by teachers when setting the tasks.

Also, direct aesthetic experience with the environment (Gigliotti 1990) and relevant personal experiences promoting empowerment and ownership (Hungerford et al., 1980) were based on the theory of experience by Dewey (1916) in Democracy and Education. Dewey clarified the peculiarity between the active and passive side of the experience. On the active side, it is trying while on the passive side, it is undergoing. When we experience something we act upon it, do something with it, and then undergo or suffer the consequences. The connection of these two phases of experience measures the fruitfulness or value of the experience.

Finally, suggested activities on sensitive or emotional content (Pooley and O'Conner, 2000) were matched with Bandura's (1986) social learning theory supported by Roper (1994). Roper stipulated that the school, especially teachers as models influence students' environmental attitude. Palmer and Neal (2004) advanced the need for education about the environment. It could help build awareness, understanding, and develop skills necessary to develop the favorable environmental attitude. The favorable attitude of college teachers greatly influences PSTs environmental attitude (Jaus 1978).

Internalization occurs as a result of self-improvement in which individuals change their norms (Cooter, 2000). Compliance, identification, and internalization are three processes in attitude change (Bloom et al., 1956). Anderson (2012) highlighted that learning involves one's cognitive, affective and psychomotor domains. The learner could develop his mental skill and enhance affective growth that includes the feelings or emotions. Krathwohl (2002) arranged the feelings or emotions from simple to more complex. It is characterized as receiving, responding, valuing, organization and modeling.

Education plays a vital role in combating the adverse effects of climate change through integration. Integration is an approach to teaching and learning, where many areas of the curriculum had connections (Lawrence, 2007). Integrating content enables learners to explore boundaries and connections across disciplines (EBEC, 2013).

Cutting across subject-matter lines bring together various aspect of curriculum into meaningful association (Shoemaker 1989). Integration is cross connections which are so significant to students' learning experiences. Interweaving curriculum truly gives students power over their knowledge influencing their attitude and values. Kovalik and Olsen (1994) strengthened Shoemaker's claim by confirming that curricular integration provides holistic context for learning. Moreover, Hudson (2010) considered the strengths of each discipline as an

integral whole and finally Beane (2010) integration challenge teachers and students to identify research problems and environmental issues without regard for subject boundaries.

Instructional Design (ID) is the process of solving instructional problems by systematic analysis of the conditions of learning (Seels and Glasgow 1998). It is a blueprint for training or experience. The instructional systems design (ISD) is a generic model. ISD is based on the premise that learning should be systematic, organized. It should be developed with an orderly process, are sequential and produced measurable outcomes. The developmental research aims to improve the processes of instructional design, development, and evaluation of instructional programs, processes and products that must meet criteria of internal consistency and effectiveness (Richey and Klein, 2005).

Kirkpatrick's Successive Four-Level Model of Evaluating Training Programs determined the effectiveness of the CC STDEA Training Modules utilized in the CC integration training. The Four-Level Model of Evaluation was a meaningful way of measuring the levels of reaction, learning, transfer and result of the training.

OBJECTIVE OF THE STUDY

This study designed and developed CC STDEA training modules integrating climate change in developing PSTS environmental attitude and internalization along the following factors: 1. environmental awareness; .2. attitude towards recovery; 3. attitude towards recycling; and 4.environmental consciousness and behavior. Further, it implemented and evaluated CC integration using CC STDEA training modules, and compared the environmental attitude and internalization of PSTs before and after the conduct of the training using CC STDEA.

METHODOLOGY

This study adopted the Developmental Research Design developed by Seels and Glasgow (1998) and Richey and Klein Model (2005). The ID Model adopted had considered developmental research a systematic study of designing, developing, and evaluating instructional programs, processes, and products that must meet criteria of internal consistency and effectiveness. In this study, the five stages in the Instructional Development of Seels and Glasgow (1998) had

postulated five phases.

Developmental Research is an interactive, cyclic process of developmental research in which theoretical ideas of the designer feed the development of products that are tested in classroom settings. Eventually, leading to theoretically and empirically founded products, learning processes the developer and (local) instruction theories (Van den Akker, 1999).

The analysis was an important part of the design and development process. It is the basic component of any teaching program. It was the first stage in the conduct of a teaching program to know the exact problem and how to handle its solution.

The researcher conducted a survey on the environmental attitudes of PSTs who were on Practicum last March 2016. Using the 42-item questionnaire, the result showed 63% of the PSTs answered agree to positive statements while 37% of the PSTs responded undecided to the negative statements. The result indicated that many of the PSTs do not have a definite answer or response to many of the environmental problems/scenario presented in the questionnaire.

Some of the PSTs were not sure of their response whether it was the appropriate action to be taken. Also, PSTs were asked to describe the status of Sawaga River and what actions can be taken to restore the ecosystem. PSTs responses were categorized using the affective domain of Krathwohl (2002).

In the design of the CC integration, the Learning Hierarchy Theory (Gagné et al. 1992) was applied. The theory stipulates sequencing of instruction or task since learning tasks for intellectual skills can be organized in a hierarchy according to complexity. With this anchor, a Task Analysis Matrix (TAM) was prepared.

A Task Analysis Matrix (TAM) was prepared to sequence the activities of climate change integration. It served as the blueprint in writing the training modules. The chart included the elements, such as concepts, instructional objectives, and a number of activities, time spent and references of the training modules. According to Bruner (1966), learners construct new ideas or concepts based upon existing knowledge and learning in an active process. Facets of the process include selection and transformation, decision making, generating hypothesis, and making meaning from information and experience. He also stated that instruction should allow the learner to discover principles for themselves through active dialogue.

The researcher developed 10 Lessons for Climate Change integration. Bruner

(1966) constructivism theory was built upon the way learners think naturally. The students wholly comprehend the concepts, when the curriculum would always go back to the fundamentals, slowly making connections between the basic concepts and the new ones (Dewey, 1938). Vygotsky's Social Development Theory emphasized social interaction between teacher and students or students among students. Theory of Vygotsky is nested within Dewey's theory of progressivism in instruction (Schunk, 2012). These theories were used for the development of the 10 training modules. Each was categorized into five CC concepts (population, pollution, biodiversity, environmental factors and phenomena, and environmental ethics). All training modules followed EE model of Hungerford and Volk (1990), Theory of Reasoned Action (TRA) of Ajzen and Fishbein (1980) and EE Model of Ramsey and Rickson (1977) on awareness/ attitude and action.

CC STDEA for PSTs Training Modules incorporated suggested hyperlinks in every lesson. It offered a variety of techniques and characteristics within various sequential stages (Farmer et al., 2007). The stages are (a) direct aesthetic experience with the natural environment (Gigliotti, 1990), (b) environmental restoration activities to increase participant ownership (Hartig et al., 2001), (c) sensitive or emotional content (Pooley and O'Conner, 2000), (d) a multi-sensory learning environment to promote student engagement (Smeesters et al. 2004), and (e) relevant and personal information that promotes empowerment and ownership (Hungerford, 1996).

Two training modules in each CC concept were designed and developed which can be taught in 60-90 minutes each. Varied teaching strategies promoting active learning and productive pedagogy were employed as environmental impact assessment (EIA), action research, benchmarking. Activities of trainees include environmental games, multimedia presentation, action planning and social action.

Teachers should become information facilitator instead of information transmitters. It applies the constructivist approach to learning where in teachers serve as facilitators of learning. Kolb's Experiential Learning Cycle (1984) suggested that people learn through exploring an event. Observing and reflecting on that, formulating abstract concepts and generalizations around it, and then testing their implications of their concepts on the new situation.

The designed training modules were tailored from the syllabus of ES 101, the second half of the term. The parts of the training modules included concept, learning outcomes, environmental attitude to be developed, materials, time

reference, procedure, evaluation, assessment of output (rubrics) and possible extension/enrichment (advocacy). There were 10 training modules with two modules for each of the CC concepts of population, pollution, biodiversity, environmental factors and phenomena and environmental ethics. Teacher's Guide (TG), Orientation, Technical References and STDEA Guide are included in the package.

The evaluation of the training modules was done adopting Alberto (1999) modified by the researcher according to its appropriateness, clarity and content accuracy. Instructional Materials Development experts who evaluated the training modules hold doctorate degrees whose experiences are more on IM production. Subject matter experts were holding doctorate degrees in Sciences. One expert was former Science Program Director of the University and the other doctorate degrees in Applied Life Science currently teaching at Central Mindanao University.

The development phase involves the creation, assembly of the media and revision based on feedback or suggestions. It was during this phase by which the material was reviewed. Suggested processes in this phase include creating a prototype, develop the materials, conduct a review, and run sessions. It is in this stage where the PSTS who were the participants reviewed and evaluated the training modules. The PSTs comments and suggestions were made as bases for the revision of the training modules. Prospective teacher users were DepEd teachers who evaluated the training modules using the same evaluation checklist used by the panel of experts. The prospective teacher users gave comments and suggestions for the improvement of the training modules.

The implementation or the main field trial was the use of the training modules by the intended users. This covers the launching and delivery of the product, and the evaluation includes the evaluation to measure how well it achieved its goals (Mary, 2009). Field trial according to Kemp (1977), examines the use of the instruction with a full-sized learner group under realistic conditions. Summative evaluation was then required to determine whether the instructional program is achieving its goals. It is in this evaluation stage where the effectiveness of learner's learning could be identified. One or more hypotheses were stated as anticipated outcomes. After instruction takes place, statistical methods are employed to gather data and report the evidence collected about learning outcomes. Conclusions were drawn that support or reject the initial hypothesis. In this study, implementation referred to the use of CC STDEA Training Modules in ES 101 – STS. The

implementation was done at Bukidnon State University, Summer 2016.

The data gathered in the study were treated and analyzed statistically. For problems 1, 2 and 3, mean and standard deviation were used to determine the validity of the CC STDEA modules regarding appropriateness, clarity, and content and content accuracy. Also, mean and standard deviation were scored to determine the effectiveness of the CC integration training using the CC STDEA among PSTs. Furthermore, mean and standard deviation were used to determine the environmental attitude and internalization among PSTs along the four factors namely environmental awareness, attitude towards recovery, attitude towards recycling and environmental consciousness and behavior.

For Problem 3, to determine if there was a significant difference of the PSTs environmental attitude and internalization before and after the climate change integration training using CC STDEA modules, the t-test was employed at 0.05 level of significance.

RESULTS AND DISCUSSION

This study investigated the development of environmental attitude and internalization of the PSTs through CC integration using CC STDEA Training Modules at Bukidnon State University, Malaybalay City during the School Year 2016-2017. Developmental Research/ Instructional Design (ID) was used in the conduct of the study. Fifty-two Music, Arts, Physical Education, and Health (MAPEH) majors were the participants of the training which was conducted from May 18-22, 2016.

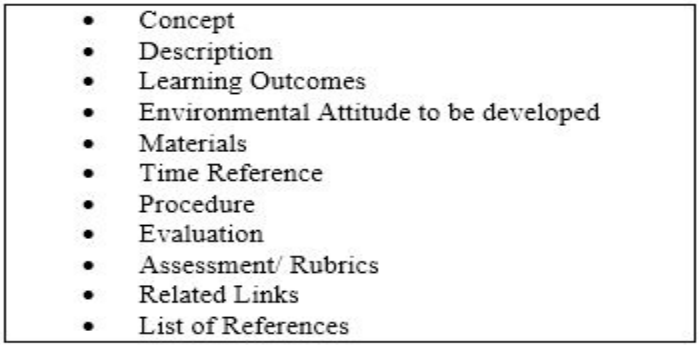

Figure 1 Training Module Format

The pre-test and post-test were conducted using the Environmental Attitude Scale (Ugulu and Erkol 2013) to the PSTs. Climate Change integration training using CC STDEA training modules was evaluated by Kirkpatrick's (1994) Four Level Model. The mean, standard deviation and t-test at 0.05 level of significance were used in data treatment.

Summary of the evaluation of the CC STDEA training modules by panel of experts along the three criteria is reflected in Table 1. Based on the results, all the three panel of experts strongly agreed that the provisions were satisfied very adequately. The computed standard deviation is less than 68% suggesting that the responses are similar indicating homogeneity in the responses among the panel of experts.

Table 1. Summary of the Evaluation of CC STDEA Training Modules by Panel of Experts

Criteria	Mean	SD	QD
Appropriateness	4.89	0.16	VME
Clarity	4.63	0.29	VME
Content and Content Accuracy	4.40	0.33	VME
Overall	4.64	0.26	VME

Legend: VME – Very Much Evident (Features are provided very adequately.)

All the three criteria of appropriateness, clarity and content and content accuracy were rated Strongly Agree (SA) which means the provisions are satisfied very adequately except for the two items of content and content accuracy which were rated Agree (A) which means provisions are satisfied adequately. Among the criteria, appropriateness got the highest mean while the criteria on content and content accuracy reached the third. Data show that the CC STDEA training modules are appropriate, clear with evident content and content accuracy.

The findings are similar to the findings of the studies conducted using ADDIE Model. Diez (2001) produced IMs that are highly adequate for the development of PSTs ability to teach basic reading skills among Grades 1 and 2 pupils; Cunanan (2002) found her materials to be useful and relevant to enhance the ability of college teachers to help develop critical thinking skills of the students; and Sumbalan (2004) and Abellanosa (2005) and Valdez (2004) considered the training materials excellent and applicable for teachers and students. Moreover, Ruiz (2010) asserts her IMs to be effective in enhancing teachers' knowledge, skills and attitude to design and write lessons adopting Thematic Approach; and finally, Alfabeto (2011) claims she produced, suitable, usable, applicable and

acceptable Theme-based Resource Book in enhancing the study and thinking skills of freshmen college students.

The PSTs, as the trainees, observed that during the CC integration training using the CC STDEA modules the IMs were appropriate and instructions were clear. As observed, the effectiveness of knowledge transmission and dissemination through instructions or teaching strategies pedagogy is important to attain maximum learning outcomes in the overall aspects of education (Firestone 1991). In this sense, teachers and the classroom practices are one of the important factors for ensuring the productive educational outcomes in relation to climate change integration. Frame 2 presents the feedback from the panel of experts on their evaluation of the CC STDEA training modules, supporting the very high rating.

Appropriateness
- *The activities apply HOTS.*
- *Activities could enhance students' interest and motivate students to work with the varied activities.*
- *IM is very good and for better application of a teaching strategy.*
- *Topics (least mastered topics) presented were specific and very applicable.*
- *IM can help teachers apply/ use better teaching learning.*

Clarity
- *Learning activities are well-sequenced and well organized with the video.*
- *Packaging is relevant to the topic (front photo coincides).*
- *Easy to comprehend and appropriate for students taking STS.*
- *Well organized and instructions are easy to follow.*

Content
- *Objectives are clearly stated.*
- *IM match content and suitable to the level of prospective student or learners.*

Figure 2. Panel of Experts Feedback on the CC STDEA Training Modules using the Three (3) Criteria

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maximum learning outcomes in the overall aspects of education (Firestone 1991). In this sense, teachers and the classroom practices are one of the important factors for ensuring the productive educational outcomes in relation to climate change integration.

In summary, the CC STDEA training modules meet the criteria of appropriateness, clarity, and content and content accuracy with a very high rating from the panel of experts. Unique features of the training modules are the following: realistic, time-able, resources or materials are readily available, simple with clear instructions and above all updated with recent trend of teaching and learning with the use of social media.

Frame 3, showing CC STDEA Training Modules evaluation and comments by panel of experts, supports the researcher's claim.

Table 2. Summary of the Evaluation on the CC Integration Training using STDEA Modules by the PSTs along the Five Concepts of Climate Change

Level	Population			Pollution			Biodiversity			Environmental Factors and Phenomena			Environmental Ethics		
	Mean	SD	QD	Mean	SD	QD	Mean	SD	QD	Mean	SD	QD	Mean	SD	QD
Reaction	4.80	0.28	VME	5.00	0.00	VME	4.70	0.50	VME	4.50	0.53	VME	4.85	0.25	VME
Learning	4.80	0.36	VME	5.00	0.00	VME	4.80	0.28	VME	4.40	0.44	VME	4.65	0.50	VME
Transfer	4.60	0.53	VME	5.00	0.00	VME	4.85	0.25	VME	4.45	0.50	VME	4.90	0.23	VME
Result	4.95	0.11	VME	5.00	0.00	VME	4.80	0.00	VME	4.20	0.70	VME	4.75	0.39	VME
Average	4.79	0.32	VME	5.00	0.00	VME	4.79	0.26	VME	4.39	0.54	VME	4.79	0.34	VME

Legend: VME – Very Much Evident

Table 2 presents the summary of the CC integration training using the STDEA modules along the five (5) concepts of climate change. As reflected in the table, the overall means generated a qualitative description of Very Much Evident (VME) which means that the features are provided very adequately. Moreover, all the items and average means of the five levels obtained a qualitative description of VME.

The overall standard deviation is less than 68% which suggest homogeneity of responses concentrated along the mean. This further indicates responses from PSTs are similar; their evaluation of the climate change integration training is unanimous.

Also, the average standard deviation is in between 0.00 to 0.54, which show

that the distribution of the PSTs' response is identical, which would mean they have the same perception on the CC concepts finding a little difficulty and less interest on environmental factors and phenomena. Disaster Risk Reduction and Preparedness (DRR and P) programs has promoted even in the communities for awareness and campaign to reduce impacts of calamities.

- *Excellent presentation/ applications of strategies and techniques for developing environmental attitudes.*
- *IMs can serve as a very useful and helpful guide for teachers teaching STS (Science, Technology and Society).*
- *This would materials would help you and other teachers in the field, and if the attitudes are specified, these could help teachers and students become aware on the relevance of the topics and of your modules.*
- *I congratulate you for coming up with the modules for teachers on how to use STDEA.*
- *The criteria for IMs were met.*
- *It is good that you provide a cover page for your modules.*
- *It is also very good that you indicated if it is a Teacher's Guide, Orientation Guide, Technical Reference and Training Module (1-10).*
- *It is good that you started introducing the concept/topic followed by a strategy.*
- *Excellent presentation/ applications of strategies and techniques for developing environmental attitudes.*

Figure 3. CC STDEA Training Modules Evaluation and Comments by Panel of Experts

- *The activity I like was the drawing part and the video presentation about the environment. It reminded me a lot on how important to be aware of our environment.*
- *The activity that I want was the drawing of the world that I want to live because we have the background of what step or how to take care of our mother Earth. The activity I like most was the drawing on the world I want to live.*
- *The activity I like most was the Guessing Game on animals and plants pasted at the back of my partner in which there was full participation for both pairs while we were enjoying at the same time.*
- *I like the "Guess Zoo" game because it helped us to be more knowledgeable about our surroundings. While having fun, it gave us more insights about the interconnectedness and interrelatedness.*

Figure 4. CC Integration Activities PSTs like the Most

The concept of pollution obtained the highest average mean followed by population, biodiversity and environmental ethics. Environmental Factors and phenomena obtained the lowest mean. The very high rating is supported by feedback from PSTs who were asked "Which of the activities of the CC STDEA training modules they like most?", is reflected in Figure 4.

Most PSTs like the drawing part and videos where the trainer requested them to draw their dream world. PSTs liked the activity because they had the freedom to express their thoughts of caring for Mother Earth and the importance of being aware of their role.

According to Ogunbiyi and Ajiboye (2009), several strategies promoting active learning have been similarly shown to influence favorably students' attitude and achievement. Drawing like videos capture rich complex interaction; visual –based instruction can provide a helpful focal point for other interactive techniques in class (Martin, 1999). One of the strategies in the training include poster making that highlights how and environment is directly or indirectly affected by both living and nonliving. Poster making as a strategy gives venue for

students to exercise critical thinking, determine cause-and-effect relationship and infer situations based on their direct experience. This strategy will also enhance students' mental ability through drawings and projecting symbols (Michaud, 2002).

Making environmental posters is a very enjoyable activity that encourages students' creativity at the same time makes them relate and work with peers. It is a very effective strategy to develop positive environment attitude and values. Drawing a landscape projecting ideal environment would encourage PSTs to develop critical thinking (Chickering and Gamson 1987).

On one hand, all levels of the concepts on pollution were rated by the PSTs with an overall mean of 5.0 and standard deviation of 0.0, indicating their assessment are very similar. Besides, the effects of pollution are very visible e.g. exhaust from vehicles which is one of the training modules, an example of CO2 emission which is the number one pollutant of the atmosphere. Figure 5 enumerates the experiences of trainees on the CC integration training using STDEA modules.

- *The activity I like was the drawing part and the video presentation about the environment. It reminded me a lot on how important to be aware of our environment.*
- *The activity that I want was the drawing of the world that I want to live because we have the background of what step or how to take care of our mother Earth.*
- *The activity I like most was the drawing on the world I want to live.*
- *The activity I like most was the Guessing Game on animals and plants pasted at the back of my partner in which there was full participation for both pairs while we were enjoying at the same time.*
- *I like the "Guess Zoo" game because it helped us to be more knowledgeable about our surroundings. While having fun, it gave us more insights about the interconnectedness and interrelatedness.*

Figure 5. CC Integration Training Activities PSTs like the Most

On the other hand, PSTs rated 5.0 as average means in all the levels from

reaction to result on the concept of pollution. Based on trainer's observation, PSTs were given the freedom to change their opinions/attitude toward certain issues e.g. sharing to other trainees their opinions may result to shifting behavior. Appropriate and interactive pedagogies were employed by the trainer in which most of the trainees consider it their favorite activities. Many of them shared the drawing activity of the world they want to live. This activity empowered trainees to plan for the future and identify their roles in preserving the environment. Most of them realized their responsibilities as future teachers of basic education.

Pedagogy is the fundamental aspect of teachers' professional knowledge, identities and practices which give the most significant impact to the students' learning outcomes. It is closely related to the transmission of knowledge and can be linked to the schooling process (Bernstein 1996). Furthermore, teacher quality had long been recognized having a good influence on student achievement (Darling-Hammond et al., 2007; George and Kaplan, 1998).

Pedagogical practices in schools need to take into account the complexities of the society and different educational environments. PSTs curriculum might be one of the catalysts to enhance learners understanding of climate change. Apart from the syllabus, the role of the teachers in teaching and learning process is also important. Effectiveness and quality teachers' pedagogical practices are important aspect to ensure environmental quality in the future. According to Morgan and Lambert (2005), it is important to consider relevant, worthwhile and enjoyable learning when designing lessons for climate change.

The action learning approach, as derived from a perspective of valuing, includes a process of implementation as well as development. It is essential to move beyond thinking and feelings to acting. Such approach is related to the efforts of some social studies educators, emphasizing community-based rather than classroom-based learning experiences. Somehow, it is the least developed of three strategies. However, a variety of recent programs have demonstrated the effectiveness of the techniques advocated by this approach (Cotton, 2006). PSTs' comments are reflected on Frame 6.

The overwhelming, amazing and inspiring feedback from the PSTs in the conduct of the training is very evident that preparation prior to the training has been done. The training was well-organized in terms of the activities, Instructional Materials (IMs), training modules and assessment tools for the trainees and above all the trainer.

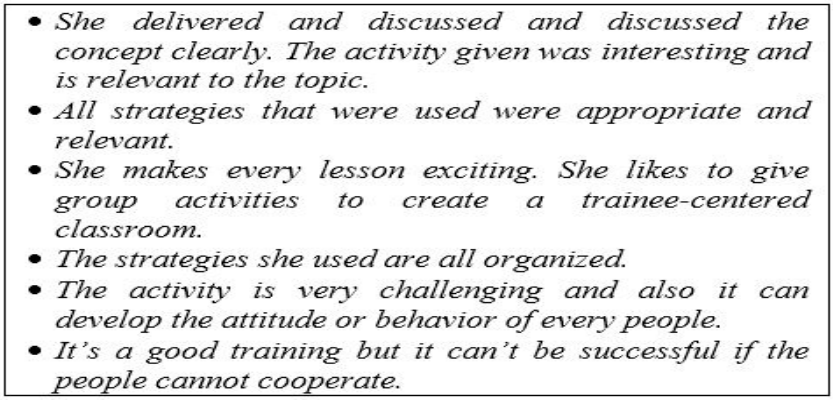
- *She delivered and discussed and discussed the concept clearly. The activity given was interesting and is relevant to the topic.*
- *All strategies that were used were appropriate and relevant.*
- *She makes every lesson exciting. She likes to give group activities to create a trainee-centered classroom.*
- *The strategies she used are all organized.*
- *The activity is very challenging and also it can develop the attitude or behavior of every people.*
- *It's a good training but it can't be successful if the people cannot cooperate.*

Figure 6. PSTs' Comments on the CC STDEA Training

On evaluating students' achievement and its related research studies have demonstrated many strategies promoting active learning. These are comparable to lectures in promoting the development of students' skills in thinking and writing. Other than lecturing, some cognitive research shows that a significant number of individuals have learning styles best reserved by pedagogical techniques. Therefore, a thoughtful and scholarly approach to skillful teaching requires that faculty become knowledgeable about the many ways strategies promoting active learning have been successfully used across the disciplines.

Based on the comments from the PSTs, the trainer modeled the best visual aid, the best actress in the classroom showing competence in terms of the good communication skills, mastery of content, and ideal classroom management where everyone participated in all the activities indoor and outdoor. Collins (2004) and Allen (2005) have shown that students prefer strategies promoting active learning to traditional lectures methods.

The Global Climate Change Index (2016) indicates the level of exposure and vulnerability of countries e.g. Philippines to extreme events as warning to be prepared for more frequent or more severe events in the future. A stipulated CHED RMO no. 020, s. 2015 encouraged HEIs to integrate the geo hazards mapping and assessment programs in science related subjects to address prevention of loss and damages.

Among the five CC concepts, environmental factors and phenomena was the least liked topic as one of the feedback from PST, with the level of result obtaining

the lowest average mean. Data suggest PSTs are not comfortable discussing on disasters. Teachers find difficulty in simulating disasters, the magnitude of its effect and answering "why and how it happens". These events or calamities are unpredictable so teachers make use of documentary files to enhance knowledge of students since making it realistic is impossible.

Documentary files, available in the internet for teachers to utilize which students can analyze them in the class. Learners can be empowered in the preparation of survival kits and evacuation plans. Simulation activities e.g. drill can also be done in schools to intensify awareness campaign against disasters. The use of these strategies and techniques in the classroom is vital because of their powerful influence on students' learning and attitude (Bloom, 2002).

Finally, Tomlinson's (1999) differentiated instruction paves way for teachers to look at individual learners' need before classroom instruction. Teachers may differentiate the content, process and products according to learners' interest, readiness, and learning preferences. Tomlinson (1999) further explicated the three curricular elements wherein classroom instruction can be differentiated. The content of instruction must be modified based on what the students should learn; the process entails activities that are intended for students to understand and master the concept or competency; and the product is the output which the students demonstrate what they learned from the concept and from the activities given to them.

Moreover, learners vary in their learning readiness, interest and learning preferences which should also be given priority in designing lessons for differentiated instruction. Tomlinson (1999) expounded that readiness is a student's position in relation to the task given by the teacher. This matches with the skills they already have which lead to growth. The interest of the learners is a powerful motivator which plays a vital role in selecting the activity and how this activity will be done in the classroom because this ignites their curiosity and passion. Finally, the learning preferences of the students should be given emphasis since students learn in the way they learn best.

In summary, among the five climate change concepts, pollution is considered the favorite topic of PSTs with the overall mean of 5.0 also of 0.00 as the overall standard deviation. They find pollution as an easy topic, observable and can be simulated by videos. PSTs are not comfortable with the CC concept on environmental factors and phenomena. They don't want to discuss calamities and disasters especially witnessing casualties. Among the CC topics, it is rated low but still obtaining the qualitative description of VME indicating features are provided

very adequately. Concepts on population, biodiversity and environmental ethics rank second to pollution.

Table 3. Summary of the PSTs Assessment of their Environmental Attitude and Internalization before and after the CC Integration Training using STDEA Modules

Factors	Pre-Test		QD	I	Post-test		QD	I
	Mean	SD			Mean	SD		
Environmental Awareness	2.67	1.34	MF	Val	2.63	0.92	MF	Val
Attitude towards Recovery	4.50	0.41	HF	Mod	4.58	0.40	HF	Mod
Attitude Towards Recycling	4.39	0.52	HF	Mod	4.42	0.45	HF	Mod
Environmental Consciousness and Behavior	4.25	0.78	HF	Mod	4.34	0.81	HF	Mod
Overall	3.95	0.76	F	Org	3.99	0.65	F	Org

Legend: HF – Highly Favorable F – Favorable Org – Organizing Mod – Modeling

As gleaned from the table, PSTs possess such favorable environmental attitude and internalization. The computed SD is not far from the homogeneity of responses among the PSTs.

According to Hassan et al. (2010) on realism of epistemology, knowledge is a process on the discovery of a thing and even new phenomenon that relates with the physical object that exist within the actual life, and be able applicable through human sense. Focusing on the development of students' potency, this epistemology also encourages them towards rational thought and activity within the realm of education. For instance, the Science's teacher can provide the knowledge and at the same time ask students to think on the greatness of God through the appreciation towards nature.

The PSTs could be trained and could be guided to look at the creation of God which able to amaze and create the feeling of fear towards God within themselves. Thus, to produce a firm and balanced student, the students should gain a high awareness towards their surroundings. For instance, the student that studies Science is concern on the elements of the nature in making their hypothesis by using the appropriate approach. Since most of the education concept shares the

same objective, it can be said that awareness towards the environment is capable to fulfill the aspiration of education.

The secondary level of values is the immediate basis in turn rooted on the primary or deeper level of which we are no longer even conscious. The secondary level is not permanent; it is consciously modified throughout life as we acquire fresh knowledge or experience. As to the primary level, however, no amount of fresh knowledge can shake it; no modification is possible of this solid basis which firmed up in childhood. While the deeper level is the bedrock of "what ought to be", it is at the secondary level that deliberate choices are made in later life (Quito, 1997).

The following are authentic, unedited notes from the PSTs learning journal.

> *"The behavior and attitudes I have learned during and after the activities are cooperation of group/ teamwork, the creativeness of an art, the effort of every activities and the knowledge we are going to share. Through this orientation, I surely bring those behaviors and apply these as I become a teacher in the future." "My experience in the lesson on climate change is that we gain knowledge about climate change. As a future teacher, we can share these to our student in the future and we and they will be aware what climate change is all about. This is a great help for me because adds on my learnings and memories/experience in this lesson. There's a saying which says that bringing memories is a lifetime process".*

Table 4 shows the comparison of the environmental attitude of PSTs before and after the training. Based on the table, there is no significant difference in the gain scores of the PSTs before and after the CC Integration Training using the STDEA modules along the factors of environmental awareness, attitude towards recovery, attitude towards recycling, and environmental consciousness and behavior.

Table 4. Comparison of the Pre-Service Teachers Environmental Attitude before and after Training

Environmental Attitude of PSTs	Before		After		t-value	p-value
	Mean	SD	Mean	SD		
Environmental Awareness	2.65	0.91	2.63	0.32	0.359	0.721
Attitude towards Recovery	4.54	0.41	4.58	0.40	1.117	0.269
Attitude Towards Recycling	4.40	0.52	4.42	0.45	0.421	0.676
Environmental Consciousness and Behavior	4.32	0.51	4.38	0.47	1.494	0.141
Overall	3.98	0.38	4.00	0.27	0.904	0.370

If $p<0.05$ then significant

The hypothesis which states that there is no significant difference in the environmental attitude and internalization of PSTs before and after the CC Integration Training using the STDEA modules is accepted. This means that Pre-Service Teachers had increased their post-test scores but then the increase was not statistically significant at 0.05 level of significance.

Accordingly, humans are not conscious of the environment. They are only thinking of the profit without the concern of the impact towards the environment and their future of life. The long term effect from the environmental pollution can be seen when the ecosystem is not able to endure the pollution (Ujang, 2008). According to Sardar (2007), the major cause of this ecological crisis could be the value and belief in influencing human's relation with the surrounding and lifestyle itself.

On the elementary school level, the student is still forming his primary values. It is on this level that a moral conscience is formed, i.e., what is right or wrong or what is good or evil. It is also on this level that good and bad habits or positive and negative values are entrenched.

On the high school level, the student reinforces this sense of values or modifies it according to his social environment. When a person transfers from the family fold into a wider society, the secondary scale of values undergoes rigorous re-evaluation. Censure, peer pressure, ridicule, and praise can modify these

secondary values. Education greatly affects them. When one acquires knowledge, this acquisition impinges itself on the secondary scale of values. New insights, theories, perspectives, new and alternate forms of behavior rectify or recast his scale of values. Mass media can easily manipulate these secondary values. If one is bombarded with ads about the pleasure of smoking, can one's scale of values remain unaffected? (Quito, 1997).

The result indicates that one shot training is not enough to change the attitude. Teachers are needed not just to impart ideas but to integrate climate change in their lessons. More subjects or courses can make use of CC integration in their lesson to intensify more the holistic influence in student attitude.

Education focused on the aspect of producing the holistic and balanced individual, which appear as the knowledgeable, responsible, as well as well-mannered individual that able to appreciate their surroundings. Thus, in relating to this aspect, environmental awareness, as the supportive element, should be taught among students. This would fulfill the aspiration of education. Individuals would be able to keep their relation with society, able to maintain healthiness of their surroundings. Since 1990s while looking at the scopes and impacts of environmental problems, such phenomenon has become very important issues on the international agenda (Madruga and Batalha da Silveira, 2003).

The nature's catastrophe had brought the serious implication towards the Earth, affecting human beings and all living species (Gore, 1993). This includes choking air pollution, water pollution in the vast majority of rivers, water shortages throughout much of the country, destruction of the remaining scatted habitats, near –total deforestation, rampant overfishing, depletion of agricultural land, and conspicuous consumption of even highly endangered species for food and traditional medicine e.g. as people continue to patronize food chains, creating a mountain of styrofoam is not far in the future (Harris, 2006). It can be noted from the data that the initial EAS rating of PSTs is already high, meaning, the PSTS have learned from their parents and siblings. In the collegiate level, the student fine tunes and finalizes his scale of secondary values. On this level, all moralizing about good and evil falls like water on a duck. Only a new technique will appeal to the college student.

People do not seem to realize that positive and negative values begin very early, i. e. on the primary level of deep level. Aside from the moral consciousness, all values which the individual carries throughout life are likewise formed on this primary level; civic values, linguistic values, environmental values, values of cleanliness, integrity , discipline, excellence, fairness, etc. If a child was taught by

his parents or teachers to say his morning and evening prayers, this habit is deeply embedded on his consciousness. When he grows older, he may not be regular in saying them (Quito, 1997). The following are authentic, unedited notes from the PSTs learning journal.

> *"I learned that we humans has a great role and responsibility to save our environment. We have climate change because of our activities which is improper when it comes to nature or in the environment. Being a responsible individual who have concern in their family, animals, plants and other organism can help us to save our nature and also help us to save ourselves for some typhoons or disaster happens. We should stop destroying our environment for us not to suffer in the future." "The behavior and attitudes I learned and practice during and after the activity is to become behave and participative. I always behave in the class during and after the activity and because I listen, I can be able to participate or answer the activities during and after."*

CONCLUSION

From the study, the Climate Change Strategies and Techniques in Developing Environmental Attitude (CC STDEA) integrating climate change, had developed the Pre-Service Teachers' environmental attitude and internalization. Features in clarity, appropriateness, and content and content accuracy of the developed training modules were provided very adequately on the level of reaction, learning, transfer and result in the Climate Change integration training. There was no significant difference in the gain scores in environmental awareness, attitude toward recovery, attitude toward recycling as well as in the environmental consciousness and behavior among the try-out participants.

The developed training modules, which integrate concepts in climate change and appropriate strategies and techniques, are appropriate, clear, with evident content and content accuracy for use in General Science Education (GSE) and STS among college students. The developed training modules could be used to enhance the development of favourable environmental attitude and internalization among college students. Environmental attitude and internalization are developed with appropriate pedagogy and integration of concepts in climate change.

RECOMMENDATIONS

1. The training modules to develop environmental attitude and internalization may be used to teach GSE as well as STS in colleges and universities.

2. Another study may be conducted to integrate climate change concepts in other courses in college to develop environmental attitude and internalization.

3. Teacher-support materials may be developed adopting other ID Model aside from ADDIE Model that integrate productive pedagogy and active learning to develop environmental attitude and internalization. Research studies may be designed to come up with authentic assessment tools to assess environmental attitude and internalization.

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