



Developing IEC Materials for Sustainability Education: Insights from Youth Environmental Awareness

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ABSTRACT

Environmental awareness is considered a vital component in global efforts to address environmental challenges. The modern education system at all levels, including the K–12 curriculum of the Department of Education, is not yet fully integrated with environmental awareness initiatives, as the Environmental Awareness program has not been systematically introduced. As part of an educational resolution for environmental program awareness, this study aims to assess the level of Environmental Awareness among Senior High School Students of San Quintin National High School and recommendations for enhancing environmental awareness through Information Education and Communication Material. Information, Education, and Communication (IEC) tools such as posters, leaflets, and digital media designed to raise awareness and promote behavior change. The study utilized a descriptive quantitative survey research design to gather data among Senior High School students of SQNHS, Philippines. Questionnaires were validated and distributed through Google Forms. Analysis of data was done using simple functions in Microsoft Excel. The data gathered reveals that the SHS students of SQNHS demonstrate a high level of environmental awareness towards environmental issues, practices, and participation in environmental programs. However, despite of obtaining high level of awareness, some issues, practices and programs still needs to be addressed, particularly, knowledge on Agenda 21 of United Nations, use of solar energy as part of energy conservation, the reduction of detergent use, participation on tree planting activities and conducting environmental programs or seminar. Hence, this study recommends strengthening an educational platform by using Information, Education and communication materials that are accessible not only to the SQNHS but also to the community of San Quintin.

RESUME

La conciencia ambiental es un componente vital de los esfuerzos globales para enfrentar los desafíos ambientales. En Filipinas, el currículo K–12 del Departamento de Educación ha incorporado aspectos de la educación ambiental; sin embargo, su implementación sigue siendo limitada. Este estudio evaluó el nivel de conciencia ambiental entre estudiantes de educación media superior de la Escuela Nacional de San Quintín (SQNHS) y propuso estrategias para fortalecerla mediante materiales de Información, Educación y Comunicación (IEC). Estos materiales incluyen carteles, folletos y medios digitales diseñados no solo para informar, sino también para promover cambios significativos de comportamiento (Servaes, 2008; UNESCO, 2017).

El estudio utilizó un diseño de encuesta cuantitativa descriptiva. Un cuestionario validado se distribuyó en línea a través de Google Forms y los datos se analizaron con estadísticas descriptivas en Microsoft Excel. Los resultados mostraron que, aunque los estudiantes demostraron un nivel alto de conciencia ambiental en general, se identificaron brechas importantes. En particular, el conocimiento sobre la Agenda 21 de las Naciones Unidas, la adopción de energía solar, la reducción del uso de detergentes y la participación en actividades de reforestación fueron limitados.

Estos hallazgos destacan la necesidad de materiales IEC que no solo transmitan información, sino que también ayuden a superar barreras motivacionales e institucionales. Se recomienda el desarrollo de plataformas interactivas y comunitarias accesibles tanto para la escuela como para la comunidad de San Quintín.

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Introduction

The natural environment has witnessed abuse by the public, considering the current situation wherein too many negative consequences on the environment, pressing challenges due to various natural causes and human activities that result in climate change, biodiversity loss and pollution (Bamberg & Moser, 2007; Yashwant Sompura *et al.*, 2021). The depletion of natural resources, burning fossil fuels, wildfires, deforestation, and the global challenge of climate change have affected our surroundings (Yashwant Sompura *et al.*, 2021). It has also been observed that due to the rapid increase of the world's population, which causes extensive land clearing for housing needs, is one factor that can cause environmental damage (Belinda, 2017). As a result, environmental degradation is experienced globally and partly results from poor environmental campaigns and ignorance (Peter, 2013).

Environmental awareness is considered as one of the vital components in global effort for addressing environmental challenges (Bamberg & Moser, 2007). In order to provide additional context to the present study, IEC materials must be placed within frameworks that are accepted by the given field. In C4D approaches, participatory communication is emphasized as a way through which communities become empowered to make sustainable decisions (Servaes, 2008). Likewise, UNESCO Education for Sustainable Development (ESD) guidelines reiterate the importance of the harmonization of knowledge, skills, values, and actions with the objective of making individuals contribute toward the sustainable future (Education for Sustainable Development Goals: Learning Objectives, 2017).

These frames remind us that IEC materials serve as vehicles not only in the transmission of knowledge, but also in the design of individual and communal change in behaviors and the norms of civic responsibility and long-run sustainability practices. Harju-Autti & Kokkinen (2014) reported that Environmental awareness is a state of being aware of, having knowledge about, and being conscious of the environment in which people live, which tends to influence people's development and pro-environmental behaviors (PEB). Significant studies proved that to increase environmental awareness, education is needed as it involves both cognitive and affective domains of learning (Dela Peña *et al.*, *undated*). That is why it is essential to consider that students should possess a strong foundation in environmental awareness through education to better understand and address environmental challenges (Tilbury, 1995; UNESCO, 2017)

One may positively ascertain the capabilities of the teachers and students to apply and be equipped with environmental education as part of the education curriculum. The modern education system at all levels, including the K-12 curriculum of the Department of Education, is inconsequentially improved as the Environmental Awareness program is not yet fully introduced. However, schools are integrating and implementing Environmental Awareness programs as part of their educational program. The Philippine Science High School's

curriculum has been recognized for having an Environmental Education program as part of the elective learning pedagogy. Moreover, with the conjunction of environmental experts and the academy, implementing environmental awareness needs substantial effort to integrate as a collaborative endeavor and for professional purposes. That is why the use of Information Education and Communication (IEC) materials, an integral part of learning, should be implemented with a sufficient level of IEC formation and development which is directly executed by professional teachers (Yuriiiovych,2022).

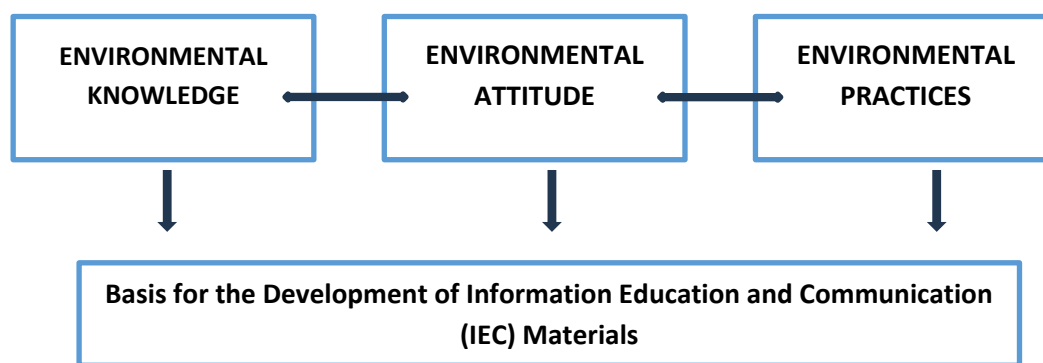
To situate this study within broader educational frameworks, Information, Education, and Communication (IEC) materials can be understood through the lens of Communication for Development (C4D). C4D emphasizes participatory approaches designed not only to transmit information but also to foster engagement and behavioral change (Kwami, 2014). Similarly, the United Nations Educational, Scientific and Cultural Organization (UNESCO) positions Education for Sustainable Development (ESD) as a transformative tool to empower learners with the knowledge, values, and skills needed to address global challenges (UNESCO, 2017). By aligning IEC strategies with ESD goals, this study highlights the potential of IEC materials to move beyond raising awareness toward catalyzing sustainable practices among learners.

This research uses the knowledge, attitude and practices (KAP) Model as its foundation. It serves as the primary basis for how aware the senior high school students at San Quintin National High School. The framework also helps to create Information Education and Communication (IEC) materials.

These materials aim to fill in awareness gaps and encourage positive actions for the environment. By figuring out the students' level of KAP, the school can customize IEC materials. As a result, San Quintin National High School (SQNHS, Philippines) will better support the Environmental Education Program. Moreover, this study is also anchored on the National Environmental Awareness and Education Act of 2008, otherwise known as Republic Act 9512, wherein the State aims to protect and advance people's rights to a balanced and healthy environment that's in tune with nature.

It also recognizes how crucial young people are in building the nation and how education can boost patriotism, speed up social progress, and help people reach their full potential. Therefore, the State will raise awareness about how natural resources contribute to economic growth and why it's important to conserve the environment and keep the ecosystem balanced for long-term national growth. As a result, groups like the Department of Education (DepEd), the Commission on Higher Education (CHED), the Technical Education and Skills Development Authority (TESDA), and the Department of Social Welfare and Development (DSWD) will work with the Department of Environment and Natural Resources (DENR), the Department of Science and Technology (DOST), and other key agencies. Together, they will add environmental education to school programs at every level (RA 9512, 2008).

Figure 1. *Framework of the Study*



Objectives of the Study

The objective of this study is to assess the level of Environmental Awareness among Senior High School Students of San Quintin National High School. More specifically, the study seeks (1) to determine the level of knowledge about environmental issues, (2) to evaluate the practices toward environmental conservation, (3) to determine the level of participation in environmental awareness programs (4) to develop recommendations for enhancing environmental awareness through Information Education and Communication Materials.

Methodology

Research Design

The study utilized descriptive-quantitative research design which sought to find out the level of knowledge about environmental issues and evaluate the practices towards environmental conservations of the respondents using survey-questionnaire.

Respondents

The study used random sampling among Senior High School students (Grades 11 and 12) of San Quintin National High School, which has a total population of 774 students. Based on eligibility and availability to respond, a total of 434 students participated in the survey. Of these, 198 (46%) were Grade 11 and 236 (54%) were Grade 12. The respondents were distributed across academic strands as follows: Science, Technology, Engineering, and Mathematics (STEM) with 88 students (20%); General Academic Strand (GAS) with 68 (15%); Humanities and Social Sciences (HUMSS) with 73 (16%); Sports with 76 (17%); and Technical-Vocational Livelihood (TVL) with 61 (14%). Since the study focused on a single school, the findings have limited generalizability. Nevertheless, the large sample size of 434 students provides meaningful insights into the environmental awareness of the youth in the San Quintin community.

Instrument

To be able to obtain the data needed for this study, the researcher used an adapted survey questionnaire from Environmental Awareness Questionnaire (EAQ) (Rogayan & Nebrida, 2019). Validation involved expert review by three environmental science educators and pilot testing with 30 students not included in the main sample. Feedback was incorporated to improve clarity, and internal consistency was checked using Cronbach's alpha ($\alpha = 0.82$), indicating acceptable reliability (Taber, 2018).

The questionnaire included specific items under environmental practices, such as turning off lights when not in use, using reusable water bottles or tumblers, recycling and reusing non-biodegradable materials, reducing detergent use, adopting solar energy, and participating in tree planting. These items were adapted from existing environmental awareness and practice survey tools and refined to fit the K-12 context.

The questionnaire underwent content validation through expert review by three specialists in science education and environmental studies to ensure alignment with curricular objectives and relevance to students' contexts. A pilot test was conducted with 30 students outside the study sample to refine ambiguous items. Reliability was assessed using Cronbach's alpha, which yielded a coefficient of 0.84, indicating acceptable internal consistency (Tavakol & Dennick, 2011). These steps ensured the validity and reliability of the instrument used in the present study.

This study utilized an AI tool (Chatgpt) for proper organizing the references and establishing the framework of this study. Upon using this AI tool, the researcher thoroughly reviewed and edited the content as necessary and had full responsibility for the final content of the publication.

Data Gathering Procedure

The data gathering procedure involved the distribution of the validated questionnaire to Senior High School students at San Quintin National High School. To certainly collect data from the respondents, the researcher converted the survey questionnaire into google form survey. Moreover, the researcher coordinated with the school authorities for the smooth conduct of the survey. After obtaining consent from the respondents, the questionnaires were administered during class hours.

Data Analysis

The responses were collected, tallied, and encoded into a spreadsheet for analysis. Descriptive statistics such as the mean and standard deviation were computed to summarize awareness and practices of both Grade 11 and Grade 12 students. For each environmental awareness item, the weighted mean was calculated from the students' responses on the five-point Likert scale. The ranking presented in Table 1 was determined by ordering the items from

highest to lowest mean score, thereby reflecting the relative awareness levels of students across different environmental concepts. All computations were performed using Microsoft Excel.

Given that the survey data were ordinal in nature, the use of inferential tests such as the chi-square test of independence (for categorical distributions) or the Mann–Whitney U test (for comparing medians between groups) would provide deeper insights into whether observed differences between groups are statistically significant (Laerd Statistics, 2015). While this study primarily focused on descriptive results, future research should incorporate these statistical techniques to enhance the rigor of the findings.

Results and Discussions

Based on the responses of students at San Quintin National High School (Senior High School), the data revealed a significant number of students showing high levels of awareness (Average Mean = 3.83). According to the interpretation legend (3.50–4.49 = Very Aware), this overall mean is categorized as “Very Aware.” As illustrated in Table 1, knowledge on global warming ($M = 4.21$) and rainforest ($M = 4.19$) indicate relatively higher values of environmental knowledge within the “Very Aware” range compared to the overall mean.

On the other hand, Agenda 21 of the United Nations obtained the lowest mean ($M = 3.12$), which falls under “Moderately Aware” (2.50–3.49). This implies that while students are generally very aware of broad environmental issues, some specific international frameworks such as Agenda 21 are less familiar. This indicates the need to further provide a consistent and strengthened educational campaign and suggests one of the lesser-known concepts that can be developed using IEC materials.

The study of Rogayan and Nebrida (2019) about Environmental Awareness and Practices of Science Students showed consistent results comparable with this study, reporting high mean values in knowledge of global warming, ozone layer, and rainforest. This environmental knowledge significantly indicates high awareness among senior high school students. Moreover, the findings are similar to the study of Galorio and Naling (2024), wherein senior high school students were very aware with regard to environmental issues, although it was also concluded that some students were only moderately aware of specific concepts and the state of the environment.

In the present study, the terms “Very Aware” and “Moderately Aware” are interpreted relative to the established Likert-scale legend and not in comparison to external or global benchmarks.

Table 1:

Table 1. Weighted mean and ranking of students' environmental awareness across selected concepts (ranking based on descending mean values)

Statement	Mean	SD	VD	Rank
1. Agenda 21 is a plan of the United Nations in which large developing countries promised to develop their industries with an eye toward protecting the environment.	3.51	1.07	VA	9
2. Rainforest is the world's biologically diverse ecosystem.	4.19	0.83	VA	2
3. Global warming is brought about by rising levels of heat trapping gases, known as greenhouse gases, in the atmosphere.	4.21	1.01	VA	1
4. The ozone layer of the atmosphere protects life on Earth by absorbing harmful ultraviolet radiation from the Sun.	4.21	0.87	VA	1
5. Sustainable development means increasing the standard of living without destroying the environment.	4.00	0.92	VA	3
6. Desertification is the decline in the biological or economic productivity of the soil in dry and semi-dry areas resulting from various factors including human activities.	3.89	1.00	VA	6
7. Acid rain is a form of air pollution in which airborne acids produced by electric utility plants and other sources fall to Earth in distant regions.	3.79	0.88	VA	7
8. Indigenous people are those who have inhabited and made their living directly off the same environment for hundreds or thousands of years.	3.96	1.05	VA	4
9. There is only one percent of all the water in the world that is available for drinking.	3.57	1.05	VA	8
10. According to the Philippine Constitution, it is the state's primary duty to protect and advance the right of the people to a balanced and healthful ecology in accord with rhythm and harmony of nature.	3.93	1.03	VA	5
AVERAGE	3.83	0.97	VA	

Legend: Highly Aware (HA) 4.50-5.00; Very Aware (VA) 3.50-4.49; Moderately Aware (MA) 2.50-3.49; Slightly Aware (SA) 1.50- 2.49; Totally Unaware (TU) 1.00-1.49.

Responses gathered in practices in relation to environmental sustainability showed that most students of SQNHS-SHS engage and exhibit positive environmental behaviors (Average Mean: 4.08). Significant data in table 2 proved that students are consistently aware of practices to sustain environmental resources such as turning off lights when not in use, using reusable water bottles or tumblers and recycling and reuse non-biodegradable materials.

According to Della Valle (2019), places of abode and self-efficacy are influential factors of environmental practices. Based on the gathered information about the respondents, most of the SHS students live with their family providing social control in obtaining environmental sustainability. However, a relatively lower value of participation revealed in practices to use solar energy and lessen use of detergents, suggesting a potential area for deeper IEC material focus to promote lesser-known sustainable behaviors.

The study is consistent with the study of Kishore and Kisiel (2013), suggesting that it needs an implication for instruction and future research on how high school students understand the concept of solar energy, indicating an underlying misconception that revealed

students' unfamiliarity on how Solar Energy works. While the findings suggest that students are very aware of broad issues such as global warming and the ozone layer, awareness of Agenda 21 remains low. This gap may be due to limited curricular coverage and lack of community-based discussions on global frameworks (UNESCO, 2017).

Table 2:
Practices in Relation to Environmental Sustainability

Statement	Mean	SD	VD	Rank
1.Turn off the lights and unplug appliances when not in use to save electricity.	4.5	0.88	A	1
2.Harness solar energy, radiation produced by nuclear fusion reactions deep in the Sun's core.	3.34	0.9	S	9
3.Plant endemic trees in the vacant areas in the community to prevent soil erosion and get more oxygen to breathe.	4.15	0.9	O	6
4.Avoid the use of plastic and Styrofoam which cause harm not only to the environment but also to human health.	4.11	1.000	O	8
5.Avoid throwing garbage anywhere and learn the science of segregation of solid wastes.	4.27	0.96	O	4
6.Keep good ethics and avoid eating with leftovers and wasting drinking water.	4.25	0.94	O	5
7.Lessen the use of detergents for they tend to create foam in gutters and in sewage-disposal plants and even appear in natural occurring ground and surface waters	3.29	1.03	S	10
8.Practice the science of composting which produces partially decomposed organic material used in gardening to improve soil and enhance plant growth.	4.13	1.03	O	7
9. Recycle and reuse non-biodegradable materials to lessen solid waste.	4.33	0.97	O	3
10.Use reusable water bottles or tumblers instead of buying bottled water in the canteen or stores.	4.45	0.81	O	2
AVERAGE	4.08	0.94	O	

Legend: Always (A) 4.50-5.00; Often (O) 3.50-4.49; Sometimes (S) 2.50-3.49; Seldom (SE) 1.50- 2.49; Never (N) 1.00-1.49.

Findings from participation in environmental awareness programs revealed that most of the students of SQNHS-SHS are aware of participating in different environmental programs such as integrating recycling initiatives and clean-up drives programs organized by school and their communities. However, one of the crucial insights gathered with low engagement in the study was obtained in participation in tree planting or reforestation as well as in attending workshops or seminars for environmental sustainability.

These results imply the need to enhance school-based initiatives and peer campaigns to increase active participation of the students. Similarly to the results from the study of Nayle *et al.*, 2024 wherein an evaluation of student leaders obtained significantly low participation in various environmental awareness activities despite high levels of awareness. Moreover, study conducted by Punzalan (2020) revealed a consistent results among SHS student in enrolled in the Philippine private educational institution, with generally aware of

environmental issues, their participation on tree planting and environmental seminars were low. Although sustainable practices such as energy conservation and waste reduction are widely adopted, behaviors such as adopting solar energy and reducing detergent use remain under-practiced. Barriers may include limited access to renewable technology, household constraints, and lack of institutional campaigns addressing these practices (Bofferding & Kloser, 2015).

Table 3:
Participation in Environmental Awareness Program

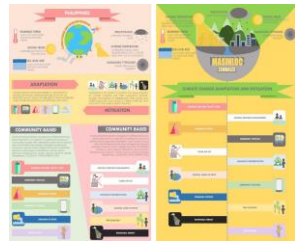
Statement	Mean	SD	VD	Rank
1.Participate in environmental awareness programs organized by your school or community.	4.05	1.12	O	4
2. Participating in clean-up drive campaigns.	4.05	0.99	O	4
3. Participating in tree planting or reforestation programs.	3.80	1.09	O	8
4.Engaging in Reuse, Reduce & Recycle initiatives within your school or community.	4.33	0.49	O	1
5. Attending workshops or seminars on environmental sustainability.	3.41	1.12	S	9
6. Encouraging friends and relatives to join environmental programs or activities	3.99	1.05	O	6
7. Using social media as a platform for environmental campaigns.	3.92	1.01	O	7
8. Take part in school-organized environmental clubs or eco-groups.	4.07	1.16	O	3
9.Integrating sustainable practices (reducing plastic use, conserving water and electricity) in your daily life as a result of participating in environmental awareness.	4.27	0.87	O	2
10. Conducting information drive regarding environmental issues.	4.01	0.97	O	5
AVERAGE	3.99	0.98	O	

Legend: Always (A) 4.50-5.00; Often (O) 3.50-4.49; Sometimes (S) 2.50-3.49; Seldom (SE) 1.50- 2.49; Never (N) 1.00-1.49.

Based on the identified gaps between high awareness and lower participation (e.g., Agenda 21 knowledge, solar energy adoption, and tree planting), the study proposes specific Information, Education, and Communication (IEC) materials that could address these areas. Table 4 outlines the types of IEC materials that may be developed, aligned with the students' needs and the findings of this research.

Table 4:
Instruction, Education, Communication (IEC) Materials that can be Developed based on the results of the Study

AREA	TOPIC	TYPE OF IEC MATERIALS	SAMPLE IEC MATERIAL
Knowledge of Environmental Issues	- Agenda 21 of United Nation - Acidic Precipitation Consequences	- Audio Visual Presentation - Poster - Brochure/Leaflet	

Practices in Relation to Environmental Sustainability	• Integration of Solar Energy • Reduce Detergent consumption	• Poster • Brochure/Leaflet • Social Media Post	
Participation in Environmental Awareness Program	• Canopy Development • Tree planting • Ecosystem Recovery • Sustainability Learning Programs • Environmental literacy Sessions	• Poster • Brochure/Leaflet • Social Media Post	

Images were taken on the study of Alberto et.,2024 as references - IEC Materials as tools to induce climate actions as perceived by coastal communities in Zambales Philippines.

Conclusion and Recommendation

To maximize impact, IEC materials should include concrete formats such as: (1) interactive videos for classroom integration, (2) visually engaging community posters in local spaces, and (3) multimedia workshops during school assemblies. Delivery channels can leverage both traditional venues (classrooms, community centers) and digital platforms (Facebook groups, TikTok campaigns). A pilot evaluation plan should include pre- and post-surveys of student awareness, focus group discussions, and feedback from teachers to assess effectiveness (Wals, 2012).

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