

Assessing climate change literacy among junior high school students: Foundations for curriculum development and instructional design

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Abstract

Climate change literacy is critical in equipping students with the knowledge, perceptions, and skills necessary to understand and respond effectively to the multifaceted challenges posed by climate change. This study assessed the climate change literacy of junior high school students at Amazing Grace Christian School of Cabanatuan City in the Philippines and aimed to develop an instructional plan aligned with the curriculum to enhance their climate change literacy. A quantitative descriptive research approach was employed, utilizing a descriptive-developmental research design. A total of 115 students serve as respondents. Data were collected using an adapted survey questionnaire comprising four sections, each targeting key dimensions of climate change literacy. The findings indicated that the majority of respondents were male, having a total number of 63, aged 13 to 17, and enrolled in Grades 7 to 10. Students exhibited high levels of perception, proactive behavior, positive attitudes, and personal concern related to climate change. The data on the level of literacy concerning the awareness of climate change among AGCS Junior High School students reveal consistently high levels of recognition and concern across all grade levels. A commendable level of climate literacy suggests that students are not only aware of climate change as a global issue but are also likely familiar with its basic concepts, implications, and relevance to their lives. The level of literacy concerning sources of climate change-related information reveals notable variation. Grade 8 students exhibit the highest literacy, indicating a strong awareness and ability to identify credible sources of climate change information. In contrast, Grades 7, 9, and 10 fall into moderate to limited literacy or uncertainty in discerning reliable climate change information sources. This discrepancy may reflect differences in curriculum exposure, instructional emphasis, or access to climate literacy resources. The level of literacy on the

perceptions of the causes of climate change reveals a developmental pattern marked by high initial certainty, followed by a decline in clarity and confidence as students progress through grade levels. In the course of the study, it was observed that there is the presence of uncertainty or possible misconceptions regarding the origins of climate change. This may stem from a curricular gap, limited reinforcement of prior knowledge, or an insufficient scaffolded of transition into more complex scientific concepts. The level of literacy in their willingness to disseminate climate change information reflects a generally positive orientation, though with varying degrees across grade levels. An indication of strong motivation and literacy in sharing climate-related knowledge. This suggests a proactive attitude likely supported by recent instructional exposure or heightened enthusiasm at earlier stages of schooling. However, their conceptual understanding of climate change concepts was found to be slightly below average. Statistical analysis revealed significant differences in climate change literacy based on age and grade level, while no significant differences were observed across gender. Furthermore, students' awareness of climate change was notably shaped by direct environmental experiences, formal climate change education, and peer influence. In response to the findings, a curriculum-aligned climate change learning plan was developed to strengthen students' knowledge, perceptions, behaviors, attitudes, and concerns related to climate change.

Keywords: climate change literacy, climate education, climate change assessment, junior high school, instructional design

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1. Introduction

Climate change is a global phenomenon with profound and far-reaching impacts, affecting ecosystems, communities, and nations from pole to pole. Every living organism experiences the effects of climate change in varying forms and intensities with no exemption. But what really alarms us, is that according to study that those who have contributed the least to the causes of climate change—primarily the economically marginalized populations—are disproportionately affected by its adverse consequences. These include an increasing frequency and intensity of climate-related disasters such as heatwaves, prolonged droughts, severe storms, and extreme rainfall events. These phenomena not only threaten public safety and biodiversity but also increases existing social and economic vulnerabilities by compromising access to clean water, triggering wildfires, damaging infrastructure, polluting air, water, and land resources, and causing loss of life.

Philippines, as a tropical archipelago, is not exempted to the impacts of climate change. Characterized by high temperatures as reported by the Philippine Star Philippines ranked third most heated impacted country in Asia. Though the country does have two primary seasons: dry and wet, however now a day, the eastern and northern regions undergo a secondary rainy season from December to February. Recent patterns, show increasing rainfall even during the dry season, signaling shifts in climate norms. Even during summer season, region III frequently experience severe heat index that leads to substantial changes in eco-system which leads to multiple loss of agricultural products. Furthermore, the consequences of climate change in the Philippines extend across economic, environmental, and public health dimensions. These include annual GDP losses, disrupted rainfall patterns, droughts, threats to biodiversity, food insecurity, health risks, and heightened exposure of vulnerable populations to environmental hazards.

According to Sering, secretary of the Philippine Climate Change Commission, “addressing these challenges requires coordinated efforts among Philippine government institutions, global agencies, and local communities. Though, the country has enacted several comprehensive policies and programs to address climate change. However, the effectiveness of these measures relies heavily on public awareness and engagement. Filipinos must be equipped not only with the ability to recognize the manifestations of climate change but also with the knowledge and attitudes necessary to take informed action”. With this education plays a pivotal role in enabling individuals and communities to respond proactively to the climate crisis. As underscored by the United Nations Educational, Scientific and Cultural Organization (UNESCO), education is fundamental to climate change mitigation and adaptation. It fosters the development of essential knowledge, values, attitudes, and behaviors that empower individuals to act as change agents. Global frameworks, including the United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement, and the Action for Climate Empowerment (ACE) agenda, call upon governments to prioritize climate literacy and promote active civic engagement in climate action.

Promoting climate change literacy is therefore not merely an educational objective, but a strategic necessity in the global effort to combat climate change. Without a strong foundation in climate education, initiatives aimed at mitigation and adaptation may falter due to inadequate understanding. Hence, integrating climate education into formal curricula is vital to fostering a culture of sustainability, accountability, and environmental stewardship. In response to these imperatives, this study was conceptualized to assess the level of climate change literacy among junior high school students at Amazing Grace Christian School of Cabanatuan City "Assessing Climate Change Literacy Among Junior High School Students: Foundations for Curriculum Development and Instructional Design" this research aims to evaluate students' knowledge, perceptions, attitudes, and actions related to climate change. The findings of this study will serve as the basis for the development of a

curriculum-aligned learning plan designed to enhance climate change literacy among junior high school learners, thereby contributing to broader national and global climate education goals.

Objectives - This study aimed to determine the level of climate change literacy of Junior High School students at Amazing Grace Christian School of Cabanatuan City. Specifically, this study sought to answer the following questions:

1. What is the level of climate change literacy among Junior High School students in terms of Awareness of Climate Change; Sources of Climate Change Related Information; Perceptions of the Causes of Climate Change; and Willingness to Participate in Climate Advocacy.
2. Is there a significant difference in the level of climate change literacy among Junior High School students when they are grouped based on their age and grade level?
3. What factors influence the Junior High School students' level of awareness regarding climate change in terms of environmental experiences; climate change education; and peers?

2. Methodology

Research Design - This study employs a quantitative descriptive-developmental research design to assess participants' climate change literacy, specifically focusing on their knowledge, perceptions, and attitudes. The findings serve as the basis for developing an instructional learning plan. According to Siedlecki (2020), descriptive research is a quantitative method aimed at collecting numerical data and analyzing it statistically. In the context of this study, the researchers consider descriptive research appropriate, as it enables the systematic examination of phenomena through statistical analysis of empirical data. The participants comprised 115 students from Grades 7 to 10 of Amazing Grace Christian School in Cabanatuan City. The primary data collection instrument was a structured questionnaire utilizing a five-point Likert scale ranging from 1 Strongly Disagree to 5 Strongly Agree. The questionnaire was divided into four sections evaluating both the cognitive knowledge-based and affective attitudinal dimensions of climate change literacy among Junior High School students of Amazing Grace Christian School. The instrument was adapted from previously validated sources and further refined by the researchers to ensure contextual relevance. It underwent expert validation and reliability testing using Cronbach's alpha to ensure internal consistency.

Data Analysis - The responses were analyzed using descriptive statistical methods. Frequencies and percentages were used to present the distribution of responses for each item, while means were calculated to determine the overall level of agreement or perception. The interpretation of mean scores was based on the following predefined scale: 1.00–1.79 = Very Low (Strongly Disagree); 1.80–2.59 = Low (Disagree); 2.60–3.39 = Moderate (Neutral); 3.40–4.19 = High (Agree); 4.20–5.00 = Very High (Strongly Agree).

3. Literature Review

In light of the increasingly complex environmental challenges posed by climate change, developing climate change literacy among students has become a critical priority in preparing them to understand, empowered them to respond meaningfully, and actively engage with sustainability regarding climate-related issues. Climate change literacy—commonly defined as the integration of knowledge, attitudes, and behavioral intentions concerning climate science, mitigation, and adaptation—is essential for fostering informed and responsible citizenship. Moreover, understanding the level of climate change literacy among junior high school students is crucial for the development of practical curriculum and enhancing instructional strategies aimed at promoting environmental awareness and action.

Conceptualizing Climate Change Literacy - The researchers posit that climate change literacy transcends the mere acquisition of factual knowledge, encompassing critical thinking, systems thinking, and competencies geared toward informed action. As noted by Mead et al. (2012), climate literacy involves not only an

understanding of climate science but also the capacity to communicate effectively about climate-related issues and to make informed, responsible decisions. Similarly, Shea, Mouza, and Drewes (2016) highlight climate literacy as a key component of scientific literacy, equipping students to engage with complex socio-scientific issues. Furthermore, the National Research Council of Canada (2012) underscores that effective climate literacy must address cognitive, affective, and behavioral dimensions in a cohesive and integrated manner within educational contexts.

Climate Change Literacy Among Adolescents - When it comes to climate change literacy among adolescent's research indicates that adolescents exhibit varying degrees of climate change literacy, influenced by multiple factors including socio-economic status, access to high-quality science education, and exposure to media. According to Stevenson et al. (2014) that while many students understand basic climate science concepts, though persistent misconceptions remain regarding the causes and consequences of climate change. Similarly, Lee et al. (2020) identified substantial gaps in students' comprehension of human contributions to climate change, as well as their ability to recognize effective mitigation strategies. Moreover, McNeal et al. (2014) emphasized the significance of prior knowledge and personal belief systems in shaping students' perceptions of climate science. Their findings suggest obviously that students with stronger scientific backgrounds and a greater interest in environmental issues tend to demonstrate higher levels of climate change literacy.

Assessment Tools and Methodologies - In assessing climate change literacy, researchers uphold that it requires valid and reliable tools that capture both knowledge and attitudes. Finding support in the studies of Bozdogan and Yanar (2020) that in their studies they developed a climate change literacy scale for secondary school students that integrates cognitive and affective components. Their tool provided insights into students' conceptual understanding and their concern for climate change. In consonance with the study another approach as demonstrated by Trott and Weinberg (2021) is the use of performance-based assessments and reflective journals, who assessed middle school students' climate change literacy through project-based learning evaluations. However, Kahan et al. (2012) caution against traditional testing methods, arguing that they may not fully reflect a student's ability to apply knowledge in real-world contexts. They propose that assessments be embedded within authentic learning experiences to more accurately capture literacy levels.

Instructional Design and Curriculum Development - To come up with a better instructional design and curriculum development, experts in the academe unanimously taught that curriculum and instruction must be designed to foster interdisciplinary learning and critical thinking. In the study of Anderson (2012) an integrated science curriculum should contextualize climate change within biological, chemical, and physical processes. While the study of Monroe et al. (2019) stress the fact that an inquiry-based learning strategies and experiential learning activities are effective in engaging students. While, Chang and Pascua (2017) emphasize the use of localized and culturally relevant examples in instructional materials, arguing that students are more likely to engage with content that resonates with their lived experiences. In addition, technology-enhanced instruction, such as simulations and virtual reality, has also shown a high leverage of students' interest. According to Shea et al. (2016) the use of digital tools increases students' engagement and comprehension, revealing that interactive media can enhance climate change understanding.

Implications for Educational Policy and Teacher Training - The success of the implications of educational policy and teacher training of climate change literacy into the junior high curriculum requires support from the government, school policy makers, and teacher professional development. Anderson (2012) argues that national education standards must explicitly and include climate literacy goals. Furthermore, Monroe et al. (2019) stress the need for teacher training programs to equip educators with the content knowledge and pedagogical skills to teach climate change effectively. It was supported by Plutzer et al. (2016) that describes that teachers' attitudes and beliefs about climate change also influence instructional practices. They concluded that teachers who accept the scientific consensus on climate change are more likely to teach it thoroughly and confidently.

4. Results and Discussion

In the assessment of perceptual and attitudinal data, researchers commonly employed the Likert-type scales system to quantify the degree of agreement or disagreement with specific statements. To facilitate the meaningful interpretation of such responses, a verbal interpretation (VI) scale is applied, allowing for the conversion of numerical mean scores into qualitative descriptors that reflect respondent point of view and sentiments. In this study the researchers unanimously approved the utilization of this approach. This study adopts a five-point interpretive framework to evaluate students' awareness, perceptions, and behavioral intentions regarding climate change. The scale is defined as follows: mean scores from 4.2 to 5.0 are interpreted as Strongly Agree, 3.4 to 4.1 as Agree, 2.6 to 3.3 as Neutral, 1.8 to 2.5 as Disagree, and 1.0 to 1.79 as Strongly Disagree.

Mean Score(M)	Verbal Interpretation (VI)
4.2 – 5.0	Strongly Agree
3.4 – 4.1	Agree
2.6 – 3.3	Neutral
1.8 – 2.5	Disagree
1.0 – 1.79	Strongly Disagree

This categorization provides a structured approach for aggregating individual responses into collective trends, thereby enhancing the reliability and clarity of data interpretation. Utilizing such a scale ensures analytical consistency and strengthens the validity of findings in relation to students' climate change-related knowledge and dispositions.

Section A: Awareness of Climate Change

Grade 7	(M)	(VI)
1. I am aware of what climate change is.	4.67	Strongly Agree
2. I understand the difference between weather and climate.	5.00	Strongly Agree
3. I know the effects of climate change on the environment.	4.00	Agree
4. I am aware that human activities contribute to climate change.	3.67	Agree
5. I have discussed climate change in class.	4.00	Agree
6. I know what global warming means.	4.33	Strongly Agree
7. I am aware of the actions that can help reduce climate change.	5.00	Strongly Agree
Total	4.38	Strongly Agree
Grade 8	(M)	(VI)
1. I am aware of what climate change is.	5.00	Strongly Agree
2. I understand the difference between weather and climate.	4.00	Agree
3. I know the effects of climate change on the environment.	5.00	Strongly Agree
4. I am aware that human activities contribute to climate change.	4.50	Strongly Agree
5. I have discussed climate change in class.	5.00	Strongly Agree
6. I know what global warming means.	5.00	Strongly Agree
7. I am aware of the actions that can help reduce climate change.	4.00	Agree
Total	4.64	Strongly Agree
Grade 9	(M)	(VI)
1. I am aware of what climate change is.	5.00	Strongly Agree
2. I understand the difference between weather and climate.	3.00	Neutral
3. I know the effects of climate change on the environment.	5.00	Strongly Agree
4. I am aware that human activities contribute to climate change.	4.33	Strongly Agree
5. I have discussed climate change in class.	4.00	Agree
6. I know what global warming means.	5.00	Strongly Agree
7. I am aware of the actions that can help reduce climate change.	4.00	Agree
Total	4.33	Strongly Agree
Grade 10	(M)	(VI)
1. I am aware of what climate change is.	5.00	Strongly Agree
2. I understand the difference between weather and climate.	5.00	Strongly Agree
3. I know the effects of climate change on the environment.	4.50	Strongly Agree
4. I am aware that human activities contribute to climate change.	4.50	Strongly Agree
5. I have discussed climate change in class.	3.50	Agree
6. I know what global warming means.	4.00	Agree
7. I am aware of the actions that can help reduce climate change.	4.00	Agree
Total	4.36	Strongly Agree

This data presents the mean responses of AGCS students from Grades 7 to 10 regarding their awareness of climate change. The findings suggest a high level of climate change awareness across all grade levels, though nuanced variations exist that warrant deeper analysis. The general observations show that all grade levels scored above (**M=4.30**) in total mean, corresponding to the (**VI Strongly Agree**). This indicates that students across the board demonstrate a strong awareness of climate change concepts. While, it is quite evident that Grade 8 shows the highest total mean (M=4.64, VI Strongly Agree), while Grade 9 records the lowest mean (M=4.33, VI Strongly Agree), although the difference is marginal. This suggests that Grade 8 students are the most confident or informed about climate change among the surveyed groups with a mean of (M=4.64, VI Strongly Agree).

Item-Level Interpretations

I am aware of what climate change is - All three grade levels—Grades 8, 9, and 10—achieved a perfect mean score of (M=5.00, VI Strongly Agree), while Grade 7 followed closely with a mean of (M=4.67, VI Strongly Agree). These results indicate a near-universal awareness and acceptance of the concept being assessed across junior high school levels. The consistently high mean scores suggest that students possess a strong foundational understanding, potentially reflecting the effectiveness of climate literacy education in these year levels. Such widespread agreement aligns with findings in environmental education research, which indicate that early and consistent exposure to climate-related content fosters not only knowledge acquisition but also positive environmental attitudes (Stevenson et al., 2014).

I understand the difference between weather and climate - This item reveals a significant variation in students' conceptual understanding of the difference between weather and climate across grade levels. Grades 7 and 10 achieved a perfect mean score of (M=5.00, VI Strongly Agree), indicating a strong comprehension of the distinction between the two concepts. Grade 8 followed with a mean of (M=4.00, VI Agree), suggesting a generally accurate understanding, albeit with slightly less confidence. In contrast, Grade 9 students exhibited a noticeable decline, with a mean score of (M=3.00, VI Neutral), signaling a potential gap in conceptual clarity at this level. Such explanation can be attributed to Bransford, Brown, and Cocking (2000), that says, conceptual understanding depends not only on exposure but also on the depth of prior knowledge and opportunities for meaningful engagement. Furthermore, according to Boon (2010) misconceptions about weather and climate are common among adolescents, as these terms are often used interchangeably in everyday language, leading to confusion if not explicitly clarified through instruction.

I know the effects of climate change on the environment - The data reveal a consistently high level of agreement across all grade levels—Grade 7 M = 4.0, Grade 8 M = 5.0, Grade 9 M = 5.0, and Grade 10 M = 4.5—all falling in VI Strongly Agree. This suggests that students possess a high understanding of the environmental impacts associated with climate change. Such outcomes align with existing literature emphasizing that early and sustained environmental education significantly enhances students' cognitive and affective engagement with ecological issues (OECD, 2020; Stevenson et al., 2014). The strong agreement among students may also reflect the integration of climate-related topics within the science and social studies curriculum, which has been shown to improve environmental literacy and promote responsible behavior (Anderson, 2012; UNESCO, 2017).

I am aware that human activities contribute to climate change - Data shows that all grade levels demonstrated agreement or strong agreement regarding anthropogenic drivers of climate change, with mean scores ranging from (M=3.67 to M=4.50). This indicates a generally solid grasp of the human-induced causes of climate change across the student population. Notably, Grade 7 students exhibited slightly less certainty (M = 3.67, VI Agree), which may reflect developmental or curricular factors influencing conceptual understanding at earlier stages of secondary education. According to (Shepardson et al., 2009; Boeve-de Pauw & Van Petegem, 2011) in their studies it shows that younger students often possess emerging but less fully formed conceptions of complex environmental issues, which tend to deepen with age and educational exposure. Also, the overall recognition of anthropogenic climate drivers among students aligns with global efforts in climate education that

emphasize the role of human activities—such as fossil fuel combustion, deforestation, and industrial processes—as primary contributors to climate change (IPCC, 2023; UNESCO, 2017).

I have discussed climate change in class - The data indicate that students across Grade 7 (M = 4.00), Grade 9 (M = 4.00), and Grade 10 (M = 3.50) generally with (VI Agree) shows that they have opportunities to discuss climate change in class, while Grade 8 students (M = 5.00 VI Strongly Agree), reflecting a heightened perception of classroom engagement with the topic. These findings suggest that climate change is being integrated into classroom discourse to a meaningful extent, particularly in some grade levels. Monroe et al. (2019) validated that such exposure is essential, as classroom-based discussions have been shown to enhance students' climate literacy, critical thinking, and willingness to engage in environmental action.

I know what global warming means - All grade levels, with the exception of Grade 10, reported strong agreement regarding their understanding of global warming, as reflected in the mean scores: Grade 7 (M = 4.33), Grade 8 (M = 5.00), and Grade 9 (M = 5.00), all corresponding to (VI Strongly Agree). Grade 10 students, while still demonstrating agreement (M = 4.00 VI Agree), reported slightly lower certainty. These results suggest a widespread conceptual understanding of global warming among junior high school students, although a slight decline in the upper grade level may point to the need for sustained reinforcement of environmental content. This pattern supports findings in climate education literature that emphasize the importance of continuous and developmentally appropriate instruction to maintain and deepen students' climate literacy over time (Hestness et al., 2014).

I am aware of the actions that can help reduce climate change - In this item it shows that Grade 7 students demonstrated the highest level of awareness regarding actions that can help reduce climate change with (M = 5.00, VI Strongly Agree), while Grades 8, 9, and 10 each recorded a mean score of (M=4.00 VI Agree). This suggests a general recognition of climate change mitigation strategies among students across grade levels. However, the lower scores in the higher grades may indicate that while awareness exists, it is not yet fully internalized or linked to specific, actionable behaviors. This aligns with the research conducted by (Mead et al., 2012) indicating that while students often express support for environmental action, their knowledge of concrete mitigation practices and their personal sense of efficacy can remain limited without sustained, context-rich instruction.

Section B: Sources of Climate Change Related Information

Grade 7	Mean (M)	VI
1. I get information about climate change from school or teachers.	4.67	Strongly Agree
2. I learn about climate change through social media platforms.	4.00	Agree
3. I watch news reports or documentaries related to climate change.	3.33	Neutral
4. I hear about climate change from my family or friends.	2.33	Disagree
5. I read about climate change in books, magazines, or newspapers.	3.00	Neutral
6. I attend talks, seminars, or school programs on climate change.	2.67	Neutral
Total	3.33	Neutral

Grade 8	Mean	VI
1. I get information about climate change from school or teachers.	5.00	Strongly Agree
2. I learn about climate change through social media platforms.	4.50	Strongly Agree
3. I watch news reports or documentaries related to climate change.	4.00	Agree
4. I hear about climate change from my family or friends.	4.50	Strongly Agree
5. I read about climate change in books, magazines, or newspapers.	4.00	Agree
6. I attend talks, seminars, or school programs on climate change.	3.50	Agree
Total	4.25	Strongly Agree

Grade 9	Mean	VI
1. I get information about climate change from school or teachers.	3.67	Agree
2. I learn about climate change through social media platforms.	2.33	Disagree
3. I watch news reports or documentaries related to climate change.	3.00	Neutral
4. I hear about climate change from my family or friends.	3.67	Agree
5. I read about climate change in books, magazines, or newspapers.	2.33	Disagree
6. I attend talks, seminars, or school programs on climate change.	1.67	Strongly Disagree
Total	2.78	Neutral

Grade 10	Mean	VI
1. I get information about climate change from school or teachers.	3.50	Agree
2. I learn about climate change through social media platforms.	4.00	Agree
3. I watch news reports or documentaries related to climate change.	3.50	Agree
4. I hear about climate change from my family or friends.	3.50	Agree
5. I read about climate change in books, magazines, or newspapers.	3.00	Neutral
6. I attend talks, seminars, or school programs on climate change.	3.00	Neutral
Total	3.42	Agree

This dataset presents student responses from Grades 7 through 10 regarding their sources of information about climate change. The data provides insight into how students access climate change knowledge, highlighting both strengths and gaps in information channels. The general observations indicate that school or teachers emerged as the most influential source overall, with a mean of $M=4.67$ for G7, $M=5.00$ for G8, $M=3.67$ for G9 and $M=3.50$ for G10 with (VI Strongly Agree and Agree). It was Grade 8 students reported the highest reliance on this source with a perfect ($M=5.00$, Strongly Agree), suggesting strong integration of climate education. While, Grade 9 having the least utilized source indicated having the lowest mean of ($M=1.67$, VI Strongly Disagree) when it comes to talks, seminars, and school programs. Indicating a significant underutilization of formal supplementary learning experiences.

Item-Level Interpretations

I get information about climate change from school or teachers - Grades 7 and 8 rated this source highly ($M=4.67$ and $M=5.00$, VI Strongly Agree), indicating that formal education is a primary driver of climate knowledge in the lower secondary levels. Grades 9 and 10 reported less reliance ($M=3.67$ and $M=3.50$ VI Agree), suggesting a possible reduction in curricular focus or student engagement at the higher grades. According to Monroe (2019) while schools remain the cornerstone for climate education, there appears to be a need for sustained emphasis in upper secondary years to maintain engagement.

I learn about climate change through social media platforms - Grade 8 again shows the highest reliance ($M=4.50$, VI Strongly Agree), possibly reflecting age-appropriate digital literacy and access. Grade 9 reports ($M=2.33$ VI Disagree), indicating low perceived value or trust in these platforms for climate information. While social media is a relevant tool, its effectiveness as a learning resource is inconsistent across grade levels. Greenhow, C., & Lewin, C. (2016) noted that the effectiveness of social media as a learning tool is influenced by factors such as age, developmental stage, and digital literacy—making its impact uneven across grade levels. Educators might consider teaching students how to critically evaluate environmental content on digital platforms.

I watch news reports or documentaries related to climate change - With the mean of ($M=3.33$ for G7 VI Neutral, $M=4.00$ G8 VI Agree, $M=3.00$ G9 VI Neutral, and $M=3.50$ VI Agree). This suggests that this traditional source is underutilized or not resonating strongly with students. Grade 9 again demonstrates low engagement pointing to a general disconnection with public media formats at this age. The researchers noted that despite the richness and proliferations of documentary and news-based content, these are not strongly influencing climate awareness. There may be a need to integrate such media more actively in classroom settings.

I hear about climate change from my family or friends - Marked variability across grades: Grade 7 reported ($M=2.33$ VI Disagree) while Grade 8 scored ($M=4.50$ VI Strongly Agree). The mean reflects a mixed influence of interpersonal communication on climate change awareness. Climate conversations at home or among peers are not consistently emphasized. In the study of Madden, H., et al. (2021) they validated that while schools are key venues for climate education, discussions about climate change at home or among peers are less frequent and often not prioritized. Encouraging family-involved climate education could help reinforce school-based learning.

I read about climate change in books, magazines, or newspapers - In this item all the mean results $M=3.00$ G7, VI Neutral, G8 $M=4.00$ VI Agree, G9 $M=2.33$ VI Disagree, and G10 $M=3.0$ VI Neutral is a reflection of low

to moderate engagement. Grade 8 again stands out with (M=4.00 VI Agree), showing higher usage of print media. It is an observable fact that traditional print sources are declining as a primary means of information, likely due to digital substitution. However, the researchers strongly uphold that still, curated readings could support deeper understanding when strategically implemented.

I attend talks, seminars, or school programs on climate change - This item, attend talks, seminars, or school programs on climate change received the lowest scores across all levels, with Grade 9 at (M=1.67 VI Strongly Disagree, G7 M=2.67, VI Neutral, G10 M=3.00, VI Neutral, and G8 M=3.50 VI Agree). The data suggests that formal programs outside the regular classroom setting are either scarce or perceived as ineffective. It also reflects that there is significant untapped potential in extracurricular or enrichment programs. It is a common knowledge that institutions should consider investing in interactive and student-centered climate initiatives beyond traditional instruction. Grade 8 consistently reports the highest awareness and usage across multiple sources, suggesting a peak period of receptiveness to both formal and informal educational inputs. While grade 9 consistently shows the lowest scores on several sources, indicating a possible developmental or curricular disengagement at this stage. The researchers have noted that a progressive shift from structured (teachers, school) to informal (media, peers) sources does not clearly emerge, indicating that climate literacy may still be heavily dependent on school-led efforts rather than self-initiated learning.

Section C: Perceptions of the Causes of Climate Change

Grade 7	Mean	VI
1. Human activities are the main cause of climate change.	3.33	Neutral
2. Burning fossil fuels contributes to global warming.	4.33	Strongly Agree
3. Cutting down trees increases the effects of climate change.	4.33	Strongly Agree
4. Natural events (like volcanic eruptions) are major causes of climate change.	4.00	Agree
5. Industrial pollution plays a large role in causing climate change.	4.00	Agree
6. Climate change is just a natural part of Earth's cycle.	4.00	Agree
Total	4.00	Agree
Grade 8	Mean	VI
1. Human activities are the main cause of climate change.	4.50	Strongly Agree
2. Burning fossil fuels contributes to global warming.	4.50	Strongly Agree
3. Cutting down trees increases the effects of climate change.	5.00	Strongly Agree
4. Natural events (like volcanic eruptions) are major causes of climate change.	4.50	Strongly Agree
5. Industrial pollution plays a large role in causing climate change.	4.50	Strongly Agree
6. Climate change is just a natural part of Earth's cycle.	4.50	Strongly Agree
Total	4.58	Strongly Agree
Grade 9	Mean	VI
1. Human activities are the main cause of climate change.	4.33	Strongly Agree
2. Burning fossil fuels contributes to global warming.	3.67	Agree
3. Cutting down trees increases the effects of climate change.	4.00	Agree
4. Natural events (like volcanic eruptions) are major causes of climate change.	4.00	Agree
5. Industrial pollution plays a large role in causing climate change.	4.00	Agree
6. Climate change is just a natural part of Earth's cycle.	3.67	Agree
Total	3.94	Agree
Grade 10	Mean	VI
1. Human activities are the main cause of climate change.	3.50	Agree
2. Burning fossil fuels contributes to global warming.	4.00	Agree
3. Cutting down trees increases the effects of climate change.	4.50	Strongly Agree
4. Natural events (like volcanic eruptions) are major causes of climate change.	4.00	Agree
5. Industrial pollution plays a large role in causing climate change.	3.50	Agree
6. Climate change is just a natural part of Earth's cycle.	3.50	Agree
Total	3.83	Agree

The data reflects both cognitive understanding and affective engagement, as key indicators of environmental literacy among adolescents. Across all grades level of the junior high school, students generally agree or strongly agree with scientifically validated causes of climate change, showing a good foundational understanding. The total means across all items ranged from (M =3.86 to M=4.39 VI Agree to Strongly Agree), indicating strong agreement with anthropogenic and some natural contributors.

Item-Level Interpretations

Human activities are the main cause of climate change - The data suggest that AGCS Junior High School students possess a generally sound understanding of anthropogenic climate change—that is, the recognition that human activities are the primary drivers of global climate change. Notably, students in Grades 8 and 9 exhibited strong agreement with mean scores of (M=4.50 and M=4.33, VI Strongly Agree), whereas Grade 7 students showed a neutral stance with a mean of (M=3.33, VI Neutral). This data indicates a developmental progression in climate change literacy, that coincides with the findings that conceptual understanding of complex environmental issues tends to increase with age and exposure to formal instruction based from the studies of Shea, Mouza, & Drewes, (2016); and Bozdogan & Yanar, (2020). The disparity among grade levels implies that while older students are likely benefiting from more advanced curricular content and cognitive maturity, younger students, particularly those in Grade 7, may require more targeted and scaffolded instruction to fully grasp the human causes of climate change. Similarly, Shepardson et al. (2011) highlights that students often hold incomplete or misconceived notions about climate change causes at early stages of learning, which underscores the need for explicit, age-appropriate educational interventions.

Burning fossil fuels contributes to global warming - In this item, it indicates that AGCS Junior High School students exhibit a solid awareness of specific contributors to greenhouse gas (GHG) emissions. This finding suggests a successful transmission of foundational scientific concepts related to climate science, particularly at the lower secondary level. According to Anderson, (2012), and National Research Council; Understanding the sources of greenhouse gas emissions—such as the burning of fossil fuels, deforestation, industrial activities, and agricultural practices—is essential for climate change literacy and reflects a meaningful grasp of the human-environment interaction. It was furthermore supported in the study of Mead et al., (2012), they validated that students who are exposed to structured climate education are more likely to accurately identify the anthropogenic sources of emissions and their role in global warming.

Cutting down trees increases the effects of climate change - All grade levels reported a strong agreement regarding the role of land use and forest degradation as critical contributors to climate change, as evidenced by the mean scores. G7 M=4.33 VI Strongly Agree, G8 M=5.00 VI Strongly Agree, G9 M=4.00 VI Agree, G10 M=4.50 VI Strongly Agree. All mean scores are an indication of unanimous consensus. Notably, Grade 8 students achieved a perfect mean score. These findings suggest that students have internalized key environmental concepts, particularly the impacts of deforestation and unsustainable land practices. This aligns with the assertions of the Intergovernmental Panel on Climate Change (IPCC, 2021), which emphasizes that land use change, including deforestation, significantly contributes to greenhouse gas emissions. Moreover, the results reflect the influence of effective environmental messaging in educational contexts, supporting the view of Monroe et al. (2019) that targeted climate and environmental education can enhance student awareness and understanding of ecological issues.

Natural events (like volcanic eruptions) are major causes of climate change - Despite the prevailing scientific consensus that natural variability accounts for only a limited portion of recent climate change (IPCC, 2021), all grade levels in this study reported agreement or strong agreement with the idea that natural events are significant contributors. This is reflected in the mean score of (G7 M=4.00, VI Agree, G8 M=4.50, VI Strongly Agree, G9 M=4.00, VI Agree and G10 M=4.00, VI Agree). Such results indicate a common understanding that natural events serves as causes for climate change. However, misconception about short-term natural phenomena—such as volcanic eruptions, solar variability, or El Niño events—are conflated with long-term anthropogenic climate trends. In the research by Shepardson et al. (2011) supports this observation, noting that students often struggle to differentiate between natural climate variability and human-induced climate change.

Industrial pollution plays a large role in causing climate change - With regard to industrial pollution, all grade levels expressed agreement, as indicated by the mean score of (G7 M=4.00, VI Agree, G8 M=4.50, VI Strongly Agree, G9 M=4.00, VI Agree, and G10 M=3.50, VI Agree). However, Grade 10 students demonstrated a comparatively lower mean, suggesting a modest decline in perceived association between industrial activity

and climate impact at higher grade levels. Generally, students appear to recognize the role of industrial processes in contributing to greenhouse gas emissions and environmental degradation. This is consistent with the findings from the Intergovernmental Panel on Climate Change (IPCC, 2021), which identifies industrial emissions—particularly from energy production, manufacturing, and chemical processing—as major contributors to climate change. The lower level of agreement among older students may point to a phenomenon identified in the literature as “information fatigue” or “cognitive overload” (Ojala, 2012), wherein repeated exposure to complex climate-related issues can lead to disengagement or diminished concern.

Climate change is just a natural part of Earth's cycle - The item addressing the perception of climate change as part of earth's natural cycle received a mean score of (G7 M=4.00, VI Agree, G8 M= 4.50, VI Strongly Agree, G9 M= 3.67, VI Agree, G10 M= 3.50, VI Agree), indicating that a substantial number of students still associate current climate change trends with natural, cyclical processes in earth's climatic history. While it is scientifically acknowledged that earth's climate has undergone natural fluctuations over geological time scales—such as glacial and interglacial periods driven by factors like Milankovitch cycles, volcanic activity, and solar radiation. Still, according to IPCC (2021), contemporary climate change is overwhelmingly attributed to anthropogenic influences. While in the study of Boon (2010) and Shepardson et al. (2011) confirms that many students hold hybrid models of climate change causation, often blending scientific facts with incorrect assumptions.

Section D: Willingness to Disseminate Climate Change Information

Grade 7	Mean(M)	VI
1. I am willing to talk to my friends about climate change.	5.00	Strongly Agree
2. I would participate in climate change awareness campaigns.	4.67	Strongly Agree
3. I am interested in posting climate change facts or tips online.	4.67	Strongly Agree
4. I am likely to correct misinformation about climate change when I hear it.	4.33	Strongly Agree
5. I would like to create or join a school club focused on climate awareness.	4.33	Strongly Agree
6. I am comfortable sharing what I know about climate change with my family.	4.33	Strongly Agree
Total	4.56	Strongly Agree

Grade 8	Mean	VI
1. I am willing to talk to my friends about climate change.	2.50	Disagree
2. I would participate in climate change awareness campaigns.	2.50	Disagree
3. I am interested in posting climate change facts or tips online.	3.00	Neutral
4. I am likely to correct misinformation about climate change when I hear it.	4.50	Strongly Agree
5. I would like to create or join a school club focused on climate awareness.	2.50	Disagree
6. I am comfortable sharing what I know about climate change with my family.	3.00	Neutral
Total	3.00	Neutral

Grade 9	Mean	VI
1. I am willing to talk to my friends about climate change.	2.67	Neutral
2. I would participate in climate change awareness campaigns.	4.00	Agree
3. I am interested in posting climate change facts or tips online.	2.67	Neutral
4. I am likely to correct misinformation about climate change when I hear it.	4.00	Agree
5. I would like to create or join a school club focused on climate awareness.	4.67	Strongly Agree
6. I am comfortable sharing what I know about climate change with my family.	4.33	Strongly Agree
Total	3.72	Agree

Grade 10	Mean	VI
1. I am willing to talk to my friends about climate change.	4.00	Agree
2. I would participate in climate change awareness campaigns.	3.00	Neutral
3. I am interested in posting climate change facts or tips online.	3.00	Neutral
4. I am likely to correct misinformation about climate change when I hear it.	4.00	Agree
5. I would like to create or join a school club focused on climate awareness.	3.50	Agree
6. I am comfortable sharing what I know about climate change with my family.	4.00	Agree
Total	3.58	Agree

The data on students' perceptions of the causes of climate change across grade levels reveal varying degrees of understanding and conviction, suggesting developmental and educational factors influencing climate literacy. Grade 7 students exhibit a strong agreement (M=4.56, VI Strongly Agree), indicating a high level of awareness and confidence in identifying the anthropogenic or natural causes of climate change. In contrast, Grade 8 mean

(M=3.00 VI Neutral) which may point to a transitional stage in cognitive or academic development, or perhaps a gap in curriculum continuity or emphasis on causality. Grades 9 and 10 demonstrate moderate agreement (M=3.72 and M=3.58, VI Agree) which, while reflective of some understanding, may also indicate a diminishing intensity of concern or a shift in focus toward more abstract scientific content, resulting in reduced clarity about specific causes of climate change. Overall, these results imply that while early secondary students particularly in Grade 7 show strong alignment with the scientific consensus on climate change causes, there is a need for sustained, developmentally appropriate reinforcement of these concepts in higher grade levels to ensure retention and deeper understanding.

Item-Level Interpretations

Willingness to Talk About Climate Change - The data on students' willingness to engage in peer discussions about climate change reveal significant variations across grade levels, suggesting developmental, educational, and psychosocial factors at play. Grade 7 students exhibit a very high level of willingness to discuss climate change with their peers with the mean average of (M=5.00, VI Strongly Agree). In contrast, Grade 8 students demonstrate a marked decline in willingness to engage in climate conversations, with (M=2.50, VI Disagree). A modest increase is observed among Grade 9 students, though responses remain generally neutral with a mean average of (M=2.67, VI Neutral). Grade 10, a renewed willingness to discuss climate change emerges, with students indicating agreement having a mean of (M=4.00, VI Agree). The data illustrate that students' willingness to talk about climate change is not static and varies with grade level, shaped by a combination of **developmental stage, peer dynamics, and educational exposure**. Ojala (2012) emphasizes that young learners who feel emotionally connected to the issue and receive encouragement from adults and peers are more likely to initiate or engage in climate-related dialogue.

Participation in Climate Change Awareness Campaigns - In this particular item the data clearly indicates that Grade 7 with a mean of (M=4.67, VI Strongly Agree) display very high willingness to actively engage in campaigns, suggesting enthusiasm and idealism often seen in early adolescence. Grade 8 students having a mean (M=2.50, VI Disagree) shows low willingness to participate in campaigns. While Grade 9 and Grade 10 with the following respective mean (M=4.00, VI Agree, M=3.00, VI Neutral) appear to regain interest in participating, likely due to increasing awareness of the consequences of inaction. These findings reflect Boeve-de Pauw & Van Petegem (2010) studies that younger students with access to experiential learning and school-supported environmental activities show increased willingness to participate in climate actions.

I am interested in posting climate change facts or tips online - The data shows that Grade 7 with a mean average of (M=4.67, VI Strongly Agree) is an indication that display a very high willingness to post about climate change facts or tips online suggesting an enthusiastic openness typical of early adolescents who are still forming attitudes and are highly influenced by group norms and school messaging (Piaget, 1972; Erikson, 1968). This may also reflect the novelty of the topic or recent exposure through integrated science curricula that emphasize global issues at earlier grade levels (UNESCO, 2021). While Grades 8, 9, and 10 with the following average mean respectively (M=3.00, VI Neutral), (M=2.67, VI Neutral) and (M=3.00, VI Neutral) is a clear indication of decline in willingness among the three Grades level signals a possible shift in developmental focus or engagement. According to (Stevenson et al., 2016) adolescents at this stage may begin to exhibit greater skepticism or concern for peer judgment, which can reduce open dialogue on socially or politically charged issues such as climate change. The psychosocial drive for conformity and identity exploration may suppress willingness to discuss topics that could provoke disagreement or appear controversial among peer groups.

I am likely to correct misinformation about climate change when I hear it - The willingness of students to correct misinformation about climate change demonstrates a critical aspect of climate literacy and civic responsibility. The data indicate that students across grade levels show a commendable level of engagement in countering false information, with Grade 7 and Grade 8 students reporting particularly high mean scores of (M=4.67 and M=4.50, VI Strongly Agree). Grades 9 and 10, while slightly lower at (M=4.00, VI Agree), still reflect a generally positive disposition toward addressing climate misinformation. This proactive attitude aligns

with what McNeill and Berland (2017) describe as the development of scientific argumentation skills, where students not only construct evidence-based claims but also critically evaluate the claims of others.

I would like to create or join a school club focused on climate awareness - The item the students like to create or join a school club dedicated to climate awareness reflects reveal a notable variation across grade levels. Grade 9 students expressed the highest interest, with a mean of (M=4.67, VI Strongly Agree), followed by Grade 7 with a mean of (M=4.33, VI Strongly Agree). Grade 10 students showed moderate interest with a mean (M=3.50, VI Agree), while Grade 8 students exhibited a substantially lower level of enthusiasm mean (M=2.50, VI Disagree). This variation may be attributed to developmental, psychosocial, and contextual factors. According to the theory of adolescent development (Erikson, 1968), middle adolescence (typically Grades 8–9) is a critical stage for identity formation and social belonging. The peak in Grade 9 may indicate a developmental readiness to assume leadership roles and engage in collective action, especially as students become more socially conscious and capable of abstract reasoning (Piaget, 1972). Their heightened sense of purpose and responsibility may explain the strong desire to institutionalize their commitment through a climate club.

I am comfortable sharing what I know about climate change with my family - This particular item exhibits notable variation in student responses across grade levels, indicating differing levels of interest or engagement. Specifically, both Grade 7 and Grade 9 students reported a high degree of agreement with a mean score of (M=4.33, VI Strongly Agree), suggesting a strong inclination about being comfortable sharing what they know about climate change with their family. Grade 10 students also demonstrated a generally positive response, with a slightly lower mean of (M= 4.00, VI Agree). In contrast, Grade 8 students recorded a neutral stance, with a mean of (M=3.00, VI Neutral), indicating a potential decline in engagement or interest at this grade level. This pattern may be reflective of developmental, cognitive, or psychosocial factors that influence students' environmental attitudes during early adolescence. According to Piaget's theory of cognitive development, students at this stage transition from concrete operational to formal operational thinking, which may temporarily affect how abstract or complex issues like climate change are processed (Piaget, 1972). Furthermore, Bandura (1997) emphasized the role of self-efficacy and social modeling in shaping motivation and behavior, suggesting that peer influence and school climate may also contribute to the observed variance.

5. Conclusion

Based on the findings of the study, the researchers concluded that:

The study is limited to one (1) Private Junior High School known as AGCS representing all grade levels. The demographic profile of the students from AGCS revealed that there are grades 7 to 10 with the majority of male students' respondents. The AGCS Junior High School students exhibit a high level of literacy concerning the awareness of climate change. The high levels of recognition, perception, action, attitude, and personal concern is very much evident across all grade levels. This indicates a commendable level of climate change literacy and suggests that students are not only aware of climate change as a global issue but are also likely familiar with its basic concepts, implications, and relevance to their lives. The respondents level of literacy concerning sources of climate change-related information reveals notable variation. Grade 8 students exhibit the highest literacy, indicating a strong awareness and ability to identify credible sources of climate change information. In contrast, grades 7, 9, and 10 fall within the moderate to limited literacy or uncertainty in discerning reliable climate change information sources. This discrepancy may reflect differences in curriculum exposure, instructional emphasis, or access to climate literacy resources.

The findings on AGCS Junior High School students level of literacy on the perceptions of the causes of climate change reveal a developmental pattern marked by high initial certainty, indicating a strong perception and likely accurate understanding of the anthropogenic causes of climate change, consistent with the early integration of environmental science in lower secondary curricula. Followed by a decline in clarity and confidence as students' progress through grade levels which suggests uncertainty or possible misconceptions

regarding the origins of climate change. This may stem from a curricular gap, limited reinforcement of prior knowledge, or an insufficiently scaffolded transition into more complex scientific concepts.

The respondents' level of literacy in their willingness to disseminate climate change information reflects a generally positive orientation, though with varying degrees across grade levels indicating strong motivation and literacy in sharing climate-related knowledge. This suggests a proactive attitude likely supported by recent instructional exposure or heightened enthusiasm at earlier stages of schooling. While the possible disengagement or uncertainty about their role in climate communication. This pattern suggests that while younger students may exhibit strong engagement, there may be a decline or plateau in higher grades unless continuously reinforced through curriculum and extracurricular initiatives.

The findings of this study on climate change literacy among junior high school students present several important implications for both learners and educators. For students, there is a clear need to reinforce education that is both scientifically accurate and action-oriented. The importance of integrating climate change topics into everyday learning experiences. Students must be empowered not only with knowledge about the causes and effects of climate change, but also with the skills to critically evaluate information, communicate climate issues effectively, and participate in environmental action. Engagement in school-initiated activities, such as environmental clubs or climate awareness campaigns, can foster a deeper sense of responsibility and agency. Furthermore, students must be guided to connect global issues to local realities, enabling them to make more meaningful contributions to their communities.

Teachers play a pivotal role in translating complex environmental science into relatable and age-appropriate instruction. To fulfill this role effectively, educators must be equipped with updated scientific content, learner-centered pedagogies, and interdisciplinary teaching strategies. Moreover, teachers are encouraged to create inclusive learning environments that encourage inquiry, dialogue, and collaborative problem-solving around climate issues. This shift from traditional lecture-based approaches to interactive, values-based climate education can inspire students to become informed and proactive citizens. Ultimately, climate change education at the junior high school level must go beyond raising awareness—it must nurture a culture of sustainability. Both students and teachers are key agents in building climate-resilient communities. Schools must, therefore, serve as both learning spaces and living laboratories for environmental stewardship. The development of a proposed learning plan that may be considered for use by preservice teachers to enhance the climate change literacy of AGCS Junior High School students as it is aligned with the curriculum utilized by the institution, as well as based on the gathered result from the study.

Recommendations - Based on the findings and conclusions made from the study, the accompanying suggestions are thusly proposed by the researchers:

That the curriculum development and instructional design must focus on behavioral change and civic engagement through deepening understanding, fostering agency, and encouraging interdisciplinary learning to transform awareness into meaningful, lifelong climate stewardship. That the developed learning guide for climate change education must be continuously integrated into the present curriculum of Junior High Schools. This can be achieved by integrating the proposed learning plan into relevant subjects. The proposed learning plan may be used to promote learning on climate change and they be given opportunities to participate in climate change mitigation and adaptation activities. These opportunities may include participating in local climate change initiatives, undertaking environmental research projects, and engaging in hands-on activities such as gardening or composting.

The varying levels of climate change source literacy among JHS students underscore the urgent need to systematically embed media and information literacy into climate education. A tiered, interdisciplinary, and culturally relevant curriculum—grounded in critical source analysis—will better prepare students to become informed, responsible, and proactive citizens in the face of the climate crisis. Curriculum development must therefore be **adaptive, motivational, and skill-building**, offering students the tools, confidence, and platforms

necessary to effectively and responsibly communicate climate-related knowledge. This approach will cultivate **not only informed students, but active climate stewards and peer educators**. Future researchers are encouraged to make further investigation into the effectiveness of climate change action in promoting climate change literacy among Junior High School students.

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