

Teachers' Difficulties in Climate Change Education

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Abstract:

Studying teachers' difficulties in climate change education is critical to improving educational outcomes, empowering future generations, and advancing global efforts to address climate change most effectively. In this context, this descriptive study aimed to determine teachers' difficulty in Climate Change Education as the basis for a capability-building plan. Needed data was collected from 64 teacher-respondents using a researcher-made questionnaire that has undergone rigorous validity and reliability tests. The ensuing analysis showed teachers having a high level of difficulty in climate change education across all areas of content knowledge and pedagogy, teaching environment, and instructional resources. Subsequent analysis also showed no significant difference in the level of teachers' difficulties when analyzed in terms of three demographic profile groupings and three areas on content knowledge and pedagogy, teaching environment, and instructional materials. The result of this study calls for allocating resources and comprehensive training for teachers, developing targeted capability enhancement programs, integrating climate change into curricula, and fostering a supportive, motivated educational community.

Keywords: Climate change, difficulties, education, teachers

Introduction:

Nature of the Problem

The Philippines had long responded to the call for climate change education under Republic Act No. 9729 or the Climate Change Act 2009. The Enhanced Basic Education Act of 2013 or the K-12 Act strengthened the curriculum integration of key climate change concepts across grade levels. These regulations acknowledge the critical need for comprehensive and integrated climate change education and offer guidelines, tools, and training courses to help teachers successfully integrate climate change concepts across various subject areas. Providing teachers with the appropriate resources and training enables them to inform pupils about the problems posed by climate change and encourage sustainable lifestyles, raising a new generation of environmentally aware people who are prepared to take on the issue head-on.

Research on teachers' difficulties in climate change education has highlighted various challenges in Content Knowledge and Pedagogy, Teaching Environment, and Instructional Resources. Research has indicated that when it comes to teaching climate change, many teachers need more pedagogical techniques and content expertise (Bencze & Carter, 2011). Effective classroom integration of climate change education is frequently hampered by time restraints, curriculum requirements, and a concentration on other subjects (Reisner & Chen, 2018). Teachers' struggles are exacerbated by inadequate teaching tools and materials, such as out-of-date textbooks or restricted access to technology (Hagevik et al., 2019).

Recognizing the need to address this issue, many countries, including the Philippines have emphasized the importance of Climate Change Education. In a study by Santos (2018), it was found that teaching climate change concepts in schools increased students' knowledge and understanding of the subject. Another study by Taguian and colleagues (2020) showed that students who received climate change education were more likely to adopt sustainable practices daily.

The researcher observed that some teachers need help teaching and integrating climate change education into their subjects and classroom practices, often needing a clearer understanding of the urgency and importance of this topic for their students. This motivated the researcher to conduct this study to provide valuable insights into teachers' barriers, such as inadequate training, limited access to resources, and a lack of confidence in addressing complex environmental concepts. By identifying these challenges, researchers can develop targeted strategies and interventions through a developmental plan to support teachers in effectively teaching climate change education and will equip them with the necessary tools, knowledge, and confidence to effectively educate students about climate change and create a more sustainable future.

Current State of Knowledge

Climate change is a pressing global issue that demands educators' active involvement, requiring robust content knowledge, effective pedagogy, supportive teaching environments, and adequate instructional resources. Julie Gess-Newsome's work on Pedagogical Content Knowledge (2017) highlights the challenges teachers face in connecting professional development to effective teaching practices, offering insights into the complexities of climate change education. Similarly, John Loughran (2018) emphasizes the integration of subject-matter and pedagogical knowledge, underscoring the need for specialized strategies to convey complex scientific concepts like climate change. Alan Reid (2019) further explores the opportunities and barriers in climate change education, addressing the multifaceted challenges educators encounter in fostering environmental literacy. Together, these works underscore the importance of equipping teachers with the tools and knowledge necessary to navigate the intricacies of teaching climate change effectively.

Climate change presents significant challenges for the Philippines, emphasizing the need for teachers to be well-equipped to educate students on this critical issue. Teachers often face difficulties in acquiring and delivering content knowledge and pedagogy effectively, particularly when addressing complex topics like climate change and its impacts. John Jamir Benzon R. Aruta (2022) highlights the mental health effects of climate anxiety on Filipino youth, underscoring the importance of equipping educators with the knowledge to address student concerns and foster meaningful discussions. Similarly, Vincenzo Bollettino (2020) reveals low public awareness of climate change in the Philippines, indicating a potential gap in teachers' understanding. To overcome these challenges, educators must engage in ongoing professional development to stay updated on scientific advancements, enabling them to provide accurate information, address misconceptions, and prepare students to face the climate crisis effectively.

The teaching environment plays a crucial role in climate change education, as it shapes the effectiveness and implementation of educational strategies. One article that addresses this topic is "Earth Observation as a Facilitator of Climate Change Education in Schools: The Teachers' Perspectives" by Panagiota Asimakopoulou (2021). The article examines the integration of satellite remote sensing (RS) for Earth Observation (EO) as a tool for facilitating climate change education in Greece. The research findings indicate that teachers have a high interest in how satellites depict environmental phenomena, and they view EO as an efficient vehicle for promoting climate change education in schools. The study also highlights the preference of teachers to focus on local natural disasters, such as forest fires and floods, which are more familiar to students. Additionally, teachers emphasize the importance of short, hands-on activities based on EO, known as "activity shots," for integrating climate change topics into their everyday teaching practice.

The article by Liezl B. Grefalda (2020) underscores the need for capacity building and knowledge management to enhance institutional resilience, highlighting broader challenges within the education system for climate change education. Teachers often lack access to comprehensive resources, training, and pedagogical support, making it difficult to deliver effective climate education. Reyes et al. (2021) further emphasize the psychological impacts of climate change, such as anxiety among Gen Z Filipinos, which adds another layer of complexity for teachers who must address both their own and their students' emotional responses. Additionally, educators face the dual role of teaching climate science and translating it into actionable disaster preparedness, emphasizing the urgent need for continuous professional development to equip teachers with the skills and tools necessary to navigate these multifaceted challenges effectively.

Several studies underscore the challenges and strategies for enhancing climate change education through instructional materials and community collaboration. Marlon and Marlene Adlit (2022) emphasize the need for diverse resources, such as interactive tools, digital fiction, and cross-disciplinary approaches, to make climate change education engaging and holistic. Renante Perez and Verlito Bua Jr. (2019) highlight the importance of integrating sustainable development into the curriculum and fostering school-community partnerships to address resource limitations and ensure environmental project sustainability. Similarly, Honeylyn Ramayrat-Sacil (2020) found that while environmental education activities have raised awareness in South Central Mindanao, resource shortages remain a significant barrier. These studies collectively stress the need for accessible resources, active learning strategies, and collaboration with community stakeholders to improve the effectiveness and sustainability of climate change education.

Theoretical Underpinnings

David Perkins' Difficulty Theory (2007) provides valuable insights into understanding and addressing students' challenges in specific subject areas. The theory emphasizes identifying common difficulty areas and analyzing their root causes. In climate change education, teachers often face challenges in effectively communicating this complex subject. By applying Perkins' theory, educators can better understand the unique difficulties involved and design targeted interventions and instructional strategies to address these issues.

The theory categorizes conceptual challenges into types such as tacit knowledge, passive knowledge, ritualized knowledge, and unfamiliar knowledge. In the context of climate change education, students may struggle with understanding the global and long-term impacts of climate change (Fien, 2013). Misconceptions, preconceived notions, and insufficient scientific background information can exacerbate these difficulties (Polman, 2006). Perkins' emphasis on causal analysis encourages teachers to investigate the root causes of these challenges, enabling the development of effective teaching approaches that address students' specific needs.

With climate change being a critical global issue, enhancing climate change education is imperative. Teachers play a vital role in fostering environmental literacy and empowering students to take action. However, the multidisciplinary and evolving nature of the subject poses unique challenges. Perkins suggests that teachers refine their understanding of difficulties, adapt their methods, and seek experiential opportunities to improve their teaching. This theoretical framework offers researchers and educators a foundation for identifying and overcoming barriers in climate change education, ensuring that learners are well-informed and equipped to address this pressing global concern.

Objectives

This study aimed to determine the teachers' level of difficulties in Climate Change Education in a public elementary school in one of the districts of Northern Negros for School Year 2023-2024 as a basis for a capability-building plan. Specifically, this study sought to answer the following questions: 1) is the teachers' level of difficulties in Climate Change Education according to the area of content knowledge and pedagogy; teaching environment, and instructional resources; 2) the teachers' level of difficulties in Climate Change Education when grouped according to the aforementioned variables; and 3) the significant difference in the teachers' level of difficulties in Climate Change Education when grouped and compared according to the aforementioned variables.

Methodology

This section presents the discussion of the research methodology used, the subjects and respondents of the study, the research instruments used, the validity and reliability of the instruments, the procedure for data gathering, and the statistical tools and procedure for data analysis.

Research Design

This study employed the descriptive research design, which aims to determine the teachers' level of difficulties in Climate Change Education in a public elementary school in one of the districts of Northern Negros for School Year 2023-2024. According to Dudovskiy (2017), descriptive research design attempts to determine, describe, or identify characteristics within the field of investigation. This research design is most appropriate for this study as it aids in elaborating the data gathered and making professional judgments. It is a fitting design for this study because it sought to provide the descriptive nature of the study as it reports the summary data such as the measure of central tendency including mean, median, mode, deviance from the mean, variation, percentage, and correlation between variables.

Study Respondents

The respondents of this study were the 64 teachers employed during the School Year 2023 - 2024. Since the total number of respondents can be easily managed, the purposive sampling technique was used. According to Norton (2018), purposive sampling refers to a group of probability sampling techniques in which units are selected because they have the characteristics you need in your sample.

Instruments

The study utilized a researcher-made questionnaire to explore teachers' difficulties in climate change education, serving as the basis for a capability-building plan. The questionnaire, validated by a jury, comprised two parts: Part I collected respondents' personal information (age, educational attainment, and length of service), while Part II focused on challenges in content knowledge and pedagogy, teaching environment, and instructional resources, with 30 items rated on a five-point scale. Permissions were obtained from DepEd supervisors and school principals before conducting the survey in a district in Negros Occidental. The researcher personally administered the questionnaire, providing instructions and clarifications as needed. Data were then collected, tallied, analyzed, and interpreted to address the study's objectives. The average rating of the three jurors was used as basis for the validity of the instrument. Validation average is 4.96, interpreted as "excellent". This showed that the research instrument was "Valid". And the reliability result was 0.987, interpreted as "excellent".

Data Gathering Procedure

The researcher secured a letter ensuring the confidentiality of the respondents and ask permission from the school principals. When the permit was granted, the researcher photocopied and brought the approved letter to the identified school heads and request the schedule to conduct the study. The researcher provided the questionnaire according to the actual number of respondents in the study. Then, he personally administered the questionnaires to the respondents. The questionnaires were gathered, checked, and encoded right after.

Data Analysis and Statistical Treatment

Objective No.1 used a descriptive-analytical scheme and mean to determine the teachers' level of difficulties in Climate Change Education according to the following areas of Content Knowledge and Pedagogy, Teaching Environment, and Instructional Resources.

Objective No.2 used a descriptive-analytical scheme and mean to determine the teachers' level of difficulties in Climate Change Education when grouped according to the variables mentioned earlier.

Objective No. 3 used a comparative analytical scheme and Mann-Whitney U Test to determine the teachers' level of difficulties in Climate Change Education when grouped and compared according to the variables mentioned earlier.

Ethical Consideration

Ethical considerations are essential in research to protect participants' rights and ensure transparency. In this study, the researcher emphasized voluntary participation, informed consent, risk minimization, confidentiality, and anonymity. Participants provided consent through initials or aliases and were free to withdraw at any time without explanation. Informed consent ensured respondents were fully aware of the research procedures and potential risks before agreeing to participate. The study prioritized minimizing harm, guaranteeing that participants faced no risk due to their involvement. Confidentiality was maintained by restricting access to identifying information, and anonymity was upheld by allowing participants to use aliases or initials to protect their identities.

Results and Discussion

This section deals with the presentation, analysis and interpretation of data gathered to carry out the objectives of this study. All these were made possible by following certain appropriate procedures so as to give the exact data and solution to each specific problem.

Table 1

Level of teachers' difficulties in climate change education in the area of content knowledge and pedagogy

Items	Mean	Interpretation
<i>As a teacher, I am having difficulties in....</i>		
1. Understanding fundamental concepts and principles of climate change.	3.73	High level
2. Translating complex climate change ideas into age-appropriate content for my learners.	3.81	High level
3. Accessing reliable and up-to-date resources on climate change for my classroom instruction.	3.76	High level
4. Integrating climate change topics into the curriculum.	3.82	High level
5. Incorporating climate change topics into different subject areas.	3.71	High level
6. Addressing common misconceptions effectively related to climate change.	3.73	High level
7. Making climate change education relevant and engaging for my learners.	3.75	High level
8. Bridging the gap between local, regional, and global climate change issues.	3.76	High level
9. Managing the potential emotional distress or anxieties that climate change education may evoke in my learners.	3.81	High level
10. Acquiring adequate training or professional development in climate change education.	3.64	High level
Overall Mean	3.75	High level

One of the important objectives of this study is to determine the teachers' difficulties in climate change education in terms of content knowledge and pedagogy. As shown in Table 3, the overall mean was 3.75 interpreted as High Level. The lowest mean, 3.64, was for item number 10, "Acquiring adequate training or professional development in climate change education." Conversely, the highest mean, 3.82, was for item number 4, "Integrating climate change topics into the curriculum."

The result implies that teachers are having difficulties in integrating climate change topics into the curriculum. As an elementary Filipino public school teacher, this suggests that there are significant barriers, such as a lack of appropriate teaching materials, insufficient training, or a curriculum that is not flexible enough to incorporate new and relevant topics like climate change. These challenges hinder our ability to effectively educate students on this

critical issue, which is essential for raising awareness and fostering a sense of environmental stewardship from a young age. Addressing these difficulties is crucial to ensure that climate change education is both comprehensive and impactful.

The results further affirmed the work of Ojomo et al. (2015) whose research provides insights into the challenges teachers face when educating about climate change. It explores the impact of professional development interventions on teacher knowledge and practice. This research is important because it highlights how professional development can enhance teachers' pedagogical content knowledge, which is crucial for effectively integrating complex topics like climate change into the curriculum and a need for educators to be well-informed about both global and local climate impacts.

Table 2

Teachers' level of difficulties in Climate Change Education in the area of teaching environment

Items <i>As a teacher, I am having difficulties in....</i>	Mean	Interpretation
1. Applying environmental principles in my classroom (e.g., waste segregation).	4.01	High level
2. Adapting climate change education to different learning environments (e.g., virtual, outdoor).	3.84	High level
3. Collaborating with other teachers in climate change education.	3.90	High level
4. class size or overcrowded classrooms that impact climate change education.	3.87	High level
5. creating a safe and inclusive classroom environment for discussing diverse perspectives on climate change?	3.84	High level
6. engaging students from different socio-cultural backgrounds in climate change discussions.	3.98	High level
7. Designing an interactive and engaging classroom on climate change, given limited resources.	3.93	High level
8. Teaching climate change education in my class because of interruptions and disruptions.	3.92	High level
9. Recommending the availability of time or class periods to teach about climate change in depth.	3.93	High level
10. Administering my class in climate change education in a well-ventilated classroom.	3.79	High level
Overall Mean	3.90	High level

The study found that teachers face significant challenges in the teaching environment related to climate change education, with an overall mean score of 3.90, indicating a high level of difficulty. The lowest mean (3.79) was for administering climate change education in a well-ventilated classroom, while the highest mean (4.01) was for applying environmental principles in the classroom. This suggests that teachers struggle most with integrating environmental principles due to a lack of resources, training, and time, often relying on theoretical discussions rather than engaging students with hands-on activities.

These findings align with Panagiota Asimakopoulou's (2021) research, which highlights that teachers often lack the necessary tools and training to implement environmental education effectively. While many teachers incorporate environmental themes like recycling or planting trees into lessons, they struggle to provide practical, real-world experiences. To address this, it is crucial to offer teachers the resources, training, and support they need to implement meaningful environmental education programs. By doing so, teachers can foster a deeper understanding of climate change and inspire students to take proactive environmental action.

Table 3

Teachers' level of difficulties in Climate Change Education in the area of instructional resources

Items <i>As a teacher, I am having difficulties in....</i>	Mean	Interpretation
1. Accessing an adequate range of instructional resources to teach about climate change.	3.75	High level
2. Finding up-to-date and scientifically accurate resources on climate change.	3.78	High level
3. Discovering age-appropriate instructional materials on climate change for your learners.	3.90	High level
4. Obtaining various multimedia resources (such as videos, infographics, or simulations) to engage students in climate change education.	3.93	High level
5. Gathering resources that address the local or regional context of climate change.	3.84	High level

6. Collecting online resources due to technological constraints or unreliable internet connectivity.	3.79	High level
7. Acquiring resources that align with their students' diverse learning styles and abilities.	3.92	High level
8. Gaining access to resources that reflect the latest advancements and emerging research in climate change science and solutions.	3.84	High level
9. Finding resources that help students connect climate change education to real-world actions and environmental stewardship.	3.95	High level
10. Getting resources that guide incorporating climate change education across various subject areas.	3.89	High level
Mean	3.86	High level

The study found that teachers face significant difficulties in accessing instructional resources for climate change education, with an overall mean score of 3.86, indicating a high level of difficulty. The lowest mean (3.75) was for accessing a range of instructional resources, while the highest mean (3.95) was for finding resources that help students connect climate change education to real-world actions and environmental stewardship. This highlights the challenge of bridging the gap between theoretical knowledge and practical action in climate change education. Teachers struggle to find resources that empower students to take meaningful steps toward environmental stewardship, emphasizing the need for innovative teaching materials that connect climate change concepts to real-world solutions.

These findings align with Iain D. Cross's (2020) study, which frames climate change as a "super-wicked" problem, underscoring the complex interplay of social, economic, and environmental factors. This perspective reinforces the difficulty teachers face in finding resources that connect classroom learning to real-world action. To address this, educators should incorporate authentic learning approaches, such as case studies, real-world examples, and hands-on activities, to help students understand the systemic implications of their decisions and engage in environmental stewardship. By providing teachers with access to these types of resources, we can better equip students to become proactive agents of change in the fight against climate change.

Table 4

Teachers' level of difficulties in Climate Change Education in the area of content knowledge and pedagogy when grouped according to Age

Items	Younger		Older	
	Mean	Interpretation	Mean	Interpretation
<i>As a teacher, I am having difficulties in....</i>				
1. Understanding fundamental concepts and principles of climate change.	3.74	High level	3.72	High level
2. Translating complex climate change ideas into age-appropriate content for my learners.	3.55	High level	4	High level
3. Accessing reliable and up-to-date resources on climate change for my classroom instruction.	3.55	High level	3.91	High level
4. Integrating climate change topics into the curriculum.	3.55	High level	4.02	High level
5. Incorporating climate change topics into different subject areas.	3.40	Moderate level	3.94	High level
6. Addressing common misconceptions effectively related to climate change.	3.37	Moderate level	4	High level
7. Making climate change education relevant and engaging for my learners.	3.59	High level	3.86	High level
8. Bridging the gap between local, regional, and global climate change issues.	3.48	Moderate level	3.97	High level
9. Managing the potential emotional distress or anxieties that climate change education may evoke in my learners.	3.55	High level	4	High level
10. Acquiring adequate training or professional development in climate change education.	3.22	Moderate level	3.94	High level
Mean	3.50	High level	3.94	High level

This study examined teachers' difficulties in climate change education related to content knowledge and pedagogy when grouped by age. Younger respondents had a high level of difficulty, with an overall mean score of 3.50. They faced the greatest challenge in acquiring adequate training in climate change education (mean: 3.22) and found making lessons engaging for learners particularly challenging (mean: 3.59). Despite their professional development, younger teachers may lack the experience and resources to make climate change relatable and engaging, resulting

in abstract and less personal lessons. Older respondents also reported a high level of difficulty, with an overall mean score of 3.94. They struggled most with understanding fundamental concepts of climate change (mean: 3.72) and integrating it into the curriculum (mean: 4.02). Older teachers may face these challenges due to less exposure to climate science during their education and difficulty adapting traditional teaching methods to incorporate contemporary topics like climate change.

The findings align with John Loughran's (2018) Pedagogical Content Knowledge (PCK) framework, which highlights the role of tailored teaching strategies in addressing diverse learning needs. Younger teachers, as novice educators, may need to develop their PCK to better connect abstract climate concepts to students' lives through engaging and relevant activities. Conversely, older teachers may benefit from updating their knowledge of climate science and adopting innovative pedagogical approaches to seamlessly integrate climate change topics into their curriculum. These insights underscore the need for targeted professional development for both groups to address their distinct challenges effectively.

Table 5

Teachers' level of difficulties in Climate Change Education in the area of content knowledge and pedagogy when grouped according to highest educational attainment

grouped according to highest educational attainment					
Items	Lower	Interpretation	Higher	Interpretation	
	Mean		Mean		
As a teacher, I am having difficulties in....					
1. Understanding fundamental concepts and principles of climate change.	3.74	High level	3.71	High level	
2. Translating complex climate change ideas into age-appropriate content for my learners.	3.74	High level	4.07	High level	
3. Accessing reliable and up-to-date resources on climate change for my classroom instruction.	3.74	High level	3.85	High level	
4. Integrating climate change topics into the curriculum.	3.8	High level	3.92	High level	
5. Incorporating climate change topics into different subject areas.	3.7	High level	3.78	High level	
6. Addressing common misconceptions effectively related to climate change.	3.64	High level	4.07	High level	
7. Making climate change education relevant and engaging for my learners.	3.72	High level	3.85	High level	
8. Bridging the gap between local, regional, and global climate change issues.	3.68	High level	4.07	High level	
9. Managing the potential emotional distress or anxieties that climate change education may evoke in my learners.	3.74	High level	4.07	High level	
10. Acquiring adequate training or professional development in climate change education.	3.5	High level	4.14	High level	
Mean	3.7	High level	3.95	High level	

The study examined teachers' difficulties in climate change education based on their highest educational attainment. Teachers with Bachelor's degrees reported a high level of difficulty, with a total mean of 3.7. The most significant challenge was acquiring adequate training in climate change education (mean: 3.5), and the least challenging was integrating climate change topics into the curriculum (mean: 3.8). Teachers with a Bachelor's degree, especially those outside the sciences, often struggle due to insufficient specific training on climate change. This lack of specialized knowledge can hinder their confidence and ability to effectively incorporate the topic into their lessons, despite their overall subject knowledge. As a result, they may face challenges in fostering scientific literacy and critical thinking about climate change in their students.

Teachers with Master's or Doctoral degrees reported a slightly higher mean of 3.95, indicating a high level of difficulty as well. Their greatest challenge was understanding the fundamental concepts and principles of climate change (mean: 3.71), and the least challenging was acquiring adequate training (mean: 4.14). Despite having advanced degrees, many teachers still lack sufficient training in climate change education, as their graduate studies likely focused more on expanding subject knowledge than on teaching complex topics like climate change. These findings align with Alan Reid's (2019) research, which highlights the multifaceted challenges in climate change education. The study underscores the importance of ongoing professional development, specialized training, and collaboration with climate scientists to address these challenges, ensuring teachers are well-equipped to deliver effective climate change education.

Table 6

Teachers' level of difficulties in Climate Change Education in the area of content knowledge and pedagogy when grouped according to length of service

Items	Shorter		Longer	
	Mean	Interpretation	Mean	Interpretation
<i>As a teacher, I am having difficulties in....</i>				
1. Understanding fundamental concepts and principles of climate change.	3.82	High level	3.66	High level
2. Translating complex climate change ideas into age-appropriate content for my learners.	3.57	High level	4.0	High level
3. Accessing reliable and up-to-date resources on climate change for my classroom instruction.	3.64	High level	3.86	High level
4. Integrating climate change topics into the curriculum.	3.71	High level	3.91	High level
5. Incorporating climate change topics into different subject areas.	3.53	High level	3.86	High level
6. Addressing common misconceptions effectively related to climate change.	3.5	High level	3.91	High level
7. Making climate change education relevant and engaging for my learners.	3.64	High level	3.83	High level
8. Bridging the gap between local, regional, and global climate change issues.	3.53	High level	3.94	High level
9. Managing the potential emotional distress or anxieties that climate change education may evoke in my learners.	3.71	High level	3.88	High level
10. Acquiring adequate training or professional development in climate change education.	3.32	Moderate level	3.88	High level
Mean	3.6	High level	3.87	High level

The study explored teachers' difficulties in climate change education based on their length of service. Teachers with shorter service histories had an overall mean of 3.6, indicating high-level difficulty. Their greatest challenge was understanding the fundamental concepts of climate change (mean: 3.82), while the least challenging was acquiring adequate training (mean: 3.32). Teachers with limited training and experience may struggle to grasp climate science's complexities, and the lack of specific resources and instructional support further compounds their difficulties. Without continuous professional development, they may face challenges in effectively communicating this critical subject to students.

Teachers with longer service reported a slightly higher overall mean of 3.87, still indicating high-level difficulty. Their biggest challenge was translating complex climate change ideas into age-appropriate content (mean: 4.0), while understanding the fundamental concepts remained difficult (mean: 3.66). Experienced teachers, accustomed to existing lesson plans and teaching methods, may find it challenging to adapt to evolving subjects like climate change. Furthermore, adapting pedagogical strategies to engage students of various ages requires additional training and time, which may not fit into their current workloads. These findings align with Molly Trendell Nation's (2017) research, which highlights the importance of teacher preparation and ongoing professional development. Nation emphasizes the need for supportive school environments and resources to address the challenges faced by both novice and experienced educators in teaching climate change.

Table 7

Teachers' level of difficulties in Climate Change Education in the area of teaching environment when grouped according to Age

Items	Younger		Older	
	Mean	Interpretation	Mean	Interpretation
<i>As a teacher, I am having difficulties in....</i>				
1. Applying environmental principles in my classroom (e.g., waste segregation).	3.77	High level	4.18	High level
2. Adapting climate change education to different learning environments (e.g., virtual, outdoor).	3.48	Moderate level	4.10	High level
3. Collaborating with other teachers in climate change education.	3.59	High level	4.13	High level
4. class size or overcrowded classrooms that impact climate change education.	3.59	High level	4.08	High level

5. creating a safe and inclusive classroom environment for discussing diverse perspectives on climate change?	3.62	High level	4.0	High level
6. engaging students from different socio-cultural backgrounds in climate change discussions.	3.81	High level	4.10	High level
7. Designing an interactive and engaging classroom on climate change, given limited resources.	3.74	High level	4.08	High level
8. Teaching climate change education in my class because of interruptions and disruptions.	3.59	High level	4.16	High level
9. Recommending the availability of time or class periods to teach about climate change in depth.	3.66	High level	4.13	High level
10. Administering my class in climate change education in a well-ventilated classroom.	3.40	Moderate level	4.08	High level
Mean	3.62	High level	4.10	High level

The study also examined teachers' difficulties in climate change education within the teaching environment, grouped by age. Younger teachers had a total mean of 3.62, indicating high-level difficulty. They faced the greatest challenge in engaging students from different socio-cultural backgrounds in climate change discussions (mean: 3.81) and the least difficulty in administering the class in a well-ventilated classroom (mean: 3.40). The lack of life experience and training in culturally responsive teaching can make it difficult for younger teachers to connect with students from diverse backgrounds, potentially leading to educational gaps.

Older teachers reported a total mean of 4.10, also indicating high-level difficulty. They struggled with applying environmental principles in the classroom (mean: 4.18) and creating a safe and inclusive environment for discussing diverse perspectives on climate change (mean: 4.0). Older teachers may find it challenging to integrate modern sustainability practices, such as waste segregation, into their teaching due to outdated methods or lack of familiarity with current technologies. These findings align with Vincenzo Bollettino's (2020) research, which highlights the low levels of climate change knowledge among Filipinos, posing challenges for teachers in climate change education. To address these issues, ongoing professional development is crucial, helping both younger and older teachers develop the knowledge and skills necessary to create inclusive, effective climate change education.

Table 8

Teachers' level of difficulties in Climate Change Education in the area of teaching environment when grouped according to highest educational attainment

Items	Lower		Higher	
	Mean	Interpretation	Mean	Interpretation
<i>As a teacher, I am having difficulties in....</i>				
1. Applying environmental principles in my classroom (e.g., waste segregation).	4	High level	4.07	High level
2. Adapting climate change education to different learning environments (e.g., virtual, outdoor).	3.76	High level	4.14	High level
3. Collaborating with other teachers in climate change education.	3.86	High level	4.07	High level
4. class size or overcrowded classrooms that impact climate change education.	3.82	High level	4.07	High level
5. creating a safe and inclusive classroom environment for discussing diverse perspectives on climate change	3.8	High level	4	High level
6. engaging students from different socio-cultural backgrounds in climate change discussions.	3.94	High level	4.14	High level
7. Designing an interactive and engaging classroom on climate change, given limited resources.	3.92	High level	4	High level
8. Teaching climate change education in my class because of interruptions and disruptions.	3.88	High level	4.07	High level
9. Recommending the availability of time or class periods to teach about climate change in depth.	3.88	High level	4.14	High level
10. Administering my class in climate change education in a well-ventilated classroom.	3.72	High level	4.07	High level
Mean	3.85	High level	4.07	High level

Table 8 highlights the difficulties teachers face in climate change education based on their highest educational attainment. Teachers with Bachelor's degrees reported a total mean of 3.85, indicating high-level difficulty. They

struggled most with applying environmental principles in the classroom (mean: 4.0) and least with administering classes in a well-ventilated classroom (mean: 3.72). The lack of advanced training and exposure to diverse teaching strategies during undergraduate studies makes it challenging for these teachers to integrate environmental concepts effectively into their classroom settings. Without specialized knowledge and professional development, they may find it difficult to incorporate these principles across various teaching interactions.

Teachers with Master's or Doctoral degrees had a slightly higher total mean of 4.07, still indicating high-level difficulty. They faced challenges in adapting climate change education to different learning environments (mean: 4.14), engaging students from diverse socio-cultural backgrounds (mean: 4.14), and recommending sufficient time for in-depth climate change instruction (mean: 4.14). Although these educators have advanced degrees, they still struggle with engaging students from varied backgrounds and adjusting lessons to limited resources and time constraints. These findings align with Reyes et al. (2021), which highlights the psychological toll of climate change, influencing teachers' ability to teach effectively. Teachers with higher educational attainment, who are expected to adapt teaching methods and address diverse learning needs, may also experience stress and burnout, affecting their ability to create supportive learning environments.

Table 9

Teachers' level of difficulties in Climate Change Education in the area of teaching environment when grouped according to length of service

Items	Shorter Mean	Interpretatio n	Longer Mea n	Interpretatio n
<i>As a teacher, I am having difficulties in...</i>				
1. Applying environmental principles in my classroom (e.g., waste segregation).	3.78	High level	4.19	High level
2. Adapting climate change education to different learning environments (e.g., virtual, outdoor).	3.46	Moderate level	4.13	High level
3. Collaborating with other teachers in climate change education.	3.53	High level	4.19	High level
4. class size or overcrowded classrooms that impact climate change education.	3.53	High level	4.13	High level
5. creating a safe and inclusive classroom environment for discussing diverse perspectives on climate change	3.60	High level	4.02	High level
6. engaging students from different socio-cultural backgrounds in climate change discussions.	3.75	High level	4.16	High level
7. Designing an interactive and engaging classroom on climate change, given limited resources.	3.64	High level	4.16	High level
8. Teaching climate change education in my class because of interruptions and disruptions.	3.57	High level	4.19	High level
9. Recommending the availability of time or class periods to teach about climate change in depth.	3.64	High level	4.16	High level
10. Administering my class in climate change education in a well-ventilated classroom.	3.39	Moderate level	4.11	High level
Mean	3.59	High level	4.15	High level

Table 9 examines teachers' difficulties in climate change education based on their length of service. Teachers with less than 10 years of experience had a total mean of 3.59, indicating high-level difficulty. Their greatest challenge was applying environmental principles in the classroom (mean: 3.78), while the least challenging was administering the class in a well-ventilated classroom (mean: 3.39). Early-career teachers often have limited exposure to environmental education during their training, making it difficult to integrate sustainable practices into their classrooms. Additionally, they may face logistical obstacles, such as managing classroom supplies or organizing trash disposal systems.

Teachers with more than 10 years of experience reported a total mean of 4.15, also indicating high-level difficulty. Their challenges included applying environmental principles in the classroom (mean: 4.19), collaborating with other teachers (mean: 4.19), and managing class disruptions during climate change education (mean: 4.19). While experienced teachers ensure a safe and inclusive classroom, they still struggle with implementing environmental concepts, promoting collaboration, and addressing classroom disruptions. These findings align with Li-Ching Ho's (2017) study, which highlights the challenges of interdisciplinary climate change education, particularly the need for teachers to be well-versed in multiple disciplines. Younger teachers may lack the experience and training to integrate

climate change into their curriculum, while older teachers may face difficulties in collaboration and managing a crowded curriculum with frequent interruptions.

Table 10

Teachers' level of difficulties in Climate Change Education in the area of instructional resources when grouped according to Age

Items	Younger Mean	Interpretatio n	Older Mean	Interpretatio n
<i>As a teacher, I am having difficulties in...</i>				
1. Accessing an adequate range of instructional resources to teach about climate change.	3.59	High level	3.86	High level
2. Finding up-to-date and scientifically accurate resources on climate change.	3.62	High level	3.89	High level
3. Discovering age-appropriate instructional materials on climate change for your learners.	3.70	High level	4.05	High level
4. Obtaining various multimedia resources (such as videos, infographics, or simulations) to engage students in climate change education.	3.62	High level	4.16	High level
5. Gathering resources that address the local or regional context of climate change.	3.59	High level	4.02	High level
6. Collecting online resources due to technological constraints or unreliable internet connectivity.	3.62	High level	3.91	High level
7. Acquiring resources that align with their students' diverse learning styles and abilities.	3.70	High level	4.08	High level
8. Gaining access to resources that reflect the latest advancements and emerging research in climate change science and solutions.	3.62	High level	4	High level
9. Finding resources that help students connect climate change education to real-world actions and environmental stewardship.	3.70	High level	4.13	High level
10. Getting resources that guide incorporating climate change education across various subject areas.	3.70	High level	4.02	High level
Mean	3.65	High level	4.01	High level

Table 10 examines teachers' difficulties in climate change education based on instructional resources, grouped by age. Younger teachers reported a total mean of 3.65, indicating high-level difficulty. Their greatest challenges included accessing adequate instructional resources (mean: 3.59) and finding age-appropriate materials that align with students' learning styles and real-world applications (mean: 3.62). These teachers often struggle to find suitable materials that speak to their students' needs, as well as resources that integrate climate change education across various subjects. The complexity of addressing diverse learning styles and abilities while making climate change education practical and relevant can overwhelm young teachers, especially when they lack experience in sourcing innovative instructional materials.

Older teachers reported a higher total mean of 4.01, also indicating high-level difficulty. They faced similar challenges, including difficulty accessing a range of instructional resources (mean: 3.86) and acquiring multimedia resources like videos, infographics, or simulations (mean: 4.16) to engage students. While older teachers have extensive knowledge, they often struggle to keep up with the latest multimedia resources due to technological limitations, limited budgets, or lack of training in digital tools. These findings align with Flora et al. (2014), which emphasizes the importance of engaging, multi-sensory educational approaches to enhance climate change education. For both young and older teachers, providing access to diverse and dynamic resources, along with ongoing professional development, is essential to improving climate change education by creating interactive and engaging learning experiences.

Table 11

Teachers' level of difficulties in Climate Change Education in the area of instructional resources when grouped according to highest educational attainment

Items	Lower Mean	Interpretatio n	Higher Mean	Interpretatio n
<i>As a teacher, I am having difficulties in...</i>				

1. Accessing an adequate range of instructional resources to teach about climate change.	3.64	High level	4.14	High level
2. Finding up-to-date and scientifically accurate resources on climate change.	3.68	High level	4.14	High level
3. Discovering age-appropriate instructional materials on climate change for your learners.	3.84	High level	4.14	High level
4. Obtaining various multimedia resources (such as videos, infographics, or simulations) to engage students in climate change education.	3.8	High level	4.42	High level
5. Gathering resources that address the local or regional context of climate change.	3.76	High level	4.14	High level
6. Collecting online resources due to technological constraints or unreliable internet connectivity.	3.72	High level	4.07	High level
7. Acquiring resources that align with their students' diverse learning styles and abilities.	3.84	High level	4.21	High level
8. Gaining access to resources that reflect the latest advancements and emerging research in climate change science and solutions.	3.72	High level	4.28	High level
9. Finding resources that help students connect climate change education to real-world actions and environmental stewardship.	3.86	High level	4.28	High level
10. Getting resources that guide incorporating climate change education across various subject areas.	3.82	High level	4.14	High level
Mean	3.76	High level	4.2	High level

Table 11 outlines teachers' difficulties in climate change education based on their highest educational attainment. Teachers with Bachelor's degrees reported a total mean of 3.76, indicating high-level difficulty. They struggled most with accessing a range of instructional resources (mean: 3.64) and finding resources that connect climate change education to real-world actions (mean: 3.86). These teachers often find it challenging to bridge the gap between theory and practice, as they lack specific training in environmental education. This makes it difficult for them to identify appropriate resources that empower students to take meaningful action on climate change.

Teachers with Master's or Doctoral degrees had a higher total mean of 4.2, also indicating high-level difficulty. Their greatest challenges were collecting online resources due to technological issues (mean: 4.07) and obtaining multimedia resources like videos and simulations (mean: 4.42). Despite their advanced qualifications, these teachers struggle to keep up with evolving multimedia resources due to funding limitations and lack of access to cutting-edge educational tools. These findings align with Jose Eos Trinidad's (2020) research, which emphasizes the importance of providing teachers with adequate resources to effectively teach climate change. For both groups, addressing these resource gaps through better access to multimedia, hands-on activities, and professional development can enhance climate change education.

Table 12

Teachers' level of difficulties in Climate Change Education in the area of instructional resources when grouped according to length of service

Items	Shorter Mean	Interpretatio n	Longer Mea n	Interpretation
<i>As a teacher, I am having difficulties in....</i>				
1. Accessing an adequate range of instructional resources to teach about climate change.	3.64	High level	3.83	High level
2. Finding up-to-date and scientifically accurate resources on climate change.	3.67	High level	3.86	High level
3. Discovering age-appropriate instructional materials on climate change for your learners.	3.71	High level	4.05	High level
4. Obtaining various multimedia resources (such as videos, infographics, or simulations) to engage students in climate change education.	3.71	High level	4.11	High level
5. Gathering resources that address the local or regional context of climate change.	3.64	High level	4	High level
6. Collecting online resources due to technological constraints or unreliable internet connectivity.	3.67	High level	3.88	High level
7. Acquiring resources that align with their students' diverse learning styles and abilities.	3.71	High level	4.08	High level

8. Gaining access to resources that reflect the latest advancements and emerging research in climate change science and solutions.	3.57	High level	4.05	High level
9. Finding resources that help students connect climate change education to real-world actions and environmental stewardship.	3.75	High level	4.11	High level
10. Getting resources that guide incorporating climate change education across various subject areas.	3.75	High level	4	High level
Mean	3.68	High level	4	High level

Table 12 highlights teachers' difficulties in climate change education based on their length of service. Teachers with fewer than 10 years of experience reported a total mean of 3.68, indicating high-level difficulty. They faced challenges in accessing instructional resources (mean: 3.64) and gathering resources relevant to the local context (mean: 3.64). Their biggest difficulties were finding resources that connect climate change education to real-world actions (mean: 3.75) and integrating climate change across various subjects (mean: 3.75). Early-career teachers, though passionate, often struggle to find materials that are both educational and practical, and to effectively integrate them into a cross-curricular framework. This lack of resources can leave them overwhelmed and unsure of how to teach climate change effectively.

For teachers with over 10 years of experience, the total mean was 4.0, also interpreted as high-level difficulty. These teachers faced difficulties accessing instructional resources (mean: 3.83) and obtaining multimedia resources (mean: 4.11), such as videos, simulations, and infographics, to engage students in climate change education. Even experienced teachers struggle to keep up with the evolving resources needed to effectively engage students and connect climate change education to real-world actions. These findings align with Mageswary Karpudewan's (2014) research on active, student-centered learning. Both younger and older teachers face challenges in accessing and utilizing resources, but by incorporating active learning strategies and providing ongoing professional development, teachers can improve their climate change education and create meaningful learning experiences.

Table 13

Differences in the Teachers' level of difficulties in Climate Change Education in the area of content knowledge and pedagogy When Grouped and Compared According to the Aforementioned Variables

Variable	Category	N	Mean Rank	Mann Whitney U-Test	p-value	Sig. level	Interpretation
Age	Younger	27	26.91	348.500	0.040		Significant
	Older	37	36.58				
Highest Educational Attainment	Lower	50	31.27	288.500	0.317	0.05	Not Significant
	Higher	14	36.89				
Length of Service	Shorter	28	28.77	399.500	0.157		Not Significant
	Longer	36	35.40				

The study aimed to determine if there are significant differences in teachers' difficulties in climate change education based on variables such as age, highest educational attainment, and length of service. According to the results shown in Table 13, there was a significant difference based on age, with younger teachers having a mean rank of 26.91 and older teachers having a mean rank of 36.58. The Mann Whitney U test produced a p-value of 0.040, indicating statistical significance at the 0.05 level, thus rejecting the null hypothesis. However, no significant difference was found based on highest educational attainment (p-value = 0.317) or length of service (p-value = 0.157), both of which had p-values greater than 0.05, meaning the null hypotheses for these variables were accepted.

The significant difference based on age suggests that younger teachers may have a more current understanding of climate change content and pedagogy, while older teachers might face difficulties due to outdated knowledge or less exposure to climate change education during their training. This aligns with Trendell Nation & Feldman's (2021) study, which highlights the challenges older teachers may face in teaching climate change due to knowledge gaps from earlier educational programs and evolving political contexts. Regardless of age, it is crucial for schools to provide professional development and resources to help teachers effectively teach climate change, ensuring that all educators are equipped with the knowledge and tools to address this critical global issue.

Conclusions

The study found that most teachers were older adults with lower educational attainment but extensive experience, suggesting that long-serving teachers often haven't pursued post-graduate studies. While these teachers contribute to the stability of the educational system, they face challenges in climate change education due to pressures from standardized testing and limited professional development opportunities. Both teachers with bachelor's and post-graduate degrees reported high levels of difficulty in key areas, with post-graduate teachers focusing on core lessons, limiting their ability to integrate climate change education due to increased workloads. The study also revealed that both novice and veteran teachers struggled to integrate climate change education, with age being a significant factor, as older teachers faced more challenges in content knowledge, pedagogy, and the teaching environment. The study recommends allocating resources and providing comprehensive training, especially for teachers with lower educational attainment, through targeted programs developed by the Curriculum Implementation Division. It also suggests that DRRM Coordinators organize Learning Action Cell (LAC) sessions to address challenges, school heads support teachers in creating effective learning environments, and teachers engage in continuous professional development to improve their knowledge, teaching methods, and integration of climate change education.

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