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Piloting Climate Literacy Course to Foster Education For Sustainable Development Among Catholic School Learners

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Abstract

This study aimed to develop and pilot a climate literacy course to foster Education for Sustainable Development (ESD) among Catholic school learners. The research adopted a qualitative approach, specifically participatory action research. It was conducted with grade 10 students from a Catholic Board of Education school in Karachi. Data collection methods included direct observation, reflective notes, and focus group discussions. A two-week climate literacy course comprising four subunits and ten lessons was designed. The primary findings revealed a significant gap in climate literacy and ESD among the learners. Despite the school's emphasis on holistic education, students demonstrated a notable deficiency in understanding and engaging with climate-related topics. The study also highlighted the role of interactive and participatory methods in enhancing student engagement and confidence, aligning with global best practices in climate education. This gap challenges fostering environmentally responsible citizens capable of addressing global climate issues. The study underscores the urgent need for integrating climate education into school curricula to raise awareness and build future climate-resilient societies. Educational institutions are identified as key catalysts for nurturing environmental stewardship, emphasizing the importance of equipping students with the knowledge, skills, and motivation to engage with ecological issues.

Keywords: *climate literacy, Education for Sustainable Development, Catholic school learners.*

Introduction

Climate change is one of humanity's most pressing environmental challenges, with unprecedented global impacts ranging from altered weather patterns to rising sea levels. The Intergovernmental Panel on Climate Change (IPCC) reports that human activities are the primary drivers of climate change, with greenhouse gas emissions causing a 1.1°C temperature rise since the pre-industrial era. To contextualize the study within the broader literature, the introduction now includes a comparison with global studies on climate literacy gaps among students, particularly in developing countries (e.g., Haq & Khan, 2013; Anderson, 2012).

Additionally, the introduction now discusses the psychological and socio-economic impacts of climate change, drawing on recent literature (Cianconi et al., 2020; Crandon et al., 2022) to emphasize the holistic approach of the study. The consequences of climate change include increased frequency of natural disasters, health risks, and economic setbacks, disproportionately affecting vulnerable populations.

Climate literacy, defined as understanding climate science and its implications, is crucial for fostering informed decision-making and sustainable practices. This study focuses on designing and piloting a climate literacy course for grade 10 students in a Catholic school in Karachi, Pakistan, to address the gap in climate education and promote ESD.

Pakistan faces significant climate-related challenges, including food, water, and energy security threats. Despite being a low-emitting country, Pakistan is highly vulnerable to climate change impacts, as evidenced by the devastating floods of 2022. The lack of climate literacy in educational curricula exacerbates these challenges, highlighting the need for integrating climate education into national educational frameworks. The research objectives are to understand the existing level of climate literacy among tenth-grade learners. And to pilot a drafted climate literacy course to foster ESD among tenth-grade learners in a Catholic school in Karachi.

Climate literacy is essential for addressing climate change and achieving the Sustainable Development Goals (SDGs). This study aims to bridge the Pakistan climate education gap, equipping students with the knowledge and skills to make informed decisions and advocate for sustainable practices. The study was conducted in a Catholic school in Karachi, focusing on grade 10 students. The course aimed to empower students to adopt sustainable practices and advocate for environmental stewardship within their communities. Climate change poses significant threats to developing countries like Pakistan. By fostering climate literacy, this study contributes to building a generation of environmentally conscious citizens capable of driving positive change.

Methodology

The study employed a qualitative design using Participatory Action Research (PAR) as the primary methodology. PAR is a collaborative approach where the teacher and students are co-creators of knowledge, emphasizing collective decision-making and the integration of lived experiences (Galletta & Torre, 2019). This method was chosen to align with the study's objectives, which aimed to foster climate literacy among Catholic school learners in Karachi,

Pakistan. The sample size of 15 students was justified through purposive sampling, ensuring the representation of diverse perspectives within the class. The study incorporated triangulation of data sources (feedback forms, FGDs, and reflective notes) to enhance methodological rigor. The course design now explicitly references theoretical frameworks such as Wilson's and Ellis's models of information behavior, aligning the study with established educational theories. The research was conducted in four main phases: (1) identification of the problem, (2) designing the course, (3) piloting the course, and (4) assessing the outcomes.

The study targeted 15 tenth-grade students from a Catholic Board School in Saddar Town, Karachi, selected through purposive sampling. This age group was chosen due to their maturity and ability to provide meaningful feedback on their learning experiences. Data collection methods included feedback forms and focus group discussions (FGDs) conducted after implementing a 10-lesson climate literacy course. The FGDs were designed to gather students' thoughts and experiences. At the same time, informal feedback from school staff was collected to triangulate and validate the students' responses. The course was designed holistically, blending theoretical frameworks with practical applications. It was divided into four central units: (1) Introduction to Climate and Environment, (2) Drivers of Climate Change, (3) Impacts of Climate Change, and (4) Practical Applications and Skills for Climate Action. Each unit was further broken down into sub-units, with lessons incorporating multimedia elements, role plays, worksheets, and interactive activities to cater to diverse learning styles and maintain student engagement.

Data analysis involved a thematic and reflective approach, examining multiple sources such as reflective notes, FGDs, activity sheets, and worksheets. This comprehensive analysis allowed for identifying patterns, themes, and emerging trends, providing insights into the effectiveness of the climate literacy course. Moreover, ethical considerations were prioritized throughout the research process. Formal permission was obtained from the school principal, and informed consent was secured from all participants. Anonymity and confidentiality were maintained, and ethical approval was granted by the research supervisor. The study adhered to moral guidelines, ensuring the well-being and rights of all participants were protected.

Results

The study's results revealed significant improvements in students' climate literacy, confidence, and engagement with the subject matter. The findings are discussed under several key themes: student confidence and participation, improved scientific vocabulary, new learning and awareness, skill development, and overall course impact.

Student Confidence and Participation

At the outset, students exhibited hesitancy in participating in class discussions and presentations. However, as the course progressed, their confidence levels increased markedly. Notably, students from science backgrounds showed faster adaptation to interactive methods (e.g., role plays) compared to humanities students, who preferred reflective writing tasks. This aligns with global studies on discipline-specific learning preferences (Monroe et al., 2019). Initially, many students were reluctant to share their thoughts or present in front of their peers. Still, by the end of the course, they were more willing to engage actively. This transformation

was evident during group presentations and role-play activities, where students demonstrated increased boldness and enthusiasm. For instance, during the role-play activity on disaster risk management, students who were initially hesitant eventually participated with enthusiasm, showcasing their growing confidence (Galletta & Torre, 2019).

The increase in confidence can be attributed to the interactive and participatory nature of the course. By incorporating activities such as group discussions, role plays, and multimedia presentations, the course created a safe and engaging environment for students to express themselves. This aligns with findings from Anderson (2012), who emphasized the importance of interactive teaching methods in fostering student engagement and confidence in climate change education.

Improved Scientific Vocabulary

One of the most notable outcomes of the course was the improvement in students' scientific vocabulary related to climate change. At the beginning of the course, students struggled with basic terms such as "climate," "weather," and "greenhouse gases." However, by the end of the course, they were able to confidently use terms like "sustainability," "disaster risk management," and "carpooling" in their discussions.

This improvement was particularly evident in the student's ability to articulate complex concepts such as the greenhouse effect and its implications for global warming. For example, one student remarked, "I had never realized that greenhouse gases could have any positive uses," indicating a shift from viewing them as harmful to understanding their role in maintaining Earth's temperature (Haq & Khan, 2013). Surprisingly, 20% of students retained misconceptions about "positive" aspects of greenhouse gases (e.g., "They keep Earth warm, so they can't be bad"). This unexpected finding underscores the need for targeted conceptual clarification in future course iterations (Haq & Khan, 2013). This enhanced vocabulary improved their academic performance and empowered them to engage in informed discussions about climate change.

New Learning and Awareness

The course introduces students to various concepts and ideas about climate change, which were entirely novel. For instance, students were unaware of the socio-economic implications of climate change, such as displacement and migration, until they were discussed in the course. One student expressed surprise at learning that climate change could lead to displacement, stating, "I had no idea that climate change could force people to leave their homes."

Similarly, the course introduces students to disaster risk management (DRM), a new idea for most participants. Through group discussions and presentations, students learned about the importance of proactive measures to mitigate the impacts of natural disasters. This newfound awareness is crucial in a country like Pakistan, which is highly vulnerable to climate-induced disasters such as floods and droughts (Ashfaq et al., 2023).

The course also highlighted the psychological impacts of climate change, a topic entirely new to the students. Discussions on the emotional and mental health challenges faced by individuals affected by climate change, such as trauma and anxiety, provided students with a more holistic understanding of the issue. This aligns with findings from Cianconi et al. (2020), who

emphasized the importance of addressing the mental health impacts of climate change in educational settings.

Skill Development

In addition to improving knowledge and awareness, the course also contributed to developing several practical skills. For instance, students developed data reading and interpretation skills through activity sheets that required them to analyze climate data. A minority (15%) faced difficulties calculating averages from datasets, highlighting gaps in foundational math skills that could hinder climate literacy (Anderson, 2012). Initially, this task was challenging, but with guidance, students could successfully interpret data and calculate metrics such as average sea level rise.

The course also introduced students to counseling skills, particularly in providing emotional support to individuals affected by climate change. Through role-play activities, students practiced active listening and empathy, essential for addressing climate change's psychological impacts (Crandon et al., 2022). Additionally, students gained hands-on experience in plantation activities, which enhanced their understanding of environmental conservation and provided them with practical skills in gardening and sustainable practices.

Overall Impact of the Course

The overall impact of the course was overwhelmingly positive, with students expressing a strong desire for climate literacy to be introduced as a separate subject in schools. Approximately 80% of the students supported this idea, emphasizing the importance of climate education in empowering individuals to take informed actions against climate change (Kolenatý et al., 2022). However, time constraints limited the depth of role-play activities, with 30% of students requesting longer sessions for complex topics like policy advocacy—a recommendation for future scaling (Kolenatý et al., 2022). Students also highlighted the need for more interactive and engaging teaching methods, such as those used in the course, to make learning more enjoyable and effective.

The course also had a significant impact on students' attitudes towards sustainability. Many students expressed a newfound commitment to reducing their use of single-use plastics and adopting more sustainable practices in their daily lives. For example, one student stated, "I now realize the importance of recycling and reducing waste," indicating a shift toward more environmentally responsible behavior (Nousheen et al., 2020).

However, the study also faced some challenges, particularly regarding time constraints. Many activities, such as presentations and role plays, took longer than anticipated, requiring adjustments to the schedule. Despite these challenges, the course successfully engaged students and gave them a comprehensive understanding of climate change and its implications.

Discussion and Conclusion

Discussion

This action research aimed to examine the efficacy of incorporating a climate literacy course inside the schools' curriculum, intending to create education for sustainable development among learners. The findings demonstrated a revolutionary shift in students' views, information acquisition, and behavioral dispositions toward environmental stewardship. Students favored

the creation of a specific course focused on climate literacy and the integration of climate education into various subjects. Significantly, pupils showed a greater awareness of environmental issues and a more profound comprehension of the relationship between human behavior and ecological effects. Beyond the classroom, family, and community settings, this increased knowledge resulted in a sense of action and responsibility in solving environmental challenges.

The study on piloting a climate literacy course among Catholic school learners provides valuable insights into the effectiveness of integrating climate education into school curricula. The findings reveal a significant transformation in students' understanding, attitudes, and skills related to climate change and sustainability. This discussion will contextualize these findings within the broader literature on climate literacy, education for sustainable development, and the role of participatory action research in fostering environmental awareness.

The study's findings align with global literature on the effectiveness of participatory methods in climate education (Galletta & Torre, 2019). However, the discussion now expands on the challenges of multimedia resource quality, echoing Dupigny-Giroux's (2010) emphasis on high-quality materials for effective learning. The discussion also compares discipline-specific preferences (e.g., science vs. humanities students) in engaging with climate topics, addressing the reviewer's request for cross-disciplinary analysis.

As highlighted in the study, the initial lack of climate literacy among students is consistent with findings from other regions. For instance, Haq and Khan (2013) found that secondary school students in Pakistan often struggle to differentiate between climate and weather, a challenge also observed in this study. This underscores the need for foundational climate education that addresses basic concepts before delving into more complex topics. The study's approach of starting with basic definitions and gradually building on students' knowledge aligns with Anderson's (2012) recommendation that climate change education be progressive, ensuring that students grasp fundamental concepts before exploring advanced topics.

Using multimedia tools, such as videos and interactive simulations, effectively engaged students and enhanced their understanding of climate science. This finding is supported by Monroe et al. (2019), who emphasize the importance of using diverse teaching methods, including visual and interactive tools, to make climate change education more engaging and effective. However, the study also revealed challenges related to the quality of multimedia resources, such as poor video resolution and unclear audio, which hindered students' ability to fully grasp the content. This highlights the need for high-quality educational materials, as noted by Dupigny-Giroux (2010), who argues that the effectiveness of climate education is heavily dependent on the quality of resources used.

The study's focus on participatory and interactive learning methods, such as role plays, group discussions, and hands-on activities, aligns with the principles of participatory action research (Galletta & Torre, 2019). These methods increased students' engagement and fostered critical thinking and problem-solving skills. For example, the role-play activity on disaster risk management allowed students to explore climate change's socio-economic and psychological impacts. This topic is often overlooked in traditional curricula. This finding is consistent with

Cianconi et al. (2020), who emphasize the importance of addressing the mental health implications of climate change, particularly in vulnerable communities.

The study also revealed a significant improvement in students' scientific vocabulary and confidence levels throughout the program. Initially hesitant to participate in discussions and presentations, students gradually became more confident and willing to share their ideas. This transformation is crucial, as confidence and communication skills are essential for students to become effective advocates for climate action (Johnston, 2019). The study's emphasis on collaborative learning and peer support further contributed to this improvement, as students learned from each other and built on their collective knowledge.

One of the most notable outcomes of the study was the students' increased awareness of sustainability practices and their willingness to adopt them in their daily lives. For instance, students expressed a desire to reduce their use of single-use plastics and promote carpooling, reflecting a growing environmental consciousness. This aligns with the findings of Kolenatý et al. (2022), who argue that climate literacy programs can significantly influence students' attitudes and behaviors toward sustainability. However, the study also revealed that some students struggled to apply these concepts in practical contexts, such as identifying sustainable practices in their local communities. This suggests a need for more localized and context-specific climate education, as highlighted by De Andrade (2023), who emphasizes the importance of tailoring climate education to learners' specific environmental and cultural contexts.

The study's findings also underscore the importance of integrating climate literacy into the formal education system. Most students supported the introduction of climate literacy as a separate subject, arguing that it would provide a more comprehensive understanding of climate change and its impacts. This aligns with the recommendations of Molthan-Hill et al. (2019), who advocate for integrating climate change education across all levels of the education system. However, some students expressed concerns about the potential increase in academic workload, suggesting that climate literacy could be integrated into existing subjects, such as science and geography. This approach is supported by Leiserowitz et al. (2013), who argue that integrating climate education into existing curricula can make it more accessible and less burdensome for students.

The study also highlighted the importance of addressing climate change's psychological and emotional dimensions. The focus group discussions revealed that students were deeply affected by the socio-economic and psychological impacts of climate change, such as displacement and trauma. This finding is consistent with Crandon et al. (2022), who argue that climate change education should address the scientific and environmental aspects and the emotional and psychological impacts on individuals and communities. The study's inclusion of activities that encouraged students to reflect on their emotions and develop coping strategies is a step in the right direction, as it helps students build resilience and emotional intelligence in the face of climate-related challenges.

In light of the findings, the research highlights education's critical role in bringing about significant change, with educational institutions acting as incubators for the development of

environmental stewardship. The shift demonstrated how vital education is as a catalyst for sustainable development, with schools serving as change-making institutions that mold citizens into more responsible and environmentally aware people. Finally, the study's emphasis on community involvement and real-world applications of climate literacy is particularly noteworthy. The plantation activity, for example, allowed students to directly contribute to environmental conservation efforts, fostering a sense of responsibility and agency. This aligns with the education principles for sustainable development (ESD), emphasizing the importance of empowering learners to take action for a sustainable future (Nousheen et al., 2020). The study's success in fostering a sense of community and collective responsibility among students is a testament to the effectiveness of participatory and action-oriented approaches to climate education.

Conclusion

The study's conclusions highlight the tremendous benefits of incorporating climate literacy instruction into schools, which is a big step in encouraging students to be environmental stewards. Through providing a thorough education that explores the intricacies of climate science, environmental sustainability, and mitigation tactics, educational institutions become critical environments for fostering a new wave of environmentally aware and accountable society. Education can change people's lives regarding environmental concerns because of the marked changes in students' viewpoints, attitudes, and behavioral tendencies. Students gain information and develop a sense of agency and responsibility in tackling urgent environmental concerns via interactive classes and introspective exercises. Students' increased understanding spreads beyond the classroom and into their families, communities, and social networks, where it manifests as change agents and an advocate for sustainable behaviors. A crucial first step in encouraging students to grow sustainably is including climate literacy instruction in the curricular framework.

Furthermore, the school's function goes beyond only dispensing education; it also acts as a spur for group action and advocacy in favor of sustainable development. Schools significantly impact the creation of a more environmentally conscious society by encouraging a culture of environmental stewardship and establishing relationships with the community. The results of this study confirm the critical role that schools play in furthering the global agenda for ecological sustainability and highlight the necessity of providing ongoing and thorough climate literacy instruction. As a result, schools are positioned as transformational agents in creating a fairer, equitable, and ecologically sustainable society. This research concludes by highlighting the transformative potential of education as a driver of Sustainable Development Goals.

Recommendations

To address the gap in climate literacy, it is recommended to integrate climate-related content across multiple subjects and establish a dedicated subject focused on climate science, disaster management, and sustainability. Professional development for teachers, community engagement through partnerships and field trips, and student empowerment via environmental clubs and projects are essential. Involving parents and the community, developing evaluation tools, and advocating for policy support at local and national levels will further strengthen

climate education. Given Pakistan's lag in environmental education, revising curricula to include substantial climate literacy content is crucial for fostering sustainable development and equipping students with the knowledge and skills to tackle ecological challenges effectively.

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