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Integration of Climate Change Education in Primary Curriculum for Sustainable Development: A Study at Primary Level

[1]Aysha Jahangir
[2]Shanza Pervaiz
[*3]Saima Kayani
[1]M.Phil Scholar, Department of Education, University of Kotli AJ&K
[2]M.Phil Scholar, Department of Education, University of Kotli AJ&K
[*3]Lecturer, Department of Education, University of Kotli AJ&K
[*3]saima.nazakat@uokajk.edu.pk

Abstract

Climate change has become one of the most pressing global challenges, with a significant impact on environmental stability and human life. Therefore, climate education has become established as a crucial approach to equipping people with the knowledge, skills, and values needed to address environmental problems. This study investigates the degree of integration of climate education into the primary school curriculum, teachers' attitudes and preparedness, and the factors influencing its effective implementation. It also highlights the importance of integrating climate-related concepts across all subjects to foster a deeper understanding and sustainable behavior among young students. A quantitative research methodology was employed, based on a cross-sectional survey of primary school teachers in the Kotli district. A sample of 254 teachers was selected using random sampling. Data were collected using a structured questionnaire with a five-point Likert scale, validated by experts and tested in a pilot study. The reliability of the instrument was measured using Cronbach's alpha coefficient (α = 0.611). Data analysis was performed using SPSS software, focusing on descriptive statistics. The results show a generally positive perception among teachers regarding the importance and integration of climate education.Teachers demonstrated high levels of confidence when addressing climate-related topics (M = 4.29), and there was broad consensus regarding the benefits of interdisciplinary climate education (M = 4.28). However, challenges such as limited resources and a lack of professional development opportunities were identified as obstacles to effective implementation. The study concludes that, while climate education is integrated to some extent into primary school curricula and teachers demonstrate willingness and positive attitudes, there is a need to improve institutional support, expand teacher training, and optimize resource allocation. These findings provide valuable information for policymakers, curriculum developers, and educators to strengthen the implementation of climate education and promote environmentally responsible behaviors in future generations.

Keywords: Climate Change, Education, Primary Curricula

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Corresponding Authors*
Saima Kayani

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INTRODUCTION

Climate change is now one of the most serious challenges facing the world today, influencing both the environment and the way people live. In recent years, countries around the world have experienced extreme weather events—such as intense heat waves, widespread wildfires, severe droughts, and devastating floods. These events show that the effects of climate change are not only real but are also happening faster and with greater intensity than many experts had expected.Climate change is putting the Earth's natural systems under serious pressure, especially those that regulate the climate and support the rich diversity of life on our planet. According to the sixth assessment report of the Intergovernmental Panel on Climate Change (2021), the situation is becoming increasingly urgent. The report highlights that without immediate, rapid, and large-scale cuts in greenhouse gas emissions, it will be extremely difficult to keep global warming within safe limits such as 1.5°C or even 2°C. This warning emphasizes the need for quick and collective action to protect the environment and sustain life on Earth. Because of this, education has an important role in helping individuals understand these issues and learn how to respond to them responsibly. The primary school years are especially important, as young children are eager to learn and begin forming habits and values that often stay with them throughout life.

Climate Change Education (CCE) is increasingly recognized as a critical strategy for preparing individuals and communities to address complex climate challenges. Education is critical to change behavior and promote climate action. Taking this into account, CCE may be understood as "learning in the face of risk, uncertainty, and rapid change" (Stevenson et al., 2017). It aims to build understanding of and the ability to address climate change, climate injustice, and the effects of global warming on biodiversity (UNESCO and Education International, 2021). High quality CCE helps to prepare students who understand the "social and economic consequences and complexities of change" and are able to adapt to such change (McKeown & Hopkins, 2010,)CCE integrates comprehensive educational approaches across formal, non-formal, and informal learning environments, targeting understanding, awareness, and proactive engagement with climate issues at all educational levels.

The primary objective of CCE is to empower learners with essential knowledge, skills, values, and attitudes that transform them into effective agents of change within their communities and broader societal contexts. Integrating climate change education into primary classrooms means weaving environmental ideas into everyday subjects instead of teaching them as a separate topic. When students encounter these concepts in different lessons, they develop a deeper and more meaningful understanding of sustainability. This kind of approach helps children grow into responsible individuals who are more aware of their impact on the environment from an early age. Globally, nations are progressively embedding climate education into their educational frameworks, demonstrating a strategic commitment to sustainable development. Notable examples include Italy's integration of climate education into civics curriculum since the 2020/21 school year and South Korea's comprehensive implementation across all educational levels in 2007,underscoring the international recognition of CCE's pivotal role in addressing environmental challenges .

The integration of climate change into primary students' curricula is critical for cultivating comprehensive awareness and empowering future generations with essential skills to address this complex global challenge. As climate change profoundly influences multiple societal dimensions, educators must strategically prioritize its inclusion in academic programs

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OBJECTIVES

Following are the objectives of study.

1- To measure the level of integration of climate change education in primary school curricula across different subjects.
2- To measure teachers' attitudes and readiness toward embedding climate change education.
3- To identify factors influencing successful implementation of climate education

LITERATURE REVIEW

Climate education is a holistic approach that empowers students to understand climate systems while developing the skills, attitudes, and values needed to address environmental issues. Integrating climate education involves incorporating it into various subjects within the primary school curriculum, rather than teaching it as a separate topic. This interdisciplinary integration allows students to connect climate concepts to real-life situations and fosters transformative learning, where knowledge translates into responsible action. This integration is particularly important in primary school, as early childhood education shapes children's attitudes, behaviors, and long-term perspectives. The literature highlights that activity-based, inquiry-based, and experiential learning strategies are especially effective in helping young students understand climate issues and adopt sustainable practices. Furthermore, primary school students are considered potential agents of change who can influence their families and communities. However, studies also point to shortcomings, such as insufficient policy integration and unequal global representation, underscoring the need for improved curriculum design and teacher training. Overall, integrating climate change education into primary school curricula is essential to forming responsible and environmentally conscious citizens who can contribute to a sustainable future (Muccione, Ewen and Vaghefi, 2025, PLOS Climate).

The article "Integrating Climate Awareness into Curricula: Pedagogical Innovations for Indian Schools and Universities" argues that climate awareness must be integrated into education systems through a multidisciplinary, rights-based, and legally sound approach. It highlights how constitutional frameworks (such as Articles 21 and 51A(g) in India) and policy measures like the 2020 National Education Policy (NEP) and the 2023 National Curriculum Framework (NCF), while acknowledging the importance of environmental and climate education, have implemented this vision inconsistently due to a lack of enforcement mechanisms, inadequate legal frameworks, and insufficient teacher training. The article emphasizes that integrating climate awareness must move beyond mere rhetoric and include experiential, project-based, and interdisciplinary teaching strategies to cultivate climate-conscious citizens capable of addressing environmental threats and promoting sustainable development. The study situates climate education within the framework of international policies such as the UNFCCC, the Paris Agreement, and the Sustainable Development Goals (SDGs 4.7 and 13.3), thus highlighting the international commitment to strengthening climate-related learning. However, it reveals a significant gap: the lack of uniform mechanisms for legal enforcement and institutional implementation, particularly regarding national commitments to climate education and effective teacher training. This lack of mechanisms limits the concrete implementation of curriculum reforms, despite strong political rhetoric (Pillai, 2026).

The study by Saraç, Yapıcı, and Güneş (2026) implemented an eight-week climate education program based on the Understanding by Design (UbD) approach in 153 primary schools in Turkey. 1,350 teachers and 35,000 students participated. The UbD model deliberately integrates climate change concepts into lesson planning by formulating clear

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learning objectives and developing activities that contribute to their achievement. This approach ensures that climate change is not treated as an additional topic but is consciously integrated into the curriculum. The teachers evaluated the integrated program using structured questionnaires and group interviews. Their results showed that the program helped students connect climate concepts with concrete experiences a fundamental

Goal of effective integration

Climate Education The program aimed to deepen teachers' and students' engagement with climate change and promote the transfer of knowledge and skills necessary for climate action. According to teacher feedback, the program boosted their confidence in teaching climate change and improved their understanding and application of climate concepts in everyday life. The activities included context-based tasks designed to help students understand climate issues and translate this understanding into everyday behavior. This supports a broader understanding of climate education that encompasses knowledge, skills, and sustainable practices, rather than simply conveying facts. However, teachers reported difficulties such as a lack of time and resources, which sometimes hindered the implementation of planned activities. This demonstrates that even well-designed climate education initiatives can face challenges in their full implementation due to contextual barriers (Saraç, Yapıcı & Güneş, 2026). TED Education and Science

Primary Education Curricula

This article offers valuable insights into integrating climate change education into primary education curricula. By incorporating climate concepts into an explicit pedagogical framework and evaluating its large-scale implementation, the study demonstrates that climate change content can be meaningfully integrated into the primary curriculum through systematic planning and active teacher participation. Primary education is a crucial stage for developing awareness, understanding, and fundamental action skills, in line with international calls for greater consideration of climate change in early childhood education. This is particularly consistent with the recommendations of organizations such as UNESCO, which emphasizes that the primary education curriculum should include climate change and sustainable development so that students understand the impacts on their lives and communities (UNESCO, 2026).

While this study highlights the benefits of a well-designed environmental education program in primary schools, it also underscores the challenges of its implementation. Key obstacles include a lack of institutional support (e.g., limited time and resources in the classroom) and the fact that these challenges sometimes prevent teachers from fully carrying out the planned activities. This underscores the need for broader, systemic changes such as reorganizing class schedules, allocating additional resources, and strengthening teacher training to ensure effective implementation and climate education across diverse school districts. Furthermore, the study does not adequately address the long-term effects on students beyond the immediate acquisition and application of knowledge. This highlights the need for further research on behavioral change and the effects of environmental education.

METHODOLOGY

This study used a quantitative approach with a descriptive research design to examine the selected issue. Data were collected through a cross-sectional survey conducted among primary teachers of city Kotli. All the primary teachers of district Kotli (864) were considered as the population of the study. From this population, a sample was selected using convenience sampling, allowing the researcher to include both male and female students who were easily accessible. A structured questionnaire was developed as the main tool for data collection. It

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was based on a five-point Likert scale and organized into three sections to cover different aspects of the study. To ensure the validity of the instrument, it was reviewed by two experts in the field of education. In addition, a pilot study was conducted before the actual data collection to check the clarity, reliability, and usability of the questionnaire. For this purpose, 30 questionnaires were distributed among students, and their feedback helped refine the instrument. Cronbach's alpha was used to measure reliability of instrument which was .611. The response rate was 100%. Statistical Package for Social Sciences (SPSS) was used for data analysis .

RESULTS

Table 1: ***Descriptive Statistics of Integration of Climate Change and Environmental Education in Primary School Curriculum***

Statements	N	Mean	Std. Deviation
1. Teachers are encouraged to use cross-curricular activities (e.g., linking science with social studies) for climate education.	254	3.96	.774
2. Climate change concepts are integrated into science lessons.	254	3.76	.887
3. Social studies subjects include topics related to environmental awareness and climate change	254	4.10	.704
4. The curriculum provides enough content about environmental protection and sustainability.	254	3.80	1.119
5. Environmental issues such as global warming and pollution are taught in different subjects.	254	4.06	1.035

Descriptive analysis suggests that, in general, respondents value the integration of climate change and environmental education into curricula positively. The highest mean score for the consideration of these topics was obtained in the social sciences (M = 4.10), indicating strong consensus. However, the relatively high standard deviations of individual items suggest context-dependent differences in implementation. Overall, the results show a medium-to-high level of integration of environmental education, although there is still room for improvement in terms of coherence and depth.

Table 2: ***Descriptive Statistics Teachers' Perceptions and Readiness for Teaching Climate Change Education***

Statements	N	Mean	Std. Deviation
6. I believe that teaching climate change is Important at the primary school level.	254	3.93	1.280
7. I feel confident in my ability to teach climate change topics.	254	4.29	.520
8. I feel that integrating climate change into different subjects is beneficial for students	254	4.28	.615
9. I have received training or guidance on teaching climate change education	254	3.90	.955
10. Lack of resources makes it difficult for me to teach climate change effectively.	254	4.06	.878

Table 2: The results indicate a high level of confidence among respondents in their ability to teach climate change topics. The mean score of 4.29 suggests strong consensus and reflects the fact that most participants consider themselves competent in teaching these topics. Scores

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between 3 and 5 show that responses range from moderate to strong agreement, with no significant differences of opinion identified.

The low standard deviation (SD = 0.520) demonstrates a high degree of homogeneity among the respondents and suggests that this confidence is shared by the majority of the sample. The results show that teachers have a high level of confidence in their ability to teach climate change topics (M = 4.29, SD = 0.520), indicating strong consensus and high homogeneity among the respondents.3

Table 3: ***Challenges in Implementation of Climate Change Education (Descriptive Statistics)***

Statements	N	Mean	Std. Deviation
11. Training opportunities are not available to help teachers teach climate change effectively.	254	3.98	.919
12. Government policies support the Inclusion of climate change education in schools.	254	3.50	1.081
13. Lack of awareness among teachers create' challenges in teaching climate change.	254	4.28	.870
14. Class size affects my ability to teach climate change topics effectively.	254	3.97	1.130
15. Time constraints make It difficult to teach climate change in regular classes.	254	3.81	2.683

The descriptive statistics table highlights key factors influencing the successful implementation of climate change education in schools. Overall, the mean values indicate that teachers generally agree that several challenges affect effective implementation.

Firstly, the statement "Lack of awareness among teachers creates challenges in teaching climate change" has the highest mean score (M = 4.28, SD = 0.870). This shows strong agreement among respondents, suggesting that insufficient teacher knowledge and awareness is the most critical barrier. It also has a relatively low standard deviation, meaning respondents largely share this view.

Secondly, "Training opportunities are not available to help teachers teach climate change effectively" (M = 3.98, SD = 0.919) indicates that most teachers feel they lack proper professional development. This suggests that limited training opportunities significantly hinder effective teaching.

Similarly, "Class size affects my ability to teach climate change topics effectively" (M = 3.97, SD = 1.130) reflects agreement that overcrowded classrooms reduce teaching effectiveness. The slightly higher standard deviation shows some variation in responses, but the overall trend still points to class size as an important factor.

The statement "Time constraints make it difficult to teach climate change in regular classes" (M = 3.81, SD = 2.683) also shows agreement; however, the very high standard deviation suggests inconsistency in responses. This may indicate possible data entry issues (as the maximum value is 43, which is outside the Likert scale) or differing experiences among teachers.

Lastly, "Government policies support the inclusion of climate change education in schools" (M = 3.50, SD = 1.081) has the lowest mean, indicating moderate agreement. This suggests that while some support exists, it may not be strong or effectively implemented at the ground level.

In conclusion, the findings reveal that the most significant factors affecting the successful implementation of climate change education are lack of teacher awareness, insufficient

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training opportunities, large class sizes, and time constraints. Although government policies show some level of support, their impact appears moderate, highlighting the need for stronger policy execution and practical support for teachers.

CONCLUSIONS

The conclusions are as follow:

1. Social sciences have the highest level of integration, indicating they are the most supportive subject area for these topics.
2. There is a strong overall agreement among respondents about the importance of environmental education.
3. The medium-to-high level of integration suggests that environmental education is present but not fully developed across all subjects.
4. Some areas may have effective practices, while others still face challenges in applying these concepts.
5. Teachers appear to feel well-prepared and capable of delivering climate change education.
6. Overall, the findings highlight a strong and consistent sense of self-efficacy among teachers regarding climate change instruction.
7. The most critical barrier identified is the lack of awareness among teachers (highest mean), indicating insufficient knowledge and understanding of climate change topics.
8. There is a strong perception that limited training opportunities hinder teachers' ability to teach climate change effectively.
9. Large class sizes are considered an important factor that reduces teaching effectiveness, although responses show some variation.
10. Time constraints also impact teaching, but responses are highly inconsistent, suggesting either varied experiences or possible data issues.

RECOMMMANDATIONS

The recommendations are as follow:

1. Education authorities should revise curricula to ensure systematic integration of climate change education across all subjects, not just social sciences, to promote interdisciplinary learning.
2. Pre-service and in-service teacher education programs should include specialized modules on climate change education, equipping teachers with both content knowledge and pedagogical skills.
3. Schools and education departments should provide continuous professional development (CPD) opportunities such as workshops, refresher courses, and training sessions focused on environmental education.
4. Educational institutions should organize awareness campaigns, seminars, and conferences to enhance teachers' understanding of climate change issues and their role in education.
5. Policies should aim to optimize class size or introduce supportive teaching strategies (e.g., group work, activity-based learning) to improve effectiveness in large classrooms.
6. Teachers should be encouraged to adopt student-centered approaches such as project-based learning, inquiry-based learning, and problem-solving activities related to real-world environmental issues.
7. Encourage educational research to identify gaps, evaluate practices, and improve strategies for effective climate change education.
8. Schools should collaborate with environmental organizations, NGOs, and higher education institutions to enrich learning experiences and provide practical exposure

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