**International Journal of Social Science (IJSS)**
**Vol.3 Issue.3 October 2023, pp: 389-396**
**ISSN: 2798-3463 (Printed) | 2798-4079 (Online)**
**DOI: https://doi.org/10.53625/ijss.v3i3.6631**


# BARRIERS TO TRANSFORMATIVE CLIMATE CHANGE EDUCATION: MITIGATION AND RESILIENCE-BUILDING

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**Article Info**
***Article history:***
Received July 08, 2023
Revised Aug 23, 2023
Accepted Sept 26, 2023

***Keywords:***
Climate Change
Resilience Education

**ABSTRACT**
The urgency with which climate change education is required demands massive coordination across all formal education systems (primary, secondary and tertiary institutions), non-formal systems (community-based and non-governmental organisations), and informal systems (museums, over the radio, in libraries, or bus stops). It also demands attention from individuals in both low and high-carbon emitting countries, as well as within and across sectors (education, energy, agriculture, transportation and urban planning). Rather positively though, education has a ripple effect that goes beyond the individual learner and has the potential to build greater environmental enlightenment and concern amongst family members and communities. Accordingly, education (formal, informal and non-formal) would also help individuals and communities build resilience and lessen their vulnerabilities to a rapidly changing climate. Hence, this paper explores the barriers that impede enhanced climate change education with a view to helping surmount them and enlighten learners and communities at large, on the dangers of climate change and strategies of minimising human activities that bring about or accelerate climate change, even as communities get sensitised on resilience measures. Accordingly, the barriers to effective climate change education as determined by this review are inadequate political leadership, low eco-literacy levels, cognitive challenges, scepticism of scientific evidence, misinformation and disinformation of facts about climate change, limited knowledge and skills to impart to learners during climate change instruction, moral and behavioural challenges and psychological and social barriers. It is thus, recommended that salient aspects of climate change be integrated into teacher-training curricula worldwide and policies be enacted aimed at mitigating scepticism and disinformation concerning climate change. Furthermore, coordination of efforts between the private sector, government, community members and civil society to promote climate change education is strongly recommended together with the adoption of transformative learning that results in perspective and behaviour change.

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## 1. INTRODUCTION

Technological advancements in computational modelling, satellite imaging and environmental sensing are enabling scientists to predict and track the effects of human-induced climatic changes with increasing precision and clarity than ever before (Hannula, 2022). Additionally, cultural issues associated with climate change are being brought to the fore through diverse forms of digital, informational and social media (Welzer, 2012; Robinson 2011).

Notably, while young people are being raised and positioned as future leaders who are expected to overcome decades-long issues arising from environmental inaction (Young, 2013), they have few opportunities to learn, voice, educate, cultivate and express their concerns, understandings and thoughts about climate change within their environments (Kagawa & Selby, 2010), yet climate change repercussions ranging from rising sea levels, changing weather patterns that threaten food security to extreme rainfall to causes catastrophic flooding are becoming common-place.

Consequently, climate change and resilience education forums should endeavour to provide a venue and outlet for young person's concerns and queries regarding climate change and education for sustainable development. However, despite the concerted efforts to impart accurate information through various school programmes and informal and non-formal venues, misconceptions about the causes and effects of climate change still abound

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necessitating the need to highlight the barriers and challenges that hinder climate change education with the ultimate objective of inventing ways of intervening on them.

Addaney and Cobbinah (2019) indicates that climate change in most parts of Africa is still regarded as a technical problem that needs specialized solutions, while Orindi and Murray (2005) observe that African countries still separate climate change from their development agenda. Accordingly, the governments are harder pressed to tackle pressing poverty challenges rather than climate change.

Moreover, Kawk (2020) indicates that climate change education in the modern society is tricky as its characterized and driven by an industrial paradigm resulting in obsession with productivity, wealth and personal development, yet studies indicate that climate change and its resultant phenomena is expected to further enhance and intensify global socio-economic disparities, thereby requiring urgent mitigation.

Raising awareness of human-induced causes of hazardous and extreme weather conditions in schools, meetings and public gatherings may go a long way in supporting community planning and actions for resilience. This is because the general public plays a significant role in decision-making, planning and electing government officials tasked with addressing climate change issues (Ceyhan et al 2013). Yet literature shows that efforts towards raising awareness are thwarted by various factors, ultimately forming the gist of this discussion, as not many studies have focused on the barriers that hinder effective, transformative climate change and resilience education.

## 2. METHODS

Desktop research was conducted that entailed systematically studying literature from various sources, including, institutional websites, electronic data bases and journals in an attempt to gather relevant information. Subsequently, thematic interpretation of the studies undertaken in the area of climate change education was conducted with the goal of unearthing the barriers to transformative climate change and resilience education. This paper, thus, presents cross-cutting barriers and challenges to transformative climate change and resilience education.

## 3. RESULTS AND DISCUSSION

### Barriers to Effective Climate Change Education

The barriers and challenges to effective climate change education vary and are intertwined to a given extent. This discussion however will attempt to distinguish the factors in accordance with the role they play in impeding climate change education. The barriers are, thus, discussed as follows:

**Inadequate Political Leadership**,

Norgaard (2011) indicates that of all demographic factors, political ideology stands out as the most robust predictor of climate change scepticism. Accordingly, climate change remains the toughest, most political issue that society has ever faced. However, this is not to say that progress has not been made (Norgaard, 2011).

That notwithsatnding, the public in the US has remained divided with a large part of the political class being indifferent to climate change issues even as climate change evidence mounts. Evidently, political affiliation and ideology are so powerful that in fact, they moderate and negate the effects of climate change education. Accordingly, highly educated people aligned to the Republican Party in the US are the most sceptical about climate change in line with Republican Party leadership's pronouncements.

On the other hand, this does not hold true for the Democratic Party whose leadership has been pro-climate change sensitization and education. Accordingly, political affiliation can water down climate change issues and invigorate disinformation campaigns, crystallising climate change denial.

Other statistics indicate that a third to almost half of the US public believes that the seriousness of global warming is generally exaggerated, even more so those allied to the conservative party. The partisan divide began in the late 1990s and has been increasing, gradually. In 2007, a study in the US indicated that 76% of Democrats said the effects of climate change had already begun, but with only 42% of Republicans agreeing. The disparity was glaring (Kawk, 2020).

**Low Eco-Literacy Levels**

Basic education and literacy are still an unmet goal in the vast majority of low and middle –income countries (LMICs). Notably, eco-literacy is more often than not, at the bottom of the to-do list. Regardless, most of these countries are highly vulnerable and prone to weather-related disasters as a result of human- induced climate change. As a result, eco-literacy education geared toward addressing climate change is just another checkbox on a long list of priorities for civil societies and governments in these countries.

Accordingly, youth climate activists in these countries have pointed out the absurdity and irony of the expectation to attend school in order to develop skills that would be irrelevant on a planet headed for ecological destruction and collapse. Evidently, there's need to prioritize eco –literacy even in the face of low literacy in low and middle-income countries in order to arm the youth with requisite information geared toward behaviour change (in light of human-activity induced climate change occurrences) and resilience-building.

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**Ambiguities in Scope and Definition of Education for Sustainable Development (ESD)**

Tening and Harder (2023) contend that sustainability education requires more than just knowledge transfer to students. Accordingly, it should seek to make significant changes to students' values, skills, dispositions and attitudes in ways that eventually lead to environmental and socio-economic transformation. On the other hand Kawk (2020) indicates that whenever climate change education is offered in primary and secondary schools, it does not focus on increasing learners' sustainability competencies (for example, future and systems thinking, commitment and the essence of environmental preservation) or their levels of eco literacy (for instance ,insights into people and societies' relationship with each other and with natural systems sustainably), implying that ESD is not for sustainable development but about sustainable development and not for climate action but about climate change.

Accordingly, even though both are imperative, when behavioural change strategies and the adoption of more sustainable lifestyles are the core of the discussion, they tend to focus on low-impact actions like switching off the lights, recycling or embracing LED light bulbs, instead of high-impact activities (like eating a plant-based diet or living car-free), that have the ability to reduce an individual's carbon footprint. Education for sustainable development approach (and not about ESD) would subsequently spur system-level change. Hence, the educators' narrow focus to ESD does a de-service to climate change education, yet climate change has shown that the negative actions of one country will most negatively impact the lives of people in another country.

Similarly, Kawk (2020) indicates that the education sector has not been able to link the dots between the goals of the Paris Agreement and SDG 4 (quality education). Consequently, the education sector failed to seize the chance to define quality education in reference to the goals of ESD, gender equality, global citizenship and human rights. Accordingly, ESD issues are compounded further by the fact that curricula in most countries barely have content on climate change.

Notably, a study conducted on 1,480 secondary schools on civics, history, geography and social studies text books from 98 countries determined that less than half of the textbooks had content on any one of the ESD areas save for the topic of environmental damage contained in 80% of the textbooks from the Caribbean and Latin American regions. Additionally, teachers at schools lacked the systemic skills and support to become change agents for sustainability, yet for effective transformative education to occur, teachers must be prepared to challenge their students to engage in critical thought. Thus, efforts to transform society sustainably have to focus on building educators' understanding of sustainability and the educators' ability to transform curricula and wider learning opportunities (Tening & Harder 2023).

**Cognitive Challenges**

Cognitive challenges have to do with complexity and difficulty of envisaging the consequences and repercussions of climate change (which may not be direct or linear) in the future. Furthermore, since the human brain can only process a limited amount of information at any given time, it may be difficult for non-specialists to build mental images of the combined and interdependent causal linkages that result in and from climate change. As a result, the lack a clear grasp of the connections between individual and collective practices and greenhouse-gas emissions and climate change and all these coupled with mistrust information sources on climate change do a lot of de-service to climate change education. Consequently, these cognitive challenges lead to other obstacles and barriers such as denial and helplessness.

**Skeptism of Scientific Evidence (Mis and Dis- Information)**

Conservatives in several countries have shown scepticism toward climate-mitigation policies and in some cases toward climate science. For example, in Brazil, Autralia Canada, the U.S., the U.K., and several other countries in Europe, studies have identified connections between rejection of climate change education and mitigating strategies and conservative politics (Ardoin et al., 2009). The studies also point to disinformation as a significant contributor to polarisation of the public over climate change issues and how it helps shape public opinion and attitude toward climate change science and education. Individuals who are exposed to this kind of disinformation more often than not do not participate in mitigation strategies and policies, impeding the efforts and ability of policymakers to develop meaningful climate change education strategies.

**Insufficient Knowledge and Skills amongst Teachers**

Educators feel ill-prepared and deficient in the necessary knowledge and skills to substantially deliver climate change instruction (Monroe et al. 2017). Consequently, educators also report the lack of basic scientific knowledge amongst them and the general population (Ross, 2000).Educators have also expressed concern about the dynamism and fast pace at which scientific knowledge changes in comparison to the slower pace at which course-books get updated (Pruneau, 2010). Consequently, many educators find it difficult fitting facts about climate change into perspective in a fast-changing scientific world. Educators have also decried the lack of resources to adequately present climate change education and the time to do so (Norgaard, 2011). Furthermore, as climate change is a huge problem and phenomenon, educators feel discouraged about their capacity and ability to make a difference (Monroe et al, 2017). This, thus, calls for re-tooling and enhancing the capacities of teachers in as far as education for climate change and sustainable development is concerned.

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**Psychological and Social Challenges**

Denial of the presence and impacts of climate change is both a psychological and social construct. Apparently, society constructs and re-constructs information to make it pleasant and less uncomfortable, leading to socially organized denial that shape the way governments respond to climate change challenges and climate change education (Monroe et al., 2017). Furthermore, it is also easier and comfortable to ignore the looming dangers than face them head on, resulting in denial. Moreover, denial is also fostered by the imperceptibility of some of the signs and manifestations of climate change. As a result, individuals and communities do not take any action and shift the blame to companies and the government, as they distance themselves from climate change manifestations.

Norgaard (2011) contends that individuals in denial regarding climate change disconnect it from their daily lives in a bid to sustain their conceptions of collective and personal identities and to safeguard their sense of empowerment. Accordingly, rapid modification in people's perception of the world also helps build denial. As a result, the perception of change in the physical and social environment is never absolute but always relative to one's own standpoint and observation (Welzer, 2012) obscuring the identification of emerging changes, such as the decline in biodiversity and other climate consequences. Hence, if society does not envision negative change in climate and its adverse consequences, it would be difficult to mobilize them and transform their actions and visions (Welzer, 2012).

Moreover, if people are to mitigate the effects of climate change, they should be willing to change their lifestyles, yet research shows that awareness of an adverse environmental consequence does not necessarily lead to action. Subsequently, people are not willing to change their way of life because they envisage it would reduce their quality of life. This implies that social norms and expectations should not impede transformation of carbon dependant lifestyles. Accordingly, societies' ownership and consumption demonstrate a high social and economic status, making it a difficult task to transform climate hazardous lifestyles.

Moreover, society tends to deny and resist information that contradicts their ideological beliefs and cultural values. This could be information that challenges freedoms and rights to consumption of various commodities including driving (in a bid to reduce carbon emissions) and reverting to plant-based diets. Accordingly, because of varied social factors, many people lose awareness of time, space and natural patterns. Moreover, globalization and advances in communication technologies have exacerbated and deracinated society making individuals less attentive to the environment and to people around them. This renders communities unable to perceive changes in the climate and the environment, ultimately forming a challenge to climate change education.

**Moral and Behavioural Challenges**

It is a widely accepted fact that human behaviour-change is a significant and irreplaceable component of effective climate-change action strategies. Tening and Harder (2023) contend that reduction in environmental problems requires a lasting transformative human behaviour-change. Accordingly, developments in transformative education/learning are increasingly being recommended for achieving behaviour change. Evidently, the need for behavioural modification hass been robustly evidenced and reported by various scholars (Varela-Losada, et al, 2022 ; Tening & Harder 2023).

Notably, behaviour change requires a type of learning that has the capacity to lead to transformations in behaviour and perspectives. Required actions on climate change need to match the magnitude of the challenges at hand, with necessary adjustments to our social and economic behaviour. For instance, there is need for the transformation in economic and social systems and collective and personal energy consumption and utilization habits. Global awareness of climate change cannot come to fruition without translation to individual actions and behaviour.

Unfortunately, reports indicate an increase in driving, flying and holidaying abroad using household appliances that emit carbon. Combating these require a change in perspective and behaviour. Consequently Kawk (2022) indicates that there are three reasons why behavioural change is important for climate action and policy. Firstly, acts of consumption are at the base of climate change challenge. As consumers, individuals in society hold the capacity to mitigate climate change as about 40 percent of OECD-countries emissions occur as a result of individuals' decisions on heating, travel and food purchases. Accordingly, households in the U.S directly account for about 35 per cent of national carbon dioxide emissions than the whole U.S. industrial sector. This, thus, requires changes in individual lifestyle and consumption and the adoption of efficiency measures to allow for almost 30 percent energy saving.

Secondly, individual behaviour change is imperative, in that, individuals are the drivers of larger organizational change processes and political systems. Consequently, understanding behaviour change as a barrier to climate change education requires going beyond psychological explanations based on the individual and identifying the way social factors influence decisions, perceptions and actions. As a result, the concept of transformative learning has been established as a critical solution to environmental sustainability problems (Tening & Harder, 2023 ; Varela-Losada. et al. 2022).

**Mitigating Climate-Change Education Barriers in Formal Learning**

To help students understand the need to mitigate climate change consequences and become change agents, the content in the curriculum should integrate climate change content (Stevenson, Nicholls & Whitehouse, 2017).

However, teaching about climate change cannot be limited to the formal curriculum and traditional educational structures only. Hence, there is need to make use of emerging informal and hybrid spaces that offer alternative opportunities for learning and action. Furthermore, for the community to bring about change there must be an understanding or information on climate change and increase in public knowledge of the effects of and responses to climate change in order to empower the public to support climate change mitigation (Ardoin et al., 2009).

Additionally, future thinking abilities in teaching, evaluating the growth of students' climate skills, and giving teachers further climate change trainings are all necessary. Notably, for transformation to happen, it is important to understand climate change, how decisions are made and by who (Kagawa & Selby, 2010). This is a major step through which major policies can be interrogated. Similarly, the teachers need to be trained in order for them to feel competent and comfortable implementing environmental education programs in the classroom (Morote, Hernández & Olcina, 2021).

Notably, inadequate teacher-training has been linked to low environmental literacy and unsuccessful environmental education initiatives. To encourage teachers to teach climate change content, the subject should be connected to their professional training (Hannula, 2022). The development of a teacher's professional identity should be a reflection of the teacher's competence, which should include subject-matter knowledge and comprehension, social performance of relevant disciplinary practices, such as talking and acting in certain ways, and acceptance as a teacher, of the climate change crisis (Lehtonen, Salonen & Cantell, 2019 ).

It therefore follows that the teachers should be trained and recognized as climate change education experts so that once a community of specialists is developed, other forms of help will inevitably emerge through institutional initiatives (Young, 2013). To address and clear misconception that climate change education is already connected and exists in other disciplines like the physical sciences, technology, engineering and mathematics, it is necessary to convert to the interdisciplinary teaching style that would incorporate it into the curricula of all disciplines (Hallar, McCubbin, & Wright, 2011; Nyakundi & Onsomu, 2023).

However, Lehtonen, Salonen, and Cantell (2019) are of the opinion that dispersal of climate change across the curriculum should be undertaken with care as it may result in the lack of crucial connections between the numerous pieces of information taught in various subject areas. Apparently, teaching through fragmentation may be challenging given the complexity of climate change and the interdependence of its components under the current cross-curricular dispersion scenario. Young (2013), on the other hand suggests that the teaching of climate change be viewed as a separate field of practice, distinct from other disciplines and should operate outside the confines of the science subjects.

Accordingly, this would provide important mechanisms like assessments and accreditation as well as funding which will distinguish curricular courses and support effective teaching (Ross, 2000). By approaching climate change as a discipline, education scholars may be able to begin researching climate change literacy in a more in-depth and pertinent way by rigorously analyzing the set of skills and knowledge associated with such literacy. Similarly, climate change content should be supported by pedagogies that can encourage learners' critical and action-oriented involvement (Keller, et al 2019). This can be done by enabling learners to share ideas and challenge their own opinions, and improve their capacity to use evidence to back their opinions (Halstead et al 2021: Oranga et al., 2020).

This may bring together the knowledge, skills and abilities required to identify opportunities and formulate a vision on how to use those opportunities to solve climate change problems. Moreover, learners can participate in climate-responsible and climate-friendly projects in the greater context of their schools or communities, extending them beyond the classroom (Robinson, 2011). For instance, learners can practice with school gardens as alternative methods for securing and producing food (Klein, 2014) in line with aim 12.2 of SDG 12, which emphasizes the optimal use of natural resources and the achievement of sustainable management.

This would enable the learners to extend the knowledge beyond the school and create a flexible social holistic learning method that integrates learning with action in local community contexts. Communities would be given the freedom to create their own climate change projects and ways to interact with the issue using a bottom-up participatory approach (Figueiredo & Perkins, 2013).

## 4. CONCLUSION

Several countries face social and political barriers to climate change education like extreme poverty and war, implying that even if educational resources were available climate change would still be the least of priorities in such contexts. That notwithstanding, studies show that disinformation is a basic contributor to public polarisation over the climate crisis, and that it helps shape public attitudes toward climate science. Individuals who are exposed to this kind of disinformation are more often than not unable to participate in mitigation policies, hindering the ability of policymakers to take meaningful climate action. With the above challenges in mind, the significance and centrality of climate change education must be recognized and prioritized. Climate change education should, thus, constitute a cross-curricular theme aimed at uniting all groups of people in search of justice. Accordingly, climate change should be at the heart of every community or school programme as early as possible.

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## 5. RECOMMENDATIONS

There's need for coordination of efforts between the private sector, government, community members and civil society to promote innovation and climate change education for maximized implementation of new and existing strategies. Furthermore, there is need for salient aspects of climate change to be integrated into teacher-training curricula worldwide and policies enacted aimed at mitigating scepticism and disinformation of facts concerning climate change by world leaders. Additionally, transformative learning that results in perspective and behaviour change should be adopted and actualised.

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**ISSN: 2798-3463 (Printed) | 2798-4079 (Online)**

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