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CLIMATE CHANGE EDUCATION AS A MEANS TO PROTECT THE PLANET: A REVIEW OF THE RELEVANT LITERATURE

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ABSTRACT

Climate change is a worldwide phenomenon and it is a great concern to all countries as it brings about a global warming climate system that affects human behavior. South Africa, like other countries, is severely affected by climate change. Although attempts are increasingly made to integrate climate change into school curricula, teachers have challenges in preparing and implementing climate change lessons. This study, therefore, sought to review literature related to the integration of climate change education in the school curriculum and to identify the strategies teachers use when integrating climate change education in teaching and learning. The study adopted a literature review approach and a comprehensive electronic search for relevant literature was done using Google Scholar search and springer which led to the discovery of a research article suitable for the study. Three African countries Kenya, Nigeria, and South Africa were selected as case studies. It emerged from the literature that although governments of South Africa, Nigeria, and Kenya, are making concerted efforts to raise climate change awareness and education, there appear to be no clear strategies for teachers to use when integrating climate change education into their lessons. What appears is that these countries are concerned about the effects of climate change and are attempting to achieve its integration in the school curriculum. The study concludes that attempts to address climate change in these countries are made although with varied strategies and paces.

Keywords: Climate Change Education, Curriculum, Framework, Teaching and learning, Integration

INTRODUCTION

Climate change is wreaking havoc in all the countries of the world and it is a major source of concern since it causes a global warming climate system, which has an impact on human behavior (United Nations 2014 and Apollo & Mbah, 2021). South Africa, like all other countries, is affected by climate change (Vogel, Schwaibold & Misser, 2015). Most countries are now progressively attempting to integrate climate change education into their school curricula. However, teachers face difficulties in planning and executing climate change education in their courses (Anderson, 2010, Stevenson, Nicholls & Whitehouse, 2017 Sezen-Barrie, Miller-Rushing & Hufnagel, 2020). Furthermore, climate change education is not aligned with current scientific and policy approaches. As a result, the purpose of this study was to examine the literature on the integration of climate change education into teaching and learning. The study also attempted to propose strategies that teachers may use when attempting to incorporate climate change into their lessons. A literature evaluation of climate change education in three nations, including South Africa, was conducted.

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BACKGROUND TO THE STUDY

Climate change is a global issue that all governments are seeking to address to mitigate its consequences on humans and the environment. Extreme weather and increasing sea levels are both consequences of climate change (NASA, 2016). Nation-states have banded together to assess the dangers and consequences of human-caused climate change. This requires countries to take climate change education seriously by having programmes that will promote climate change consciousness. The Intergovernmental Panel on Climate Change (IPCC), which represents the majority of countries on the planet, is emphasizing the dangers and consequences of climate change (Sezen-Barrie, Miller-Rushing & Hufnagel, 2020). Wildfires, flooding, and environmental changes appear to be increasing in frequency at an alarming rate (Sizen-Barrie et al., 2020). This suggests that there are attempts to rapid action on climate change and that governments are committed to implementing initiatives aimed at raising awareness of climate change and combatting its consequences on the environment in general and human life in particular.

Since there appears to be a growing interest in studying climate change education and developing programs to integrate climate change into environmental and science education curricula (Anderson, 2012), the South African education system should adjust its pace to keep up with other countries, enhance its efforts to integrate climate change into the school curriculum. This means that climate change education should prominently feature almost in all school subjects.

Since climate change is having a disruptive effect, and it is happening quicker than any time in the last 2,000 years (Amanchukwu, Amadi-Ali, & Ololube, 2015), climate change education should be promoted and teachers as implementers of the curriculum should have a sound content and pedagogical content knowledge of climate change education.. Rising levels of carbon dioxide and other heat-trapping gases in the atmosphere have warmed the earth, resulting in a variety of effects such as rising sea levels, melting snow and ice, more extreme heat events, fires and drought, and more extreme storms, rainfall, and floods, as previously mentioned (Amanchukwu et al. 2015). The need to act quickly on climate change has become a political issue, with the UN Secretary-General (Ban Ki-moon) informing world leaders that the world's glaciers are melting faster than the climate negotiations in New York (Amanchukwu et al., 2015). In South Africa climate change is taking its toll (Vogel, Schwaibold & Misser, 2015) and this is evident by rising heat levels, droughts, floods, and unfavourable climatic conditions. The complexity of climate as an interrelated system, which includes earth and socio-ecological systems, as well as 'deeper' thinking, necessitates serious concentrated efforts and tactics, critical research, and reflexive and transformative educational approaches (Vogel et al., 2015). For the South African government, climate change is causing multiple stressors, including a large proportion of the population living in abject poverty, food insecurity, biodiversity degradation, and killer diseases such as tuberculosis and human immunodeficiency virus infection, and acquired immune deficiency syndrome (HIV/AIDS) (Anyanwu, Le Grange & Peter Ziervogel 2015). The South African National Climate Change Response Policy White Paper advises teaching climate change concepts and related topics at all levels of formal education to address the country's vulnerability (Department of Environmental Affairs, Republic of South Africa, 2011). In South Africa, this appears to be a welcome development in dealing with climate change.

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Since climate change is a universal challenge, and it appears that all governments are willing to embark on climate change education and integrate it into school curricula, teachers must have up-to-date knowledge of the fundamentals of climate change science to present concepts in ways that stimulate learners' interest and develop a deeper understanding (Anyanwu, Le Grange & Peter Ziervogel, 2015). According to Anyanwu et al., (2015), there is a growing interest in developing-country teachers' knowledge and awareness of climate change. This effort is a welcomed strategy and must be stepped up to get the desired result.

Nwankwo and Unachukwu (2012) found that instructors in Nigeria lacked adequate knowledge of the causes and impacts of climate change, as well as the necessary techniques for managing climate change instruction. Science teachers, according to Ekpoh and Ekpoh (2011), have limited knowledge and awareness of climate change. Instructors' knowledge, attitudes, and comprehension of climate change are right to some level in South Africa (Vijovic, 2013) but only a few teachers have a deeper scientific understanding of climate change dangers. Furthermore, the majority of the teachers had assumptions regarding effective climate change mitigation and adaptation techniques. There appears to be a scarcity of literature focusing on teachers' strategies in incorporating climate change education into their teaching and learning. Thus, the purpose of this study was to use a literature review approach to explore the strategies employed by secondary school teachers to incorporate climate change education into their lessons as it appears that there is no curriculum-aligned and locally relevant climate change education pedagogical practices for integrating climate change (Bofferding and Kloser (2015).

METHODOLOGY

This paper followed an integrative literature review approach to investigate how climate change education is implemented and the strategies that are used by teachers in integrating it into their lessons. An integrative literature review is a noncontact method that involves reading and analyzing the existing literature about the topic (Guijuan, 2009; Snyder, 2019). It is a non-contact method because it does not involve objects or persons and focuses on the purpose of the study. The researchers set out by sorting the contents into categories searching for the latent content and formulating themes on various levels. The authors conducted a comprehensive electronic search using Google Scholar, and Springer led to the discovery of various research articles. The search was conducted on the title, sometimes some keywords on the title like ‘integration of climate change education, strategies for teaching climate change education’ resulted in the discovery of relevant articles. These articles were scattered in different journals and were reviewed. A total of 33 articles were reviewed by the authors. These articles were published between 2010-2021.

FINDINGS/LITERATURE REVIEW

The Notion Of Climate Change Education

Climate change has prompted governments to develop ways for integrating climate change education into policy and practice (Apollo, & Mbah, 2021; Anderson, 2010). Climate change is currently at the forefront of our daily lives, with its consequences and ramifications seen around the world (United Nations 2014). It is described as a change in the atmosphere caused

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by human activity rather than natural climatic fluctuations. This shows that if people change their habits to be more environmentally friendly and sustainable, the situation can be improved. Furthermore, integrating climate change education into formal education systems can be one of the most important and successful strategies for building learners' capacity to deal with the climate problem (Mochizuki & Bryan, 2015). Families and communities gain when individuals share what they have learned, particularly on adaptation and mitigation (Mochizuki & Bryan, 2015). This means that citizens should be informed of the dangers that climate change poses to societies, and governments should lead climate change awareness initiatives (Stevenson, Nicholls & Whitehouse, 2017). Any endeavour to successfully adapt to and mitigate climate change necessitates adequate knowledge, skills, and behavioral changes, which education may supply (Anderson, 2010). Individuals and communities can benefit from climate education by making educated decisions and acting to achieve climate-resilient, long-term development of the environment (Anderson, 2010). Policymakers have not adequately engaged and investigated the possibilities of making education a significant participant and centrepiece in climate change education. Existing climate change frameworks, on the other hand, might make use of education as a mitigation and adaptation tool. The United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, for example, both feature sections urging states to encourage climate change education (Anderson, 2010). This research looks at what and how teachers should teach, as well as how learners might be motivated to learn, to prepare for an uncertain future caused by climate change's dangers and human and ecological consequences. Climate change education is about teaching and engaging learners in learning amid risk, uncertainty, and rapid change, as well as making them aware that humans have never faced a scenario like the one that the planet is currently facing (Intergovernmental Panel on Climate Change, 2014). Climate change education for sustainable development (CCESD) is a multidisciplinary and interdisciplinary response to climate change that improves knowledge and awareness of the basic science, causes, and impacts of climate change; encourages changes in individual and societal behaviors and lifestyles; and improves individual and societal adaptation and mitigation capacities (Ferguson, 2019).

For climate change education to be effective and successful in achieving its fundamental goal of climate change awareness it compels climate change education pioneers to demand a focus on the kind of learning which is characterized by critical and creative thinking and capacity building that will enable youth to engage with the information, inquire, understand, ask critical questions and take what they determine are appropriate actions to respond to or even combat climate change (Stevenson, Nicholls & Whitehouse, 2017). Climate change education is about creatively preparing children and young people for a rapidly changing, uncertain, risky, and possibly dangerous future. It is about making learners aware that the actions they take determine the effects of climate change in the future (Stevenson et al., 2017). This means that for the integration of climate change education in the teaching and learning curriculum planners of climate change education need to understand what meaning learners and teachers make of climate change.

International Trends In Climate Change Education

It is vital to first comprehend international patterns to comprehend climate change education in South Africa. A study like this, on the other hand, may talk about climate change in the context of all of the world's countries. To gain a better understanding of international patterns

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in climate change education, two African countries were chosen for this study. Nigeria and Kenya were chosen as study sites to learn more about how climate change education is handled in these nations.

Building Nigeria's Responses to Climate Change (BNRCC) is a project in Nigeria that intends to assist in the development of educated climate change responses in the country (Amanchukwu, Amadi-Ali & Ololube, 2015). The BNRCC's critical mission is to build capacity at the local, state, and national levels (Ibid). There was a Canadian-Nigeria Climate Change Capacity Development Project before the BNRCC (C-NCCCDP). The C-NCCDP's goal was to raise climate change awareness and mobilize a network of people who were willing, equipped, and capable of dealing with the problem (Amanchukwu et al. 2015). In Nigeria, the C-NCCCDP aided a multi-sector assessment of climate change impacts and adaptation. C-NCCCDP Assessments reports on climate change were eventually created as a result of C-NCCCDP Assessments, and these greatly aided in the design of BNRCC's work, which includes policy recommendations on climate change (Amanchukwu et al., 2015).

The BNRCC's work must be able to inform, motivate, engage, and collaborate with interested and affected parties across the country to be successful (Amanchukwu et al., 2015), and Nigeria's climate change must be directed by Nigerians. This BNRCC project reaches out to federal and state ministries and legislatures, including the ministries of the environment, agriculture, and water resources, women's affairs and social development, health, education, information, finance, and justice, as well as the National Planning Commission and the Energy Commission (Amanchukwu et al., 2015), as well as parastatals and agencies like the Nigerian Meteorological Agency, the National Emergency Management Agency, and the National Planning Commission (Amanchukwu et al., 2015). Also participating are the media, non-governmental groups, faith-based organizations, community-based organizations, professional and scientific associations, universities, research institutions, and local community leaders. The Nigerian educational system and curricula are also overhauled to include the issue of climate (Amanchukwu et al., 2015).

In terms of university students' knowledge and understanding of climate change in Nigeria, the findings of Ayanlade and Jegede's (2016) study on climate change education and knowledge among Nigerian university graduates show that the majority of the graduates who participated in the study are aware of climate change and that their awareness has been developed through various channels (Ayanlade & Jegede 2016). Even if they are aware of climate change, they have varied perspectives on it, and different graduates have different interpretations. Their perspectives on the physical environment, the level of climate change courses taught, and the degree gained in tertiary education may all influence their judgments. The majority of the participants in this study were taught about climate change; the teachings were not thorough, but they were briefly mentioned during lectures (Ayanlade & Jegede, 2016).

Climate change affects Kenya, as it does every other African country. Droughts, floods, and other extreme weather events are common, resulting in low agricultural production and the destruction of all other sectors of the economy (Huho, 2015). As a result, the Kenyan government has been looking for measures to ensure a better awareness of climate change issues to avoid climate-related threats (Huho, 2015). As a result, Kenya has made significant investments in education, which is seen as a critical component of the development process. Several programs have been launched to raise climate change education awareness. UNICEF, for example, has assisted children in the Mombasa region in adapting to the projected impacts

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of climate change by training students and teachers to notice early warning signs of flooding and to prepare for the start of catastrophes such as floods (Anderson, 2010).

Ochieng and Koske (2013) conducted a study in the Kissumu Municipality to assess climate change awareness and perception among primary school teachers and found that primary school teachers see climate change as a danger. This research revealed the importance of launching capacity-building activities to improve teachers' knowledge of the subject, particularly if they are to be deployed as important actors in Kenya's climate change awareness campaigns (Ocheng & Koske 2013). Huho (2015) conducted a study among university students to determine the climate change knowledge gap in Kenya's education system and found that, despite the importance of climate change knowledge to university courses, only 7.4 percent of students wanted climate change studies to be taught in universities.

The majority of students (33.3 percent) preferred that the course be taught only in primary schools. The majority of students thought that afforestation and reforestation were effective mitigation techniques. This research highlighted two major obstacles to gaining a useful understanding of climate change. These included, first and foremost, negative attitudes toward agriculture, which was viewed as the most vulnerable industry to climate change. Second, there is prejudice in Kenya's educational system when it comes to the climate science curriculum. Climate science courses should be integrated into all disciplines taught in schools, colleges, and universities, or climate change should be taught as a separate subject at all levels of education (Huho, 2015).

In acknowledgment that education is a vital agent in tackling the issue of climate change, the Kenyan government is mainstreaming climate change in educational curricula at all levels through the Ministry of Environment and Forestry in conjunction with the Ministry of Education (Ministry of Environment and Forestry, 2020). As a result of this partnership, recommendations for mainstreaming climate change in curricula at all levels of education and training have been drafted. This decision is the result of several measures, including the establishment of the National Climate Change Response Strategy in 2010, which improved understanding of global climate change and its effects in Kenya. Following that, the Climate Change Act was signed into law in 2016. The National Climate Change Action Plans are in charge of putting this law into effect. The plans provide direction and priority measures for dealing with climate change following Vision 2030. The government proposes that education include formal primary, secondary, tertiary, and adult education; professional development; worker training; and learning through informal means such as cultural and social experiences in the draft guidelines for mainstreaming climate change in curricula at all levels of education and training document (Ministry of Environment and Forestry, 2020). According to the guidelines, curricula planners should integrate climate change components so that students can understand, acquire knowledge and skills, and apply concepts related to climate change, which will aid in the implementation of global and national climate change goals (Ministry of Environment and Forestry, 2020).

Climate Change Education in South Africa

In South Africa, the Department of Education and the Department of Environmental Affairs and Tourism (DEA&T) are collaborating to ensure that environmental education and sustainable development are integrated into curriculum subjects in schools (Mawela, 2020). South Africa's school curriculum is identical across the country, regardless of whether students

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live in rural or metropolitan areas. In South Africa, education is centered on a single curriculum policy known as the Curriculum and Assessment Policy Statements (CAPS). According to CAPS, learners should know and be able to explain: the difference between weather and climate; the different climates in South Africa; the climate of their area; and the factors that influence both of these systems, such as temperature, wind, air pressure, and precipitation by the end of grade 5 (South Africa, 2012). These topics are covered not only in Geography and the social sciences but also in Natural and Life Sciences subjects.

Except for grade 7, students in grades 5 through 11 study weather and climate. Learners in grade 10 learn about the greenhouse effect's impact on people and the environment, as well as global warming's evidence, causes, and consequences in Africa, as well as the impact of climate change on Africa's environment and people, including deserts, droughts, floods, and rising sea levels. The function of oceans in climate management in Africa; the El Nino and La Nina processes and their influence on Africa's climate; and reading and understanding synoptic weather maps are all topics covered in grade 11 (South Africa, 2012).

The results of focus-group discussions with children aged 14 to 17 in KwaZulu-Natal and Limpopo were published in the UNICEF report change through the eyes of a child; Children in South Africa discuss climate change. The youngsters were mostly aware of the future repercussions of climate change (UNICEF, 2011), and many of them predicted that when they grow up and become physicians, they will most likely have to deal with serious diseases caused by climate change. The children were able to foresee some of the economic consequences of climate change, as well as remedies that may be utilized to mitigate and adapt to those consequences. However, the poll found that children's understanding and perspectives on climate change remained biased (Vijovic, 2013). Based on her examination of 32 semi-structured interviews with these instructors, Vijovic (2013) believes that the majority of high-school geography teachers had an accurate understanding of climate change-induced dangers, but only a few had deeper scientific knowledge and understanding of these concerns. According to Anyanwu, La Grange, and Beets (2015), for climate change education to be successful, instructors must be completely educated in climate change science to properly convey the concepts behind climate change's source, effects, and solutions.

The findings of Nkoana's (2020) study on the awareness and perceptions of climate change hazards among South African seventh and eighth-grade students show that climate change education influences perceptions of current and future climate change threats. Short-term hazards were more concerning to students than long-term concerns. Short-term concerns, such as providing basic requirements and dealing with criminality, were also prioritized over long-term dangers, such as climate change, according to the responses (Nkoana, 2020). The local context and discourse within which learners view and experience their environment are represented by a daily fight for these basic requirements. Students were typically unaware of the most common and direct causes and effects of climate change, according to a study done by Akrofi, Sarpong, and Gumbo (2019). This suggests that students may be contributing more to global warming and climate change than they realize. Climate change education is required to raise learners' environmental understanding and views.

Integration of Climate Change Education Into The School Curriculum In South Africa

The curriculum is the list of subjects that students and teachers must study to meet specific goals and objectives (Ikechi, Ifeanyieze, & Ugwuoke 2014). It is a set of tasks designed to be

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completed to acquire desired societal knowledge, skills, attitudes, and values. The curriculum, according to Ikechi et al. (2014), is a purposefully and methodically planned body of knowledge, skills, and attitudes organized into subject topics and taught to students in schools. However, whether at the primary or secondary school level, the curriculum refers to the list of subject issues taught in the school, which changes by level and is determined by societal demands. Mathematics, Life Science, Natural Science, Social Sciences, English FAL, English HL, and Economics are examples of such disciplines.

Integration is the process of incorporating one thing into another to better it. In this study, integration refers to incorporating climate change education into existing school disciplines included in the CAPS papers to teach students about the meaning, causes, impacts, mitigation, and adaptation measures related to climate change (Ikechi et al., 2014). As a result, if education is to contribute to the current challenge of weather variations, climate change must be integrated into the curriculum to ensure that learners in South Africa's primary and secondary schools are aware of climate change issues, including mitigation and adaptation strategies as a tool for combating the impacts (Selim, 2012; IPCC, 2007; Ikechi et al., 2014).

Teacher Roles and Pedagogical Strategies to Teaching Climate Change Education

Climate change education is a global phenomenon that necessitates a comprehensive approach to combating the threat. Africa is one of the most sensitive continents to climate change, owing to both its vulnerability to expected changes and its lack of adaptive potential (IPCC, 2007, 2014). The majority of environmental education focuses on behavioural change (Wals, 2011). However, the changes needed to address difficult issues like climate change entail more than raising knowledge and changing attitudes (Wals, 2011:179; O'Brien, 2015). Instead, building critical-thinking capacity (which some have argued should be "radical" (O'Brien, Reams, Caspari, Dugmore, Fagbihimani, Fazey, & Winiwater, 2013)) that will enable citizens to understand what is going on in society, ask critical questions, and be determined and spur on action may be required (Mayer & Tschapka, 2008; Jikling & Wals, 2008 cited in Walls, 2011:179).

Transdisciplinary approaches –(TD) (Thompson – Klein, 2010) must therefore include means to embed multiple inputs, development requirements, and expectations from a variety of actors, many of whom are located outside of learning centers, in the curriculum. As a result, integrating for climate change education necessitates integrating across 'conventional' educational disciplines (O'Brien, 2015). The necessity for transformative education for change has become more widely recognized. The need for a revolutionary approach to teaching and learning climate change education has been recognized internationally (O'Brien et al., 2013; O'Donoghue, 2014). Learners can learn to know, do, and be able to improve themselves and society through the transformative approach.

Another way for instructors to incorporate climate change education into their lessons is through project-based learning (PBL). According to Killen (2010) and the South African Institute for Distance Education (2012), this form of learning is oriented on learning in the real world and allows learners to actively participate in gaining topic knowledge and expertise. The experiential learning theory underpins the problem-based learning approach (Muller & Wood 2021). Some methodologies that can be utilized to give chances for socially relevant climate change teaching and learning include transdisciplinary, integral thinking, and transformative learning (Vogel, Schwaibold & Miser 2015). The adoption of learner-centered inquiry

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(MoPSE, 2016; MoGE, 2013) and deep learning pedagogies (Fullan & Langworthy, 2013) that encourage expanded learning is required to achieve the three goals of an outcome-based approach, alignment to ESD, and climate change action (Lucas, Claxton & Spenser, 2013). Deep learning focuses on cultivating the learning, producing, and doing dispositions that young people require to succeed now and, in the future (Fullan & Langworthy, 2013). Expansive education focuses on cultivating a learning disposition or mentality, as well as knowledge and a mindset oriented toward dealing with complexity and difficulties. Its goal is to connect students to the outside world as well as the local community (Lucas, 2019). Teachers' roles shift dramatically as a result of these approaches: they become facilitators and activators, or change agents, working with students to co-create (i.e., arrive at) information, ideas, and actions for innovative change (Fullan & Langworthy, 2013). Teachers who use these methods are expected to model and practice what they are teaching.

DISCUSSION

Although countries, particularly South Africa, Nigeria, and Kenya, are making concerted efforts to raise climate change awareness and education, there appear to be no clear strategies for teachers to use when integrating climate change education into their lessons. What appears is that these countries are concerned about the effects of climate change and are attempting to achieve its integration in the school curriculum. As a result, climate change education in these countries appears to be scraping the surface, as it does not appear to be centered on teaching and learning, which is the fundamental business of education. For climate change education to be effective, Bofferding and Kloser (2015) stressed the need for climate change education pedagogical strategies to be curriculum aligned and locally relevant to the needs of each country. Learners must be able to use examples in their immediate environment in addition to classroom teaching. Some of the strategies that may be proposed for the teaching and learning of climate change education include critical thinking, transdisciplinary and project-based learning (Monroe, Plate, Oxarart, Bowers & Chaves, 2019). These approaches, however, must be curriculum aligned and locally relevant to the needs and aspirations of individual countries. The South African government through the South African National Climate Change Response Policy White Paper emphasizes the teaching of climate change concepts and related topics at all levels of formal education to address the country's vulnerability (Department of Environmental Affairs, Republic of South Africa, 2011). What seems to be still unclear is how teachers at the classroom level would integrate climate change education in their lessons. This means that there is a need for a clear framework that will specifically guide teachers on how climate change education should be integrated with the lesson. It can also be shown that these countries' efforts to raise climate change awareness have had a significant impact on residents' attitudes and perceptions about climate change and its consequences. However, this does not seem to be translating into teaching and learning practices that could serve as the main drivers of climate change education. For instance, in Nigeria, although teachers are aware of climate change, there seem to be different interpretations of climate change education. The teacher education institutions themselves seem to be varying in terms of training pre-service teachers on climate change and in some institutions climate change education is not emphasized as it is briefly mentioned during the lectures (Ayanlade & Jegede, 2016). This kind of situation will not assist in enhancing climate change education in schools in this country.

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Although there seems to be no clear strategy on how teachers should integrate climate change education in their lessons, Kenya is moving at fast pace in terms of climate change education. Several programs such as training students and teachers to notice early warning signs of flooding and to prepare for the start of catastrophes such as floods have been launched (Anderson, 2010). This is an indication that Kenya is a bit ahead of other countries that this study focused on Climate change education is mainstream in educational curricula at all levels through the Ministry of Environment and Forestry in conjunction with the Ministry of Education (Ministry of Environment and Forestry, 2020). However, apart from these training programmes and the seemingly mainstreaming of climate change in educational curricula Kenya like the other two countries do not seem to have a clear strategy on how teachers should integrate climate change in their classrooms.

CONCLUSION

It can be concluded from the above literature review that Nigeria, Kenya, and South Africa are aware of the catastrophic impact of climate change and are decisively and seriously addressing it through climate change education as there are policies and programmes that are focusing on climate change awareness. Although these countries are addressing climate change, there seem to be varied strategies for dealing with this common enemy (climate change), and the paces with which these countries move differ. It can also be deduced from the literature that there are no coherent and clear pedagogical strategies that are suggested for teachers to effectively integrate climate change education in their classrooms. It is therefore recommended that teacher education institutions introduce climate change education modules for all pre-service teachers so that the integration of climate change education could be achieved at all levels of the schooling system. Teachers' roles in classroom teaching and learning are crucial, and they should be considered as assisting students in developing the skills they need to effectively adapt to and mitigate climate change in their environment.

RECOMMENDATIONS

This study, therefore, recommends the following:

- That efforts should be intensified by the government and stakeholders to address the problem caused by climate and reverse the damage to the environment.
- An intersectoral forum that involves the Department of Basic Education (DBE), Department of Forestry and Fisheries (DEFF), and other stakeholders should as a matter of urgency be established and an integrated strategy is developed to deal with climate change. This strategy should among other things include the organization of workshops that will increase consciousness among teachers, learners, and communities.
- To bolster climate change content and pedagogical knowledge among teachers by embarking on training programmes (continuous development teacher development programmes) for pre-service and in-service teachers.

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