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Infusing Climate Change Education into Curriculum and Assessment Policy Statement (CAPS) as a Resilience Strategy in South Africa: Towards a Theory of Change

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ABSTRACT
Despite the prominent role played by education in knowledge creation, developing of skills and attitudes among people, little has been done in the domain of climate change education in the current Curriculum and Assessment Policy Statement (CAPS) in South Africa. This is not to say that no scholars have looked at issues of climate change in education. Therefore, the main goal of this research is to investigate how curriculum development and learning materials should incorporate climate change to raise awareness. The researcher attempts to illustrate deeper learning approaches that aim to instil values and belief systems in the domain of climate change knowledge and experience. The study used qualitative interviews and purposeful sampling methods to ascertain rich and in-depth information from the participants. The findings revealed that the majority of the teachers emphasized that the CAPS's lack of explicit content was the primary issue. Given the limited knowledge creation in the domain of climate change in developing countries, in particular South Africa's curricula, the study concluded that much has to be done to integrate climate change education in the current CAPS curricula. The study recommends that continuous awareness campaigns should be undertaken to conscientise people about the importance of climate change education.

Keywords: *Climate Change Education, Sustainable Development, Infusing, Resilience, Intermediate Phase, Senior Phase, FET Phase*

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INTRODUCTION
One of the issues affecting everyday life generally and teaching and learning specifically is the climate.[1] Indeed, South Africa in particular, as well as all of Africa, is suffering from climate change due to factors including inadequate adaptation ability and anticipated alterations to lived experiences.[2] Complex and interrelated mechanisms lead to the effects of climate fluctuation and change. To adapt to climate change, education must provide multidisciplinary, interdisciplinary, and transdisciplinary approaches to teaching, learning, and curriculum development. These stresses typically intersect with a variety of other complex, interacting stresses (such as HIV/AIDS, environmental degradation, etc.). Climate change and its effects

[1] Horst W J Rittel and Melvin M Webber, "Dilemmas in a General Theory of Planning," *Policy Sciences* 4, no. 2 (1973): 155–69.
[2] IPCC, *Summary for Policymakers of the Synthesis Report of the IPCC Fourth Assessment Report* (Geneva: IPCC Secretariat, 2007).

are significant issues in South Africa, where some projected estimates show significant warming.[3] Forecasts for Africa point to warming that is more than twice the average world temperature (see the various IPCC reports). Given the specific vulnerabilities that South Africa's communities face from climate change, what will it take to create a vibrant and empowered citizenry? This study contends that the development of the agency necessary to "live" with climate change effectively requires a thorough and meaningful education that spans early childhood through adult learning experiences.[4]

Many educational specialists who work in knowledge domains related to sustainability, such as climate change frequently advocate for a shift in the way we "think" and perhaps even "feel" about these issues.[5] For instance, Wals observes that "addressing climate change... involves a change of thinking," adding that "the climate problem is ultimately between the North and South Poles as much as it is in between our ears".[6] Most environmental education attempts to change people's behavior.[7] However, addressing complex issues like climate change requires more than just raising awareness and changing attitudes.[8] Instead, it is important to cultivate critical thinking abilities, which some have called for to be "radical"[9] might be required to assist
citizens in understanding social issues, posing critical questions, and determining whether and how to take action.[10]

Some international literature addresses the issue of students' awareness of climate change in relation to this problem;[11] educators' awareness;[12] the effects of climate change;[13] the incorporation of climate change into agricultural science in secondary schools;[14] and the role of the media in raising awareness of climate change.[15] This study explored the extent to which implementation of the curriculum contributes to awareness of climate change among teachers and learners in the context of embracing sustainable development in the curriculum in South Africa. Thus, the question of climate change remains a significant challenge in the context of sustainable development in the implementation of the curriculum in South Africa. This is not to say that no scholars have looked at issues of climate change in other countries such as Kenya as focal points within the discourse of embracing sustainable development in the curriculum. However, a better understanding is needed in the domain of creating and infusing climate change awareness into public schools' curriculum in South Africa.

The climate crisis is the greatest threat facing the planet and South Africa can never divorce itself from this threat. Humanity has little time to turn around the tide and education is critical in doing so. Climate change education in South Africa is subpar, particularly among countries with the highest responsibility for greenhouse gas emissions. Some of the more noteworthy lessons regarding how climate

[3] Department of Environmental Affairs (DEA)., *Long-Term Adaptation Scenarios Flagship Programme (LTAS) for South Africa* (Pretoria, 2013).
[4] Karen O'Brien, "Political Agency: The Key to Tackling Climate Change," *Science* 350, no. 6265 (2015): 1170–71.
[5] Arjen E J Wals, "Mirroring, Gestaltswitching and Transformative Social Learning: Stepping Stones for Developing Sustainability Competence," *International Journal of Sustainability in Higher Education* 11, no. 4 (2010): 380–90; Bob Jickling and Arjen E. J. Wals, "Globalization and Environmental Education: Looking beyond Sustainable Development," *Journal of Curriculum Studies* 40, no. 1 (February 2008): 1–21, https://doi.org/10.1080/00220270701684667..
[6] A E J Wals, "Sustainability Needs Links between Theory and Practice in Education. Press Release, Wageningen University," 2014.
[7] Arjen E J Wals, "Learning Our Way to Sustainability," *Journal of Education for Sustainable Development* 5, no. 2 (2011): 177–86.
[8] Wals, "Learning Our Way to Sustainability"; O'Brien, "Political Agency: The Key to Tackling Climate Change."
[9] Karen O'Brien et al., "You Say You Want a Revolution? Transforming Education and Capacity Building in Response to Global Change," *Environmental Science & Policy* 28 (2013): 48–59.
[10] Michela Mayer and Johannes Tschapka, "Engaging Youth in Sustainable Development: Learning and Teaching Sustainable Development in Lower Secondary Schools," 2008.
[11] Henry Olu Owolabi, Emmanuel Kofi Gyimah, and Mark Owusu Amponsah, "Assessment of Junior High School Students' Awareness of Climate Change and Sustainable Development in Central Region, Ghana," *Educational Research Journal* 2, no. 9 (2012): 308–17.
[12] Uduak Imo Ekpoh and Imo Jackson Ekpoh, "Assessing the Level of Climate Change Awareness among Secondary School Teachers in Calabar Municipality, Nigeria: Implication for Management Effectiveness," *International Journal of Humanities and Social Science* 1, no. 3 (2011): 106–10; Nkechi J Okoli, "Teacher Preparation and Climate Change Curriculum at University Level in Nigeria," *International Journal of Multidisciplinary Academic Research* 2, no. 3 (2014): 1–8.
[13] S Aja, "Addressing the Challenges of Climatic Change through Environmental Education for Sustainable Universal Basic Education Programme in Nigeria," *IOSR Journal of Humanities and Social Science (IOSR-JHSS)* 20, no. 11 (2015): 10–13.
[14] Michael Ei Ikeh, Florence O Ifeanyieze, and Cajethan U Ugwuoke, "Integration of Climate Change into the Senior Secondary School Agricultural Science Curriculum in Nigeria," *Atmospheric and Climate Sciences* 4, no. 04 (2014): 614.
[15] Onkargouda Kakade, Shilpa Hiremath, and Namrata Raut, "Role of Media in Creating Awareness about Climate Change-a Case Study of Bijapur City," *IOSR Journal of Humanities and Social Science* 10, no. 1 (2013): 37–43.

change affects education are presented in this study.[16] There hasn't been much research on how climate change affects education.[17] Consequently, a deeper comprehension of the impact of climate change is required in all educational settings, from primary to postsecondary. Therefore, there is a critical need for immediate collaboration between education and climate stakeholders to merge the education sector with climate policy and decision-making processes. This will help elevate the education workforce as key climate advocates and enhance the ability of education systems to participate in climate action.

Therefore, the main goal of this research is to investigate how curriculum development and learning materials should incorporate climate change to raise awareness. The researcher attempts to illustrate deeper learning approaches that aim to instil values and belief systems in the domain of climate change knowledge and experience, as highlighted by Wals as pertinent in bringing about the integrative learning for change, in light of the knowledge-based learning and materials design discourse.[18] The study also advises against switching from surface-level, content-based approaches to teaching about climate change to a deeper, more systemic, coherent approach based on socio-economic factors.

This study aims to address the following questions by conducting a thorough introspection into the relevant role that formal education plays in raising awareness about climate change in South Africa among teachers and students in particular:

1. Is the content adequately and explicitly presented to raise awareness of climate change among the learners in the current South African public school curriculum?
2. In what ways does the implementation of curriculum help increase awareness and knowledge of climate change among teachers and students?

LITERATURE REVIEW

UNESCO also identified teacher professional development in education for sustainable development as the top priority, acknowledging the transformative role that teachers must play in reorienting education to help realise a sustainable future.[19] According to Chakeredza et al., higher education is essential for bolstering knowledge systems.[20] They stated that topics related to climate change must be included in university curricula. It is long overdue for curricula to integrate evidence-based scientific information on African experiences to tackle the continent's unique challenges. Unfortunately, UNESCO noted that teacher education in Climate Change Education for Sustainable Development is still in its infancy.[21]

Bloom et al., attest to this fact and state that, even though higher education is crucial for supplying the leadership and preparation needed to meet these challenges and advance sustainable development, Africa is among the continents with the least institutional, intellectual, and technological capacity to address the climate crisis.[22] Rolls et al. provided support for the concepts and claimed that only science education discusses climate change education and that the topic is only marginally important in educational research and practice.[23] The curricula could be handled as a separate

[16] Klas Sandell, Johan Öhman, and Leif Olov Östman, *Education for Sustainable Development: Nature, School and Democracy* (Studentlitteratur, 2005); Anthony A Leiserowitz, Robert W Kates, and Thomas M Parris, "Sustainability Values, Attitudes, and Behaviors: A Review of Multinational and Global Trends," *Annu. Rev. Environ. Resour.* 31, no. 1 (2006): 413–44; Stephen Sterling and David Orr, *Sustainable Education: Re-Visioning Learning and Change*, vol. 6 (Green Books for the Schumacher Society Totnes, 2001); S. Sterling, "Higher Education, Sustainability, and the Role of Systemic Learning," in *Higher Education and the Challenge of Sustainability*, ed. P.B. Corcoran and A.E.J. Wals (Dordrecht: Kluwer Academic Publishers, 2004), 49–70; Ioan Fazey, "Resilience and Higher Order Thinking," *Ecology and Society* 15, no. 3 (2010); O'Brien et al., "You Say You Want a Revolution? Transforming Education and Capacity Building in Response to Global Change."

[17] Mutizwa Mukute and Tichaona Pesanyi, "Contextualising Curriculum Design and Recontextualising Its Implementation: The Case of Climate Change Education for Southern African Transfrontier Conservation Area Practitioners," *Southern African Journal of Environmental Education* 30 (2014): 53–65.

[18] Wals, "Mirroring, Gestaltswitching and Transformative Social Learning: Stepping Stones for Developing Sustainability Competence."

[19] UNESCO, *UN Decade of Education for Sustainable Development: The DESD at a Glance* (Paris, France: UNESCO, 2005).

[20] S Chakeredza et al., "Mainstreaming Climate Change into Agricultural Education: Challenges and Perspectives." (Nairobi, Kenya, 2009).

[21] UNESCO, *UN Decade of Education for Sustainable Development: The DESD at a Glance*.

[22] D. Bloom, D. Canning, and K. Chan, *Higher Education and Economic Development in Africa* (Harvard: . Harvard University Press, 2005).

[23] Edmund T Rolls, Fabian Grabenhorst, and Leonardo Franco, "Prediction of Subjective Affective State from Brain Activations," *Journal of Neurophysiology* 101, no. 3 (2009): 1294–1308.

subject, according to Okey and Ndum, but they stressed the urgent need to address climate change challenges through systematic education programs that are not subject-specific.[24]

According to UNESCO, education is essential for comprehending, reducing, and adjusting to climate change.[25] They argue that while education is important at all levels and in both formal and informal settings, educating children about climate change from an early age is the most effective way to change attitudes and behaviours. Similar views were voiced by EAC, which claimed that learning and research institutions play a significant role in advancing climate change knowledge as well as in the preparation and presentation of climate change information in a way that benefits local communities, partner states, and the region.[26] Access to climate change technology and information is a critical component required to effectively respond to climate change regionally.

Therefore, it is clear that since the beginning of modern education, many social, economic, and political issues have been addressed with the belief that education is one of the potential human resources and mechanisms. One example of this kind of thinking is Education for Sustainable Development (ESD), which holds that education can fundamentally alter children's perspectives and be the first important step toward sustainable development.[27] As a result, environmental education is receiving more and more attention on a global scale. As a result, different subjects at different educational levels are incorporating environmental content to provide students with the pertinent knowledge and skills they need to protect and conserve the environment.

Towards a Theory of Change

This research posits that education and training for the following generation of learners—university graduates, educators and learning facilitators, young students enrolled in school, and adult learners—will require more than a straightforward realignment of the curriculum, like mixing in a "bit of social science/development studies" with a "bit of biophysical science.". "To educate the next generation of scholars and citizens to be "emancipated" and to understand knowledge content about the complex climate system, it will be necessary to carefully rethink paradigms and the ways that curricula and knowledge about climate change are currently framed.[28] Additionally, we will need to begin considering our options for combating climate change.[29] Broader approaches that are conscious of, knowledgeable about, and sensitive to the needs of society and the larger environmental context in which decision-making takes place will be required by these knowledge content domains and curricula (e.g., citizen science). These skills and expertise are usually found in specific local settings, such as the rigorous education system in South Africa, and are typically acquired from reputable institutions like schools or universities.[30]

Hence, to effectively address the diverse needs and perspectives of stakeholders, it is essential to adopt a transdisciplinary approach to curriculum development. This approach involves integrating various inputs,development requirements, and expectations from multiple actors, many of whom are external to educational institutions.[31] Additionally, fostering an educational environment that encourages the collaboration of different worldviews and personal perspectives is crucial for addressing climate change learning. This includes breaking down traditional disciplinary barriers

[24] S Okey and V E Ndum, "Curriculum Development on Climate Change in Nigerian University System-Challenges and Solutions," *Nigerian Journal of Curriculum Studies* 20, no. 3 (2013).
[25] UNESCO, *World Conference on Education for Sustainable Development* (Bonn, Germany: UNESCO, 2009).
[26] EAC, *East African Community Climate Change Master Plan* (Arusha, Tanzania: East African Community Secretariat, 2011).
[27] Damtew Wolde, "The Role of Education in Addressing Environmental Problems and Sustainable Development of Ethiopia," *IER FLAMBEAU* 15, no. 1 (2008): 1–38.
[28] Wals, "Learning Our Way to Sustainability."
[29] Carl Folke, "Resilience: The Emergence of a Perspective for Social–Ecological Systems Analyses," *Global Environmental Change* 16, no. 3 (2006): 253–67; O'Brien, "Political Agency: The Key to Tackling Climate Change."
[30] Wals, "Learning Our Way to Sustainability"; Wals, "Mirroring, Gestaltswitching and Transformative Social Learning: Stepping Stones for Developing Sustainability Competence"; Wals, "Sustainability Needs Links between Theory and Practice in Education. Press Release, Wageningen University"; Andreas Muhar, Jan Visser, and John Van Breda, "Experiences from Establishing Structured Inter-and Transdisciplinary Doctoral Programs in Sustainability: A Comparison of Two Cases in South Africa and Austria," *Journal of Cleaner Production* 61 (2013): 122–29.
[31] J. Thompson-Klein, *Creating Interdisciplinary Campus Cultures: A Model for Strength and Sustainability* (San Francisco: Association of American Colleges and Universities, 2010).

in schools and universities, such as biology, physics, economics, and law.[32] In response to recent calls from both local and global sources, there is a growing push to reform the way information regarding 'climate change' is presented. The traditional methods are no longer adequate to address the complex environmental and social challenges of the modern era. Many writers are now calling for a new approach to building capacity and educating the public.[33] Some argue that a complete "revolution" is necessary to effectively address the challenges posed by global environmental change.[34] Developing a broader knowledge of the various environmental challenges that society is facing is a key aspect of valuing an open knowledge system over a closed, uniform, and linear one.[35]

Some may suggest that effectively adapting to climate change necessitates a more daring approach to educational engagement with human behavior, emerging issues, and societal well-being. O'Donoghue emphasizes the importance of knowledge-based learning processes that facilitate deeper understanding and enhance critical thinking skills.[36] Such sequences should be integrated into both educational settings and broader multi-stakeholder reflective learning initiatives in an evolving environment. Nevertheless, to engage in higher-order thinking, one must investigate the "interior" viewpoints of religious significance, aesthetic experience, emotional responses, ethical principles, and cultural values all of which have an impact on the way we create meaning.[37] Therefore, it becomes equally important to comprehend how shifting perspectives and framing ideas empower individuals to take action for change as it does to comprehend the intricacies of global warming.

A range of approaches, such as transformational learning,[38] transdisciplinary learning,[39] and integral thinking can be used to generate opportunities for societally relevant climate change learning.[40] People's worldviews, particularly those regarding climate change, are shaped by their experiences in schools and colleges.[41] In our complex world, it is important to consider a range of differing viewpoints from various epistemic communities, including those that advocate for transdisciplinary methods and the process of changing perspectives, as discussed by Scharmer and Funtowicz & Ravetz.[42] Jickling & Wals argue that universities must foster sustainability skills.[43] This may involve looking beyond traditional educational institutions to identify external sources of knowledge and incorporating them into the curriculum. Doing so can facilitate shifts in perspectives on climate change and environmental issues.

Research Philosophy

Killam asserts that the inquiry must be guided by a variety of paradigms, or sets of beliefs, including positivism, interpretivism, and constructionism.[44] These perspectives have their roots in different schools of philosophy. A paradigm, according to Guba & Lincoln, is a basic belief system that is influenced by presumptions regarding ontology (the study of reality), epistemology (the study of knowledge), and

[32] Sterling and Orr, *Sustainable Education: Re-Visioning Learning and Change*; Fazey, "Resilience and Higher Order Thinking"; O'Brien et al., "You Say You Want a Revolution? Transforming Education and Capacity Building in Response to Global Change"; O'Brien, "Political Agency: The Key to Tackling Climate Change."
[33] O'Brien et al., "You Say You Want a Revolution? Transforming Education and Capacity Building in Response to Global Change."
[34] O'Brien et al., "You Say You Want a Revolution? Transforming Education and Capacity Building in Response to Global Change."
[35] Fumiyo Kagawa and David Selby, "Ready for the Storm: Education for Disaster Risk Reduction and Climate Change Adaptation and Mitigation1," *Journal of Education for Sustainable Development* 6, no. 2 (2012): 207–17; O'Brien et al., "You Say You Want a Revolution? Transforming Education and Capacity Building in Response to Global Change"; O'Brien, "Political Agency: The Key to Tackling Climate Change."
[36] Rob O'Donoghue, "Think Piece: Re-Thinking Education for Sustainable Development as Transgressive Processes of Educational Engagement with Human Conduct, Emerging Matters of Concern and the Common Good," *Southern African Journal of Environmental Education* 30 (2014): 7–26.
[37] Sean Esbjörn-Hargens, "An Ontology of Climate Change," *Journal of Integral Theory and Practice* 5, no. 1 (2010): 143–74.
[38] Jack Mezirow, "Transformative Learning: Theory to Practice," *New Directions for Adult and Continuing Education* 1997, no. 74 (1997): 5–12; Andrew Kitchenham, "The Evolution of John Mezirow's Transformative Learning Theory," *Journal of Transformative Education* 6, no. 2 (2008): 104–23; Edward W Taylor, "An Update of Transformative Learning Theory: A Critical Review of the Empirical Research (1999–2005)," *International Journal of Lifelong Education* 26, no. 2 (2007): 173–91.
[39] Thompson-Klein, *Creating Interdisciplinary Campus Cultures: A Model for Strength and Sustainability*.
[40] O'Brien et al., "You Say You Want a Revolution? Transforming Education and Capacity Building in Response to Global Change."
[41] Wals, "Mirroring, Gestaltswitching and Transformative Social Learning: Stepping Stones for Developing Sustainability Competence."
[42] C.O. Scharmer, *Theory U. Leading from the Future as It Emerges* (San Francisco: Berett- Koehler Publishers, 2009)Silvio O Funtowicz and Jerome R Ravetz, "Science for the Post-Normal Age," *Futures* 25, no. 7 (1993): 739–55..
[43] Jickling and Wals, "Globalization and Environmental Education: Looking beyond Sustainable Development."
[44] Laura Killam, *Research Terminology Simplified: Paradigms, Axiology, Ontology, Epistemology and Methodology* (Laura Killam, 2013).

methodology (the process of making discoveries).[45] While epistemology focuses on how knowledge is acquired via methodical processes, ontology deals with what is deemed true or real.[46] This suggests that a qualitative-interpretive technique values people's unique perceptions of reality and accepts that people's experiences are genuine and affected by society. Conversation or hearing from others, helps researchers comprehend the experiences of others. Based on the interpretative framework, the research looks into how climate change education can be integrated into CAPS. For the purpose of this study, we framed this study in trying to understand the processes, experiences and practices teachers go through in delivering the current CAPS curricula. We wanted to understand not only how people interpret their experiences and construct their worlds but also what meanings they attribute to their experiences. We sought to understand people's actions considering their values and beliefs about the teaching fraternity or profession. We tried to understand the assumptions underlying the choices teachers make, which are lived experiences within specific contexts and circumstances of their existence.

METHODOLOGY

This section outlines the methodology guiding the research. Data collection methods included conducting one-on-one interviews. To explore teachers' lived experiences, qualitative analysis was deemed appropriate as alluded to by Strauss and Corbin.[47] This study used phenomenological design, to investigate teachers' viewpoints on how climate change education can be integrated into CAPS. Purposive sampling was used in this study to collect comprehensive data from ten (10) teachers at Makupula Secondary School and ten (10) teachers at Kayamandi High School. The research entailed interviewing teachers to obtain their specific opinions. The data was analysed using grounded thematic data analysis to gather viewpoints and ideas from the teachers.

Informed consent was given by each study participant to confirm comprehension and desire to participate. Participants received information about their rights, such as respect for their privacy, consent, and information protection. For the purpose of this study, participation was entirely voluntary. Researchers assured that there would be no harm against them. To protect informants' identities, their names won't be revealed.

Ethical Considerations

Participants received guarantees about their rights, such as the right to privacy protection, protection from information disclosure, and the right to agree. To find out if the participants were willing to participate in the study, effective communication was created with them. It is essential to remember that every participant gave their consent voluntarily. The investigators exercised extreme caution to guarantee that the subjects suffered no hazards, humiliation, excessive strain, or cruel treatment. Confidentiality and anonymity were assured, and they were scrupulously upheld during the research. The researcher also took care to ensure that the participants' identities remained secret.

DISCUSSION OF FINDINGS

The teachers' perceptions and lived experiences are discussed in this section. The findings were consolidated into the following three themes identified from the teachers' perspectives, judgements, and lived experiences, namely (1) Challenges in the infusion of climate change content into CAPS; (2) Continuous teacher development; and (3) Future of climate change in CAPS.

Challenges in the infusion of climate change content into CAPS

The majority of the teachers emphasized that the curriculum lacked explicit content as the primary challenge. As a result, they said that the teachers had to make a special effort to explain the entire idea. They claimed that because the current CAPS curricula are assessment-oriented and teachers appear to only teach material that will likely be assessed, the situation was extremely uncertain. As a result, the content is not given much attention. Instructors also mentioned how little is understood about climate change.

[45] Egon G Guba and Yvonna S Lincoln, *Fourth Generation Evaluation* (Sage, 1989).
[46] Killam, *Research Terminology Simplified: Paradigms, Axiology, Ontology, Epistemology and Methodology*.
[47] A. Strauss and J. Corbin, *Basics of Qualitative Research: Grounded Theory Procedures and Techniques* (Newbury Park, CA: Sage Publications, Inc., 1990).

They are unable to instruct students on the subject because of their limited understanding of it. A similar issue was brought to light by Litus, who pointed out that effective climate change education will continue to be hampered by teachers' ignorance of the subject.[48]

Teachers also believed that most stakeholders would not be in favor of adding more content to the curriculum, even though they believed that climate change needed to be addressed in a special discipline. They asserted that the majority of those involved in the education sector believed that the curriculum was already overburdened and that adding more would be extremely undesirable. According to a study by Bangay & Blum, one of the main issues that could potentially lessen the role that schools play in providing students with the knowledge, desirable attitude, and applicable skills they need to make an impact on their local environment is the overloaded nature of secondary school curricula.[49]

It was also determined that the DBE has no control over the curricula offered by universities. Because of this, some of the university-trained teachers may not be qualified to teach some of the concepts in the CAPS curricula because they lack pertinent knowledge on those topics. Lastly, educators expressed reluctance to teach the practical aspects of climate change. They supported the notion that, as a developing nation, South Africa is ill-prepared to deal with the technical aspects of climate change and can only incorporate basic theoretical ideas into the curriculum.

Consequently, the study contends that much work needs to be done to integrate climate change education into the current CAPS curricula given the limited knowledge creation in the domain of climate change in developing countries, particularly South Africa's curricula, in an attempt to connect the significance of these results to research questions. It goes on to suggest that ongoing awareness campaigns be launched to educate the public about the significance of climate change education.

Continuous Teacher Development

Pre-service and in-service teacher education and training is also central to equipping teachers with the knowledge and skills to provide appropriate services for students from different backgrounds, with different capabilities and orientations. Such teacher education, training and professional development should be fully funded by the State and targeted to help teachers embrace diversity and use it to enhance the learning experience, including through the use of new information and communication technologies in the classroom. Well-designed induction programs are important for the retention of new entrants in the profession and to enable them to perform effectively.

Teachers would have the knowledge, attitude, and abilities needed to handle any new concepts with the help of such training. Teachers disclosed that there weren't enough funds for that and voiced worries that it would seriously jeopardize the success of the new curriculum's implementation. It was expected of the few teachers who did receive the orientation to orient other teachers. However, since few of the teachers who got training shared their knowledge with other teachers, the orientation was ineffective. Dal et al. (2009) suggested that rather than holding in-service pieces of training, it would be preferable to incorporate climate change education into teacher education. For teacher candidates, creating courses on climate change awareness could be beneficial.

Future of Climate Change in CAPS

Teachers had varying opinions about what they thought should happen with CAPS in the future. Some felt that the curriculum reform would undoubtedly help address environmental challenges by incorporating new topics like biodiversity preservation, environmental sustainability, removing environmentally hazardous processes, and sustainable resource use, to name a few. A plan like this is probably going to provide useful information for reducing climate change. Some educators, however, believed that CAPS is already overburdened.

RECOMMENDATIONS

The following recommendations are made to preserve the environment for present and future generations, based solely on the study's findings: Curriculum specialists should: a) ask experts in climate change to

[48] S. Litus, *Climate Change and Environment Education* (New York: UNESCO, 2012).
[49] Colin Bangay and Nicole Blum, "Education Responses to Climate Change and Quality: Two Parts of the Same Agenda?," *International Journal of Educational Development* 30, no. 4 (2010): 359–68.

submit necessary content for future curriculum reforms to incorporate into the curriculum, and b) give teachers' unions and other education-related stakeholders more influence over teacher preparation programs nationwide. c) to give teachers the skills and knowledge they need to pass on to students, emphasis should be placed on providing ongoing professional development in the area of climate change; d) the CAPS should incorporate content related to climate change; and f) to determine the most effective approaches to addressing the challenges posed by climate change, more research should be conducted to ensure that more is known about how well our curriculum is performing in this area. It is also recommended that DBE should have a direct influence over universities‘ programs.

CONCLUSION

Given the limited knowledge creation in the domain of climate change in developing countries, in particular South Africa’s curricula, the study concluded that much has to be done to integrate climate change education in the current CAPS curricula to conscientise people about the importance of climate change education.

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