

Infusing Climate Change Content into Kenya's Secondary School Taught Curriculum: Successes and Challenges

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Abstract: *Despite the great role played by education in creating knowledge, developing skills and attitudes among people, little climate change content exists in taught curricula especially in most developing countries. This study therefore aimed at undertaking a survey on Kenya's situation to establish steps made in infusing such content into the taught curriculum and challenges that come with such efforts. The study targeted heads of selected subjects (Agriculture, Biology, Chemistry, Physics, History, Christian Religious Education, Geography and Business Studies) from Kenya Institute of Curriculum Development. The study employed a survey research design. Purposive sampling technique was employed to select subject heads that the researcher felt that their subjects were directly or indirectly related to climate change. The study conducted interviews from sampled respondents to ascertain the research problem and answer the research questions. Views from the sampled respondents were then analyzed and the findings are presented and discussed in this paper.*

Keywords: *Challenges, Climate Change, Infusion, Successes, Taught Curriculum*

I. Introduction

UNESCO (2009), asserts that climate change consequences are likely to impact disproportionately on people in Asia and Africa as well as those living in Small Island Developing States although the specific nature of climate threats will vary between countries. They propose that education would play a central role in understanding, mitigating and adapting to the changing climate. They also argue that although education at all levels and in both formal and informal settings is needed instilling climate change awareness and understanding at a young age is ultimately the best way to change behaviours and attitudes.

In reaction to this, several such vulnerable countries have reacted to control the situation. For instance, the Government of Vietnam identified climate change adaptation as one of its top priorities. In 2010, the Vietnam Ministry of Education and Training (MOET) took an important step by developing the "MOET Action Plan on Education Sector Response to Climate Change (UNESCO, 2009).

In South Africa the National Curriculum Statement (NCS) for both Life sciences and Physical sciences learning areas grades 10-12 learners are required to among other things: behave as responsible citizens and as such be able to make informed decisions on environmental management and lifestyle choices for a sustainable future e.g. ozone, global warming and the greenhouse effect, acid rain and its consequences. They are also supposed to be able to present scientific arguments on the risks and benefits of the combustion of organic products and the manufacturing of synthetic products on human development, society and the environment. For grades 4-9 the requirements of the Natural sciences curriculum are among others to: be familiar with the different gases that are present in the atmosphere and their proportions at different levels of the atmosphere as well as be able to identify carbon (IV) dioxide, oxygen and photosynthesis through reactions (Suthananda *et al.*, 2012).

In Seychelles, according to the Seychelles National Curriculum Framework (2001), curriculum documents were being revised, and there may be opportunities for the inclusion of new content related to climate change. The curriculum for secondary level Geography does not include climate change as a specific topic rather it is considered to be more of a cross-cutting theme. Several topics are indirectly related to climate change, including: industries and environmental impacts, weather and climate, population studies, urbanization etc. There are no specific resources available to help Geography teachers integrate climate change more comprehensively into their lessons.

In Kenya the only effort that has been made to infuse climate change in the curriculum is the development of the National Climate Change Response Strategy (NCCRS). The NCCRS acknowledged that little has been done in the infusion of climate change into the curriculum, they blame this on the lack of adequate climate change information, knowledge and long-period data to researchers, planners, policy makers

and the general public on climate change impacts, adaptation and mitigation measures (Government of Kenya, 2009).

1.1 Statement of the Problem

The UN Secretary-General, Ban Ki Moon in 2008, proclaimed climate change as the defining challenge of our time. This followed accumulated scientific data including evidence of positive feedback mechanisms that would amplify the warming of the planet and of abrupt, irreversible climate 'tipping points' (UNESCO, 2010), that forced IPCC to adopt a firmly unequivocal and more urgent tone of dealing with climate change (IPCC, 2007). A similar stand was adopted by Romm (2007), who claimed that climate change was coming faster and rougher than scientists had expected. In this difficult scenario UNESCO (2013), proposed that education had a crucial part to play in building social and individual capacities and attitudes for climate change mitigation so as to pre-empt worst case climate change scenarios in the future. Second, it has the task of developing the skills, capacities and attitudes for adaptation in the face of already evident and looming climate impacts. Lastly, education has a continuous role to play in stimulating and reinforcing understanding of and attentiveness to the realities of climate change. Despite the danger that climate change poses to humanity and the crucial role that education has to play in mitigating and adapting to its consequences Bloom *et al.*, (2005), claimed that Africa is among the continents with the least intellectual institutional and technological capability to address the climate challenge. This study reviewed a wide variety of literature and established that most of the studies conducted in Africa delved on issues of students' awareness of climate change (Henry *et al.*, 2012); teachers' awareness (Joy and Eunice, 2014; Ekpoh and Ekpoh, 2011; Nkechi, 2014); climate change impacts (Aja, 2015); infusion of climate change into secondary school agricultural science (Michael, 2014) and the role of media in creating climate change awareness (Onkargouda *et al.*, 2013). Very few of the reviewed studies were conducted in Kenya on issues of climate change and the few mainly touched on indigenous coping and adaptation strategies (Edward *et al.*, 2014), status of climate change content in Kenya's selected secondary school subjects (Kariuki *et al.*, 2016) and perceptions of teachers towards the integration of adaptation strategy topics on climate change into secondary school agriculture syllabus (Stephen *et al.*, 2014). From reviewed literature, this study established that no study had been conducted to establish efforts being made by curriculum developers, successes and challenges, in a bid to infuse climate change content into the curriculum. This study therefore undertook to conduct a survey on sampled curriculum developers from Kenya Institute of Curriculum Development (KICD) to establish the successes they have made as well as challenges they face in their bid to infuse climate change content into Kenya's secondary school curriculum.

1.2 Objectives

This study was guided by the following research objectives:

- i. To find out the successes Kenya Institute of Curriculum Development has achieved in infusion of climate change content into the taught curriculum.
- ii. To evaluate the challenges that KICD faces in its effort to infuse climate change into the curriculum.

1.3 Rationale of the study

The study was aimed at establishing steps made in infusing climate change content into the curriculum and the challenges that Kenya's curriculum developer faces in their effort to infuse such knowledge. In so doing, this study is expected to lead to advancement of knowledge on how best Kenya's education curriculum can address climate change issues and some of the challenges of infusion of climate change content into the curriculum. Practically environmental campaigners will get the status as it is in Kenya and therefore act accordingly. Finally the study shall form a basis on which others can develop their studies.

II. Literature review

UNESCO (2009), argued that education has a central role to play in understanding, mitigating and adapting to the changing climate. They argue that education at all levels and in both formal and informal settings is needed but instilling climate change awareness and understanding at a young age is ultimately the best way to change behaviours and attitudes. Similarly EAC (2011), posed similar sentiments that learning and research institutions play an important role in developing climate change knowledge, preparation and presentation of climate change information in a way that benefits local communities, partner states and the region and that access to climate change information and technology is one of the key elements necessary to effectively respond to climate change regionally.

It is therefore evident that since the start of modern education, it has been trusted as one of the potential human assets and mechanisms to tackle many of the social, economic and political problems we have seen so far. Education for Sustainable Development (ESD) is one instance of such belief that education can play indispensable roles in changing the minds of children - the very first and key step to move towards sustainable

development (Damtew, 2008). Accordingly, Environmental Education has been given an increasing attention at the global level - as a result of which - various subjects at different levels of schooling are made to incorporate environment related contents so as to equip learners with relevant knowledge and skills necessary for protecting and conserving the environment. It dates back to the first International Environmental Education Conference, which took place in Belgrade in 1975. The conference's definition of environmental education is cited in Stapp *et. al.*, (1975): "An integral part of the educational process, aimed at practical problems of an interdisciplinary character, build a sense of values, and contribute to public well-being. Its focus should reside mainly in the initiative of the learners and their involvement in action and guided by both the immediate and future subjects of concern."

The Conference on Environmental Education later held in Tbilisi defined Environmental Education as a process aimed at developing a world population that is aware of and concerned about the total environment and its associated problems, and has the attitudes, motivation, knowledge, commitment and skills to work individually and collectively towards solutions of current problems and the prevention of new ones (Stapp *et. al.*, 1997). What is defined in the Belgrade Conference is more about prescription on how environmental education should be worked out to achieve the intended goals (working on practical problems, developing important values and thereby strive for public well-being). Thus, the consideration of environmental education as a necessary part of educational process and its interdisciplinary nature are major points underlined in this first conference. Whereas, in the Tbilisi Conference, as a follow up of the Belgrade Charter, the concept of environmental education was described in a more specific manner like developing peoples' awareness, attitudes, knowledge, skills, and increasing the participation of the people to work collaboratively and individually for the same goal- finding solution to the contemporary environmental problems and thereby saving tomorrow a better world.

Other organizations as well as researchers have advanced the concept of Environmental Education. For instance, USA Environmental Protection Agency (EPA, 2015), described environmental education as a process that allows individuals to explore environmental issues, engage in problem solving and take action to improve the environment. Similarly UNESCO (1978), defined it as a learning process that increases people's knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges and foster right attitudes, motivations and commitments to make informed decisions and take responsible action. Conclusively, Environmental Education is seen as organized efforts to teach how natural environments function, and particularly, how human beings can manage behaviour and ecosystems to live sustainably. This implies that Environmental Education is concerned with teaching individuals and communities, ways of transitioning to a society that is knowledgeable of the environment and its associated problems in order to be aware of the solutions to environmental problems and be motivated to solve them.

Since Environmental Education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work towards their solution (Stapp, 1969), UNESCO and UNEP identified six key objectives of environmental education as follows:

- i. Awareness: Environmental education should foster appreciation of environment. It should help different groups and individuals to acquire awareness of and sensitivity to the overall environment and its allied problems.
- ii. Knowledge: Environmental education should help social groups and individuals gain a variety of experience in and acquire a basic understanding of the environment and its associated problems. The people should be informed of their roles in causing environmental problems around them — deforestation, overgrazing, bush burning, desertification, erosion, loss of soil fertility etc.
- iii. Attitude: Environmental education should help acquire a set of values and feelings of concern for the environment and the motivation for active participation in environmental improvement and protection programmes. Individuals and groups need to adopt ethical values that awaken strong feelings for the environment and all its living and non-living components
- iv. Skill: Environmental education should foster and assist in conservation practices and the skill needed to prevent environmental degradation e.g. soil erosion control through the uses of biological and mechanical methods. The people should be taught how to mobilize their human and natural resources to prevent ecological problems.
- v. Evaluation: Environmental education should enable the people to assess government programmes and land management practices that are being introduced.
- vi. Participation: Environmental education should provide opportunity for social groups and individuals to be actively involved at all levels involved in working towards resolution of environmental problems.

Recently UNESCO (2010), introduced the concept of Climate Change Education for Sustainable Development (CCESD). They argue that knowledge, skills and competences relevant to mitigation and

adaptation are the core elements that the school curricula should include. Climate Change Education should introduce basic scientific concepts, theories and projections of climate change. Themes such as sustainable consumption, disaster preparedness, environmental protection, recycling, water, desertification and renewable energies should be discussed, taking into account their relevance in the specific national and local context.

Despite the perceived crucial role of Environmental Education as well as Climate Change Education, numerous challenges still exist in their development. For instance, Environmental Education in many cases is seen as an alternative education which has little value to mainstream educational development goals, and is therefore widely addressed through 'add-on' of environmental topics in curricula and training programs (Bangay & Blum (2010). Such inclusion of some environment related themes or topics in the form of classroom lessons across various school subjects may not be sufficient to bring about meaningful pro-environmental behavior among learners - which is the ultimate goal of Environmental Education (Rickinson, 2001).

UNESCO (2005), also identified the professional development of teachers in education for sustainable development as the top priority, in recognition of the transformative role that teachers and teacher educators need to play in re-orienting education to help realize a sustainable future. Chakeredza *et. al.*, (2009), affirms that university education has a vital role to play in strengthening knowledge systems. They noted that issues of climate change should be infused into curricular of universities as a matter of urgency. The growing need for evidence based scientific data on African experiences to be infused into the curricula to serve the African specific problems is overdue. However, UNESCO (2005), sadly noted that development of teacher education in Climate Change Education for Sustainable Development is in its infancy. Bloom *et. al.*, (2005), affirms that fact and claims that despite the fact that Higher Education plays a critical role in preparing and providing leadership to meet these challenges and to stimulate sustainable development, Africa is among the continents with the least intellectual institutional and technological capability to address the climate challenge. *Rolls et. al.*, (2009), endorsed the thoughts by claiming that climate change education has peripheral status in educational research and practice, and when it is addressed, it is only within science education. He emphasized the clear and present need to respond to climate change challenges through systematic education programmes that are not restricted to a single subject area while Okey and Ndum (2013) pointed out that the curricula could be handled as a separate subject or infused and integrated into the existing courses.

III. Methodology

The study adopted a survey research design. Purposive sampling design was employed to identify eight subject heads from Kenya Institute of Curriculum Development. Sampled subject heads included heads of: Agriculture, Biology, Business Studies, Chemistry, Christian Religious Education, Geography, History & Government and Physics.

Data was collected from the sampled respondents using an interview guide that consisted of the following questions:

- i. How many times have the national goals of education been reviewed since independence?
- ii. If they have ever been reviewed, were climate change issues factored in the review?
- iii. Mention some of the successes you have made in infusing climate change into the curriculum.
- iv. Highlight some of the challenges you face in your endeavors to infuse climate change issues into secondary school curriculum.
- v. Do you give any in-service training to teachers upon review of the curriculum?
- vi. Mention some of the topic(s) (if any) in your area of specialization that can create awareness among learners on climate change.
- vii. Do you think it would be necessary to introduce a subject at secondary school level to specifically address climate change?
- viii. What are the future plans for KICD to address the menace that climate change is?
- ix. Rate the current secondary school curriculum as far as creating climate change awareness is concerned.

- | | |
|-----------------|-----|
| a. Excellent | [] |
| b. Good | [] |
| c. Satisfactory | [] |
| d. Poor | [] |
| e. Very poor | [] |

IV. Data analysis and discussions

4.1 Review of national goals

The study wished to establish whether curriculum developers had reviewed the national goals of education and if yes whether any efforts were made to infuse climate change into the curriculum. It was established from the interviewed respondents that the national goals of education in Kenya have been reviewed

once since independence (1963), in the year 2003. During the review, two goals were incorporated into the original goals of 1964. The eighth goal that was introduced paved way for introduction of environmental issues into the curriculum. The goal was 'To promote positive attitudes towards good health and environmental protection.'

4.2 Successes in infusion of climate change content

Sampled interviewees were asked to establish the successes made in infusion of climate change content into the curriculum. Some of the successes that were highlighted are discussed below:

It was established that following the review of the national goals and introduction of the eighth goal, Geography became the carrier subject. Geography under the topic Climate has a sub-topic, climate change. The sub-topic defines explicitly the major concepts of climate change, global warming, greenhouse gases and greenhouse effect. It also highlights causes and impacts of climate change. The interviewee however admitted that adaptation and mitigation measures are not explicitly addressed. Other topics in geography that were highlighted to directly or indirectly link to climate change included: forestry, mining, agriculture, population, transport and communication and management & conservation of the environment. The other major success highlighted was production of radio programs. KICD was reported to make radio programs to sensitize the public on emerging issues since such programs would have a wider reach.

The other sampled subjects were also reported to have made effort in infusion of climate change content but the interviewees admitted that the content was not explicit enough. For instance History gives a historical background of development of industries, the history of energy sources etc. These briefly highlight the negative impacts of industrialization and forms of energy such as coal and oil. The representative for History however accepted that such were not explicit.

In Biology, conservation measures were addressed under the topic Ecology. The interviewee however admitted that owing to the fact that the content was not explicit, it would require the effort of the teacher to put it into perspective for the students to understand the whole concept. Similar scenarios were reported in other subjects, for instance Christian response to the impact of science and technology on the environment (CRE); emerging issues in business studies (BS); carbon and its compounds (Chemistry). Such topics addressed pollution, desertification but as expressed by the interviewees, it needed a lot of teachers' effort to bring in the idea of climate change which they highlighted as an emerging issue.

Curriculum experts also cited the introduction of emerging issues in each and every subject. The section paves way for teachers to address such issues as climate change under the emerging issues. However this also requires teachers to have adequate knowledge on such issues without which they would hardly address them.

4.3 Challenges in infusion of climate change content

The study sought to establish the challenges that curriculum developers faced in their attempt to infuse climate change content into the curriculum. Some of the challenges exposed by those interviewed are discussed in this section.

The main challenge highlighted by most of the interviewees was that the content was not explicit in the curriculum. They mentioned therefore that it required the teachers to go out of their way to bring out the whole concept. This they said that it was highly uncertain since the current Kenyan education system is exam oriented and therefore teachers seem to teach only what is likely to be examined. The content therefore receives little attention.

Respondents also reported that little is known concerning climate change. Teachers as well as curriculum developers have limited knowledge on the whole issue and are therefore not in a position to educate learners on the same. A similar problem is exposed by Litus (2012), who noted that lack of teacher knowledge of climate change will remain a barrier to effective climate change education.

The interviewees also felt that despite the fact that climate change needed to be addressed in a special discipline, infusing more content into the curriculum would be unwelcome by most stakeholders. They claimed that needs assessment conducted by the institute established that most stakeholders in the education sector felt that the curriculum was already overloaded and therefore adding any more would be highly unwelcome. A study by Bangay & Blum (2010), lays similar claims that 'the over loaded nature' of secondary school curricula is a major problem that could potentially reduce the role that schools contribute to equip learners with the necessary knowledge, desirable attitude and relevant skills to impact their local environment.

The issue of policy guidelines concerning subjects' selection was also highlighted as a great challenge. Curriculum developers felt that the climate change content carrier, Geography, is an optional subject as per the Ministry of Education (Kenya) guidelines. This makes the subject attract less attention and therefore the content hardly reaches all learners. Earlier studies in Kenya showed diminishing prevalence of Geography with only a

small percentage (25% as per 2013 KCSE) of learners selecting the subject as exposed in Kariuki *et. al.*, (2016), citing KNEC (2014).

It was also established that the institute (KICD) has no control over universities' programs. Some of the teachers trained in universities therefore may not have relevant knowledge on some of the content in the KICD curriculum and for that reason are unqualified to teach some of the concepts. KICD however develops curriculum for teacher training colleges which they claimed to have made tremendous effort to highlight climate change issues.

Finally respondents expressed reservations on teaching of the practical part of climate change. They were for the idea that Kenya being a developing country is not well equipped to handle technical details of climate change rather can only infuse into the curriculum simple theoretical concepts.

4.4 In-service training to teachers

The study sought to establish whether KICD gave teachers any in-service training following successful curriculum review. Such training would equip teachers with necessary knowledge, attitude and skills to handle any new concepts. Curriculum review experts expressed that although such training ought to be undertaken, it had not happened in the past. Respondents cited limited funds for that and expressed concerns that the same posed serious threat to successful implementation of new curriculum. Curriculum developers however said that they conducted orientation following the 2003 review. Few teachers received the orientation and were expected to orient other teachers. However the orientation did not work since those that received training hardly passed the knowledge to other teachers. The institute however uses online platforms to provide knowledge to teachers and members of the public on reviews. Dal *et al.*, (2009), proposed that it would be better to integrate climate change education into teacher education rather than conduct in-service trainings. For instance, it may be helpful to design courses about climate change awareness for teacher trainees.

4.5 Future of climate change in Kenya's curriculum

The study sought to establish if respondents found it necessary to have climate change addressed in a special subject and the future plans for KICD in addressing the climate change menace. Respondents unanimously expressed their support for a special discipline to address climate change, however, they ruled out such plans since parents and education stakeholders felt that current curriculum is already overloaded. In a similar way, Ethiopia's Environment Policy Document (EPA, 2002) aimed to promote the teaching of environmental education on a multidisciplinary basis and to integrate it into the on-going curricula of schools and colleges and not to treat it as a separate or additional subject, though they acknowledge that the it should be done at the tertiary level.

Concerning the future plans for KICD, respondents gave diverse views on the issue. Some oversaw a 'bright' future. They were for the idea that since the curriculum is currently undergoing reforms, there are plans to infuse emerging issues into the curriculum and such environmental sustainability, protection of bio-diversity, eliminating processes that endanger environment, sustainable use of resources etc. Such a move is likely to yield positive fruits to mitigation of climate change.

V. Conclusions

Curriculum plays a major role in disseminating information and skills as well as changing people's attitudes. This study therefore affirms the need to use education as a tool understand, mitigate and adapt to climate change that stands as a challenge to current and future generations. It is for that reason that this study wished to examine Kenya's secondary school curriculum in a bid to establish efforts being made to infuse climate change content into the curriculum as well as challenges that come with the same. The study sought to conduct a survey on Kenya Institute of Curriculum Development. The study used purposive sampling to select a sample that constituted eight curriculum developers representing eight sampled subjects that the researchers felt were directly or indirectly linked to climate change. Interviews were conducted and data obtained was analyzed using descriptive statistics. Findings are discussed in section IV of this paper. Based on the findings of the study, the study made the recommendations in the following section.

VI. Recommendations

Based on the findings on this study, the following recommendations were made to all stakeholders in the education sector for purposes of securing our earth for ourselves and for future generations:

- i. That curriculum developers should call on climate change experts to submit required content for infusion into the curriculum during the ongoing curriculum reforms
- ii. KICD should be given a greater role in determining teacher training course at all levels including universities

- iii. Emphasis should be made to train teachers that are well equipped with climate change knowledge so as they are able to pass the same to learners
- iv. Irrelevancies should be eliminated from the curriculum so as to have more relevant issues addressed without overloading the curriculum
- v. Efforts should be made to organize existing content in such a way that learners can easily connect and get the required knowledge and skills without relying on the teacher to make interpretations
- vi. More research should be done to ensure that more is known on how best our curriculum is doing as far as climate change is concerned in a bid to establish the best methods of solving the climate change menace.

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