JRIIE Journal of Research Innovation and Implications in Education
Center for Research Implications & Practice

Website: www.jriiejournal.com **ISSN 2520-7504 (Online) Vol.5, Iss.2, 2021 (pp. 39 - 49)**

Exploring Tanzanian Secondary School Biology Curriculum on Climate Change for Biological Literacy

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Abstract: *School curriculum plays a crucial role in equipping citizens with knowledge and skills needed to make day to day decisions. In Tanzania, secondary school biology curriculum considered biology literacy as one of the important components on students' learning. In this regard, this study explored the biology curriculum, specifically the component related to climate change and its role in equipping young people with knowledge and skills useful for making day to day decisions. This paper mainly employed qualitative data collection tools and also quantitative data collection tool was used. A total of 322 students responded to the questionnaire, 162 respondents were located in urban area and 160 respondents were based in rural area. Then, the total of eight student focus group discussions were involved. In addition, thirteen teachers from secondary schools were interviewed, eight were biology subject teachers and five school club teachers. Purposive sample included eight schools in total, four of these schools were located in urban area and other four in rural area. The findings indicate that most of participants need to be more aware of the effects of climate change on human health, however, little consideration was taken into biology curriculum to teach the concept for socio-economic development. Therefore, this paper recommends the biology curriculum developers in Tanzania to put much consideration to incorporate the aspect of climate change for facilitating development of skills and knowledge of sustainable development among Tanzanians.*

Keywords: *Climate change, Biological Literacy, Sustainable Development, Biology Curriculum, Secondary School*

How to cite this article (APA):

Juma, Z. R. (2021). Exploring Tanzanian secondary school biology curriculum on curriculum change for biological literacy. *Journal of Research Innovation and Implications in Education, 5*(2), 39 – 49.

1. Introduction

The wider global climate change trends are greatly reflected in Tanzania's climate too. Tanzania is one of the African countries which has experienced climate changes and its impact from time to time. It is predicted that Africa will be one of the regions worst affected by climate change (BBC World Service Trust Report, 2010). Studies show that in Tanzania mean annual temperatures and average daily temperatures will rise by between 2 to 4ºC by 2075 as a direct consequence of climate change (URT, 2003). Apart from temperature data, change in rainfall patterns is likely to be more torturous and with immediate severe effects. Rainfall patterns across Tanzania have already changed markedly, and yields from rain-fed agriculture could halve in the next decade (BBC World Service Trust Report, 2010).

Global climate is swiftly changing and people in society are not well informed on the consequences of these changes. Tanzania is among countries which have

experienced changes in the weather and seasons (BBC World Service Trust Report, 2010). They experienced temperatures increase and that the rains are not falling as they used to. Many are struggling with the impacts of drought and are frustrated by increased environmental degradation and resource scarcity. Despite these many challenges caused by climate change, most Tanzanians have no understanding of the relationship between these issues and climate change. In this regard, studies need to be conducted in order to explore to what extent secondary school biology curriculum has advocated for the issues of climate change to students so that they can engage in sustainable development effectively.

Climate change is an aspect which is interdisciplinary, disciplines such as biology, ecology, chemistry, sociology, geography, agriculture, and medicine. In this study, climate change is discussed as an important and relevant aspect in biology discipline. It prepares students to explore, understand, and resolve societal challenges for sustainable development. Miller (2011) argues that biological knowledge can lead to improvements in many spheres of society, including social, economic, political, and cultural life. Indeed, many of the cultural, economic, political, and social dilemmas that face contemporary societies can be linked to lack of knowledge about biological and environmental issues (Miller, 2011). For example, people need to understand how problems such as climate change and global warming come about and their impact on human health, and the safety and sustainable sources of energy, amongst many other issues (Hofstein, Eilks, & Bybee, 2011; Osborne & Dillon, 2008).

Further, Tanzanian communities have many socio-biological challenges that they face which need solutions. For example, in the highlands of East Africa, the spread of malaria, which is a leading cause of death in Tanzania, is linked to changes in temperature and rainfall (Haines, Kovats, Campbell-Lendrum, & Corvalan, 2006). Malaria kills about one million people in Tanzania each year and over 400 million cases are reported per annum (Mboera, Makundi, & Kitua, 2007). The impact of this disease is profound; the social and economic costs of malaria, particularly in rural and agricultural areas, have been linked to intergenerational poverty, and economic underdevelopment (Mboera et al., 2007). Climate and temperature change exacerbate the problem so the issue of climate change is important in Tanzania. Yet the link between human activity, climate change, rainfall and the spread of diseases such as malaria, is not widely understood in many communities where widespread deforestation continues unchecked. In the highland areas, increases in local temperature accelerate the growth of malaria parasites which leads to the transmission of the disease (Afrane, Githeko, & Yan, 2011). This problem affects rural people most severely and it is in these areas where deforestation, often as a result of domestic practices such as felling trees for firewood for cooking purposes, is common (Pattanayak et al., 2006).

In turn, school can play an important role in equipping students with skills and knowledge of climate change for development of biological literacy. This implies the school biology curriculum need to be developed in such a way that it caters for the students' development of literacy in climate change issues in relation to biology.

Statement of the Problem

Sustainable development in African context will be well combated if people are well informed with challenges related to sustainable development (BBC World Service Trust Report, 2010). Rapid change of Africa Climate is founded on the belief that it affects sustainable development (BBC World Service Trust Report, 2010). This create a need of people to be better informed, in order to understand and respond effectively to their changing climate (BBC World Service Trust Report, 2010). For instance, malaria transmission rate is temperature-dependent, any factor that alters the temperature in the highland would reduce the duration of parasite development, larval development and increase the mosquito biting rates, and subsequently increase malaria transmission in the highlands (Afrane, Githeko & Yan, 2011). Therefore, if people are aware of activities which alter temperature in highland, they will work hard not to exacerbate temperature change in order to reduce malaria transmission. In this regard, Africa's response to climate change will be dictated by how well it is understood by its people.

Consequently, school curriculum is crucial in providing people with the information about climate change for their sustainable development. This implies, it can play an important role to help Tanzanian citizens to be well informed about climate change in relation to sustainable development. Unfortunately, little is known about how climate change is currently known by Tanzanian young people (BBC World Service Trust Report, 2010). In this regard, this study seeks to address to what extent biology curriculum facilitate to help young people to be well informed about climate change in relation to their study on Biological issues in secondary schools.

3. Literature Review

According to 2012 census estimates, young people between the ages of 15 and 24 years comprise approximately 20% of the Tanzanian population (URT, 2013). The majority of this population live in rural areas (International Funds for Agricultural Development, IFAD, 2011). The comparative youthfulness of the

population places an additional responsibility on the Tanzanian government to ensure that the physical as well as social, and economic wellbeing of youth are taken into account in government policy. In this regard, biological literacy can play a role for socio-economic wellbeing of young people (Kaptan & Timurlenk, 2012). For this reason, biological literacy is important and relevant to this paper on climate change and its impact on health.

Climate change is a global issue but different countries experience the impact on human and environmental health in different ways. Hanna and Spickett (2011) argue that climate change has a direct environmental impact which leads to extreme changes in temperature and rainfall causing heat waves, fires and flooding. The indirect impact of climate change affects environmental conditions such as water, air, food production and vector-borne diseases and other infectious diseases (Hanna & Spickett, 2011). Both the direct and indirect effects of climate change increase health risks to human beings. Changes in rainfall as a result of climate change also affect the spread of diseases such as malaria and diarrhea diseases (Haines et al., 2006). In countries like Tanzania, where malaria is common, there is a need to establish strategies to manage the damage done by climate change in order to prevent occurrence of these diseases.

Mahaffy, Martin, Schwalfenberg, Vandenbrink, and Eymundson (2013) suggest that climate literacy is particularly significant for African students and teachers. They argue that because Africa is more vulnerable to climate change, the current modelled impact of this change is likely to affect water availability, which is a major concern. Related to this is the fact that changes in rainfall patterns are likely to adversely affect agricultural and economic productivity and this would increase the risk of widespread food shortages (Mahaffy et al., 2013). World Health Organisation (2013) statistics highlight that health issues may be exacerbated by climate change, particularly resulting in higher child mortality. Young people therefore need access to reliable education in their science classes at school and for this reason, climate change education should be a priority in Tanzanian schools.

Hanna and Spickett (2011) state that the impact of climate change on human health needs to be contextualized according to the burden it places on human health and the spread of disease as well as the increased demands that are placed on health-related public infrastructure. For instance, the ability of developing nations to mitigate the effect of an increase in malarial illnesses that maybe a consequence of climate change depends on establishing sustainable programmes to control these diseases (Haines et al., 2006). Haines et al. (2006) contend that the diseases caused by climate change in developing countries such as Tanzania mainly affect young people and they argue for cost-effective intervention in health and other sectors that deal with human health and climate change. With this in mind, the education sector can also play an important role in equipping young people with knowledge about the impact of climate change on human health.

Sociocultural Theoretical Framework

This study employed two sociocultural theoretical frameworks. These sociocultural theoretical frameworks were social constructivism and social constructionism. Some scholars use these two theories interchangeably while other use them differently (Young & Collin, 2004). This study employed the theories differently. Constructing knowledge in social constructionism occurs within the individual's mind as a result of his or her social interactions (Young & Collin, 2004). In line with this, Gergen (2009) argues that within constructionist thought, meaning is created through the interactions of people within a social community who use words and actions to express their views on a particular issue, event or action. Gergen (2009) further comments that during these kinds of interactions group participants have opportunities to challenge or question received knowledge that exists in the world they live in. In sum, in social constructionism, the emphasis lies with the negotiations that take place as knowledge is constructed and shared within the collective (Young & Collin, 2004).

In this regard, the study argued that climatic issues in relation to health in biological learning is the act of 'knowing' Biology as a part of a complex socially constructed process that emerges from a range of social relations, interactions, negotiations and practices that are, in turn, shaped by the history and culture of a particular society (Jha, 2012). However, at an individual level, biological knowledge and skills are constructed cognitively through interaction with others (Ültanır, 2012). Building on the works of both social constructivism and social constructionism, this study argued that people cannot contribute to the social negotiations of knowledge construction (social constructionism) if they have not yet constructed that knowledge in the mind (social constructivism). Also, during the process of constructing knowledge through social negotiations (social constructionism), individuals have the opportunity to create individual knowledge (constructivism). Thus, the study argues that learning is personally constructed but socially mediated (Hruby, 2001).

3. Methodology

3.1 Research Design

This study employed qualitative case study design. In qualitative case studies, the researcher studies a specific issue or problem within a particular context and pay careful attention to the context in order to generate detailed information about case study phenomena (Baxter & Jack, 2008; Hatch, 2002). This implies, the case study approach provides insight through intensive investigation and rich description of the research context (Hatch, 2002). This study takes a case study approach to the investigation of climate change as an aspect in biological literacy as a sociocultural phenomenon in Tanzania that is experienced by those who are immersed in that setting (Merriam, 1988).

Merriam (1998) argues that research methodologies in case study emphasize the importance of sociocultural interpretations of the unit of analysis. In this study, the interpretation, analysis and discussion of data draws heavily on the sociocultural theoretical frameworks. The case study approach taken in this study provided researcher with an opportunity to explore the ways in which school communities in particular, and wider society more generally, frame climatic change issues in the context of biological literacy within the Tanzania.

3.2 Sampling and Sampling Procedures

In this study the researcher employed purposive sampling known as critical case sampling. Onwuegbuzie and Leech (2007, p.112) describe critical case sampling as follows: "In critical case sampling, individuals, groups or settings are selected that bring to the fore the phenomenon of interest such that the researcher can learn more about the phenomenon than would have been learned without including these critical cases".

The study was conducted in two regions of Tanzania: Dar-es-salaam and Tanga. Dar-es-salaam was selected because it is a large urban city where most people have access to educational resources and there is a larger pool of qualified and experienced teachers compared with Tanga in Lushoto district were resources are fewer (URT, 2010). In addition, well-equipped social services, such as hospitals, are available in Dar-es-salaam and living standards are reasonable. For that reason, many teachers choose to work in this area (International Institute for Educational Planning, 2006).

In this study, Year Four Tanzanian junior secondary school students aged between 16 and 18 years who were enrolled in the Biology classes were involved in filling questionnaires and focus group discussion. This group of participants had almost completed the entire Biology curriculum for Tanzanian junior secondary schools and had good insights about school Biology curriculum. The teacher who taught these students were also interviewed to get insight of the phenomenon understudy. In addition, five teachers involved with school clubs as extracurricular activities were interviewed. These school clubs had a degree of biological knowledge or awareness (such as health, HIV/AIDS or/and environmental clubs). The researcher interviewed club teachers who were not necessarily Biology teachers but who had knowledge and skills that would help develop specific components of biological literacy within the club.

3.3 Data Collection

Qualitative researchers frequently include several sources of data in their research design (Yin, 2011). Baxter and Jack (2008) argue that the use of a variety of data offers multiple lenses that expose different components of the phenomenon. For this reason, the researcher selected both qualitative and quantitative approaches that drew on several data collection methods including semi-structured interviews, questionnaires and focus group discussions

The data was collected in both urban and rural private and government secondary schools in Tanzania. Students and teachers participated in this study. Students first participated through a questionnaire that was administered to find out their views about a range of socio-scientific issues, in the focus groups conducted so that these issues could be discussed in greater depth. A total of 322 students were able to respond to questionnaires given to them. In this study, eight focus group discussion were conducted, one in each school. Each focus group with at least five students were given opportunity to contribute their views in detail in focus group discussion.

Teachers participated in this study through interviews. Eight Biology teachers in total: one teacher in each school, because it was hard to find more than one teacher teaching Year Four students in any one school which was my original plan. They were selected because they taught Year Four Biology in the participating schools and were therefore familiar with the Biology curriculum, the Year Four students, and their school environment. In the urban schools, there were two male Biology teachers and two female Biology teachers, while in the rural schools there were three male Biology teachers and one female Biology teacher. All the teacher participants were highly cooperative and were eager to make the researcher's job of data collection as easy as possible. In addition, five

school club teachers were interviewed. Pseudonyms were used instead of real names of teachers during discussion.

3.4 Data Analysis

Qualitative data from the teachers' interviews and students' focus group discussions were subject to an on-going 'constant comparison' analysis. Cohen, et al. (2007) describe constant comparison analysis as a process whereby the researcher compares new data with existing data and categories. Researcher chose to use constant comparison analysis because the participants who shared a category, such as Biology teachers, were involved in the same kind of interview with similar questions that fitted within similar nodes such as professional background. Researcher found that constant comparison analysis was most useful when comparing data across the participants as well as through the range of research tools (Cohen et al., 2007).

Quantitative data from the questionnaires included closed questions so researcher used a different system of analysis which included the Statistical Package for Social Sciences (SPSS) software programme. The data from the SPSS package translated to graphs, charts, and tables. The researcher have made use of the frequencies, and percentages that were generated by this software package. Some of the data in the SPSS package were translated into Microsoft Excel graphs and tables.

4. Results and Discussion

The findings of this study were addressed according to the order of research objectives. The first research objective was to find out students' perceptions about climate change and its impact. The second research objective was explore teachers' perceptions about the implementation of the Biology curriculum in teaching climate change.

4.1 Students' Perspectives on Climate Change and Its Impact on Human Health

This section includes data and findings from the questionnaire and focus group discussions. Climate change has an increasing impact on human health (Mahaffy et al., 2013) and Haines, et al. (2006) argue that many people want to be more knowledgeable about how to deal with the situation. This section explains students' responses to a questionnaire item that read: 'I am interested in learning about health issues that are related to climate change'. Their responses are summarized in figure 1 below.

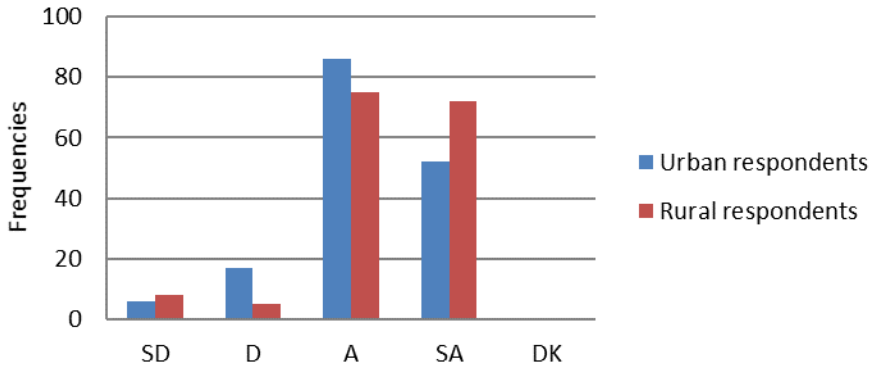


Figure 1: Climate change and health issues

These findings show that a large number of respondents (n=285) were aware of the potential effects of climate change on their health and were interested in learning more about these matters (figure 1). In Tanzania, people tend to see links to climate change in relation to droughts, floods, coastal storms and desertification since these conditions affect their wellbeing and many have already begun to directly experience these events (The Centre for International Governance Innovation, CIGI, 2009).

The students also responded to a related questionnaire item that read: 'In school my understanding of health issues that are related to climate changes has improved'. Their responses are summarized in figure 2 below.

Figure 2: Students' understanding of health issues in relation to climate change improved in school

The majority of respondents either strongly agreed or agreed that education about climate change is improved and that what they had learnt at school had helped them to understand how climate change affects human health (see figure 2). However, in the current Biology syllabus, few connections are actually made between climate change and associated health issues (URT, 2005). These findings indicate that most students were satisfied with what they learned at school in relation to climate change despite the fact that the current Biology syllabus does not cover much about these issues.

The students' responses to a related questionnaire item that read: 'What I have learned in school about health issues in relation to climate change is useful for making decisions in my everyday life' are outlined in figure 3 below.

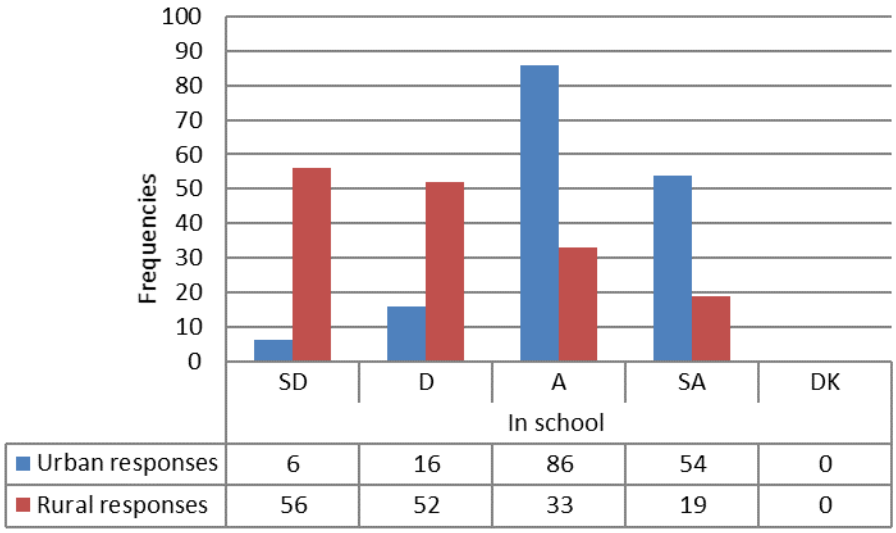
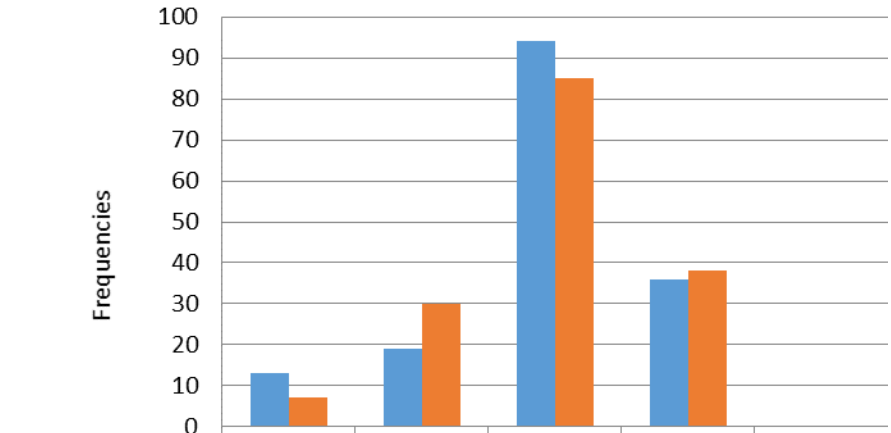


Figure 3 School learning about climate change in relation to human health and its usefulness in making students' daily decisions

The majority of urban respondents either strongly agreed or agreed that they learned about climate change at school (see figure 3). In rural schools, the majority of respondents (108 out of 160) either strongly disagreed or disagreed that school is the place where they learn about climate change and associated health issues. This may be due to the fact that these particular rural students were located in an agricultural community where the impact of climate change has been directly experienced, especially during dry seasons where increasingly severe droughts make agricultural activities much more difficult. CIGI (Centre for International Governance Innovation.) (2009) also notes that drought caused by climate change is seriously affecting agricultural activities and food security in Eastern Africa. In this study, it was clear that

students in urban areas, have not yet experienced the effect of climate change to the same extent as the rural areas and this may account for the variation in responses between rural and urban students.

The respondents were asked to indicate their level of agreement with an item that read: 'Outside of school I have learned interesting things about health issues that are related to climate changes'. Their responses are summarized in figure 4 below.



	SD	D	A	SA	DK
Urban responses	13	19	94	36	0
Rural responses	7	30	85	38	0

Figure 4 Usefulness of out-of-school knowledge about climate change and health

The responses to this item were very similar between urban and rural students. Overall, the respondents either strongly agreed or agreed that they had acquired the useful information from sources outside of school (see figure 4). From focus groups, they mentioned sources including the media, community projects, magazines and community meetings.

Participants in all eight focus groups believed that climate change is one of the factors that will create the most serious challenges in Tanzanian society in the future. The questionnaire respondents were asked to express their overall perceptions about different climate change scenarios and their effects on health. This developed a series of questions about this following Haines et al. (2006) argue that when climate change increases rainfall and has an effect on temperatures, hence increase diseases such as malaria. Table 1 shows that the majority of students understand that climate change can be detrimental to human health.

Table 1 Beliefs about the effect of climate change on human health

Item	Urban responses (Frequencies)					Rural responses (Frequencies)				
	SD	**D**	**A**	**SA**	**DK**	**SD**	**D**	**A**	**SA**	**DK**
I believe that climate change poses risks to human health.	3	20	91	48	0	1	14	69	76	0
I believe that the effects of global warming such as flooding causes an increase in some diseases like malaria.	27	13	47	68	07	26	20	65	49	0
I believe that climate change causes an increase in asthma, respiratory allergies and airway diseases.	11	14	74	62	1	07	25	80	47	1
	n=162					**n=160**				
Total	**n=322**									

CIGI, (2009) argues that African perspectives of climate change are mainly focused on climate issues in terms of the direct effect on human lives, although people are also concerned about the risks to national economies. Most of the respondents in this study also believed that climate change poses a risk to human health. For the most part, the respondents either strongly agreed or agreed with the statement that the effect of global warming such as flooding increases the occurrence of malaria. Also, four groups from urban schools (from private and government schools) and rural private schools argued that heavy rain provides favorable breeding sites for mosquitoes which facilitate the spread of malaria.

In addition, a large number of respondents either strongly agreed or agreed that climate change accelerates illnesses such as asthma, respiratory allergies and other airway diseases. These questionnaire data concur with findings from the focus group discussions. Participants in four focus groups in private and government schools believed that changes in temperature can exacerbate certain illnesses, such as asthma and respiratory infections. Participants in two other urban groups suggested that heavy rain can cause flooding which can lead to an increase in some diseases, such as cholera and bilharzias.

During the focus group discussions, several participants also mentioned that drought caused by climate change can result in a variety of health problems. Members of four groups from urban schools (private and government schools) and rural schools (private and government schools) were aware that drought causes starvation because not enough food is produced to feed people. They were also aware that it causes malnutrition such as kwashiorkor (severe protein deficiency) and marasmus (severe energy deficiency). Members of three focus groups claimed that many of the factories in the urban areas increase global warming and contribute to ozone depletion. One of the urban government participants elaborated on this: "I think that not all the air we breathe is good for our health. Sometimes we inhale bad air which causes respiratory problems and that can cause infections or even cancer" (male participant, urban government school).

In summary, the findings from both the focus group interviews and the questionnaire indicate that the majority of respondents were aware of the effects of climate change on human health. The findings also show that rural students who have experienced the impact of climate change on agricultural activities were less satisfied with the level of information they received about these issues at school.

4.2 Teachers' Perception about the Implementation of the Biology Curriculum in Teaching Climate Change

Five out of the eight teachers explained how they incorporate ideas about climate change into their teaching about diseases but said that they only do this occasionally. They mentioned topics like environment and diseases which involve discussions about illnesses like cancer or malaria. Macky said, "I talk about climate change when I'm teaching about human health and when I teach about diseases like cholera. I usually explain to my students about the effect of environmental change on the spread of disease" (female teacher, urban private school). Abel, a rural schoolteacher, added that he shows students how the rainy season increases the number of breeding sites for mosquitoes and talks about how this in turn increases the risk of malaria. The participants viewed climate change as an important concept that needed to be integrated into health topics in Biology classes. However, the teachers had little knowledge about climate change and were unable to incorporate these understandings in their teaching to any great degree.

In one of the schools in rural area, the researcher had an opportunity to interview a teacher who was involved with school club deals with issues of environment and have biological component in relation to climate change. The club is called Malihai. The club activities show how teachers involved themselves in students' development of biological literacy as it relates to health matters. Shema, the patron of the Malihai club, indicated how it is possible to connect different kinds of knowledge to come up with authentic learning. This implies students need to be equipped with the ability to connect a range of biological concepts to other kinds of knowledge in order to be able to make informed socio-scientific decisions related to their lives. In other words, biological knowledge does not occur in isolation from other kinds of knowledge (Haight & Gonzalez-Espada, 2009). For instance, knowledge about climate change helps people to protect themselves from being affected by health challenges created by climate change.

4.3 Discussion of Results

Climate change has already posed many challenges to people's health in Tanzania. According to CIGI (2009), climate change has already increased incidence of droughts in eastern Africa. This threatens agricultural activities and increases food insecurity which in turn has resulted in malnutrition. Specifically, CIGI reports that climate change threatens human health in Africa because extreme climatic conditions cause natural disasters leading to a scarcity of safe drinking water and the spread of water-borne communicable illnesses, such as cholera and diseases. Awareness of these issues was also discussed by participants. The students said that they were particularly interested in learning about health relating to climate change. The researcher believes that raising awareness of the need for conserving the environment and taking appropriate action in order to reduce or respond to factors that contribute to extreme climate changes need to be a priority of secondary school Biology education.

While the student participants in urban areas had learnt about climate change and health both in and outside school, rural students had more opportunities to learn about climate change in school. This might be due to the current secondary Biology syllabus having few topics which relate climate content to health issues (URT, 2005). To affect change and increase student knowledge about the impact of climate change, perhaps teachers need to take personal initiatives to integrate these issues when they teach about health. However, as noted previously, many Tanzanian teachers depend on the syllabus for direction about what to do in the classroom; so if the syllabus is silent about climate change and health, it is unlikely that teachers will talk about those issues. In this respect, many students, especially those in rural agricultural areas who see the direct effects of climate change, depend on other sources of information outside the school environment for information. Currently, many Tanzanians learn about climate change and its effects through the media (BBC World Service Trust Report, 2010). There is clearly a need for students to learn about climate-related health issues at school. In light of this, initiatives need to be taken for the school curriculum to put more emphasis on climate change and health. Teachers need education and professional development to enable them to integrate climate change issues into their teaching of health in order for the students to be well informed and apply this knowledge in their daily lives.

This study reveals that both students and teachers have some awareness of the effect of climate change on human health. The students were aware of some of the health effects caused by climate change including conditions such as drought which causes a lack of food and increases the occurrence of kwashiorkor and marasmus. They also knew that environmental conditions caused by climate change increases the risk of diseases like malaria, cancer, asthma, respiratory allergies, cholera, and bilharzias. These findings are in line with Niringiye and Douglason (2010) who comment that climate change increases the spread of diseases such as malaria due to environmental modifications like deforestation. For these sorts of reasons, the teachers who participated in this study commented on the importance of teaching about climate change and its impact on

human health. While both rural and urban students had some knowledge about climate change and health in schools, it can still be argued that the Biology syllabus does not adequately cover these issues.

5. Conclusion and Recommendations

In concluding, the students also talked about the impact of climate change on their lives and it was clear that very little teaching takes place on these issues, although again, agencies outside of school, such as the media, were a key source of information, especially in rural areas. Climate change was of particular interest to the rural participants many of whom were from agricultural communities where the effects of climate change were directly experienced. However, both urban and rural students were interested in knowing more about these issues.

This is due to various challenges related to the implementation of the Biology curriculum as well as other factors that are outside the reach of schools. As a result, it seems that very little is happening concerning the development of biological literacy amongst Tanzania's young people many of whom urgently need reliable and accurate information to make decisions that will affect their lives and their wellbeing. There is a Swahili saying, "*Usipoziba ufa utajenga ukuta*", which means that if you do not fill up a crack, you will have to build a wall. It is time for government officials, curriculum developers, and other education stakeholders to begin building new walls that stand solid against the lack of knowledge that many young Tanzanians hold to about biological matters. These partial truths, misconceptions and misunderstandings about Biology affect their own lives and those of their families. It is surely easier to educate young people with the knowledge and skills that they need to use both now and in future than it is to deal with the terrible human and environmental consequences of biological illiteracy.

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