



The Role of Language of Instruction and Development of Biological Literacy among Tanzanian Secondary School Students

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Abstract: *In Tanzania, secondary education expected to play an important role of equipping young generation with biological knowledge and skills for socio-scientific decision making of their lives. However, language of instruction is very crucial to make sure that youth are well informed with socio-scientific issues. English is used as the language of instruction to learn biology which to most of students is their second or third language. The language seems to be a challenge to students' learning, however many studies did not indicate to what extent it assists in students' acquisition of biological literacy. Therefore, this study explores students' and teachers' perspectives on the role English as the language of instruction plays in equipping young people with useful knowledge for biological literacy. The study used qualitative case study approach whereby both urban and rural secondary schools were used as research sites. The findings revealed that the language of instruction is a hindrance for their learning of biology for literacy. Therefore, this study recommends initiatives to be done to improve students' learning using English as a language of instruction which will facilitate learning for understanding. In turn, the situation will facilitate students to be well informed and make important decisions for their socio-scientific challenges and development.*

Keywords: *Language of instruction, Biological literacy, Socio-scientific issues, School curriculum and informed decisions*

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1. Introduction

Miller (2011) contend 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 a 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, they need to have a level of awareness about the potential and the ethics of genetic modification, and the safety and

sustainable sources of energy, amongst many other issues (Hofstein, Eilks, & Bybee, 2011).

Further, the connection between a biologically literate citizenry and strong economic productivity can be seen most clearly in wealthy nations where biological and biotechnical advancements have led directly to increased economic development (Njoku, 2011). In line with this, many countries have begun to explore the possibilities of biotechnology to improve their own agricultural systems, increase crop production, and promote economic growth (Van Montagu, 2020). In some nations, for instance, seed and agricultural biotechnologies have led to a dramatic increase in agricultural harvests (Van Montagu, 2020). Also, stem cell research and genetic engineering have led

to a range of biomedical advances and discoveries but it is vital that the wider public grasps the implications of these developments and is aware of the ethical, political, and legal challenges involved in order to be able to make accurate, informed decisions about whether to use biotechnology or not.

Consequently, all the social and economic development requires government initiatives which will help their citizens to be able to make important decisions related to development (Hodson, 2014). This implies that people in the society need to be well informed to be able to make decisions related to socio-scientific development for their sustainable development. In this regard, schools can play a crucial role in equipping young generation with biological knowledge useful for making decisions for their daily lives concerning their social, economic, political and cultural issues (Anakara, 2021). However, language of instruction in schools cannot be ignored since it plays a crucial role to make young generation to be well informed on important biological knowledge useful for making decision for their socio-scientific issues (Amin, 2009).

Language of instruction is a tool to inculcate acquisition of biological knowledge and skills to secondary school students (Amin, 2009). Therefore, it is very important to make sure students grasp the use of language instruction for their effective learning of biological knowledge and skills. However, in Tanzania, language of instruction, which is English, seems to be a challenge to many students in secondary schools (Qorro, 2013). Therefore, this study explores the role English as language of instruction plays in assisting Tanzania secondary school students to acquire biological literacy.

1.1 Statement of the problem

There is growing international concern that focuses on the importance of equipping citizens with scientific knowledge and skills that can be applied in everyday situations outside the classroom (Hodson, 2014). In line with this, Holbrook and Rannikmae (2009) argue that science education aimed at developing biological literacy needs to be grounded in the communities where schooling takes place. This is because students' direct experiences of socio-biological challenges within a particular society or community can help them to make immediate and authentic links with the Biology curriculum if it reflects their needs, priorities and everyday realities (Holbrook & Rannikmae, 2009). Suwono, Pratiwi, Susanto and Susilo (2017) contend that science education is increasingly linked to ideas about citizenship education. They argue that science in schools should build students' biological literacy so that they can become informed participants in the science-related debates and issues that take place in

their society if social, economic and political development is to take place. Likewise, Yuenyong and Narjaikaew (2009) argue that, internationally, the acquisition of biological literacy needs to be a high priority.

Further, language of instruction plays a crucial role to ensure students in the schools are well informed about biological knowledge useful for making their daily decisions. Tanzanian secondary school use English as a language of instruction to assist students' learning of biological knowledge. However, to many of these students, English is their second or third language, this implies it is not their native language. Currently, it is not evident to what extent this situation influences' students learning of biological knowledge and skills for their socio-scientific decisions in their lives. With this in mind, this study explores the role language of instruction plays in Tanzanian secondary schools in helping students to acquire the knowledge and skills that will allow them to make informed decisions about Biology-related issues that affect the social, economic and political development of the nation.

2. Literature Review

Science literacy is a broad term and encompasses literacies within the different natural sciences sub-components, such as biology, physics and chemistry (Suwono et al., 2017). Therefore, biological literacy is a subset of science literacy (Suwono et al., 2017). In this study biology literacy means acquisition of biological attitudes, skills, and knowledge that allow people to participate in biological debates and develop problem-solving and decision making skills in their everyday lives (Onel & Durdukoca, 2019). Suwono et al., (2017) argue that biological literacy is important because it helps people to think logically and critically about issues they encounter in their lives that involve biological problems or puzzles.

Biological knowledge is crucial for students as current and future citizens in making biologically reasoned decisions in their everyday life in issues such as biotechnological products, climate change and its effects in health as well as reassessment of their cultural issues (Suwono et al., 2017). For instance, many countries have begun to explore the possibilities of biotechnology to improve their own agricultural systems, increase crop production, and promote economic growth (Van Montagu, 2020). In some nations, for instance, seed and agricultural biotechnologies have led to a dramatic increase in agricultural harvests (Van Montagu, 2020). But there are ongoing debates about the environmental risks of biotechnologically produced food that affect people in their everyday lives (Van Montagu, 2020). Also, the effects of cultural practices on human health need to be

reassessed. For example HIV/AIDS epidemic is a major concern in Tanzania. One of the challenges here is the stigma and discrimination that people with HIV/AIDS face in Tanzanian society (Mhode & Nyamhanga, 2016). Shame, fear and prejudice mean that many people are unwilling to be tested for HIV or disclose their results to family members, friends, and sexual partners (Mhode & Nyamhanga, 2016). This culture of silence about HIV/AIDS and a lack of knowledge about disease transmission facilitate the spread of the disease. All these issues need citizens to be well informed in order to make proper decisions about their lives.

Suwono et al., (2017) argued that biological literacy is not a single endpoint that can be attained within one biology course, but is a continuum the acquisition of which develops throughout life. This implies biology literacy can be acquired within the school and out of the school context. Consequently, this implies each country need to put forward the proper strategies to make sure its citizens are acquire useful biological knowledge and skills for making decisions for their daily lives. In this regard, Tanzania used a secondary school curriculum to ensure students as current and future citizens gain the biological knowledge and skills for their lives.

However, in addressing about acquisition of biological knowledge and skills we cannot disregard the issues related to language of instruction. Language of instruction is a tool which facilitate students to acquire biological knowledge and skills (Amin, 2009). In this sense, students need to be competent in using language of instruction. Nevertheless, Tanzania secondary school use English language to learn science subjects such as biology. To many of these students English is great challenges (Qorro, 2013). This situation may compromise their learning of biology for literacy.

The language of instruction in Tanzanian schools is the subject of ongoing debate (Qorro, 2013). The reason for this is that Swahili is the medium of instruction in primary schools (Telli, 2014) but a legacy of British colonization is the continued use English as the language of instruction in secondary schools (Telli, 2014). The change from Swahili as the medium of instruction at primary school to English at secondary school is underpinned by the misguided belief that students who have learnt English as a school subject at primary school will be proficient enough in English to cope with it as the medium of instruction in secondary schools (Juma & Opanga, 2021). Qorro (2013) argues that students lack proficiency in English because about 99% of young people are taught in Swahili during their primary education years.

In addition, Swahili is the first language for most Tanzanians and is in fact, the lingua franca of Tanzania

(Juma & Opanga, 2021). For most students, it is a substantial leap to speaking English at secondary school. In Qorro's (2013) view, a widespread lack of English proficiency hampers students' learning at secondary school level and makes communication between teachers and students difficult. The language debate in Tanzanian schools may well have an impact on the development of biological literacy because secondary school Biology is taught and studied in English, a language that many students struggle with.

1.2 Theoretical Framework

The relationship between language and biological literacy is well trapped in terms of linguistically informed on sociocultural theories of thinking and learning. Sociocultural theory framed by Vygotsky's (1978) on development and learning placed language at center stage as a tool for self-reflection and thinking in learning (Akpan, Igwe, Mpamah & Okoro, 2020). Further, recently, expansions of the theory have extended to its linked to language use and forms of literacy with modes of thought (Akpan, et al., 2020). This line of thinking reflects increasing interest in functional and social perspectives on language on learning theorists (Amin, 2009). Linking ways of using language with different ways of thinking has made findings that language is used differently depending on context.

In this regard, this study uses social constructivist theory as social-cultural theory of learning. This theory recognizes the importance of language of instruction to students' science learning. Social constructionists recognise the role of language in the social construction of meaning (Schultheiss & Wallace, 2012). Gergen (2009) argues that human relationships in the social world are tied to language. The words people speak during negotiations and what is agreed by the members of the group become a form of "truth telling" (Gergen, 2009, p. 10). With this in mind, social constructionism provides an opportunity for a researcher to scrutinize the kind of language used by participants during the interactions with them in the field to arrive at a meaningful interpretation of what they were told during the course of the research (Schultheiss & Wallace, 2012). To this end, the social constructionist thinking has guided the research process in this study; it has provided the way of interpreting and analyzing data as well as giving a way of taking a critical stance on emerging practices in the Tanzanian education system.

3. Methodology

This study employed qualitative case study. According to Njie and Asimiran (2014) qualitative case studies assist researchers to study a specific issue or problem within a particular context in detail. They suggests that careful attention to context can generate detailed information

about case study phenomena. In this study, a case study approach was chosen because the phenomena understudy, could not be studied without taking into account the institutional contexts in which Biology is taught and the wider sociocultural contexts in which schools operate. This involved a close examination of classrooms, pedagogical practices, resources and the geographical location of schools. In addition, the cultural and social beliefs, values and practices that teachers and young people bring to these environments was also an important consideration in shaping the case study.

The data was collected through focus group discuss for student-participants. In each of the eight secondary schools, one focus group discuss was involved in gathering information. Therefore, a total of eight focus group conducted from eight schools. Each focus group had five to six students and gender was carefully considered. Wilkinson (1999) noted that focus group discussions are usually conducted amongst individuals who share similar experiences and are able to discuss the phenomenon under study. The shared experience aspect of the focus group discussions was achieved in this study by selecting participants from Year Four students who had been in the same cohort for their Biology classes throughout their four years of schooling in their particular school. Further, Hollander (2004) argues that in focus groups, participants often influence each other's responses, for this reason data are more often indicative of group opinions rather than individual points of view. In this regard, the views of focus groups were considered as group voice as opposed to individual views (Hollander, 2004).

Semi-structured interviews conducted with eight biology teachers. Bisman and Highfield (2012) argue that semi-structured interviews can be a useful way of exploring multiple views and allows the researcher to probe for further information. Interviews are usually based on a set of open-ended questions that prompt participants to talk about their experiences (Creswell, 2012). The use of semi-structured interviews therefore allowed the researcher to gather in-depth information by encouraging participants to tell their stories about how students acquire and apply biological knowledge (Bisman & Highfield, 2012; Creswell, 2012). In each interview, the participants were encouraged to share their ideas and the researcher was conscious of finding ways of maintaining their sense of comfort and ease (Creswell, 2012).

4. Results and Discussion

The findings in this paper involve perceptions of students learning biology subject as well as their teachers in both urban and rural Tanzanian secondary schools. Moreover,

the teachers who were patrons or matrons of school clubs as extra-curricular activities were involved in this study.

4.1 Students Perception on the language of instruction

First and fore most participants were concerned about how the society views them after failing examination, especially National examinations. This is what one participant complained.

Not everyone who performs poorly in examinations is unintelligent. The English language is a real obstacle because somebody may know the answer but fail to write it well in English. (Urban male participant A, government school)

This implies students view their inability to be competent in English language as reason for the failure of examination. This raised concern about the English language as the medium of instruction in Tanzanian secondary schools and most of them saw it as an obstacle to their learning. This view is supported by Qorro (2013) who argues that English as the medium of instruction in Tanzanian secondary schools causes serious problems for students' learning.

All the participants talked about the challenges they face when English is the medium of instruction in classrooms. Young people in each of the focus groups agreed that switching from using Swahili, which is the medium of instruction in primary schools, to English as the medium of instruction in secondary schools, is a major challenge for them. Members of one focus group commented that English is taught as a subject in primary school and they expressed their dislike of the subject. They also commented that it is not always taught well and that poses problems for them when they reach secondary school and are required to write and speak in English. Juma and Oponga (2021) also argued that the switch from Swahili as the language of instruction in primary schools to English in secondary schools negatively affects the majority of Tanzanian children who have attended Swahili-medium primary schools.

In the rural schools, the participants felt that English-medium schooling was more problematic for them compared with their peers in urban schools. Members of one rural focus group said that even speaking and writing in Swahili is a challenge for many of them and that English as a medium of instruction is yet another barrier to their learning. This is because in rural villages, tribal peoples speak their own languages and maintain their own distinctive linguistic traditions. In these communities,

people communicate in their own tribal language at home rather than in Swahili and in this regard, Swahili is a second, third, or even fourth language for many. Once students in these areas reach secondary school and are required to speak English, they quickly begin to fall behind in their studies. One participant (participant B) commented:

There is a need to improve the way that English is taught and spoken at school. Teachers need to give us more opportunities to practice speaking and writing in English. When we start off our schooling in Swahili and then at the end we have to do our examinations in English, we really struggle. That's because we still use English in our studies so it's important for us to be fluent in English. (Male participant B, rural government school)

Another participant C added, “I think English language teaching should be improved in primary schools. We see our peers in International schools; when they reach secondary school they are very fluent in English” (male participant C, urban government school).

The participants in one focus group thought that establishing Swahili as the medium of instruction from primary school all the way through to university level would improve the quality of education rather than having to chop and change between primary and secondary schools. On the other hand, several participants believed that English should remain part of the education system because of global trends and the demand for fluent English speakers. They commented that Tanzania is not disconnected from the rest of the world in this respect.

4.2 Teachers views on Language of instruction

Teachers were asked their views on the role of language of instruction in teaching student for development of biological literacy. One of the participants argued that,

The language of instruction in secondary schools is English and this is a serious problem because students spend seven years in primary schools studying and speaking Swahili. This is a real stumbling block for many students. (A rural schoolteacher D, private school)

This quote exemplifies the concerns of several participants about the language of instruction in secondary schools in Tanzania. All eight teachers argued that having English as the medium of instruction is a barrier to understanding. One participant explained:

Most of us are more comfortable speaking in Swahili than we are speaking English. We use Swahili in primary education but the switch to English at secondary education is a major challenge. We don't have a good foundation in English language. (Female urban schoolteacher E, private school)

The participants noted that mixing Swahili and English and switching back and forth between languages was the only way of getting students to understand their lessons. One participant commented:

I remember my students being taught Biology by one European teacher. It was very difficult for them to understand so I repeated everything in Swahili after that European teacher left. Teachers are forced to use English but if we were to do that all the time in our teaching practice, our students would fail. It is necessary to mix English and Swahili though it is not actually allowed. (A male teacher F, rural private school)

A rural schoolteacher, added that most of students are fluent in their tribal languages and Swahili but less fluent in English. He said that the situation has a significant impact on students' performance in Biology. Sometimes teachers translate issues from the students' tribal language into Swahili and then translate again into English. But English is not very popular with many students. In one rural school, the researcher saw that students had written a message in their tribal language on the classroom ceiling. It read: “*English ya nyokwe*” (‘*English is the language of your mother*’). This is not easy to translate but it is intended to be a derogatory comment about the English language.

Discussion

The findings show that both teachers and students consider that maintaining English language as the medium of instruction is a major hindrance to students' biology learning. The participants' major concern was the switch from the Swahili language as the medium of instruction in primary schools to English in secondary schools. Qorro (2006) argues that language issues in Tanzanian schools have not been considered seriously although they have a significant effect on the quality of learning. Further to this, Telli (2014) contends that while students need to be competent in both English and Swahili, there is a need for a clearer policy about the languages of instruction in Tanzanian schools. While the researcher agrees with Telli that students need to be competent in both languages, the major issue is to think about how students can become fluent in both languages. Improving their competency in English enhances future employment prospects both

locally and globally, and this is an important consideration.

In many Tanzanian classrooms, it is common practice to borrow Swahili words in order to express meaning in English. Most participants acknowledged that they frequently switch between English and Swahili but some teachers discouraged students' use of Swahili in class. The rural students who participated in this study found it more challenging to express themselves fluently in English while the urban students had fewer difficulties. This could be because most rural students speak their own tribal languages as well as Swahili, so English is their third (or even fourth) language. On the other hand, Swahili is the lingua franca of the cities, so English is often a second language.

However, code switching between English and Swahili appears to be common amongst both urban and rural students. Mwinsheikke (2003) argues that this creates problems for students' learning and assessment. For example, although students understand when teachers switch languages, teachers set tests and exams in English (Mwinsheikke, 2003). So while students may well be able to answer the questions in Swahili, they may struggle to provide the same answers in English and if they answer questions in Swahili, they will fail the examination (Mwinsheikke, 2003). This creates many tensions around the language of instruction in educational settings.

The participating students felt strongly that there needs to be one language of instruction from primary through to university education whether it is English or Swahili.

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Currently in Tanzania, parents, teachers, academics, policy-makers and students have different views about the language of instruction. Telli (2014) found that policy-makers in Tanzania prefer English because it is an international language and argues that students need to become fluent in it through their schooling. Qorro (2006) argues that there are good reasons for "teaching English" but not "teaching in English" (p. 4), suggesting that students can become proficient speakers by learning English as a school subject. Qorro (2006) believes that Swahili needs to be the main language of instruction for all levels of education, arguing that it is widely used in trade, offices and throughout the country.

5. Conclusion and Recommendations

The findings indicate that learning of biology for literacy is facing the hindrance due to the poor competence of students on language of instruction which is English. Therefore, initiatives need to be put in place to improve the situation so that students may acquire that useful knowledge and skills for their socio-scientific decisions of their lives. There is Swahili saying which says '*usipoziba ufa utajenga ukuta*'. This means if you will not fill up the crack you will end building the whole wall. This implies something needs to be done immediately to improve the situation before it become difficult to retrieve. In the light of the findings of this study, public debates need to be reflected in education policy about the language of instruction, not only for Biology learning, but for the whole secondary school curriculum.

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