

LANGUAGE CHALLENGES GRADE 11 LEARNERS ENCOUNTER IN LIFE SCIENCES INSTRUCTIONAL MATERIALS AND ASSESSMENTS

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Abstract

Language plays a pivotal role in enabling learner acquisition of scientific knowledge and skills. Whilst previous research indicates that proficiency in the language of learning and teaching (LoLT) does not guarantee learners' understanding of concepts taught, the current paper argues that learners who are proficient and fluent in the LoLT have an advantage in the science classrooms. Language affords learners to read the text in learning materials and assessments with understanding. Understandably science (Life Sciences) is a language on its own which is academic and authoritative which every learner grapples with despite fluency in the LoLT, the argument is that the challenge is compounded for those learners whose home languages are different from the LoLT. The current paper therefore sought to explore the language challenges grade 11 learners encounter in the teaching and learning materials and assessments in Life Sciences. In both qualitative and quantitative non-experimental designs, 28 grade 11 Life Sciences learners whose home languages were different from the LoLT, were purposively selected from a school where English is the LoLT. A 4-point Likert scale questionnaire was administered to learners through a google form. It sought learners' biographical information related to their home language and proficiency in English, challenges encountered in instructional materials and assessments, and their views about the use of code switching during the teaching and learning of Life Sciences. Focus group interviews were used to collect qualitative data. Quantitative data was analysed using Statistical Package for the Social Sciences (SPSS) software to obtain descriptive statistics and qualitative data was subjected to content analysis. Most of the learners (75%) indicated that the complexity and specialisation of the scientific language make it difficult for them to understand scientific concepts in the teaching and learning materials such as textbooks, activities, worksheets, and assessments. Whilst many learners pointed out that the use of English as the LoLT limits their acquisition of Life Sciences concepts, only 25% prefers to be taught in their home languages and the majority (72%) appreciated the use of English. They indicated that it places them at an advantage as all assessments are administered in English. Overall, the study found that three quarters of the learners (21 out of the 28) were of the view that code switching made the scientific concepts easier to understand. However, learners from other African countries (18%) who did not speak indigenous languages as homes language, were against code switching. The findings have implications for curriculum policy implementation and instructional materials design.

Keywords: *Code switching, language challenges, life sciences, scientific language.*

1. Introduction

Language is a fundamental tool in science education and learning science requires learning the language of science (Salloum & BouJaoude, 2020). Most of the rural and township secondary schools in South Africa consider English as the main language of instruction in the classroom (Fang, 2006). Moreover, teaching resources and study materials for science subjects such as Life Sciences are written in English (Seah & Chan, 2020). This is despite the fact that the majority of the learners in rural and township schools are not English first language speakers who lack proficiency and fluency in the English language (Probyn, 2009).

Language plays a pivotal role in enabling learner acquisition of scientific knowledge and skills. Whilst previous research indicates that proficiency in the language of learning and teaching (LoLT) does not guarantee learners' understanding of concepts taught, the current paper argues that learners who are proficient and fluent in the LoLT have an advantage in the science classrooms. Language affords learners to read the text in learning materials and assessments with understanding. Understandably science (Life Sciences included) is a language on its own which is academic and authoritative which every learner grapples with despite their fluency in the LoLT, the argument is that the challenge is compounded for those learners whose home languages are different from the LoLT.

1.1. Problem statement

The 2021 National Senior Certificate Results on School Subjects published by the Department of Basic Education (2022) shows that there has been a decline of 4.8% in the pass rate in grade 12 final Life Sciences examinations i.e. from 2018 (76.3%) to 2021 (71.5%). According to the minister of Basic Education in South Africa, this decrease attests to the subsequent effects of COVID-19 pandemic on learning. COVID-19 pandemic had significantly reduced the physical interaction between teachers and learners as well as putting a considerable limit on the time spent in teaching and learning in the classrooms (Ramathan, 2021). According to Irish and Kang (2017), poor academic performance of learners in science subjects is mainly caused by their lack of understanding of the language used in learning materials and assessment tools. As such, learning science requires learning the language of science and giving correct responses to assessment task questions (Seah & Chan, 2020).

1.2. Purpose of study

The current paper therefore sought to explore the language challenges grade 11 learners encounter in the teaching and learning materials and assessments in Life Sciences. The study sought to answer the questions: 1. What are the language challenges encountered by the grade 11 learners in Life Sciences teaching and learning materials and assessments? 2. How do Life Sciences teachers assist the grade 11 learners in mitigating the language challenges they (learners) encounter in teaching and learning materials and assessments? 3. How does the use of code switching as a teaching strategy contribute to mitigating or causing the challenges that the grade 11 learners encounter in Life Sciences teaching and learning materials and assessments?

2. Literature review

Yore, Bisanz, and Hand (2003) posit that language is a basic aspect of culture, society, and communication. On the other hand, Seah and Chan (2020) argue that language, especially in written form, is an important human characteristic, though its explicit nature and role vary across discourses and purposes. In science education, language plays an integral part in providing insight into the ideas and knowledge of learners, teachers, and scientists and acting as either a bridge that gives learners easy access to science concepts or a barrier that prevents learners from understanding the scientific content (Sutton, 1996).

Accordingly, Probyn (2001) found that teaching and learning through a relatively unfamiliar language contributes to stress and depression among learners and teachers. This is compounded by the scientific language which is distinct in that it encompasses technical terms with specific definitions and gives specific disciplinary meaning to words that may have different usage in the everyday language (Seah & Chan, 2020). Thus, scientific language can pose considerable challenges to learners due to its distinction in linguistic devices and strategies from the languages used in other disciplines and everyday life (Halliday, 2004).

In an investigation, Fang (2006) identified several features of scientific language that could pose challenges to science learning which include: unique use of prepositions; conjunctions and pronouns; ellipses, subordinate clauses; prepositional phrases; abstract nouns; lengthy nouns and complex sentences; interruption construction; and passive voice. Learners also encounter various types of text with unique language features and structures, which have reading requirements that are distinct from requirements in other subjects. These include science-specific procedural recounts, causal explanations, and persuasive discussions (Probyn, 2001).

English, which is the LoLT, is unique in that it is in control of the political, social, economic and educational structures as the language of opportunity and power (Yore, Bisanz, & Hand, 2003). However, most of the secondary schools in rural areas and townships enrol learners who are not first or even second language speakers of English (Grobler, 2018). Rickford (2005) suggests that LoLT policies in the country create 'linguistically structured inequalities or linguistic discrimination', where poor proficiency in the English language results in poor achievement across the curriculum. As such, in a study to investigate teacher use of learners' home languages in science instruction, with a particular focus on the affordances and challenges of using learners' home languages, Mavuru and Ramnarain (2020) found that learners could express themselves "confidently in their home languages" (p. 2472).

3. Methodology

The study was framed within quantitative non-experimental research design and qualitative design (Creswell, 2014). A non-experimental research design focuses on objective measurements and statistical analysis of data gathered through survey designs and questionnaires (Creswell, 2014).

3.1. Selection of participants

Using purposive sampling technique (Patton, 2002) one school was selected for the study. The school enrolled learners from neighboring rural and informal settlements where isiZulu and Setswana were the languages spoken at home. Accordingly, the school offers Setswana as Home Language and English is offered as First Additional Language. Nevertheless, English is the LoLT in the school and all formative and summative assessments are administered in English. From the school, 28 grade 11 Life Sciences learners whose home languages were different from the LoLT, were purposively selected for the study.

3.2. Data collection and analysis

A 4-point Likert scale questionnaire (McMillan, 2010) was administered to the learners through a google form. The questionnaire consisted of three sections. The first section sought learners' biographical information related to their home language and proficiency in English. The second section sought learners' insights about the language challenges they encounter in Life Sciences teaching and learning materials and assessments. The last section sought learners' views on the role code switching plays in either mitigating or causing the challenges encountered in grade teaching and learning materials and assessments. Quantitative data was analysed using Statistical Package for the Social Sciences (SPSS) software to obtain descriptive statistics. Qualitative data was collected using focus group interviews with learners. and the data was subjected to content analysis (Bowen, 2009). Analysis of the data collected in different sections gave the researchers insight and, more importantly, authenticity on language challenges grade 11 learners encountered in life sciences instructional materials and assessments.

4. Findings

The findings are presented in three sections: learners' biographical information; learners' insights about the language challenges encountered in Life Sciences teaching and learning materials; and assessments; and learners' views on the role code switching plays in either mitigating or causing the challenges.

4.1. Learners' language profiles

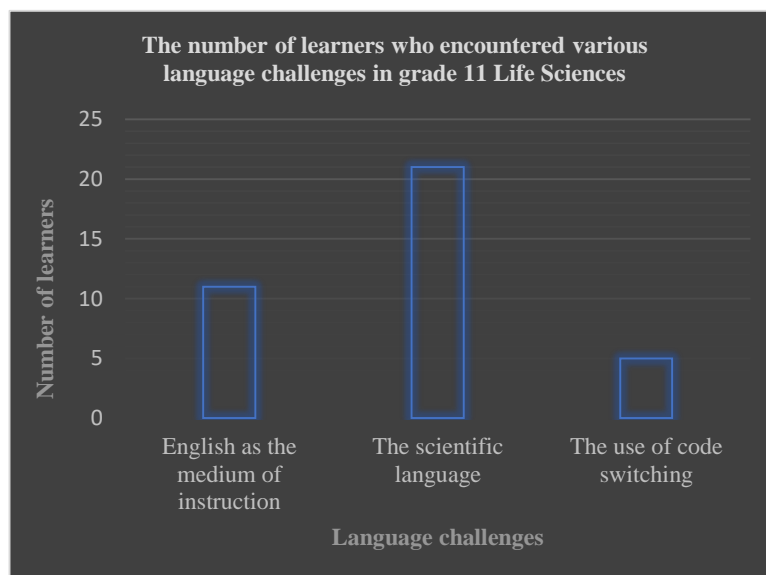
A total number of 28 learners participated in the study with 16 males and 12 females. The results showed that 89% of the participants were South African nationals, and the remainder were Zimbabwean nationals. 71% spoke Setswana, 17.9% IsiZulu, and 11.1% Shona as their home languages to communicate at home. Nevertheless, all these learners used either English only or English and Setswana to communicate among themselves and with the teachers in the Life Sciences classrooms. Though English is the LoLT and the one used in the teaching and learning materials and assessments the school curriculum made learners to study Setswana as a Home Language since grade 8 and English as an Additional language.

4.2. Learners' insights about the language challenges encountered

Figure 1 below displays the responses of the grade 11 learners in the selected school on the various identified language challenges in Life Sciences. Learners were instructed to select a language challenge/s that they found to be hindering their quest in understanding the scientific content and/or achieving good grades in Life Sciences. The learners' responses were based on three aspects: English as the medium of instruction; the scientific language; and the use of code switching. Learners were allowed to select more than one challenge depending on their views. Whilst many learners pointed out that the use of English as the LoLT limits their acquisition of Life Sciences concepts, only 25% prefers to be taught in their home languages. The figure shows that 11 learners (39.3%) faced challenges with English as the medium of instruction. English can be considered an unfamiliar language to the sampled learners as they were second or even third English language speakers. The majority (72%) appreciated the use of English in the teaching and learning process. They indicated that it places them at an advantage as all assessments are administered in English.

Most of the learners (75%) indicated that the complexity and specialisation of the scientific language makes it difficult for them to understand scientific concepts in the teaching and learning materials such as textbooks, activities, worksheets, and assessments. Such experiences by learners could be explained by the fact that Life Sciences has technical terms which are not even in English and incorporates many languages such as Greek and Latin, which are equally foreign to learners. In the focus group interviews, most of the learners indicated that they often find it frustrating that some basic English words such as force, cell, energy and photo, to name a few, assume a different meaning from the ordinary English language when used within the science discipline. One learner pointed out that the same words may carry specific meanings in different scientific subjects.

Figure 1. Number of learners who encounter various language challenges in grade 11 Life Sciences.



4.3. Learners’ views about code switching in either mitigating or causing challenges

Overall, the study found that three quarters of the learners (21 out of the 28) were of the view that code switching made the scientific concepts easier to understand. However, a small number of learners (18%) indicated that they faced challenges in understanding the subject matter when Life Sciences teachers use code switching between English and indigenous language/s in the classroom. One of the reasons may be that the sampled participants include learners who are originally from another country whose home language is different from any of the South African 11 official languages. Therefore, those learners would naturally not appreciate to be taught sciences via code switching with a language unfamiliar to them.

Table 1 that follows shows the participants’ responses towards using English only as the medium of instruction or code switching between English and Setswana as the media of teaching and communication in the classroom. The results obtained from this section of the questionnaire gives insight on the efficacy of code switching between English and Setswana in the teaching and learning of Life Sciences.

Table 1. Participants’ responses on the languages used to teach.

Item description	Number of learners (%)			
	Strongly agree	Agree	Disagree	Strongly disagree
Being taught Life Sciences in English only is beneficial to me.	29	43	21	7
Use of code switching between English and Setswana in Life Sciences makes it easy for me to understand.	43	32	14	11
Use of code switching between English and Setswana in Life Sciences makes me more confused and stressed.	18	7	54	21

It is evident from table 1 that many learners (72%) agreed and strongly agreed that it was helpful and of an advantage for them to be taught in English only. 75% of the learners showed appreciation of how code switching helped them to understand Life Sciences concepts. In another question to explore learners’ views on the impact of language used in assessment tasks on learners’ performance. More than half of the learners (57%) agreed that being taught in English only increased their chances of succeeding in assessments. More than three quarters of participants (82%) indicated that being taught Life Sciences through code switching (English and Setswana) increases their chances of succeeding in assessment tasks. One learner argued that it is not necessary to write proper English in a science assessment because science has its own language, which if you can understand using code-switching during class discourses, you increase your chances of performing well in assessments.

5. Discussions and conclusions

The study sought to explore the language challenges grade 11 learners encounter in the teaching and learning materials and assessments in Life Sciences. An important finding from the study is that both English as a LoLT and scientific language pose daunting challenges for learners whose home languages are different from the LoLT. As such, Yore, Bisanz, and Hand (2003) considered English as the language of opportunity and power since it controls the political, social, economic, and educational structures. On the hand the uniqueness of scientific language, which is subject-specific and encompasses specialised terminologies with specific definitions, has also been described the same in recent studies (e.g. Seah & Chan, 2020). Whilst some learners appreciated the use of code switching in making concepts more comprehensive, other learners did not see it that way. Such a finding disagrees with Rickford (2005) views that code switching has often been perceived as an approach used by weak English language performers to compensate for the language deficiency. Another important issue to note is that whilst code switching enables learners to access concepts, it is difficult for teachers to meet the language demands of learners from diverse linguistic backgrounds. The findings have implications for curriculum policy implementation and instructional materials design.

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