



Research Article

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The Impact of Using Code Alternation in Teaching Life Science to English First Additional Language learners in South African schools

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Abstract

The study aimed at investigating the extent to which English is used as a medium of teaching and learning Life Sciences in a South African rural high school. As the government has given recognition to the country's multilingual, multi-ethnic and multicultural composition, School Governing Bodies are mandated to choose any of the eleven official languages as a medium of instruction (RSA, Act 108 of 1996), but the power of deciding which language to use as a medium of instruction has been taken by teachers to shield their own shortcomings. To be able to explore and understand the prevailing situation, the researchers employed a qualitative design which translated into researchers observing classes, evaluating learners' written texts and interviewing the teachers as methods of collecting data. The findings are that: first, learners' and teachers' proficiency levels in English are very low, as such, the English language is not a pivot of learning and teaching in the South African education system. This emanates from the fact that although in theory the majority of the South African schools have adopted English as a medium of instruction, in practice, this is far from the truth as teachers employ code alternation in the form of code switching, code mixing and sentence translation as viable means of scaffolding the learning of content subjects.

Keywords: code alternation, language of learning and teaching, medium of instruction, School Governing Bodies

1. Introduction

The introduction of Outcomes Based Education (OBE) after 1994 failed dismally to elevate the South African standard of education. In light of this failure, Curriculum 2005 was ushered in and this also did not improve the dismal performance of the education system. Thus, in 2012, Curriculum and Assessment Policy Statement (CAPS) was introduced and it remains to be seen if CAPS will achieve the desired outcomes even if measures are not put in place to get to the root cause(s) of the poor performance of the South African educational system. Setati, Adler, Reed & Bapoo (2002: 129) state that mathematics and science teachers are faced with a double challenge of teaching these subjects in English at the same time that learners are still struggling to master basic English structure and usage

and they believe that it is this challenge that has seriously prevented the majority of learners from acquiring better knowledge of Mathematics and Science as they lack the functional use of the target language, English. Hence, there is an urgent need to conduct studies on the significant role of language on the performance of learners in South African schools (Msimanga, Denley & Gumede, 2017).

2. Background

English as the medium of instruction is blamed for the ills of the country's education by arguing that it contributes to high failure rate and school drop-out (Siquau, 2005). In some cases, educators use mother tongue or alternate codes as they lack functional use of English language. After analysing the results for Trends in International Mathematics and Science Study for 2011, Prinsloo, Rodgers & Harvey (2018) argue that language is one of the biggest factors that contributed to the poor performance by South African learners. To improve the current performance, the government need to ensure that there is optimum equivalence on the use of home and school languages.

In situations where there is disparity between home and school languages, learners memorise what the teachers impart to them in order to prepare for the final examination without the necessary understanding and there is no attachment of meaning to the information. English second language learners in a science class normally improve their conceptual and procedural knowledge when guided by their teachers through incremental scaffolds (Großmann & Wilde, 2019). As English is still regarded as the language of upward social mobility in many parts of Africa and globally, parents want to give their children a starting advantage that will spur them on in life. One advantage that is widely acknowledged is the belief that children can learn English better if they use it as the medium of instruction (MOI) from an early age.

Currently, there is a pressing need in South African school for ESL learners to improve their performance in science (Schulze & Lemmer, 2017). The challenge is that the Department of Basic Education is falling to implement stimulating methods which teachers can utilise in class to help learners improve their performance when teaching content subjects in English. On the other hand teachers complain that majority of ESL learners have low proficiency in English which make it difficult for them to understand complex scientific knowledge presented in class. Teachers therefore, apply code alternation which is a commonly observed phenomenon in situations where a second or foreign language is used (Sert, 2005). Alternatively, teachers can use problem-based learning (PBL) to help learners understand scientific concepts presented in class (Valdez & Bungihan, 2019). Their study revealed that effective use of PBL enhances the performance in a grade 9 chemistry class compared to learners taught using the traditional method. The use of PBL therefore can be applied in South African schools to bolster the performance of learning who are struggling in science, technology and mathematics subjects.

3. Literature Review

Several studies were conducted on the performance of South African learners in both Mathematics and Science (e.g. Seepa, 1998, Setati, 1998, Setati *et al.*, 2002 & Vorster, 2002) and the results indicate that language plays a significant role on the poor performance of learners. This can be attributed to the fact that more than 90 % of learners in South African school receive tuition in English which is not their first language, therefore, the content presented is not clearly understood. Teachers also have different perspectives on using English as the language of learning and teaching, hence they adopted strategies which can help them promote communication in class (Ferreira, 2011). Code-switching and code-mixing are some of the common strategies which teachers indicate they use when teaching, though during lesson observation it is clear that in some cases, teachers interpret entire sentences to make learners understand the concept presented.

A similar situation was reported in Botswana where teachers indicated that code-switching increases learner participation and lesson comprehension (Mokgwathi & Webb, 2013). Although

English has been entrenched as the official language of learning and teaching in all schools in Botswana but teachers still switch to Setswana to scaffold learners who are have low proficiency in English. Code-switches is thus used by teachers to confirm if learners understand the concepts taught, to motivate them and to create close relationship (Lin, 2013).

Wolff & Mnguni (2015) argued that effective integration of everyday life skills in the science curriculum can help to improve the performance of learners even in rural schools. Ngula & Nartey (2013) suggested steps which to be taken towards the development of Ghanaian English in an effort to help learners improve their performance in Ghana than emphasising proficiency in standard British English. Therefore, building an adequate corpora for the study of Ghanaian English will help all stakeholders involved in education to determine its proper status and its effectiveness. In a study conducted in Malaysia, it was observed that majority of learners in rural schools whose first language is Malay, lack pragmatic competence when trying to speak in English which is their second language (Thuruwan & Yunus, 2017). Hodge and Cobb (2019) advise teachers to understand learners as cultural being learning in second language which they lack proficiency. The use of information and communication technologies (ICT) has positive impact in motivating learners improve their performance in science. This study is an investigation of the extend in which English is used as the language of learning and teaching in a Limpopo high school in an attempt to change perception that mathematics and science are very challenging and suitable for very few learners.

Low proficiency in English has a detrimental effect on the performance of learners in mathematics and science which are challenging subjects which also require abstract thinking.

The performance of South African learners in mathematics and science has been discussed in several forums where lack of proficiency in English is indicated as the main challenge. Reddy *et al.* (2016) gave a comprehensive report of the performance of South African students in Trends in International Mathematics and Science Study (TIMSS) from 1995 to 2015. The results indicate a slight improvement in 2015 in both Mathematics and Science but still South Africa at the bottom five of the surveyed countries.

To remedy the situation, Barnwell, Moschkovich & Pakeng (2017) propose that language diversity in mathematics classes should be accommodated. Language can be used as a resource which can anchor communication in class in case students fail to grasp what the teacher presents in English which is the language of learning and teaching. Even the fact that South Africa is a multilingual country which has granted eleven languages an official status, therefore local languages can be skilfully used in a class where English is used as the MOI. Nichol, Chow & Furtwengler (2019) argue that professional development of science teachers help to empower science teachers with adequate knowledge which they impart to learners.

4. Research Methodology

The study design is qualitative as the approach is useful for exploring and understanding a central phenomenon in the natural setting of the participants (Creswell, 2012, p. 626). The collection of data was carried out through using three different instruments as follows: Firstly, through non-participant observation, the researchers observed three teachers over a span of 12 contact sessions or periods that were spread over a period of two weeks. Cohen, Manion & Morrison (2000: 305) maintain that observations provide rich data as they enable researchers to “gather ‘live’ data from ‘live’ situations” which provide a broader understanding of the situation under investigation. Before each observation session started, a short meeting was held with the relevant teacher for familiarisation with the subject matter during the contact session. Field notes were taken which helped in evaluating the nature of classroom interaction between the teachers and the learners. A video recorder was also used to capture proceedings during one contact session for each teacher in order to facilitate a close and accurate review of what happened during the lesson.

Secondly, in order to use a variety of writing protocols as research instruments, eighteen different writing tasks: tests, homework and projects were collected. The writing protocols formed a major part

of the collected data because learners are assessed according to the marks they got during the course of the year as well as during the final examination. Researchers highly value data collected from students' written tasks as they serve as rich empirical sources on how people portray their culture (Dawson, 2009). The writing tasks made it easy for the researchers to double-check the recurring problems in the learners' written work. All the collected writing samples helped the researchers to determine the prevailing state of experiences of learners with regard to the use of English as the LOLT in Life Sciences.

Thirdly, interview schedules were also employed for the study. Fontana & Frey (2005:685) alluded that an interview is not just "a neutral exchange of asking questions and getting answers" but it is an active interaction between the interviewer and interviewee. The interviews were conducted separately for the three Life Sciences teachers plus 18 learners sampled for participation in the study. In-depth interviews were carried out with the selected learners in order to get their views on the use of English as the LOLT in Life Sciences classes. The interview questions were presented in English, but one of the researchers was tasked to simplify the questions and employ code alternation where necessary during the course of the interviews. Each participant was given 15 minutes to respond to the interview questions, but some learners who could not easily express themselves in English finished earlier. The second part of the interview involved three Life Sciences teachers responsible for teaching the subject from grades 8 - 12. Each participant was asked seven unstructured questions which helped the researchers to assess the teachers' attitudes towards English as the LOLT and also to augment responses obtained from the learners. All three participants were able to express themselves freely in English even though they struggled to get the right term at times.

5. Results and Discussion

The study results and discussion were organised under different themes that emerged during data analysis and the themes were arranged separately.

5.1 Classroom observation

Data collected from different classes which the researchers had observed confirmed that code alternation was widely practised among both teachers and learners at that particular school. Gardner-Chloros (2009) defines code as an umbrella term for languages, dialects and styles. Teachers who participated in the study indicated that they were forced to switch codes because learners from the deep rural areas possess very low proficiency levels of English which is supposed to be used as the MOI. They also pointed out that when the teachers strictly stick to English in class, learners end up grasping very little and this results in a high failure rate. The information which teachers present in class either in the form of notes on the chalkboard or hand-out is expected to be meaningful for the learner to communicate back to the teacher.

5.2 Code switching

In order to show the nature of learner-teacher interaction, different forms of code alternation were observed by the researchers. However, only the examples which have been used by the teachers were selected for the purpose of this study. Code switching was used during class discourse by the teachers to define certain concepts when the teachers felt that their learners could not comprehend the concepts because of their limited knowledge of English. On the other hand, learners code-switched when they got stuck while interacting with teacher or as a means of confirming that they have really grasped what the teacher was presenting to them.

The researchers observed that teachers constantly switched from English to Xitsonga and vice-versa without visibly disturbing the smooth flow of the lesson. One teacher articulated a lesson on population dynamics in this manner:

Excerpt 1: In population dynamics, we can use the Petersen index formula to estimate the population size. Hi nga swi kota ku tiva leswaku ku hanya tinhlampfi tingani edanwini leri nga kwaka kusuhi (we can estimate the number of fish which are found in the nearby dam). If we can cast a net into the dam and catch a certain number of fish...

The teacher automatically and unconsciously switched between the two languages in an effort to disseminate knowledge to the learners. He presented his subject matter in English and went a step further to give an example in Xitsonga for the learners to draw inferences on how to estimate the population. He believed that learners would have a better understanding of population dynamics if he gave a practical example in their mother tongue. Van der Walt (2009) has observed that sometimes teachers “use code switching to narrow the gap between them and the learners”. This view is further expounded by King & Chetty (2014, p. 48) who posit that “L2 (English) is being used as the matrix language for the delivery of content”. Therefore, the teacher in the example above deviated from the standard norm of using English and inserted Xitsonga words in sentences for the learners to understand. Code switching was functionally used to enable the learners to have a familiar picture of fishing which is a common activity in their village. Additionally, it was used as a resource to facilitate teaching and learning in a bilingual class and encourage students to use their first language when they fail to find suitable word during communication.

5.3 Code mixing

Code-mixing was mainly used to support classroom communication where the teacher or learners failed to find a suitable expression to describe a particular Life Science concept or term. It is a useful strategy which enhances meaning making in class and help learners realise the role of their first language in learning science. Muysken (2000) describes code mixing as a term which refers to cases where lexical items and grammatical features of two languages are used in a single sentence. It is an effective strategy in rural schools where the teachers insert words from an indigenous language into a sentence which is constructed in English. Furthermore, the teacher may mix codes when reiterating a point, or as a way of reinforcing the meaning of a particular word or phrase. The example below used by the teacher in class exemplifies what code mixing is:

Excerpt 2: The brain is divided into two main parts: laha hi ngana (where we have the) cerebrum na (and) the cerebellum. The cerebrum hi yona yi fambisaka (controls) our vision, auditory centre, na swin'wana (and other functions) whereas the cerebellum yona yi fambisa (controls)...

The teacher easily switched from English to an indigenous language which in this case, is Xitsonga and the learners understood the contents presented through the style used. This is in line with Muysken's (2000) argument that code-mixing involves inserting words with different language indices into a phrase structure of another language. Learners also mixed codes when they responded to the question, thus making constructive contribution to the lesson. The main problem which the researchers observed is that the lesson progressed very slowly as the teacher had to make sure that he explained every term in Xitsonga.

5.4 Interpretation of sentences

The last aspect of code alternation is interpretation of sentences which totally goes against the school language policy of using English as the MOI. The teachers regard interpretation as an escape route when the learners do not understand the subject matter at all. It is mainly carried out in grade 10 classes as students are coming from grade 9 where Xitsonga is the main language used in most subject, though it is an infringement to the departmental policies. The researchers observed one class in which the teacher consistently made statements in English and quickly interpreted them in Xitsonga while

writing notes on the board in English. The following statement illustrates the basis of the findings:

Excerpt 3: Obesity is when a person is very fat because he/she usually eats food containing a lot of starch. Obesithi hi loko munhu a nyuherile ku tlula mpimo hikokwalaho ka ku dya swakudya leswi nga tala xitachi.

The process of interpreting each sentence has a serious negative effect because it impinges on the smooth running of a lesson, thus making the process of imparting knowledge tedious and slow. The method takes double the amount of time expected and makes the learners lose interest in the English version and pay attention to the mother-tongue version (Brock-Utne, 2004). This confirms that there is a dire need to provide knowledge to learners in a language which they fully understand to help them improve their performance.

Although code alternation is used as a language practice that is supposed to support classroom communication, it acts as an impediment to the process of learners becoming proficient in English. Hence, teachers also struggle to finish the syllabus as they cannot move fast enough when compared to the style of using English only. However, teachers insist that it is unthinkable to expect learners who have no contact with native speakers to understand challenging subject matter which is presented in English only. Uys & van Dulm (2011, p. 75) recommends that “code-switching deserves consideration as sound academic practice in classrooms in which the medium of instruction is not the home language of all learners, as is the common case in South Africa”.

This view runs contrary to the fact that tests and examination question papers are set in English and the school policy clearly stipulates that teachers must use English as the MOI. Thus, our education system is in a dilemma of whether to allow teachers to promote code alternation in classes or to monitor that they strictly use English which is the MOI in most schools. However, data provided confirm that strict use of English as the MOI have more challenges than opportunities and code alternation seems to provide solutions to some of the challenges.

5.5 Writing protocols

Learners writing protocols were thoroughly examined to evaluate difficulties found in intersentential and intrasentential levels. On answer where learners were expected to write paragraphs or short description, the researchers found that learners experience numerous difficulties which range from glaring grammatical errors, lack of transition from one aspect to another as well as traces of circumlocution. Learners were expected to write their answers in English only and they struggled to find suitable words to make their answers easily understood. In some cases, learners wrote very short paragraphs or just skip the question as they lack proficiency in English which is the LOLT.

As writing involves creativity in retelling pieces of information and using descriptive words where necessary, learners find it challenge to write coherent long sentences and paragraphs where they were expected to do so. They lacked the standard academic English which they had to use to express their ideas and write meaningful paragraphs. Williams & Lowrance- Faulhaber (2018) aver that bilingual learners quickly develop knowledge and understanding of written language when given instruction in both their mother tongue and the language of instruction. Using both languages, therefore gives learners an opportunity to easily respond to challenging science questions and boast their courage to answer all questions.

5.6 Interviews

Data from the interviews indicate that participants were seriously concerned with the performance of learners in Life Sciences as they struggle to understand challenging content presented while trying to learn English at the same time. All participants confirm that they are compelled to switch or mix codes as a strategy to help learners feel comfortable and make meaning from the information presented.

Participant 2 pointed out that: "I encounter challenges when I use English the whole period as very few learners participate without fear of making grammatical errors." Participant 1 argued that she is compelled to interpret almost the whole subject matter to help learners grasp the content presented. As majority of the learners have low proficiency in English, they are unable to make meaningful contribution during class discussion. In schools where learners have low proficiency in English, they overwhelmingly prefer the use of some of their first language to scaffold them to fully comprehend the subject matter presented (Song & Lee, 2019).

Participants further agreed that majority of teachers in their school and the whole district often use code switching and some use their mother tongue and translate to English when teaching content subjects. Participant 3 remarked that: "sentence translation is used by teachers who have low proficiency in English, as they mainly use the mother tongue and translate to English where necessary." However, none of the staff member support the issue of changing English and use Xitsonga as the MOI because they think English provide learners with more opportunities to interact with others. Participant 1 also remarked that there are two grade 12 teachers who translate every sentence in the textbook and claimed that it helped them to get better results during final examination. Data confirm that all participants are aware of the linguistic impact of code alternation and they apply it to help learners comprehend information presented. This is in line with Dearden's (2014) findings that in most countries the use of English as the MOI is associated with reputable international image, prestige and reputation. It is not surprising that schools prefer to use English as the MOI even if they realise that learners perform poorly in most subjects.

6. Conclusion

The study established that code switching plays a functional role in the teaching and learning of Life Sciences in rural schools. In addition, a thorough examination of the learners' written work revealed that their writing is culturally induced as their writing style is influenced by the traditional culture, oral narratives and the rural environment where they live. Their writing also has traces of circumlocution which is rife among the South African people and this is a direct opposite of the English style of writing. In spite of the challenges which majority of learners in South African schools encounter, English continue to be the preferred MOI (Harmse & Evans, 2017).

Furthermore, both learners and teachers do not use English effectively in content based subjects as it is challenging to acquire or impart knowledge in a language which they have inadequate proficiency. The teachers resort to code alternation when learners do not understand the subject matter presented in English. They also used code alternation when they wanted to put more emphasis on concepts which they think learners will not adequately understand when presented in English. This clearly confirms that in a classroom where both teachers and learners are not first speakers of English it is challenging to expect learning to be conducted strictly in a language which they lack proficiency (Msimanga, *et al.* 2017). On the other hand, learners resorted to code alternation as an instrument to help them fill in gaps in communication when they failed to express ideas fluently in English. They also used it to demonstrate to the teacher that they have understood the concepts as they are capable of explaining the concepts to other learners in their mother tongue.

The study found out that majority of learners who come from poor or low income households with no exposure to English have difficulties in using English functionally to interact with the teachers as well as to write. The researchers discussed the matter with the principal and the teachers on what can be done to solve that situation. It was recognized that the low proficiency levels in English prevent learners from interacting intellectually with the teachers which results in poorly constructed sentences and sometimes in breakdown of communication. The researchers also acknowledge that the excessive use of different forms of code alternation hampers the progress of imparting knowledge effectively and efficiently and further research is still needed to help improve the situation.

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