



Cultural taboos in mediating science in a Namibian bilingual primary school



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Background: The need to meet the demands of education in the 21st century has seen Namibia move, after democracy in 1990, from a segregationist educational system to an inclusive one in a bid to develop students' capacities to think critically, particularly in science. Research indicates that cultural taboos can impact on how science knowledge is transmitted to and acquired by students.

Objectives: The objective of this study is to investigate whether and how cultural taboos impact on the teaching of science in a Grade 4 class in Namibia.

Method: Using a single case study design, we investigate the impact of cultural taboos on students' acquisition of concepts relating to sexual reproduction and excretion, focusing on the extent to which cultural taboos influence talk as a mediating tool.

Results: Findings indicate that cultural taboos silence students and impede the teacher's ability to unpack sensitive concepts in science, potentially creating misunderstandings.

Conclusion: Cultural taboos impact how effectively sensitive science concepts are mediated in this context.

Contribution: This article adds to the knowledge of cultural taboos in science teaching but also develops a view of science teaching in a disadvantaged rural area where children are being taught in English, not their mother tongue. The use of cultural historical theory, we feel, also adds a fairly tale lens to the understanding of how scientific concepts must be linked to everyday concepts for student acquisition.

Keywords: cultural taboos; language; mediation; cultural historical theory; primary school.

Introduction

Many countries aspire to having a scientifically literate citizen body to accelerate the fourth Industrial Revolution. Namibia is no exception to this. Having gained independence in 1990, Namibia established a new national ministry of Education and Culture which favoured a 'student-centred' approach to teaching and learning (Lipinge & Likando 2013). The drive towards a focus on the student signalled a move towards the development of a scientific citizenry able to meet the needs of the 21st century. This movement required a shift from fundamental pedagogics under apartheid to a more progressive, student-aligned pedagogy in the newly democratic Namibia.

While Namibia was clearly committed to a move from fundamental pedagogics under apartheid to a more progressive pedagogy under democracy, unfortunately we continue to see serious under-performance in Namibian schools, especially in science and mathematics attainment (see Makuwa 2004; Mutorwa 2004; Nyambe 2015; Hartley 2011; Wolfaardt 2005). This is most profoundly evident in rural schools that lack human and material resources to action a curriculum that relies on a level of initiative from the teacher that was not required under apartheid education (Kasanda & Kapenda 2015). In fact, rather than research indicating a shift towards progressive student-focused pedagogy, what we continue to see in Namibian schools is a focus on teacher-centred, didactic lessons (Hardman & Set 2021). This impacts on a teacher's ability to effectively teach science as teachers tend to rely on chalk and talk to cover content, rather than to develop students' meaningful acquisition of the content. The traditional Initiate Response Evaluate (IRE) sequence illustrative of most traditional pedagogy continues to permeate teaching even today (Hardman & Set 2021; Sinclair & Coulthard 1975). We are not suggesting that the IRE sequence is necessarily negative for conceptual acquisition, but longitudinal research suggests that this kind of discourse structure is best used for reinforcing knowledge rather than for

developing conceptual understanding, as student interaction is correlated with student attainment (Bi, Anderson & Huang 2013). In this article, we recognise the power of the IRE sequence to open interaction, but we are mindful of what kind of interaction is opened, that is, the interaction centred on drawing out student conceptions rather than obtaining single known answers to factual questions. What does appear clear in the literature is that a progressive type of pedagogy called 'constructivism'¹ appears to correlate with higher student interaction in class and more dialogical interaction, and, consequently, is related to improved student outcomes (Hardman 2021; Mercer 2015). Pedagogy, then, is the central vehicle through which a teacher engages students in a lesson and the primary tool the teacher uses for this is language. As we discuss in the theory section, Vygotsky's theory of mediation in the Zone of Proximal Development (ZPD) provides a theoretical foundation for understanding the teacher and student talk in this article.

In Namibia, the struggle to break away from rule-based, rote learning towards more conceptually oriented exploratory engagement is further exacerbated by teachers' lack of subject content knowledge, limited resources, lack of competencies in English as a medium of instruction, cultural factors, and student background (Kasanda & Kapenda 2015; O'Sullivan 2006). Achieving the Namibian goal of education for all poses considerable challenges because of the dilemma of the English-only policy for teaching and learning from Grade 4 upwards, placing heavy demands on linguistic ability for both teachers and students. What this policy means is that students are essentially not learning in their mother tongue. This situation arises from a view of language as monoglossic, where the teacher and student are assumed to use only one language in a lesson when learning (McKinney & Tyler 2019). What research has shown, however, is that monoglossic ideologies around language are based on a view of language that is not tenable in actual classrooms, especially where students are learning outside of their home language. A more current and coherent view of what actually happens in classrooms challenges the notion of monological learning by indicating that teachers and students switch languages when constructing the meaning of concepts in a classroom dialogue (Antia 2017; Blackledge & Creese 2017; García & Wei 2014; Makalela 2015). This notion of 'translanguaging' is neatly defined by McKinney and Tyler (2019) as placing the:

[E]mphasis on the description of communicative practices involving a wide range of linguistic and semiotic resources, as well as on the ideological dimension of disrupting a monoglossic and monomodal understanding of language. (p. 145)

In this article we illustrate how translanguaging serves as a mediator of students' acquisition of content knowledge. Our engagement with this term and our focus on pedagogy outlined in the theory portion of this article is impacted by the understanding that Namibian students perform extremely badly in international benchmarking tests of

1. We discuss this concept further in the theory section of the article.

science (SACMEQ). It is against this background of a policy shift towards a more progressive pedagogy and the use of translanguaging as a tool in teaching that we seek to investigate the impact that cultural taboos have, as they are discussed through language in a science class, on how students acquire science concepts in a Grade 4 Namibian classroom. Given the need for open discussion in a classroom for optimal learning, we are interested in what cultural taboos, transmitted through language, enable in a given lesson. Our focus is then on how cultural taboos mediate science concepts in a Grade 4 science class.

Research indicates that cultural taboos have a significant impact on how science and biology is taught in Namibian schools, with parents feeling that sexuality education is inappropriate at a primary school level. Given the challenges facing children in Namibian schools with regard to the learning of science concepts, this article focuses on an experienced science teacher in rural Namibia in a bid to understand how cultural taboos potentially influence how he uses talk to mediate scientific concepts to students. The question we pose is: *Do cultural taboos influence how a teacher uses talk to mediate scientific (abstract) concepts in this context? If so, in which ways do they do so?*

The focus on culture as influencing cognition derives from our theoretical foundation in Vygotskian cultural historical work.

Cultural taboos

According to Talavera (2002):

People from the earlier era were in some ways more enlightened than people today. Most children had involved themselves in sexual games that were played before puberty and, hence, could not lead to pregnancy. These games were a safe way to discover sex and parents would often cast a blind eye on them. (p. 38)

The above quote from Talavera (2002) suggests that prior to colonial rule, which brought with it the taboos inherent in Christianity, Namibians did not fear or stigmatise sexuality as taboo and, in fact, treated sexual development as a natural and normal part of development in young children. This shifted, however, when children reached puberty where sexual game playing became forbidden to protect against unwanted pregnancy. Colonialism and its focus on Christianity as a central religion changed how people viewed sexuality. Deeply patriarchal, Christianity at the time that Namibia was colonised had a view of African sexuality (as well as female sexuality) as inherently dangerous and needing to be curbed (Becker 2007; Talavera 2002). Hence, we find in previously colonised societies based in Christian mores the pervasiveness of social taboos around sexuality and reproduction (Lukola & Van Dyk 2015). The impact of taboos is further exacerbated in contexts where a society is very hierarchical, and a firm distinction is made between the young and the elders who are regarded as leaders of the youth. According to these studies, when topics

around sexuality and reproduction are discussed with young students, these topics are viewed as offensive and too sensitive to explicate in substantial depth (Frank & Kxahas 2006; Hailonga-Van Dijk 2007). Further, there is a body of research that indicates that cultural taboos can have a negative impact on health in any given society (Mulenga, David & Pinehas 2018). It is the potential of the taboo to cause a negative impact on the group that is of interest to this study.

Cultural taboos are believed to have a negative impact on teachers' ability to foster meaningful classroom discourse because some of the more sensitive concepts remain unexplained or are left at the level of an everyday understanding which can lead to misunderstandings, given the abstract nature of scientific concepts (Hussain & Khan 2008; Sorcar et al. 2017). In Namibia, such taboos have led to robust debates in primary education over the introduction of sex education in schools as well as an awareness of HIV/AIDS and others sexually transmitted diseases (Hailonga-Van Dijk 2007; The Namibian Newspaper 2019; Talavera 2003). In an interview with Nampa, the Education Ministry's deputy director for HIV/AIDS management, Julius Nghifikwa, he emphasises that although Namibian education introduced revised comprehensive sexual education (CSE) in 2013 that aimed to equip primary school students with knowledge, skills and values around sexuality and reproduction in order to assist them in making healthy decisions in their later sexual lives, this has not been met with much success at the level of the actual classroom. In fact, some have even argued that it is culturally wrong for young children to be introduced to topics related to sexuality (The Namibian Newspaper 2019). There is a suggestion that the graphic content of sexuality education will lead students to engage in inappropriate sexual conduct while still in primary school (The Namibian Newspaper 2019). O'Sullivan (2006), Furayi (2017) and Silas (2015) indicate that Namibian parents are not comfortable with their children learning about sexuality. The Namibian National HIV Sentinel Survey in (2004) quotes one young girl as saying:

I was never told anything by my parents. When you hear about something pertaining to sexuality and ask your parents for more information, all she will do is chasing you away or tell you that you are irritating her. (MOHSS Report of the National HIV Sentinel Survey 2004:11).

While this is an old quote, recent doctoral work undertaken by Furayi (2017) echoes these findings. Clearly, then, there is a challenge that needs to be addressed around cultural taboos' influence what and how teachers teach science and biology in the classroom. There is a dearth of published papers that address the notion of cultural taboos negatively impacting on the learning of science and biology in Namibian schools and, hence, a central issue in this article is around the impact of cultural taboos on the teaching in a Grade 4 science classroom. The central importance of language as a pedagogical tool that carries with it sense and meaning in a classroom is discussed in what follows.

Theoretical framework

We locate our study in a constructivist paradigm. The term 'constructivism' has become so popular in educational circles that it has begun to lose coherence as a tight theoretical framework for understanding pedagogy as involving dialogical interaction between teacher and taught in a specific developmental space. Misunderstandings that constructivism is a relativist theory where all knowledge is equal abound and continue to be perpetuated (Spaull 2022). For us, constructivism finds its roots in the work of Piaget (1977) and Vygotsky (1978, 1986). While ontologically and epistemologically distinct, what both theorists have in common is an understanding of cognitive development as an active process; that is, they both see children as active cognising agents who construct knowledge through transacting with the world. There is no suggestion here that all knowledge is relative as there is a certain epistemic weight agreed upon by disciplines when determining how concepts will be used in any specific disciplinary field (Muller 2009). Another central tenant of constructivism is the understanding that language functions as a cognitive tool to develop children's high functioning. While we appreciate the work Piaget has done in describing how cognition develops universally, our own work is more interested in how cognitive development is differential across culture, history and context. We draw our theoretical impetus, then, primarily from the cultural historical work of Vygotsky, both because he situates individual development in a socio-cultural context but also because of his central focus on language as a developmental tool. As we are interested in cultural taboos in this article, his lens on culture, history and context provides us with a way to investigate our data in depth.

Our focus on language as the central mediating tool in a classroom is based on the theoretical framework derived from Vygotsky's (1978, 1986) cultural-historical theory. Our understanding that dialogical interaction is a necessary condition for learning is informed by the work of Bakhtin (1981). For Vygotsky, all higher cognitive functions (HCF), those things that make us uniquely human such as reading and writing, are not innate but are, rather, developed in time through a process called mediation. Language, for him, is the primary tool through which HCF are mediated. Vygotsky (1986) articulates mediation as a process where a culturally more competent other (in this article, the teacher) guides a novice into new ways of knowing in a uniquely social space called the ZPD. In his general genetic law, Vygotsky (1978) indicates that:

Every function in the child's cultural development appears twice: first, on the social level, and later on the individual level; first, between people (inter-psychological), and then inside the child (intra-psychological). This applies equally to voluntary attention, to logical memory, and to the formulation of concepts. All the higher functions originate as actual relations between human individuals. (p. 57)

What this quote highlights is that all higher cognitive functions are mediated. It is within the ZPD that mediation

of abstract concepts happens. Cognitive development is not, therefore, an individual innate happening, but, rather, it is structured through dialogical interaction between a more competent other and the student. It is in this sense that cultural taboos can heavily influence the promotion of dialogue in a lesson. Should the cultural taboo close discussion, this impacts directly on the developing child's conceptual acquisition as research indicates that dialogical interaction in a classroom is necessary for learning (Hennessy et al. 2020; Matusov & Miyazaki 2014). This is, of course, stressed in the general genetic law quoted above. It is within the ZPD that the mediation of what Vygotsky (1986) calls scientific concepts occurs. We noted in our introduction that children in this study move in Grade 4 from learning in their mother tongue to learning in English. This move is not without significant challenges, but is, in some way, mitigated by the use of translanguaging as a tool to make meaning of the English content being taught (McKinney & Tyler 2019). Translanguaging involves the use of home language to understand the content being taught and, as we shall see in this study, is a potentially useful tool for developing meaning.

Vygotsky (1986) distinguishes between two kinds of concepts: scientific (abstract) concepts, which are abstract and must necessarily be taught in the absence of any empirical referent, and everyday concepts that are contextually embedded and empirically learnt. While the scientific concept differs from the everyday concept, Vygotsky indicates that both are necessary for the development of higher cognitive functions:

The formation of concepts develops simultaneously from two directions: the direction of the general and the particular. (Vygotsky 1986:126)

The development of a scientific concept begins with the verbal definition. As part of an organised system, this verbal definition descends to concrete; it descends to phenomena which the concept represents. In contrast, the everyday concept tends to develop outside any definite system; it tends to move upwards toward abstractions and generalisation. (Vygotsky 1978:163)

The weakness of the everyday concepts lies in its incapacity for abstractions, in the child's incapacity to operate on it in a voluntary manner. (Vygotsky 1978:168)

The weakness of the scientific concepts lies in its verbalism, in its insufficient saturation with the concrete. (Vygotsky 1978:169)

We are more concerned to show that systematicity and consciousness do not come from outside, displacing the child's spontaneous concepts, but that, on the contrary, they presuppose the existence of rich and relatively mature representations. Without the latter, the child would have nothing to systematize. Systematic reasoning, being initially acquired in the sphere of scientific concepts, later transfers its structural organisation into spontaneous concepts, remodelling them 'from above'. (Vygotsky 1978:172)

These quotes, drawn from Chapter 6 in *Thought and Language*, indicate the importance of linking the abstraction of the scientific concept to the everyday experience that the child is familiar with. The abstraction being taught only makes sense to the child in relation to their everyday experience. In the process of coming to understand and

comprehend the novelty of abstractions, the child must be able to link this to everyday concepts. While everyday concepts have empirical referents in the child's environment, scientific concepts' relation to the empirical is mediated through other concepts. This is an important distinction: the empirical, practical nature of everyday concepts means that they can all too often result in misunderstandings, hence the importance of the fact that everyday concepts undergo development when they encounter scientific concepts.

In this article we make a distinction between science content taught in school and scientific concepts, that may indeed be related to science content but have a much broader range than this in that they refer to all abstract concepts such as democracy in History or verbs in English lessons. The significance of scientific concepts lies in the fact that they are so abstract that they need to be taught and cannot be learnt through empirically interacting with the world. Photosynthesis, for example, cannot be taught in a single lesson, but is developed over time as the child learns and develops sufficiently to understand that, at base, photosynthesis is about the transformation of light into chemicals. Our use of Vygotsky's notion of scientific and everyday concepts, coupled with his notion of teaching as mediated, informs our analysis as we look for instances where scientific concepts are elaborated and whether these are linked to everyday concepts so that the child can meaningfully appropriate the concept.

Methodology

As noted above, this article is located in a qualitative, constructivist paradigm which views students as active cognising agents who co-construct meaning together with their teacher in order to acquire knowledge. This article reports on a single case study. We chose a case study design as we wish to understand the influence of cultural taboos on classroom talk in depth, while not seeking to generalise to any larger population (Yin 2011). The cultural-historical theory that informs this article lends itself to a qualitative research design and interpretive approach to analysis.

Research site

The context of this study is a school located in the northern part of Namibia about 750 km away from the capital city of Windhoek. The school was purposively sampled for this study from 'disadvantaged' primary schools in a Namibian township in the Oshana Region. The term 'disadvantaged' relates to the lack of material and human resources in the school, and generally refers to schools that were deprived under the apartheid regime that established Bantu education in Namibia prior to democracy. The Oshana Region, where this study was conducted, is regarded as one of the poorest performance regions in mathematics and science subjects. The school is situated in a low socio-economic environment, with surrounding informal settlements (shacks) and high rates of unemployment, crime, and substance use. The school has 1000 students and 36 teachers. While school fees

are low, the teacher reports that significant numbers of children are unable to pay their fees. There are four classes per grade with approximately 38–40 students in each class. Teachers and students in this school are native Oshiwambo speakers but may speak slightly different dialects of Oshiwambo as dialects tend to differ depending on whether a child is from a rural or urban area.

The school has students in Grade 0–7 and the building is in a state of disrepair with many broken windows. There is no library or science laboratory in the school. Most of the teaching staff has been teaching here from before independence in 1990. That is, teachers in this school taught using a rote-style prior to independence and some continue to do so. English is the medium of instruction from Grade 4–7 while Oshiwambo is used from Grade 0–3. As noted, all teachers and students speak Oshiwambo in their homes. Students in this school are transitioned to English as the medium of instruction in Grade 4 and we note that English proficiency in Grade 4 classrooms is understandably low. What we are dealing with here, then, is students who are not only having to learn a new language (English) but are having to learn novel science content in this new language. We suggest, therefore, that students face the dual challenge of a novel language of instruction coupled with novel content.

We chose this specific school because there is a body of research indicating that schools situated in high poverty level areas, with children from disadvantaged backgrounds, tend to perform poorly in science subjects (Fleisch 2008; Hardman 2005). Our focus on science lessons was informed both by the findings that students in Namibia perform poorly in science and by our interest in cultural taboos that are more likely to be evident in science than in other types of lessons. Students do not own science textbooks and there is neither a science laboratory nor a science tool kit for doing experiments in the school. Science is taught, then, entirely with the use of the blackboard. The lack of material resources for conducting experiments especially in science is a challenge as many of the abstract concepts in science require, at the minimum, a microscope to enable the child to link the complete abstraction of say, photosynthesis, with the changing of light into chemicals.

Sampling, participants and data collection

Participants in this study were purposively sampled because we wanted to investigate a very specific subject regarding cultural taboos and how they open or close students' access to scientific concepts. It was also important to us that the school and class sampled would approve of our accessing a Grade 4 science classroom.

The participants for this study were the Natural Science teacher, Mr Shilumba (pseudonym) and his fourth-grade students. Mr Shilumba was 49 years old at the time of data collection and has a university degree in education, specialising in mathematics and science. He has 16 years' experience teaching Natural Science and had taught at this

school for 8 years at the time of this research. He speaks four languages, but he is a native speaker of Oshiwambo. Mr Shilumba was recommended to us by the head of the department as a good teacher who is passionate about teaching and uses a variety of modalities in his teaching praxis to gain and hold students' attention.

There are 38 students in this class: 5 boys and 23 girls. All are native Oshiwambo speakers. The lessons observed covered four units: plants as living organisms, animals, the system of the body, and communicable diseases.

We chose to focus on Grade 4, as it is in this grade that students are transitioned from mother tongue to English as the medium of instruction; that is, the child transitions from learning to read to reading to learn. We feel, then, that this grade provides teachers with a significant, perhaps the most significant, challenge faced at primary school: teaching children in a language that is not their own. Our focus on Grade 4 is further informed by the movement in this grade from very concrete, context-bound thinking, to more abstract thinking. The students in this study have been taught in their mother tongue from Grade 0 to Grade 3 and have only had 5 hours a week exposure to English during those 3 years. Students' grasp of English, then, is extremely tenuous.

Data collection

Video data were collected and transcribed but we made use also of interviews and students' workbooks and tests to triangulate our findings. We chose to videotape lessons as there is too much that happens in any single lesson for a researcher to focus on but, further, we wanted to look specifically at how cultural taboos influence the acquisition of scientific concepts and this required that we transcribed, verbatim, what was said in each lesson. The content taught in the lessons is predominantly transmitted through the medium of language in this school as there are few textbooks and not every child has access to a textbook. All lessons across a single topic were videorecorded and transcribed by the researchers. In the case of the data for this article, 5 hours of video data were recorded around this specific topic. Teachers' interviews were audio recorded and transcribed after the interview. We chose to interview teachers in order to ascertain their theories of pedagogy and what serves as best practice for science teaching. Student workbooks and tests were photocopied in order to triangulate between what we observed in the class and what students represented in their responses to set questions. While we interviewed teachers in the school in order to ascertain their attitudes about how best to teach science, this does not form part of the current article and these interviews are not analysed in this article.

Data analysis

In this analysis we look for instances of (1) cultural taboos, and (2) how these function in a classroom in terms of whether they open dialogue, promoting the construction of meaning, or whether they constrain dialogue, thereby preventing

conceptual acquisition. The analysis involved focusing on teacher and student talk as talk is viewed as a primary mediating tool in classrooms (Hennessy et al. 2016; Mercer & Littleton 2007). We take the utterance as our unit of analysis where this refers to a piece of talk that can be meaningfully understood outside of its context. For example, 'What is that system that involves making babies'.

Data analysis began by reading the transcribed text to familiarise ourselves with the content of the text. As we had a large amount of transcribed data, we sampled data to analyse in terms of an IRE sequence, as these sequences enabled us to capture both student and teacher talk. We sampled from the transcriptions using what Hardman (2008) has called evaluative episodes; these are moments of teacher talk where the teacher explains what it is that forms the actual basis of the lesson, that is, what the concept under discussion is about. These episodes require that the teacher elaborate what evaluative criteria underpin the specific concept being taught. Basically, these episodes indicate what a correct answer is in relation to the topic under discussion. Once we selected these episodes, three in relation to this article, we analysed the episodes looking for instances of: (1) cultural taboos, (2) explication of scientific concepts and (3) whether the teacher makes an explicit link between the scientific concept and the everyday concept.

In relation to student workbooks, we were interested in seeing how students represented what they had learnt in class in a test. To get a sense of what students produced, we checked this against our transcription and video of that part of the lesson where they had learnt the content being tested.

Findings and discussion

What follows is an analysis of data drawn from a lesson on the reproductive system. This data is drawn from the transcriptions and selected for its ability to talk to the central foundation of this article: cultural taboos. Below in extract 1 we reproduce a verbatim interaction between students and teacher as it was videotaped and transcribed. This is a Grade 4 classroom that is learning about the reproductive system. Mr Shilumba begins the lesson by eliciting prior knowledge from the students by means of a closed question.

Extract 1

Science lesson on the reproductive system:

- T: 'What is that system that involves making babies, what is that system?'
- Ss: [*prolonged silence*]
- T: 'Tell me the name of the system that involves the process of making babies? [*Lombweleinge osytem ei hai deallinga nokumona oubabicky*]'
- S: 'Is giving birth to babies (*Okudala ounona*)'
- T: 'No ...'
- S: 'Is to buy babies [*Okulanda ounona*].'
- T: 'No!'

- T: 'Tell us Alma the name of that system?'
- Alma: [*hesitating and scratching her head and no response*']
- T: 'What is that system that called rep ... ?'
- Alma: [*shouts immediately*] 'Reproductive system!'
- T: 'Yes, reproductive system. [*writing on the chalkboard while talking*]'
- T: 'What is reproductive system? [*prolonged silence*]'
- T: 'Reproductive system are the female and male organs. When we are talking about reproductive system, we mean private parts, and female and male organs are involved here, and these organs are called private parts or genital organs. These parts are very important, they need to be protected.'
- Ss: [*not paying attention to the teacher, and they engage private talk and some are looking away*]
- T: Do you understand what reproductive system is?'
- Ss: [*shouting*] 'No!'
- T: 'Who can tell us what is the reproductive system?'
- Ss: [*no response, and students are dodging under the table; some are looking away*]
- T: 'Are you scared to talk with about this system with me? [*Osytem ei omweitila okwii popya naame hano*].'
- Ss: [*shouting*] 'Eee [Yes]!'
- T: 'Why are you scared to talk about this system? [*Osytem ei omwei tila shike?*]'
- S: [*stands up and looks very shy*] 'Because it's not right to talk about those things with the elders. [*Shaashi kaishi nawa okupopya oinima ei novakulunhu*]'
- T: 'Okay class, now with reproductive system ... We are not going to discuss it more in details because you guys are still young. This system is meant for adults only, but because it's written in your textbook we will talk about it a little bit.'
- SS: [*look very surprised; mouths wide open*]
- T: 'I want you to know that there is a system called reproductive system that involved male and female organs. This system is the one that makes people to make babies, when you are ready. For now you are not ready yet for this system. It is a taboo to use this system at your age. When you are ready to make babies is when your reproductive system will be in use.'
- Ss: [*not paying attention while the teacher is explaining, they engage in private talk and some are looking outside*]
- T: 'Reproductive system in other words means when you start sleeping with your *moi moi* [*non-standard language used in the township to refer to boyfriend or girlfriend*] Either at your place or at his place and eventually *tamu dala okaana* (make a baby).'
- Ss: [*look very confused*]
- T: 'This is how the system works. If you are a grown-up man you will decide to have a house, a wife and your kids, and the reproductive system is the one that make us to have children.' [*Osytem ei ohai longo ngaha Ngee omumati wakulu, oto tokola okuninga eumbo, tokongo omukulukadi nounona voye, oreproductive system oyo nee haitukwafa okuninga eefamily detu. Osytem ei otwei pewa nale okudja keshito, maara inatu ipewa twiilongife nai*]. This system is part of our nature but we must not misuse it.'

The discourse patterns in this teaching episode demonstrate teacher-fronted talk, combined with the dominant patterns of IRE interactions. The use of closed questions in an IRE sequence is well established in research as a didactic technique (Sinclair & Coulthard 1975; Rees & Roth 2019). While there is serious criticism levered against an IRE sequence in developing students' understanding of concepts, the use of the IRE sequence can only be adjudicated in relation to the *evaluation* move the teacher makes.

Extract 2

Tell us Alma!

T: 'Tell me the name of the system that involves the process of making babies? [*Lombweleinge osytem ei hai deallinga nokumona oubabicky*]'

S: 'Is giving birth to babies [*Okudala ounona*]'

T: 'No.'

S: 'Is to buy babies [*Okulanda ounona*]'

T: 'No!'

T: 'Tell us Alma the name of that system?'

Alma: [*hesitating and scratching her head and no response*]

T: 'What is that system that called rep ... ?'

9. Alma: [*Shouts immediately*] 'Reproductive system!'

In extract 2 we can see how evaluation, the feedback move, is used by Mr Shilumba to get an answer from the students. Where evaluation is elaborated, then the IRE sequence is more useful for learning than when it is not elaborated. Where feedback is not elaborated, the sequence becomes merely an exchange of questions with known, closed responses. Note how in line 8 Mr Shilumba prompts Alma to remember the name of the reproductive system. He is not content to merely note, for example in line 4, that a student is wrong. He goes forward trying to elicit the correct answer. Although extract 2 does not promote dialogue, it does move the discussion along. That is, an IRE sequence can open a form of interaction in a question-response mode, while not necessarily developing dialogue. We grant that this is not ideal and is certainly not dialogical interaction; however, it does at least recruit students' attention and scaffold their entrance into the unfolding lesson. Using questions to scaffold engagement is a useful mechanism for recruiting and holding attention (Feuerstein et al 1981).

However, it is important here to distinguish between the notion of 'scaffolding' and mediation in the ZPD. The term 'scaffolding' was coined by Wood, Bruner and Ross in 1976 and relates to a capable teacher assisting a student in solving a specific task; that is, it is task dependent whereas the ZPD is developmental and mediation within the ZPD unfolds over time. In the extract, we do not see Mr Shilumba evaluating students' responses in any depth and, in fact, we see that students are embarrassed to respond. The reason for this silence does not need to be guessed: in line 26 a student indicates that reproduction is not something you talk to elders about. Mr Shilumba picks this up and labels it a cultural taboo in line 34. What we can see, then, in this extract, is that a cultural taboo silences children in a lesson. However, it is interesting to note that the students' unwillingness to engage in this taboo subject does not immediately shut the teacher's talk down. So, while children become silent in the face of a cultural taboo, in this instance the teacher does not. Rather, although Mr Shilumba indicates that this is in fact only for adults to know (lines 28 and 29), he doesn't close the teaching episode but continues to go on, in even greater detail, discussing sexual organs, using his guiding questions as scaffolds to indicate (1) what he is about to talk about or (2) what question he wants the answer to. What we have here is a scenario where cultural taboos potentially end a discussion

before it begins, by silencing children, but that this need not happen if the teacher has the confidence to continue teaching. The suggestion here is that Mr Shilumba is opening a space for describing what is potentially taboo. This is not, we would argue, an instance of opening the students' ZPD, because there is no developmental task being worked on here. What we can say is that the teacher has sufficient confidence in his knowledge to pursue the taboo subject but not in a developmental way. We argue this because there is no buy-in from the students and it is, in fact, only Mr Shilumba who is pushing the discussion forward.

In line 31 Mr Shilumba elaborates the scientific concept of the reproductive system, an abstract notion that requires a microscope to view in depth. While sexual organs are visible and concrete and understood in context by students, the actual process of reproduction involving ova and sperm is not something that can be seen or learnt in a concrete manner. Although he is clearly aware that this knowledge is only for adults (lines 28 & 29), he goes further and even links the scientific concept of a 'reproductive system' to something that the children can grasp, sleeping with their 'moi moi' (or lover). That is, he recruits the children's everyday concepts of intimacy to assist them in understanding the scientific concept. In this way he attempts to achieve what Vygotsky indicates is necessary for meaning to develop: the linking of the abstract scientific concepts with the students' everyday spontaneous concepts. However, his example is problematic because a Grade 4 child may think that merely occupying the same bed with your lover leads to sexual reproduction. So, while Mr Shilumba is aware that the subject is taboo, he does attempt to go further in depth and tries, at least, to elaborate how one becomes pregnant. Note the switch of language that Mr Shilumba engages in: in English he is comfortable enough to mention words like 'genitals', something he does not do in Oshiwambo, where this is considered taboo. This implies that the linguistic choice of English here provides the teacher with a way to speak about reproduction while avoiding the social taboo and concomitant embarrassment of explaining sexual reproductive organs in Oshiwambo. From a cultural perspective, it's more appropriate for Mr Shilumba to use English to discuss sexuality than it is to use Oshiwambo. In the multilingual 'African' culture, it is more acceptable to use English when discussing a sensitive issue like genitalia rather than an African language which might sound derogatory, offensive and disrespectful, given the cultural taboo associated with it (Susuwela-Banda 2005). A further point regarding the teacher's translanguaging needs to be made in relation to this classroom. These children have just transitioned to English as a medium of instruction, and there is a sense as well that they may not understand what he says in English as well as they would understand it in their mother tongue, allowing Mr Shilumba to effectively dodge this potentially embarrassing moment. What is also clear in this extract is that children are unwilling to engage in a discussion that they consider taboo, especially with someone whom they respect as an elder. Cultural taboos, therefore, have the potential to silence students, closing the construction

of meaning rather than opening meaningful dialogue. Moreover, in a bid not to upset children, the teacher is unable to adequately elaborate the scientific concept of a reproductive system, opening the door for later misunderstandings when children are required to engage with this knowledge.

In the following learning episode, we give another account of how Mr Shilumba's instructional practice was constrained by cultural taboos while trying to explain the process of the excretory system.

Extract 3: Science lesson on the excretory system

In this lesson the teacher is occupied in explaining the excretory system (Table 1).

Just as sexuality is taboo in this context, so too is talk of bodily functions. We can see this quite clearly in extract 3 where Mr Shilumba is trying to explain how waste is removed from the body via defecation. There is a heavy reliance in this extract on everyday concepts such as eating and then 'remove what is not needed'. The scientific concept of excretion is not elaborated; rather, the teacher repeats the word 'excrete', without defining or explicating it and without linking it adequately to everyday concepts the students may understand, such as defecation. That is, the abstract scientific concept 'excrete' remains at the level of what Vygotsky would call mere 'verbalism'; it makes no sense to the students in the absence of linking it to their everyday concepts and elaborating it in more depth.

Unable to explicitly refer to defecation as it is taboo, the teacher illustrates defecation in two ways: first, as we see in the picture, he imitates the action of defecation and, second, he refers to 'going outside' an Oshiwambo euphemism for going to the toilet. In the science textbook, however, children are presented with the word defecation, something that they will need to know in the excretory system. Mr Shilumba explains the concept of the excretory system by saying; 'You will go to the toilet and remove what is not needed or excrete what is not needed and that is excretory we are

talking about' (turn 3). Here, the teacher avoids saying that the person goes to the toilet and defecates. Instead, he refers to 'removing what is not needed or excrete what is not needed'. This is very vague, and students may have difficulty understanding exactly what is being referred to here. Unless the process of excretion is explicitly elaborated, students are left thinking that excretion relates to removing something that is not needed; this could be interpreted as basically as removing one's trousers when going to the toilet. Note again that this description of defecation is given in English, rather than Oshiwambo. Again, we have a sensitive issue that may cause embarrassment shielded from the children through the use of English which they may well not fully understand.

To consolidate his verbal speech, Mr Shilumba went on to use the body movement and the gesture in which he bends his knees, leans forward and puts his right hand behind his buttocks to show the process of excreting faeces (see Figure 1). This imitation of defecation helps him to avoid talking about it explicitly because in the Oshiwambo culture, it is a taboo for an adult to use the word defecation or even the colloquial word 'pooing' when addressing young children, as this is considered a private bodily function that should not be openly discussed. The teacher further employed an Oshiwambo euphemism (go outside) to concretise the concept and provide the context for learning the scientific concept of excretion.

TABLE 1: Lesson.

Turn	Actor or action	Speech	Translation and images
1	Mr S	Can we move on to excretory system ... let me tell one thing!	-
2	Ss: <i>[Very curious to listen and they all look straight to the teacher]</i>	Yes	-
3	Mr S: <i>[Using body gestures in which he bends his knees, leans forwards and put his right hand behind his buttocks to show the process of excreting faeces or defecating]</i>	Let's say you had a dinner or lunch, and you take some cool drinks; later this system will start working, and you will go to the toilet and remove what is not needed or excrete what is not needed. And then you excrete it out like this, and that is the excretion we are talking about	See Figure 1
4	Mr S	<i>Moshiwambo excretion otashiti okuya kondje</i>	In Oshiwambo excretion means going outside [<i>an Oshiwambo euphemism for defecation</i>].



Source: Image by Beata Set, 2021

FIGURE 1: Mr Shilumba uses gestures to represent defecation on a toilet.

Yet, the literal meaning of this euphemism has no direct relation to the scientific concept of excretion. The scientific definition of the process of excretion, the act or process of excreting of metabolic waste products such as urea, carbon dioxide, and faeces from the body, remains completely unexplained in this lesson. The consequent underdeveloped understanding of excretion is illustrated in students' answers to a question on excretion on a test.

The students' written scripts illustrated in Figure 2 and Figure 3 exemplify how they have appropriated the shared meaning of the process of excretory system presented to them during the lesson.

The two figures represented are extracts of two students' written text in response to the question: 'What is the excretory system?'. In their responses to this question, both Mary and Juu reproduced the teacher's speech as well as producing a graphic depiction of exactly that movement the teacher had shown in the classroom. Instead of defining what the scientific concept of excretion means; both Mary and Juu chose to incorporate drawings of a person defecating, representing the teacher's embodied explanation. For instance, in her written answer Mary says: 'Is going to the toilet and ...', while Juu writes that 'Is to like this ...'. Due to their limited fluency in English, they both inserted drawings to convey their meanings. In this scenario, Mary and Juu recounted what they had seen in the classroom and what they had understood in their everyday context. While both students have reproduced exactly what Mr Shilumba did in the classroom, they are not given marks for this and are in fact marked incorrect. This is problematic as the students are representing precisely what they were taught in the class. Of course, we have no way of knowing whether the drawing they have reproduced is

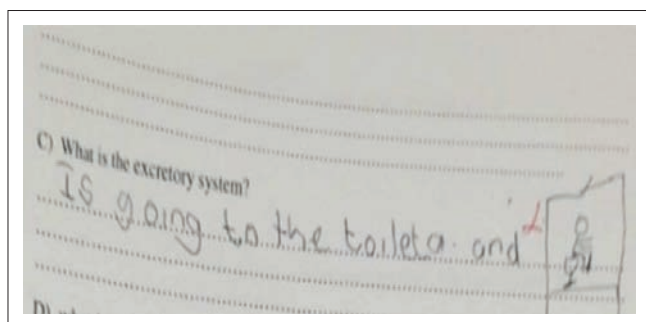


FIGURE 2: Mary's test.

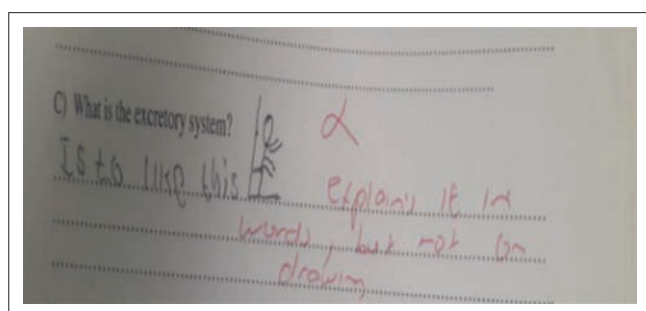


FIGURE 3: Juu's test.

understood by them as a representation of defecation, but we can see that they have produced what is a correct rendition of what they were taught. It must appear very puzzling to these two students to receive feedback indicating they are incorrect, when they are clearly representing what they saw in the classroom. It is also important to note that the students are unfamiliar with English, and this could very well be the reason that they have chosen to draw what they were taught; they simply don't have the English vocabulary to explain excretion. If Mr Shilumba had been able to translanguange in the classroom, to switch to Oshiwambo when discussing the excretory system, he could have translated what the word excretion means into Oshiwambo, and then related it to an everyday familiar event such as defecating, urinating or sweating to link the scientific (abstract) concept 'excretion' with the body's removal of waste product. This could well have aided the students in their understanding.

While the Namibian curriculum advocates for a student-paced and student-centred approach to teaching and learning, what we see in the data reported here is that the teacher is still very much in control of the lesson and is the 'expert' who 'transmits' the knowledge to the students, who are viewed as fairly passive. The question that we were interested in answering was about the impact cultural taboos potentially have on the mediation of scientific concepts. What we can see from our data is that:

- Cultural taboos silence students. Students feel uneasy discussing taboo subjects with those they recognise as elders.
- While cultural taboos silence students, they do not immediately end the teaching episode depending on whether the teacher pushes through the taboo. We see this in extract 1 where Mr Shilumba continues to attempt to teach about the reproductive system. However, the silencing of the students, together with the sensitivity of the space opened by the taboo, means that the teacher is unable to adequately elaborate the scientific concept he is trying to teach; this leads to a reliance on rather vague everyday examples of, for instance, getting pregnant by sleeping in the same bed as your 'moi moi'. In both extracts in this article it does appear that cultural taboos impact on how talk is used in a classroom as a mediating tool. This is seen too with the teacher reverting to English (which may not be understood by the students) when discussing taboos.
- When faced with a cultural taboo, the teacher reverts to using English to describe the content under investigation. This is problematic in this instance because these students have only just begun to be taught in English as a language of instruction. However, the teacher's reason for teaching in English appears to be to avoid the cultural taboo being fully understood in the students' home language thereby avoiding embarrassment.

Bakhtin (1981:341) emphasises the importance of 'dialogic utterances' (interactions or events) between speakers to gain real meaning of the words through collective negotiations and reconstruction of a 'word meaning with one's own tone,

accent and nuance'. This resonates with Vygotsky's general genetic law that indicates that meaning is co-constructed through dialogical interaction, in that the focus is on a dyad involved in collectively negotiating the meaning of the abstraction being taught. The general genetic law explains how a child uses spontaneous (everyday) concepts to make sense of the abstraction being taught. The meaning of the abstract concept is generally understood within a disciplinary body (1 plus 1 equals 2 for example is epistemologically agreed upon in mathematics). For this meaning to be owned by the child, sense must be made of it using the everyday. In this study, students did not get many opportunities to practise science talk (Lemke 1990). This is indicative of dominant discourse patterns described by Lemke's notion of 'triadic dialogue' which favours teacher dominance of the talk that leads to a pedagogical monologue as opposed to a dialogic interaction between teacher and taught. This has an impact on students' acquisition of the meaning of scientific concepts. For Lemke (1990) 'triadic dialogue' can inhibit the establishment of a thematic pattern of science content, making the science content implicit and inaccessible to students regardless of the teacher's best intentions. Data presented in this study indicate that students were generally silenced in relation to the classroom talk, in this instance because of the culturally taboo subject of bodily functions and sexual reproduction. For Vygotsky (1986) the scientific concept cannot be acquired by the student in the absence of a linking to the everyday, spontaneous knowledge the child brings to the lesson. Hence, where children are silent in a class, they cannot bring their own concepts to bear on making sense of the abstract knowledge being taught. This inhibits their ability to construct meaning around the scientific concepts they are being taught. We note, however, that students discussed in this article are seriously hampered by a lack of English knowledge, impacting on their ability to either engage in discussion or co-construct meaningful dialogue with the teacher. While cultural taboos have a silencing effect on students, we cannot ignore the impact that lack of familiarity with the language of instruction has on meaning making in this context. We note that Mr Shilumba is an energetic and passionate teacher. He does what he can to include students in the classroom discussion and uses not only language but gestures, actions and drawings on the chalkboard to engage students. However, hampered by the cultural taboos that silence students as well as by the lack of English language fluency, Mr Shilumba is in an invidious position.

Conclusion

In this article we investigated the impact that cultural taboos in Namibia have on the use of language to mediate abstract concepts to children in Grade 4. Our findings suggest that cultural taboos shut down dialogical interaction because they silence students who are not generally encouraged to talk about taboos with elders such as a teacher. However, cultural taboos do not end teacher talk. Rather, faced with the taboo, the teacher does one of two things: he first tries to explain the scientific concept with reference to everyday concepts that

are not culturally taboo (such as 'going outside'); secondly, he mobilises English as instructional talk, a language that students have very little familiarity with, excluding them once again, from understanding the concept he is teaching. Unfortunately, in a bid to avoid the taboo subjects, the teacher makes use of everyday concepts that are not explicitly related to the abstraction he is teaching. Lying in a bed with your 'moi moi' does not lead to sexual reproduction unless you engage in sexual activity. Similarly, 'going outside' does not necessarily relate to the abstraction of excretion. In the absence of very clear teacher explanations and elaborations of the scientific concepts, we may anticipate student misunderstandings of these concepts. While we are aware of a body of work around cultural taboos, there is in fact, very little written about cultural taboos in schools in Namibia and how they may impact on students' acquiring scientific concepts. We feel our work opens a way to understand the fact that cultural taboos can hinder learning by silencing and preventing discussion. However, what we did not expect, but what emerged in our findings, was that cultural taboos need not necessarily derail the teacher's train of thought and that the teacher sought to move discussion along rather than shutting it down. Students, though, were unable to follow his questions and answers both due, we would argue, to the taboo nature of the discussion as well as to the difficulties of learning in a language that is not one's own.

We conclude then the cultural taboos discussed in this article influence the use of talk as a mediating tool in Grade 4 science lessons in this specific classroom. As this is a case study, we do not seek to generalise to other contexts. We also provide a caveat when reading these results: the students are not native English speakers and lack familiarity with English as a medium of instruction. This clearly impedes their access to abstract concepts. A second caveat relates to the pedagogical practices underpinning the teaching of science in this classroom. While Mr Shilumba tries to engage students in discussion, an open dialogue where students and teacher co-construct meaning, something essential for concept acquisition, ultimately does not happen. Student voices are predominantly silent in the lessons observed. Research indicates that pedagogy impacts acquisition of concepts and where students are not engaged in constructing meaning with the teacher through dialogue, the pedagogy cannot lead to acquisition (Hardman 2019; Knight & Mercer 2015).

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Authors' contributions

J.H. wrote most of the article while B.S. collected the data. Both authors analysed the data and reviewed the article with edits.

Ethical considerations

Ethical clearance to conduct this study was obtained from the University of Cape Town by the ethics committee in the school of education (No. EDNREC20211105).

Confidentiality was ensured and participants were given pseudonyms to protect their identity. Where pictures are used in the data set, faces are blurred to avoid recognition. All students involved in this study gave assent to this study (by choosing between a happy or sad face on a piece of paper) and their caregivers gave consent for them to be part of this study. Adult consent for student participants took the form of a written consent form.

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Data availability

The data that support the findings of this study are available from the corresponding author, J.H., upon reasonable request.

Disclaimer

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