

# Scaffolding Epistemological Access in the Context of Forbidden Discourses: A Case Study of a Grade 4 Natural Science Class in a Namibian School

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## Abstract

Qualitative in orientation and using the case study methodology, the research drew upon Margaret Archer's theory of agency to examine how, at the point of confluence of culture, structure and agency, the teacher's agency was enabled or constrained in attaining the agential project of scaffolding epistemological access in a Grade 4 Natural Science classroom. The study found that when positioned into a face-to-face relationship, or a direct relationship, with the structural, cultural, and agential causal powers, the teacher's agential project of scaffolding epistemological access in a Grade 4 Natural Science classroom was constrained than enabled. The teacher was placed into a pedagogical dilemma where on the one hand, structural causal powers (e.g., the curriculum, syllabus, school authorities) demanded the teaching of topics on human sexual reproduction and human excretory systems. At the same time, causal cultural powers exerted by cultural properties, which include values, norms, and taboos, render conversation with young children over sexual reproduction matters and human excretory system forbidden discourses. The study concluded that cultural factors are among the myriad factors that potentially lead to poor performance in Natural Science by Namibian learners and African learners in general. The study recommends that in teacher education programs, it is essential to interrogate the school curriculum regarding its sensitivity and responsiveness to the cultural contexts of both teachers and learners. Similarly, such programs should investigate developing appropriate agential powers of aspiring teachers to resist or circumvent causal cultural powers that obstruct or hinder meaningful science learning.

**Keywords:** agency, culture, epistemological access, science learning, structure

## Introduction

Despite several post-independence reforms, the poor performance of learners in literacy, mathematics and natural sciences, and the high dropout rate at both primary and secondary school levels, remain a significant concern for the Namibian education system (Makuwa & Maarse, 2013; Mutorwa, 2004; Wolfaardt, 2005). Studies on the science literacy of Namibian learners continue to yield similar findings. For instance, the 2004 and 2005 Southern and Eastern Africa Consortium for Monitoring Educational Quality (SACMEQ) studies reported that Namibian learners' scores in Mathematics and Science were lower than in other African countries.

This study focuses on science learning in Namibian schools as its subject of investigation. In particular, the study investigates how cultural taboos shape and influence the teacher's scaffolding of epistemological access in a science classroom. The study draws on Arch's (1995) theory of agency to critically examine how, at the confluence of culture, structure and agency, teacher agency is

enabled or constrained in attaining the agential project of scaffolding science learning in a Grade 4 Natural Science classroom. Archer's theory of agency was chosen as it provided the study with theoretical lenses for a clearer view of the phenomenon under investigation and the description language to describe it.

## Context of the Study

The study took place in northern Namibia, about 750 kilometers from the capital city of Windhoek, in a region called Oshana Region. The school has a population of 1037 learners and 36 teachers. There are four classes per grade, with approximately 38 to 40 learners in each class. The school is located within a historically disadvantaged, predominately Oshiwambo-speaking community. The setting is a typical traditional Oshiwambo village. Namibia Aawambo language, spoken in northern Namibia, consists of various dialects with distinct urban and rural varieties. Learners walk to school from their villages daily. Some teachers reside on the school premises, while others are from towns or villages.

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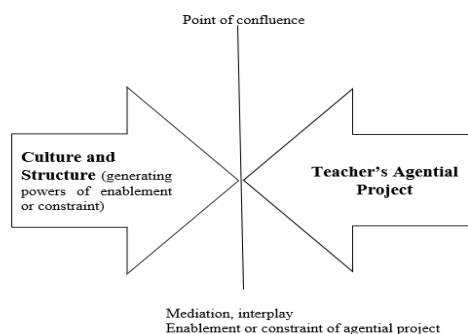
In the school, learners do not own any science textbooks and can barely conduct science experiments. The school building is generally in disrepair: classrooms have broken windows, and no library or science lab exists. Most teachers at this school had taught there since before Namibia gained independence in 1990. All the teachers and learners in this school are native Oshiwambo speakers.

### Archer's Theory of Agency

Archer (1995) conceptualizes the theory of agency from the perspective of a layered ontology consisting of three distinct and autonomous layers of culture, structure, and agency. From Archer's perspective, culture denotes the ideational world – "the world of ideas, values, beliefs and practices" (p. 256). On the other hand, structure denotes physical and social structures, material resources, roles, and organizational positions. Conclusively, agency refers to the mechanism through which the powers of enablement and constraint exerted by the structures of culture and structure are mediated.

Of significance to this study is Archer's concept of an "agential project" (p. 198), where she conceptualizes 'agential project' as goals tolerated by a social agent. These goals range from satisfying biologically grounded needs to the utopian reconstruction of society. In this study, the teacher's scaffolding of epistemological access in science learning constitutes the teacher's agential project. Crucial to the study are the activities at the point of confluence, the nexus, or the point of interaction where the causal powers of culture, structure, and agency meet and interact. At this confluence point, structural and cultural properties are transmitted to agents, potentially exerting powers of constraint and enablement concerning the agential project. Figure 1 below shows the confluence of powers of enablement or constraint and human agency.

**Figure 1**  
*The point of Confluence and Interaction of the Causal Powers of Culture*



*Note.* From "Culture and agency: The place of culture in social theory (2nd ed.)," M. S. Archer, 1996, p. 196, Cambridge University Press. Copyright 1996 by Cambridge University Press.

The structural and cultural powers of constraint or enablement do not possess an intrinsic feature of automation or social hydraulics (Archer, 1995; Danermark et al., 2019; Dobson et al., 2013). Instead, they only happen through mediation by a human agency at the point of confluence. Therefore, the powers of enablement or constraint to be triggered, activated, or brought into action must be positioned in a face-to-face relationship or direct relationship with an agential project such that the powers either obstruct or aid the attainment of a specific project.

Whether the structural and cultural powers of constraint or enablement are exercised is how human agency receives or realizes them. Archer, Danermark, et al. and Dobson et al. all recognize the powers of human agency in resisting or circumventing structural and cultural powers of constraint in unpredictable ways. It is through these powers that human agency operates as a mediating mechanism.

### Objective

This study investigates how teacher agency was enabled or constrained in attaining the agential project of scaffolding science

learning in a Grade 4 Natural science classroom at the confluence of structure, culture and agency.

### Methodology

#### Design

The research adopted the qualitative case study methodology. The case study methodology was chosen as it provided opportunities for a 'greater understanding of the phenomenon' under investigation (Bairagi & Munot, 2019; Bryman, 2012; Creswell & Creswell, 2018; Yin, 2018). A single case study was pursued to understand cultural taboos' effect on the teacher's scaffolding and mediation of meaningful engagement and understanding of scientific concepts in a Grade 4 science lesson (Crowe et al., 2011). We were convinced as researchers that focusing on one case study would be ideal for us to carry out a more profound and fine-grained study. We, therefore, decided to focus on one Grade 4 class, including the learners and one teacher. The qualitative case study research methodology enabled us to generate rich, vivid, and thick data to understand the phenomenon under investigation (Gustafsson, 2017).

The data were collected at two time periods: the beginning of the year (classroom observation) and the middle of the year. We observed some lessons and collected written assessments to provide rich data on classroom interactions and validate the data. We also took detailed field notes during each science lesson to record general impressions of recurring classroom events and questions that needed further clarification.

Observation data were augmented with data sourced through video recording. The video recording was chosen because it offered visual details of what is happening in the entire classroom, including all the modes that are used for science meaning-making (i.e., talk, gesture, eye movement, images, and mode manipulations (Bucher & Niemann, 2012; Roschelle, 2000). It should, however, be noted that in keeping with the ethical requirements permission was first sought before the video recording was conducted, as was the case for accessing the research site. The video-recorded data enabled the researchers to review and confirm any arising matter that needed some clarifications during the data analysis process and to retrieve all the modes for transcribing.

#### Participants

In this study, selecting the research site, time, people, and events was purposeful (Burke & Christensen, 2014; Creswell & Creswell, 2018; Creswell & Poth, 2018; Malsbary, 2016). This entailed starting with the case selection before narrowing the focus to a given subject area and then the research participants—a small group of people nested in their context to be studied in-depth (Miles et al., 1994). Purposive sampling was the procedure for narrowing down the case. As Alshenqeeti (2014) argues, this entails sampling deliberately, with some purpose or focus in mind. It was on this basis that the participants for this study were purposively sampled. The sample included the Natural Science teacher, Mr Shilumba (pseudonym) and his fourth-grade learners, consisting of 38 learners.

#### Ethical Considerations

Consistent with ethical requirements, the school, the teacher, and the learners are given fictitious names to protect their identities. All other details or facts that could potentially jeopardize the anonymization process have also been changed or removed. This also applies to photographic images or recorded videos, where care was taken to ensure participant identities were not revealed. The participants were offered the right to withdraw their consent or participation if they did not want to be video recorded or share some of their materials with the researchers. However, none of the participants withdrew from the study. At the broader level of ethical considerations, the study sought ethics clearance from the institution affiliated with the authors. In addition, permission was sought from the gatekeepers to enable us

to access the research site. This entailed seeking permission from the Ministry of Education through the Regional Education authorities and the school principal.

### Data Analysis

Data analysis drew on Arche's (1995; 1996) concepts of structure, culture, and agency and how these forces interacted at the confluence point to either aid or obstruct the teacher's agential project of scaffolding epistemological access in a Grade 4 Natural Science classroom. The concepts provided lenses through which a more transparent view was obtained of how cultural taboos enabled or constrained learning and teaching in a Grade 4 Natural Science classroom.

### Results

To establish how lessons were observed and video recorded at this point of structure, culture and agency confluence, the teacher's agential project of scaffolding science learning in a Grade 4 Natural Science classroom. The following sections present these lessons as *Teaching Episode 1* and *Teaching Episode 2*. Both teaching episodes 1 and 2 demonstrate the discourse patterns that were taking place in the Natural Science classroom.

Teaching episode 1: Lesson on the reproductive system

This section presents data from a science lesson on the human reproductive system. The discourse patterns that ensued during the lesson are presented below:

Extract 1- lesson proceedings.

T [Teacher]: What is that system that involves making babies? What is that system?

Ss [Students]: {prolonged silent}

T: *Lombweleinge osytem ei hai deallinga nokumona oubabicky* [Tell me the name of the system that involves the process of making babies?]

S [Student]: *Okudala ounona* [is giving birth to babies]

T: Noo,

S: *Okulanda ounona* [is to buy babies]

T: Noo!

T: Tell us, Alma, the name of that system.

Alma: {hesitating and scratching her head and no response}

T: What is that system that is called rep.....?

Alma: {Shouts immediately} Reproductive system

T: Yes, reproductive system {writing on the chalkboard while talking}.

T: What is a reproductive system?

Prolonged silence

T: Reproductive systems are the female and male organs. When talking about the reproductive system, we mean private parts and female and male organs are involved here, called private parts or genital organs. These parts are very important, and they need to be protected.

Ss: {not paying attention to the teacher, and they engage in private talks, and some are looking away}

T: Do you understand what the reproductive system is?

Ss: {shouting} No!

T: who can tell us what is the reproductive system?

Ss: {no response and learners are dogging under the table. Some are looking away}

T: *Osytem ei omweilita okwii popya naame hano* [Are you scared to discuss this system with me?]

Ss: {shouting} eee [yes]!

T: *Osytem ei omwei tila shike* [why are you scared to discuss this system?]

S: {stood up and looked very shy} *shaashi kaishi nawa okupopya oinima ei novakulunhu* [because it is not right to talk about those things with the elders]

T: Okay, class, now, with the reproductive system, we are not going to discuss it in more detail because you guys are still young. This system is meant for adults only, but because it was written in your textbook, we will talk about it briefly.

S.S.: {looks very surprised with mouth wide open}

T: I want you to know that there is a system called the reproductive system that involves male and female organs. This system is the one that makes people make babies when they are ready. For now, you are not ready yet for this system, and it is taboo to use this system at your age. When you are ready to make babies, your reproductive system will be in use.

Ss: {learners are not paying attention while the teacher is explaining, they engage in private talk while the teacher is busy explaining, and some are looking outside}

T: Reproductive system, in other words, means when you start sleeping with your *moi moi*, {moimoi is the non-standard language used in the township to refer to boyfriend or girlfriend} either at your place or his place and eventually *tamu dala okaana* (make a baby).

Ss: {look very confused}

T: *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 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 makes us have children]. This system is part of nature, but we must not misuse it.

### In Teaching Episode 1

The results show that the teacher was not keen to engage learners in an extended conversation on the human reproductive system. Instead, the teacher asked questions not meant to probe the learners' understanding or elaborate on their ideas. This is evident in questions 1, 3, 8, 10, 13, and 19, which are designed to elicit a quick one-word response or a correct answer. For example, in question 10, Mr Shilumba (pseudonym) asked learners a closed question: *what is that system called, rep....?* This question offered learners one option: they were expected to reply with a specific word immediately without being able to justify or elaborate on their responses.

The teacher's style of questions did not allow learners to provide extended responses. For example, after the learners' prolonged silence to the question posed in turn 10, the teacher asked if they were scared to discuss the reproductive system (see turn 21 above). The learners responded immediately by shouting: *"yes"* (see turn 22). Next, the teacher asked the learners why they were scared to discuss the reproductive system (turn 23). A learner immediately affirmed the discomfort of discussing the reproductive system with elderly people: *"it is not right to talk about these things with elderly people"*. In response to the learner's answer, the teacher affirmed: *"we are not going to discuss it more in detail because you guys are still young. This system is meant for adults only, but because it is written in your textbook, we will talk about it a little bit"* (turn 25).

It can be concluded from the results in *Teaching Episode 1* that a restricted engagement on human reproduction characterised the teacher's facilitation or scaffolding of science learning. Given the limited discourse in which he engaged the learners, the teacher did not facilitate meaningful science learning. The following section below shows the results from *Teaching Episode 2*.

### Teaching Episode 2: Process of the Excretory System

This section presents data from a science lesson on the excretory system. The discourse patterns during the lesson were captured as given in Table 1.

**Table 1**

*Extract 2- Lesson Proceedings Discourse Patterns during the Lesson*

Turns	Actor/ action	Speech	Translation and images
1	Mr Shilumba	Can we move on to the excretory system? Let me tell you one thing!	

Turns	Actor/ action	Speech	Translation and images
2	Ss: Very curious to listen, and they all look straight at the teacher	Yes	
3	Mr Shilumba Using body gestures in which he bends his knees, leans forwards and puts his right hand behind his buttocks to show the process of excreting faeces/defecating	Let us say you had 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	Mr Shilumba uses the gestures to represent a person pooping on the toilet
4	Mr Shilumba	Moshiwambo excretion otashiti okuya kondje	In Oshiwambo, excretion means going outside (an Oshiwambo euphemism used for pooping).

### In Teaching Episode 2

Covering the topic of the excretory system, Mr Shilumba was referring to how science works in the everyday life experience (e.g., discussing the eating of food and then afterwards going to the toilet to poo to represent the ideas of the excretory system) without creating space to interrogate how the same language experiences are used in science written texts.

For instance, 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 to make a poo. Instead, he referred to “removing what is not needed or excreting what is not needed”. This statement alone is not clear for the learners to understand pooping concerning excretion. Thus, learners might have trouble comprehending Mr Shilumba’s verbal explanation, “remove or excrete what is not needed”, because this statement is vague and is conveyed in English.

To consolidate his verbal speech, Mr Shilumba used body movements and gestures in which he bent his knees, leaned forward, and put his right hand on his back to show the process of excreting faeces/defecating. The use of the gesture here assists him with avoidance of talking about poop/faeces and what the person does in the toilet. In Oshiwambo culture, it is a taboo for an adult to use the word pooping when addressing young children. It is considered unpleasant and embarrassing. In turn (4), Mr Shilumba went on to use a common Oshiwambo euphemism to substitute the word pooping; “otashiti okuya kondje” (literally, it means “going outside” in English). The teacher employed an Oshiwambo euphemism to concretize and provide the context for learning the scientific concept of excretion.

Nevertheless, the literal meaning of this euphemism has no direct relationship with the scientific concept of excretion. Moreover, it is unlikely for these learners to establish a relationship between their everyday concepts with the targeted scientific concept of excretion despite translanguaging. Therefore, the exact scientific definition of excretion, ‘the act or process of excreting or removing metabolic waste products, which includes urea, carbon dioxide, and feces from the body, went unexplained during the classroom discourse.

It can be concluded from *Teaching Episode 2* that the teacher’s scaffolding of science learning on the human excretory system was characterized by restricted language, avoiding engaging learners in an extended conversation. Instead, the teacher resorted to using gestures to avoid detailed conversation. In addition, the teacher sometimes sought refuge in describing the human excretory system using the local language: Oshiwambo. It can further be concluded that the restricted discourse chosen by the teacher may have hindered learners’ understanding of scientific concepts on the human excretory system.

### Discussion

We position teaching episodes 1 and 2 presented above as activities happening at the point of confluence (in Figure 1), where the teacher’s agential project of scaffolding epistemological access in a Grade 4 Natural Science classroom came into a face-to-face relationship or a direct relationship, with the structural, cultural, and agential powers of enablement or constraint. The structural

powers are represented in episodes 1 and 2 by the school curriculum, school authorities and the leadership that requires teaching the human reproduction system and the human excretory system as part of the Grade 4 Natural Science curriculum. The cultural powers in the two episodes are represented by the values and norms that regulate discourses on the human reproduction system, or the human excretory system, from an African traditional cultural point of view.

The agential powers of constraint or enablement are represented by the roles of the school leadership and other educational officials who are employed to enforce the implementation of the curriculum. However, as argued earlier, the forces of constraint or enablement do not activate or happen automatically. Instead, their activation depends on how human agencies receive them through mediation. For example, in teaching episodes 1 and 2 above, it is evident how the cultural powers of constraint were exerted on the teacher’s agential project, obstructing the teacher’s ability to engage learners in a meaningful and elaborated scientific conversation.

We argue, therefore, that while acting at the point of confluence, the teacher, Mr Shilumba, found himself in a pedagogical dilemma. On the one hand, the structural powers exerted by the curriculum, enforced by the agential powers of the school authorities, required him to teach the topic of the human reproduction system. But on the other hand, the ontological layer of culture exerted powers of constraint that obstructed or hindered meaningful science teaching by imposing what we would like to term a forbidden discourse on the teacher.

The cultural taboo disinclined the teacher and the learners from engaging freely in an open classroom discussion on the human reproduction system and the excretory system as required by the school curriculum. While much of the science classroom talk would involve unpacking the meaning of scientific ideas about the reproductive system and how it works, or the excretory system and how it works, the observed conversation was proved to be constrained. Moreover, the teacher’s explanations were far from those that could possibly communicate the scientific meaning of the reproductive and excretory systems.

It is evident that the teacher was cautious not to violate the cultural taboos and engage in culturally forbidden talks with children. Given the cultural taboo, the teacher could not meaningfully scaffold epistemological access in his Grade 4 science classroom. It should also be noted that the cultural taboos become even more of a challenge when the forbidden talk is attempted in mother tongue instruction. We, therefore, argue that the findings of this study concerning the constraining powers of culture, structure and agency are consistent with the findings of prior studies that used Archer’s theory of agency. In particular, the findings are consistent concerning the causal powers generated by the ontological layers of structure, culture, and agency to either enable or constrain agential projects.

For example, a case study of two Master of Education programs intended to train teacher educators in the United Republic of Tanzania (Ramadhan, 2018) investigated how the ontological layers of structure, culture and agency generated causal powers that enabled or constrained the development of quality teacher educators. The goal of the study was “to uncover, identify and explain conditions enabling and/or constraining the M.Ed. [Master of Education] program’s development of quality teacher educators.”

Located in a university context, the findings of Ramadhan's study illuminated how structures (e.g., faculties, deans, heads of departments, teaching and learning committees, etc.), culture (e.g., ideas, beliefs, theories, values, ideologies, concepts, etc.), and agency (different actors or role players) generated causal powers in some cases constraining while in other cases enabling the agential project of the M.Ed. program's development of quality teacher educators. The present study's findings are also consistent with a study by Quinn (2012), which investigated enabling and constraining conditions for academic staff development. Quinn's study unveiled how culture, structure and agency generated causal powers to enable and/or constrain academic staff development.

In this study, the teacher made several attempts to evade the constraining influence of structure, culture, and agency. This is consistent with Arche's (1995, 1996) arguments that structural, cultural, and agential powers of constraint or enablement do not possess intrinsic features of automation. Instead, constraint or enablement depends on how such powers are received and mediated. For instance, teacher Shilumba (pseudonym) in the current study attempted to use English as an escape route for violating cultural taboos.

The teacher resorted to using English only while defining freely what the reproductive system is. For instance, the teacher explained in English: "when we are talking about the reproductive system, we mean private parts and female and male sex organs are involved here, and these organs are called private parts or genital organs" (turn 15, in Teaching Episode 1). Important to note here is that the teacher is not hesitant to mention the words like "private parts" and "genital organs" since he is using the English language to utter these words that he would not mention freely in his native Oshiwambo language.

This implies that the linguistic choice of English here plays a significant role in escaping social taboos and avoiding the disconformity and embarrassing situation of explaining sexual reproductive organs in Oshiwambo. From a cultural perspective, it is inappropriate to talk about sexual-related issues as it is in Oshiwambo culture. In the multilingual African culture, it is more pleasant to use the English language when discussing the issue that has to do with genitalia rather than using the African language, which might sound more derogatory, offensive, and disrespectful (Banda, 2016, 2018).

Furthermore, another escape route was for Mr Shilumba (pseudonym) to utilize everyday life analogies and metaphors since he was uncomfortable using the direct terms associated with the reproductive system (turn 29 & 31). For instance, in turn (29), the teacher explained hesitantly and spoke in a low voice while incorporating Oshiwambo as a way of 'bridging the discourse' (Gibbons, 2006) and yet, as a resourceful language for explaining the process of the reproductive system. Here, the teacher tried to contextualize the process of the reproductive system by relating it

to a practical and concrete experience when he said: "reproductive system, in other words, means when you start sleeping at your boyfriend's place or your girlfriend's place and you will eventually make a baby" (turn 29). Here, the teacher avoids explaining directly how the scientific process of the reproductive system works while also avoiding explaining the sexual reproductive organs. This can result in unmediated scientific concepts or the incomplete appropriation of scientific knowledge.

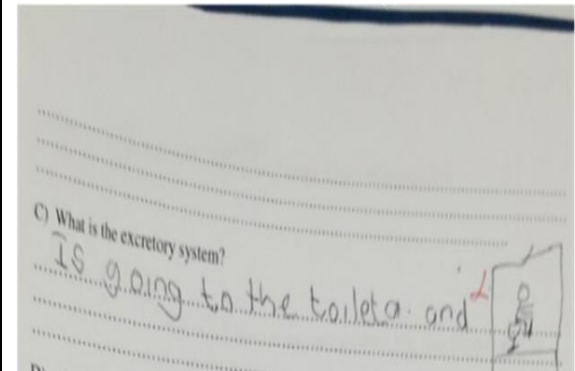
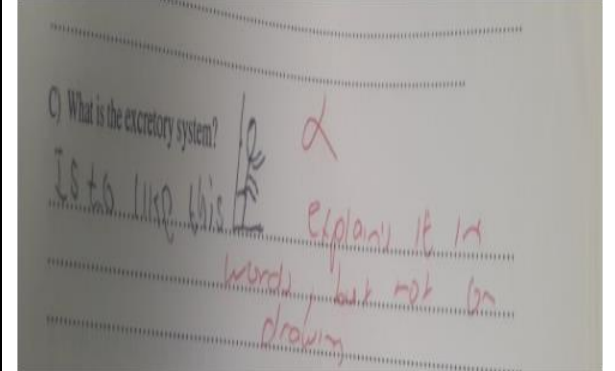
Again, the teacher incorporates the non-standard Oshiwambo language, "oumoi moi", commonly used in the township to refer to boyfriend or girlfriend. Here, we can see how the teacher is evading mentioning the words boyfriend and girlfriend since these words are regarded as unsuitable for young children in Oshiwambo culture. It seems Mr Shilumba's explanations (29 & 31) were unclear and very ambiguous for the learners to construct the correct scientific idea of the reproductive system.

While providing a generalized account of everyday life experiences of girlfriends and boyfriends sleeping over at one another's places in an effort to explain the process of the reproductive system, there is a sharp contradiction between what the thematic patterns he was trying to fit into (Lemke, 1990). Similarly, teacher Shilumba (pseudonym) attempted to use his human agency to evade the constraining cultural powers that imposed a forbidden discourse on him. For instance, to explain the human excretory system, the teacher tried to evade cultural taboos by using body movements and gestures to explain the concept to the learners.

One might ask how these learners can conceptualize the new scientific concept of "excretion" through this explanation. At the same time, the fundamental impetus of education entails assisting learners in moving along the 'mode continuum' (Gibbons 2003, 2006) from their common-sense understandings to more formalized and systematic ways of understanding, which is nowhere evident in this episode. Nevertheless, the learners' scripts below in Table 2 exemplify how they have appropriated the shared meaning of the process of the excretory system presented to them during the lesson.

Students Mary and Juu (all pseudonyms) respond to the question in a test: "what is the excretory system." In their responses to this question, both Mary and Juu reproduced the teacher's speech and his gestures in a different modes of drawings and written words to represent their definitions of the concept of the excretory system. However, instead of defining the concept of excretion, Mary and Juu incorporated the drawings of a person pooping to represent the teacher's embodied explanation. Although, for instance, Mary started her explanations with the written mode, "Is going to the toilet and ...", while Juu wrote that "is to do like this..." because of the manner it was demonstrated to them, they both inserted the drawings to convey their meanings. However, as can be seen from the teacher's assessment of the task, both Mary nor Juu did not provide the correct response.

**Table 2**  
Appropriated Shared Meaning of the Process of the Excretory System

Mary's written text	Juu's written text
	

In sum, we conclude that both teaching episodes 1 and 2 reflected a learning and teaching situation where the teacher's agential project of scaffolding learning of science concepts was

hindered by the powers of constraint exerted by the cultural ontological domain. The forbidden discourse or the cultural taboo obstructed the teacher from engaging in a meaningful scientific

conversation with his learners over the scientific concepts involved in the human reproduction system and human excretion. Instead of engaging in a meaningful scientific conversation, the teacher resorted to using euphemisms and gestures.

Similarly, the learners were equally constrained by the same cultural norms and values to engage the teacher in a meaningful conversation. While from a structural perspective, the teacher was expected to teach the concept of human excretion as a curriculum requirement. He was constrained to do so from a cultural perspective. As was the case with teaching episode 1, in teaching episode 2, the teacher did not possess agential powers to challenge the cultural taboos. Instead, the teacher obliged the cultural taboos and compromised his teaching. However, the question remains whether the teacher should have gone ahead and challenged the taboos or whether the curriculum should have been culturally responsive to take cognizance of how to handle specific topics that are culturally forbidden discourses.

### Conclusion

The study concluded that not only do structural, cultural, and agential factors constrain the meaningful facilitating of science learning but also lead to the observed poor performance in Natural Science Namibian learners and African learners in general, which was mentioned at the beginning of this paper. Scientific topics were turned into forbidden discourses as cultural taboos. The pedagogic dilemma faced by the teacher and the attendant obstruction by factors such as culture contributes to learners' observed low performance in Natural Science.

One of the critical questions emanating from the study is whether the teacher lacked the necessary agency to challenge, resist and circumvent the causal cultural powers of constraint and teach the topics as required by the school curriculum. Alternatively, the question is whether or not the school curriculum should be culturally sensitive and that it should consider factors that may be culturally inappropriate to handle with young learners. Such topics could be introduced at the appropriate age in the school curriculum.

The study recommends that in developing the agential powers of future teachers, teacher education programs, particularly in the African context, should spend time unpacking contextual factors that are likely to exert powers of constraint that may obstruct teachers' agency to handle specific topics. In the same vein, there is a need to interrogate school curricula in terms of their sensitivity and responsiveness to the cultural contexts where both teachers and learners come from. It could be that the curriculum is developed from perspectives that are foreign to the cultural context within which it is delivered.

### References

- Alshenqeeti, H. (2014). Interviewing as a data collection method: A critical review. *English Linguistics Research*, 3(1). <https://doi.org/10.5430/elr.v3n1p39>
- Archer, M. S. (1995). *Realist social theory: The morphogenetic approach*. Cambridge University Press. <https://doi.org/10.1017/CBO9780511557675>
- Archer, M. S. (1996). *Culture and agency: The place of culture in social theory* (2nd ed.). Cambridge University Press. <https://doi.org/10.1017/CBO9780511557668>
- Bairagi, V., & Munot, M. V. (2019). *Research methodology*. CRC Press.
- Banda, F. (2016). Towards a democratization of new media spaces in multilingual/multicultural Africa: A heteroglossic account of multilocal and multivoiced counter-hegemonic discourses in Zambian online news media. *Linguistics Plus*, 49. <https://doi.org/10.5842/49-0-686>
- Banda, F. (2018). Translanguaging and English-African language mother tongues as linguistic dispensation in teaching and learning in a black township school in Cape Town. *Current Issues in Language Planning*, 19(2), 198–217. <https://doi.org/10.1080/14664208.2017.1353333>
- Bryman, A. (2012). *Social research methods* (4th ed.). Oxford University Press.
- Bucher, H. J., & Niemann, P. (2012). Visualizing science: The reception of power point presentations. *Visual Communication*, 11(3), 283–306. <https://doi.org/10.1177/1470357212446409>
- Burke, R., & Christensen, L. (2014). *Educational research: Quantitative, qualitative, and mixed approaches* (5th ed.). SAGE Publications.
- Creswell, J. W., & Creswell, D. J. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- Creswell, J., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE Publications.
- Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A., & Sheikh, A. (2011). The case study approach. *BMC Medical Research Methodology*, 11, 100. <https://doi.org/10.1186/1471-2288-11-100>
- Danermark, B., Ekström, M., & Karlsson, J. Ch. (2019). *Explaining society: Critical realism in the social sciences* (2nd ed.). Routledge.
- Dobson, P., Jackson, P., & Gengatharen, D. (2013). *Critical Realism in research explaining broadband adoption in rural Australia: Modes of reflexivity and the morphogenetic approach* (37th ed.). Edith Cowan University.
- Gibbons, P. (2003). Mediating language learning: Teacher interactions with ESL students in a content-based classroom. *TESOL Quarterly*, 37(2), 247. <https://doi.org/10.2307/3588504>
- Gibbons, P. (2006). *Bridging discourses in the ESL classroom: Students, teachers, and researchers*. Continuum.
- Gustafsson, J. (2017). Single case studies vs multiple case studies: A comparative study.
- Lemke, J. L. (1990). *Talking science: Language, learning, and values*. Ablex Publishing Corporation.
- Makuwa, D. K., & Maarse, J. (2013). The impact of large-scale international assessments: A case study of how the ministry of education in Namibia used SACMEQ assessments to improve learning outcomes. *Research in Comparative and International Education*, 8(3), 349–358. <https://doi.org/10.2304/rcie.2013.8.3.349>
- Malsbary, C. B. (2016). Qualitative research in super-diverse schools. *International Journal of the Sociology of Language*, 2016(241), 9–37. <https://doi.org/10.1515/ijsl-2016-0021>
- Miles, M. B., Huberman, Michael, A., & Saldaña, J. (1994). *Qualitative data analysis a methods sourcebook* (4th ed.). SAGE Publications.
- Mutorwa, J. (2004). National report on the development of education in Namibia. In *Proceeding of International Conference on Education* (16-21). Geneva.
- Quinn, L. (2012). *Re-imagining Academic Staff Development: Spaces for Disruption*. Sun Press.
- Ramadhan, M. K. (2018). *A critical analysis of the establishment, conceptualization, design and curriculum component selection of Master of Education programmes at selected Tanzanian universities* (Doctoral thesis, Rhodes University, Makhanda, Eastern Cape Province, South Africa). Seals. <http://hdl.handle.net/10962/62214>
- Roschelle, J. (2000). Choosing and using video equipment for data collection. In E. Kelly & R. Lesh. *Handbook of research design in mathematics and science education* (pp. 709-731). Erlbaum.
- Williams, L. H., & Montgomery, S. K. (2018). Synthesizing proximate and distal levels of explanation: Toward an evolution-informed sociology. *Frontiers in sociology*, 3(15), 1–15. <https://doi.org/10.3389/fsoc.2018.00015>
- Wolfaardt, D. (2005). Namibia: A case for a gradual transitional bilingual language programme. In J. Cohen, K. T. McAlister, K. Rolstad, and J. MacSwan (Eds.) *Proceedings of the ISBA: 4th International Symposium on Bilingualism*. Somerville, USA.
- Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE Publications.

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