





# The language of instruction in mathematics teacher education for the early grades



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**Background:** Teaching mathematics in junior primary classroom requires an understanding of concepts and knowledge to communicate them applicably. The role of language of instruction is thus deemed significant in creating adequate insight into mathematical content. Teacher training institutions are therefore required to produce skilful teachers to utilise the mother tongue (MT) as medium of instructing mathematics.

**Aim:** Lecturers' perceptions on the use of MT in the teaching of mathematics is viewed crucial in determining the values and emphasis they place on the preparation of student teachers to effectively teach mathematics in MT. The study aims at uncovering the perceptions of mathematics lecturers regarding MT instruction in the University.

**Setting:** The study was conducted at one of the University of Namibia campuses which train teachers.

**Methods:** Purposive sampling was used to select four lecturers. Semistructured individual interviews were used to obtain lecturers' perspective on the stated issue.

**Results:** Findings indicated that although lecturers were aware of the benefit of teaching mathematics in MT, not all were in agreement with teaching in MT especially at the university. Findings further indicated that there are various impediments for teaching mathematics in MT at the university including students' background and the lack of resources, including lecturers who speak the MT.

**Conclusion:** A recommendation deriving from the study is that two parallel policies for language in education are implemented, one pertaining to the school environment, under the control of the Ministry of Education, and one pertaining to the tertiary education, under the auspices of the university. For tertiary education it is advocated that courses embrace both the official English language, as well as the Mother Tongue, in equal proportions.

**Keywords:** mother tongue; code-switching; language policy; mathematics; social construction; preservice teachers; micro-teaching; English.

## Introduction

One of the central aspects of teaching school mathematics is the ability of the teacher to communicate it effectively (Essien 2010). Teaching mathematics involves understanding mathematical concepts and then communicating them scientifically. The language used in the mathematics classrooms is thus deemed crucial in creating access to and adequate insight into mathematical concepts. The role of language in the teaching of mathematics has been a concern to various researchers in Africa and beyond (Chitera 2010; Makonye 2015; Monroe 1996). Language is a significant tool for communication as it acts as the fabric used in constructing networks of ideas and meaningful relationships between one concept and another (Monroe 1996); it occupies significant place in transmitting knowledge to learners. According to Makonye (2015), language is central to teaching, learning and communicating meaning; he further adds that language is important because mathematical concepts are communicated through the medium of language.

Various African countries, including Namibia, have introduced language policies that require learners to be taught in the mother tongue (MT) during their early years of their primary education. This directive means that all subjects, including mathematics, are to be taught in the MT or the predominant local language. In Namibia, this policy stipulates that learners in Grades 1–3 are taught either through the MT, a local language or English. From Grades 4 to 12, the medium of instruction is English, which, as per the constitution, is the official language as a medium of

instruction up to the tertiary level of education. The policy states that private schools are allowed to teach in English but must offer at least one local language (Ministry of Basic Education, Sport and Culture 1993).

Namibia has a rich diversity of languages, with about 15 recognised local languages that are also used as medium of instruction at early grades. Oshiwambo is the most spoken, with about nine dialects; however, only two dialects (Oshindonga and Oshikwanyama) are used in schools as first languages and medium of instruction. The majority of people who speak Oshiwambo are situated in the northern part of the country, and thus most universities at this part of the country produce teachers who engage in teaching in Oshiwambo (Oshindonga or Oshikwanyama).

Kazima (2008) argues that if a country is to produce teachers who are skilled in teaching in the mother language, the teaching in the MT has to extend to colleges and universities, to ensure that teachers are trained to handle the language of instruction. In Namibia, the Crebbin Consultancy Report (Crebbin et al. 2007) recommended various models, and one of the recommendations was that all junior primary teachers should be able to teach fluently in both the MT and English language. Thus, junior primary teachers, especially those who teach mathematics, need to be trained and skilled in teaching in the MT in order to realise teaching and instruction of the subject in a local language. Nkonde et al. (2018) note that it is possible for a person to be familiar with the language but incompetent in using it for cognitive purposes; thus, it is important for preservice teachers to be trained in utilising the MT as the language of instruction. However, Chauma (2012) recommends that teachers need formal training in mother tongue instruction, in developing the advanced skill of using MT as the medium of instruction for the entire curriculum, rather than only offering MT as an extra subject. This argument is reinforced by Phakeng (2016), namely that competency of teaching in the language of instruction is essential in supporting learners towards greater mathematics achievement.

Correspondingly, Chauma (2012) argues that higher education institutions need to assist lecturers in contextualising their training by using the MT during their instruction in order for student teachers to be able to model this pedagogy when embarking on their profession. Chauma's sentiments are supported by Batra (2006) who argues that this revolution might not be limited to the Colleges of Education but must also be extended to the universities involved in teacher preparation programme. It is therefore important to note that if junior primary teachers are to teach in the MT, this competency and dexterity should be a result of a fundamental reinforcement developed during their tertiary education and training.

Based on the researcher's observation, junior primary preservice teachers in Namibian universities are being trained in English, as postulated by the university language policy, despite the fact and knowledge that they are going to teach learners in the MT. This policy might deprive students,

the prospective teachers of the opportunity of engaging in appropriate mathematical dialogue and communication strategies for solving mathematical problems that will prepare them for the classroom conditions. Preservice teachers need to be well trained in various aspects that involve the use of MT, such as formulating lesson plans in the MT, setting activities in the MT and, resultantly, teaching mathematics in the MT. Over the past years, mathematics has evolved into a subject that does not only require learners to memorise content but also requires communication of concepts and interaction with each other using the learned content knowledge that is needed to solve problems not previously encountered; this might require a preservice teacher who is well grounded in the language of the immediate environment.

Lecturers' perceptions on the use of the MT to teach mathematics are crucial as they determine the values and emphasis they place in the preparation of student teachers to effectively teach mathematics in the MT. The main aim of this study was therefore to uncover the perceptions of mathematics lecturers regarding MT usage in the training of junior primary preservice teachers at the university level, specifically in mathematics lessons at one of the satellite campuses of the University of Namibia.

The following questions underpinned this research:

1. How do lecturers prepare preservice teachers to teach mathematics in the MT?
2. What are the lecturers' perceptions about teaching preservice teachers mathematics in MT?
3. What can be done to address the gaps in the teaching of mathematics in the MT at the university level?

## Home language (mother tongue) as medium for teaching mathematics

Numerous researchers (Araza 2018; Chauma 2012, Kazima 2008; Khejeri 2014; Nkonde et al. 2018) have looked at MT instruction in relation to the teaching and learning of mathematics. Notably, there have been arguments among researchers on the value of MT in the teaching of mathematics, where some believe that it jeopardises the learning of mathematics, whereas others believe it is endowed with the potential to enhance the learning of mathematics.

In a study by Nkonde et al. (2018), findings indicated that when the MT was used in the teaching of mathematics, teachers did not struggle with explaining mathematical concepts and learners recalled effortlessly what they were taught. Participants in the study further added that learning in the MT discourages rote learning and promotes real learning. Moreover, participants also indicated that there was remarkable classroom participation and engagement among learners.

Other researchers have established that children in primary education tend to reach higher cognitive development levels faster when using the MT as the language of instruction

than when using a second language (Dea, Basha & Abera 2014). According to Chitera (2010), people often express their thinking in their MT or first language; thus, if learners are presented with a mathematical problem in a second language, they translate it to the MT for understanding before solving the problem. Hence, using the MT to teach mathematics prevents incorrect and inaccurate translations and will ensure that the problem-solving process is not weakened.

According to Farik and Hafiz (2016), the learning of mathematics in the MT helps to advance mathematical vocabularies that could be easily remembered by the learners. Chitera (2010) contends that using learners' local language benefits them with their learning progress, especially during the explanation and clarification of concepts. Learners are able to express themselves better in the MT as opposed to expressing themselves in a foreign language such as English. According to Njoroge and Gathigia (2011), using the MT can result into a much greater sense of cultural pride and awareness, which reinforces the learners' social identity. Furthermore, it gives learners a sense of belonging and ownership. Teaching learners in a language with which they identify at home helps them to develop an alignment with mathematics and, more so, to appreciate how mathematics is part of them through their mother language.

However, Mashegoane (2017), in contrast asserts that children will learn mathematics and science in English throughout their lives and thus it is discouraging and a waste of time for learners who will only learn mathematics in the MT for their first 4 years of their education. Consequently, he argues, this policy has created problems for teachers who will teach these learners in higher grades and find that there is not a solid English language foundation. Khejeri (2014) warns that the Khejeri (2014) warns that in the use of MT there may be the danger of inculcating tribalism in young learners, who then do not embrace other as part of one nation and accept diversity. The MT instruction may rather discourage national unity, interaction and communication with learners of other tribes and nations.

## Current practice in Namibian teacher education

According to Kaphesi (2003), it is crucial for teachers who teach in lower primary grades to take account of the MT's vocabulary and language structure. Preservice teachers need to be more effective in oral communication in the MT to assist learners in the development of general language skills as well as the language (discourse) needed for mathematics. Thus, preservice teachers should be able to use the mother language to ensure that learners not only develop proficiency in the language to enable them to read and comprehend but become familiar with the language of mathematics, thus developing mathematics vocabulary in the MT.

As a leadership approach, Chitera (2010) describes the structures of teacher education programmes in terms of language in education policy (LiEP) in some countries.

In Ethiopia, for example, the policy mandates that the language of learning and teaching (LoLT) for primary teachers who are being prepared to teach in the first 4 years of schooling in training colleges should be the same as the LoLT for the first 4 years of schooling in primary schools. However, this is not followed in practice in the teacher education programmes, as teacher educators seem to ignore this policy and opt for whatever they feel are comfortable with, and this puts student teachers at a disadvantage. In Burkina Faso, preservice teachers who teach *écoles bilingue* (learners 9 years or older who have not had a chance to be enrolled in formal primary schools but have well-developed language skills of local languages) are familiarised with the first and other languages used as LoLT. In Ghana, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GTZ) has worked on strengthening the teaching in local languages in most of the teacher training programmes in the country. In addition, new teachers have been educated in using the local language for instruction (Chitera 2010).

## Theoretical framework

Social constructivism is a logical thinking approach proposed by Lev Vygotsky which holds that social interaction, language and culture have an effect on the learning process. Amineh and Asl (2015) define social constructivism as a theory of knowledge used in sociology and communication theory to study knowledge and understandings developed jointly by individuals around the world. Social constructivists see teaching as a process of integrating new knowledge into learners' preknowledge. The teachers, as knowledgeable persons, competently use language to communicate new knowledge to the learners (Chauma 2012). It is vital that teachers build on what the learners already know, and this relates to language; as such, teachers should be supportive of learners' attempts to express themselves. This is also true for lecturers. Their teaching methods should create an environment rich in oral language by allowing student teachers to share and communicate ideas, ask questions and solve problems together. Language is a verbal representation and plays a crucial role in mathematical thinking; hence, it is important that teachers communicate effectively in the MT (Khalid & Tengah 2007) for learners to fully understand concepts.

At whatever level of their teaching profession, mathematics teachers are considered more proficient in a particular language and knowledgeable in mathematics content, and thus they should be able to communicate information appropriately and accurately using a language that is understood by learners to guide them in reaching their level of independence. The ability to communicate effectively depends on the linguistic proficiency of the teacher, and a poor linguistic proficiency may therefore become a challenge in assisting learners in mastering the content and language of mathematics.

## Methods

### Research design

This research adopted a qualitative method. Qualitative study is defined by Astalin (2013) as a scientific investigation

which pursues to provide a holistic, largely narrative, description to enlighten the understanding of researchers with regard to social and cultural phenomenon. The researcher found this method appropriate for this study in order to obtain a comprehensive narrative of the perception of lecturers with regard to using MT to teach mathematics. In this case, one specific campus of the University of Namibia was the focus. The study, being a case study and a narrative account (Gay, Mills & Airasian 2011), enabled the researcher to understand how participants perceive teaching mathematics in MT at the university level.

## Participants of the study

The population of this study comprised all mathematics lecturers in the Department of Early Childhood and Lower Primary from one education campus of the University of Namibia campuses. Participants were further identified using purposive sampling. Savin-Baden and Major (2013) define purposive sampling as a method in which specific settings, persons or activities are consciously chosen in order to offer information that cannot be obtained elsewhere from the choices. A specific purposefully selected sample provides rich information about the research. The department of early childhood education consists of four lecturers responsible for teaching mathematics, and because of the small number, all the four lecturers comprise the sample for this study.

## Data collection

Data for this study was collected by means of a semistructured face-to-face individual interview method. Semistructured interviews are a combination of structured and unstructured questions. This kind of interview method enabled the researcher to obtain in-depth information from the participants about their thoughts, actions and beliefs (Johnson & Christensen 2012). This method further enabled the participants to freely express situations from their point of views and to interpret their expressions or inputs. Participants were therefore encouraged to freely give their honest viewpoints. Interviews lasted for about 40 min, and all interviews were recorded on a voice recorder. Participants were interviewed during their nonpeak times to ensure that minimal disturbances of any sort to their daily work were encountered. Permission to participate in the research was sought from the university and from the lecturers involved. Participating lecturers were requested to sign consent forms for confidentiality assurance.

## Findings

### Participants' profiles

Four lecturers in the Department of Early Childhood and Lower Primary were interviewed for this study.

### Lecturers' perceptions on the advantages and disadvantages of teaching mathematics in mother tongue

Participating lecturers were asked about the benefits of teaching mathematics in the MT, both at the university and

school level. Among other factors, participants highlighted ease of communication and fluent explanation of concepts, instant understanding of mathematical concepts and the transformation of learners into innovative thinkers. Participant 1 (L01) stated that when learners are being taught mathematics in their MT at junior primary level, the teacher is able to explain concepts better and this relates to what the learners already know. L01 further indicated that what is most crucial with regard to teaching mathematics in the MT, at the lower primary level specifically, was concept formation, because there are various concepts in mathematics that learners need to comprehend at an early stage, and this is easier in a language in which they are competent.

Participant 2 (L02) indicated that when teaching mathematics in the MT, learners instantly grasp mathematics content, compared to when taught in a foreign language. In addition, both L02 and L04 emphasised greater classroom participation among learners during the learning of mathematics, stressing that teaching in the MT enables learners to express themselves fluently and without fear of being laughed at or judged, in comparison to when a lesson is conducted in English or another foreign language. L02 also believes that because mathematics involves reasoning, teaching learners in the MT allows them to practise reasoning as they can draw on their vocabulary of familiar words, which aids in expressing themselves and supporting them in understanding better when the teacher is explaining strategies and procedures in mathematics.

The fourth participant (L04) added that learners are more likely to be innovative and independent thinkers when taught in their native language. He explained that the teaching and learning of mathematics require learners to be innovative and independent problem solvers, and this can be possible once learners have a good understanding of the presented concepts and are able to relate it to context. This understanding of mathematics is facilitated by the use of the MT which provides such central insight.

In contrast, L03, when asked about the benefits of teaching mathematics in MT, stated that:

'First of all, I have a problem with that [*teaching in MT*]; I don't believe in teaching learners in MT; it would be beneficial [*only*] if learners were going to learn in MT [*in all*] those whole phases [*i.e. from pre-grade to university*] but if not, it will be challenging translating from MT to English later, so why don't they just make the learners comfortable with English to start with?' (participant L03)

L03 did not see any benefit in teaching mathematics in a native language, as concluded by various researchers, as he felt that the current education system of teaching learners in the MT and then later shifting to English will cause challenges to learners and in the process could affect their achievement in mathematics. L03 indicated that the main challenge for learners is with the transition from MT to



English, and this, he believes, is the reason why most students at university are not entirely proficient in English, which affects their performance. This is in line with Nkonde et al. (2018), who are concerned that the early transition from MT to English as the language of teaching and learning could have a long-lasting effect on learners, as it takes time for learners to acquire and develop fluency in a second language. Setati (2002), in her review, found that first-year students at the university level who were taught in English as a second language experienced difficulties in understanding simple mathematical terms such as *integer*, *perimeter* and *multiple*.

### Lecturers' perceptions on the challenges in teaching mathematics in the mother tongue at the university

It appears from the interviews that not all the lecturers were in support of teaching mathematics in MT at the university level because of various challenges. However, two of the participants, namely L02 and L04, indicated that teaching mathematics in MT has both positive and negative effects. Positive effects include preservice teachers finding it easier to understand and interpret the syllabus and also understanding the theories because the language used is familiar to them. In addition, preservice teachers will be able to develop a better understanding of the mathematical concepts and operations using the MT, as it will prepare them for teaching mathematics in the MT. L02 specifies that:

'Because teaching them in English while they are going to teach in MT ... sometimes they struggle to translate mathematical concepts they have acquired from the university. This, somehow, it may lead to poor teaching methodologies, because they might translate concepts wrongly to learners. However, if they are prepared in MT it might help them also on how to understand the national curriculum better, because even those at university, if you ask them prepare a lesson plan, they will write it in English language, which leads to many struggling to plan lessons in MT when they fully join the profession. Even to prepare the teaching aids and learning activities, they do it in English, so they are not really well prepared, if I can put it that way; the only person who get that advantage is the one who gets an opportunity to teach at a school where English is a medium of instruction.' (L02)

L04 concurred that preservice teachers should be taught in the way in which they are going to teach in schools. L04 expresses that:

'You cannot train students in English language and you expect them to teach in another language. You should use the same language that will be used in the field otherwise it becomes difficult for the students to use a different language, since there are terms that are difficult to translate from English into MT.'

This then means that L04 argues for using MT instruction for preparing preservice teachers for their role in teaching mathematics in the Junior Primary phase.

However, all participants contended that the idea of training preservice teachers in the teaching of mathematics in MT can be complex due to various reasons. These reasons include availability and variety of lecturers who are nonspeakers of the local MT, poor development of MT vocabularies and students coming from diverse ethnic groups.

Participants L01 and L02 were concerned about lecturers who cannot speak the MT, stating that it is a challenge for the university to make this a reality. Participants argued that although there are teacher educators who speak the MT, it does not mean that they are fluent in it or that they would have adequate proficiency. This implies that the university has to employ specific lecturers who competently speak the MT for the implementation of this policy to be a success. However, it might be a challenge to find such lecturers, because they may not always be readily accessible.

Participants were also of the view that teaching mathematics in the MT at university would be a daunting task because of the diversity of the preservice teachers who come from different native language backgrounds. Moreover, participants explained that presently, all preservice teachers from a variety of ethnic groups are taught in one mathematics class. Teaching mathematics in MT would require students to be taught according to their own MT, which would exert more pressure on the University to provide more lecturers with a variety of native languages to teach mathematics. This would have financial implications.

Another concern raised by L01 was the lack of vocabulary in MT languages. The participant felt that because MT languages in general do not really have adequate words for mathematical concepts and are not well developed, teaching students at university level in the MT would deprive them of more mathematical knowledge, deeper appreciation and may result in confusion. L01 expressed that:

'... and I think that can be a little bit of a problem because some native languages do not really have words for mathematical concepts, and even in my own language, Afrikaans, for example, when you count two digit numbers – and I saw this when I was a teacher sometimes – when you are saying 52 in English, you say the 10th first then the units, but in Afrikaans you say the opposite, the unit first then the 10th, and if the child did not make that connection they would write 25 instead of 52.'

Another issue raised by L01 with regard to teaching in the MT was that the official language and the language of instruction for the university is English, but if the preservice teachers are to be trained in the MT, there could be consequential implications. This may result in restrictions which could affect their exposure to and training in English; it may also pose challenges if they wish to pursue further studies at universities within Namibia and abroad, where English is the language of instruction.

As L04 puts it:

‘When at university level, the focus is more on research and most of the information obtainable from the libraries are not in MT but rather in English. Equally, most of the information on Internet is also in English, and therefore, this already dictates on what language students are to be taught in at the university.’

### Preparation of teachers with regard to teaching mathematics in mother tongue

Participants were also interviewed on how they prepare preservice teachers to properly equip them in teaching mathematics using the MT. It became evident from the participants that they do not prepare teachers to teach mathematics in the MT: ‘We don’t really prepare them to teach in MT’ (L02). Some participants indicated that it is a ‘call to combat’, especially as many lecturers do not speak any of the MT languages used at the university.

However, although lecturers indicated that they do not prepare them to teach in MT, some of them make efforts to sensitise students about teaching in MT, either through lecture delivery or during micro-teaching.

#### Lecture delivery

L01 explained that:

‘I cannot speak any other local language except my own; [hence] sometimes in class when we discuss things I would ask, “OK, what is the word in *your* MT for this concept, and do you have a word, or do you have to *invent* something or how do you do that?”’

She further stated that this is only helpful to a certain extent, in that students do not always know the terms and she is incapable of helping them either. She commented that sometimes students would argue about various concepts in the MT, but she was unable to help. L01, however, stressed that she trains the students in mathematics teaching methodology, and not mathematical concepts and operations taught at Junior Primary level. It was reported that it is only when preservice teachers are on teaching practice that they practise using MT for teaching. She, however, believes that students do not get much from the teaching practice sessions because the teachers struggle with teaching in the MT as a result of a number of factors which include the lack of mathematics textbooks in MT.

L03, who does not speak the local MT, stated that although he does not teach students in the MT, he prepares them for the teaching of mathematics by giving them simple tasks, the same kind that they would give to their learners. He teaches the same concepts directly as they ought to be taught at Junior Primary level, giving them the same type of examples and the same form of tasks that their learners would have and do in the schools. He expressed that:

‘So my job is to try and make sure they know it [*mathematics*] as perfect as possible so to enable them to use their language to explain it to their learners.’

**TABLE 1:** Lecturers’ demographics.

Lecturers	Years at the institution	Speaks the offered mother tongue	Trained for junior primary	Trained in mathematics	Gender
L01	11 years	No	Yes	Yes	Female
L02	2 years 7 months	Yes	Yes	Yes	Male
L03	4 years	No	No	Yes	Male
L04	5 years	Yes	No	Yes	Male

L02, who is able to speak the MT as indicated in the Table 1 above, stated that he goes to the extent of explaining some concepts in the MT. He indicated that he at times focuses on topics that might be challenging for the students and the learners. L04, who speaks the MT as well, indicated that he prefers to teach from the students’ context, which enables him to relate to their culture and language when teaching mathematics.

#### Micro-teaching

Participants also described another method that they use to help preservice teachers teach mathematics in vernacular language: presentations of micro-teaching in MT. According to L04, he allows preservice teachers to do their micro-teaching presentations either in English or the MT, whichever language they are comfortable in. Participant L04 clarifies that allowing students to do presentations in the MT creates room for improvement, as students also learn from each other and an acceptable competency.

### Recommendation for preparing preservice teachers to teach mathematics in the mother tongue

Participants were requested to comment on how higher education institutions can help prepare the Junior Primary teachers to become well-equipped in teaching mathematics in the MT. Most of the participants believe that the best strategies include lesson presentations in MT and code-switching.

L02 recommends that the university run the two parallel language policies: that of the university and that of the Ministry of Education. This recommendation entails that the approach and the medium of instruction for mathematics be changed to allow lecturers to instruct 50% in English and 50% in MT in order to accommodate all student teachers who may find themselves teaching at various school environments or where a native language may be of relevant use. He further suggested that during examinations, students should be given question papers in both languages. Accordingly, the university needs to employ lecturers who are proficient in the local languages to teach mathematics at junior primary level so as to allow the development of proficiency of the native language and fluent communication between lecturers and students.

L03 and L04 commented that lecturers should schedule more presentations in the MT so that students become familiar with concepts and methodologies of teaching mathematics

in the MT and, more so, to create room for students to be corrected when errors occur. This finding aligns with L02, who recommends that lesson presentation in the form of micro-lesson in the MT is a good strategy to prepare preservice teachers as is the use of code switching between the MT and English:

‘Those of us that understand the MT [*Oshiwambo*] which our students speak, I advise that we do code-switching, maintaining English as a medium of instruction and also get a little bit in Oshiwambo to clarify things. Also, we can allow them to do micro-teaching in Oshiwambo; it will assist them and perhaps encourage students to familiarise themselves with the syllabus in MT because they are reluctant to use them. They should also be allowed to do lesson plan in Oshiwambo and be encouraged to also formulate lesson objectives and basic competencies in Oshiwambo. Sometimes we can ask them to have activities trying to translate objectives and competencies from English to Oshiwambo – it may help them – and also designing activities in Oshiwambo, instead of just teaching in English as medium of instruction.’

L03 suggested that students be trained in a native language and then taught in a particular language to prepare them for the classroom: ‘Let them be taught the way they are going to teach so that they become innovative or knowledgeable to translate those words’.

L01 also spoke of the need to be proficient in MT. Her response indicated that challenges in the teaching of mathematics in the MT could arise with the absence of MT translations for mathematical concepts and terms:

‘Well, I don’t know, but I assume you need to have a good knowledge of your MT, ... then, secondly, in [*the*] classroom, you have to emphasise this whole idea of language policy, and as a student teacher you must keep in mind that there are some concepts [*for*] which we don’t have words in MT, so maybe you need to form ... some platforms or group where you can discuss these things and come up with words that can be used and develop teaching materials that can be used by MT users. Because for me, if MT users are not going to be proactive themselves, nobody is going to do it for them.’

## Discussion

This study sought to derive information from the perceptions of teacher educators regarding the use of MT instruction in teaching mathematics at the university level. Teacher educators’ perceptions can determine the value placed on MT and the effect this has on their preparation of junior primary teachers. This focus of this study on the perception of the mathematics teacher educators aligns with the statement by Khejri (2014) that people only commit themselves to a goal if they value the goal, and therefore wish to pursue it.

The findings revealed that two of the four participants were not proficient in the MT used at this specific campus, which meant that there is a challenge to fully implement the policy on learning to teach mathematics in the MT.

Participants, however, outlined various benefits of teaching mathematics in MT as well as challenges, which are discussed in the subsequent sections.

## Benefits

**Ease of communication:** The findings indicate that teaching mathematics in the MT encourages participation with the students being able to express themselves freely. Students are motivated to participate in the lessons and discussions because they understand the language, can use it to draw on what they already know and relate what they are learning to everyday life. In addition, students are able to negotiate meaning together as they interact. Mother tongue instruction thus supports a learner-centred approach for both preservice teachers and ultimately their learners as they actively participate during the lessons. Learners take responsibility for their learning, which becomes meaningful and exciting (Nkonde et al. 2018)

**Encourage understanding of concepts:** Findings also indicate that when students are taught how to teach mathematics in the MT, they quickly grasp the concepts, in contrast to when they are taught in another medium of instruction such as English. When students are taught in a language with which they are familiar, they tend to remember easily. This notion was confirmed by Araza (2018) that when learners are learning in their MT, they tend to understand concepts more quickly with less effort, with deductive reasoning being promoted.

**Promote innovative thinking:** The findings further revealed that both preservice teachers and learners are able to actively become involved in problem solving to discover new ideas and find solutions, especially when taught in the MT language. This finding concurs with Balane et al. (2017), who explain that thinking skills can only be perfected when one uses the MT. They further indicated that the use of MT as a medium of instruction promotes high levels of cognition with students being able to reason, critique and solve problems.

## Challenges

While acknowledging the benefits that come with teaching mathematics in the MT, participants also identified the challenges of teaching mathematics in the MT languages. Challenges include the lack of mathematics lecturers who speak the MT, poor development of MT vocabulary, students from various ethnic groups in one class and the lack of resources in the MT.

### Lack of required mathematics lecturers

Findings showed that the lack of lecturers who speak the MT was a concern. Participants indicated that many lecturers do not speak any of the vernacular languages offered at the campus and thus deprive preservice teachers of understanding the subject matter and gaining pedagogical

knowledge of MT instruction if preservice teachers are taught in English. According to Chauma (2012), a poorly trained teacher is one who has had no teaching preparation in using the language of instruction; MT is the language of instruction in this instance.

### **Lack of mathematical vocabulary in the vernacular language**

Findings revealed that there is a lack of mathematical vocabulary in many of the vernacular languages, including Oshiwambo, for some of the mathematical concepts and terminology. The absence of certain terminology in the MT can pose a challenge for teacher educators to effectively teach mathematics, and lecturers have reported that it is challenging to find appropriate vocabulary to convey the correct meaning. This finding aligns with those of Chauma (2012), where teachers found a lack of some mathematical terminologies in Chitumbuka, as the language lacked the vocabulary to express mathematical terminologies and concepts. Thus, teachers found it difficult to articulate meanings of these concepts. However, Kazima (2008) indicated that although teachers were able to explain such concepts in relation to their roots and origins, learners still experienced problems with these words because they could not remember their meaning and found difficulty in explaining the concepts.

### **Lack of resources in mother tongue**

Participants indicated that the university teaching focuses more on research, so teaching mathematics in the vernacular, in this case Oshiwambo, is a challenge because there is a paucity of reading and other teaching and learning resources in this language. According to Araza (2018), books are relevant in the teaching and learning process, and without them, teaching and learning cannot be effective, and in addition, instructional resources are crucial in promoting learning and motivating students.

### **Preparation of preservice teachers**

Findings revealed that participants do not prepare preservice teachers to teach mathematics in the MT. Reasons given for this practice are that lecturers cannot speak the MT, while others believe that the university language policy does not state that students should be taught in the vernacular. A few participants have, however, stated that they do code-switch, presenting lessons in MT and also teaching students mathematics from their context.

Findings indicated that participants who do not speak the MT occasionally ask preservice teachers to translate some mathematical concepts to others. However, it is not always certain that preservice teachers will translate correctly or find appropriate concepts, which could cause confusion. Nkonde et al. (2018) also asserted that teaching mathematics concepts using familiar words in the MT for unfamiliar mathematical concepts could be tricky and confusing.

## **Recommendations from the findings**

### **Policy transformation**

Participants expressed the need for universities to run the two parallel policies, which means both languages, namely English and the MT, should be seen as valuable and lecturers should instruct both in English and in the MT, particularly when training junior primary teachers. The Crebbin Consultancy Report (Crebbin et al. 2007) recommended that all junior primary teachers should be able to teach fluently in both the MT and the English language, and this is only possible if teachers are given appropriate training in both languages. Nkonde et al. (2018) also argue that teachers should be trained in the local languages which become the medium of instruction in the Junior Primary phase, where there is currently a lack of practitioners who are fluent in the MT.

### **Code-switching**

Another important recommendation accorded from the findings was for the university to employ lecturers who are fluent in both English and the MT or for lecturers to practise co-teaching in the case of lecturers who cannot speak the MT.

Some participants indicated that the best strategy is to code-switch. Lecturers who can speak the MT can do code-switching while maintaining English as medium of instruction; they can bring in MT for clarification. Nkonde et al. (2018) affirmed that code-switching makes it easier for teachers and students to understand concepts that are difficult to translate, as they can be taught either in MT or in English. Code-switching has been given merit by researchers such as Setati (2002) who argue that code-switching provides additional resources for meeting classroom needs and should not be seen as a weakness of insufficient knowledge of specific languages but rather a verbal skill requiring a higher degree of competency in multiple languages. However, translation does not always reproduce the exact meaning for the intended purpose, so caution is needed.

## **Conclusion**

This study sought to uncover the perceptions of lecturers with regard to teaching mathematics in MT at the university level to preservice Junior Primary teachers. Findings of the study show that while all participants acknowledge the benefits of teaching mathematics in the MT, they do little to ensure that preservice teachers are given appropriate training to safeguard the use of MT in mathematics classrooms. Most participants indicated that they predominantly use English, stating that it is the language of instruction at the university. Participants who were eager to use MT in their instruction identified the lack of resources in MT and poor development of MT mathematical vocabularies as limitations in providing training for preservice teachers. Higher education institutions and the Ministry of Education need to guarantee that both languages of instruction are equally promoted and supported, particularly in the training of Junior Primary teachers,



because currently more emphasis is placed on English. There is a necessity for mathematics resources and other publications in MT to assist lecturers in ensuring that students are well equipped with mathematics subject and pedagogical content knowledge for MT instruction.

This study thus concluded that mathematics lecturers in the Department of Early Childhood and Lower Primary are not preparing preservice teachers to ensure that they are able to teach mathematics in the MT but assume, because students have studied MT as a subject, they are able to teach mathematics in it, even though the strategies of teaching mathematics in MT may be different.

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## Authors' contributions

T.S. was involved in conceptualisation, designing of the work, data collection and drafting of the article. C.L. carried out critical revision and editing of the article and funding acquisition. A.N. and J.M. were involved in the revision and editing of the article. All four authors approved the final version of the manuscript.

## Ethical considerations

Ethical clearance to conduct this study was obtained from the University of Johannesburg, the Faculty of Education Research Ethics Committee. (ref. no. Sem 2 2018-031).

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## Data availability

Data from which the findings of the study were derived from, are available on request from the corresponding author.

## Disclaimer

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