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Mathematics Teacher Reflections on Storytelling in the Mother Tongue as a Learning Strategy

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Abstract

Storytelling as a strategy for teaching and learning mathematics in Quintiles 1–3 schools has been found to be positively associated with success in mathematics. Integrating stories in mathematics education has been found to be critical in promoting the conceptual understanding of mathematical concepts both at school and higher education levels. The question posed in this study was what mathematics teachers' views were on the use of stories to teach school mathematics to Quintiles 1–3 learners in their mother tongue. Bruner's narrative mode of thought where the paradigmatic and narrative modes of thought are described was used as the lens for the study. The study was conducted in one Quintile 3 school in the Nelson Mandela Metropolitan Area of the Eastern Cape in South Africa where two secondary school teachers participated as co-researchers in a participatory action research study. The statements of the participants in the unstructured interview revealed that utilising storytelling as a pedagogical strategy in mathematics could yield enormous educational benefits. These include better retention of mathematical concepts, enhanced enjoyment of the subject, and the development of an enquiring mind amongst learners. However, to maintain learner interest, the stories chosen should not be too long and should be based in a relevant context.

Keywords: reflection, storytelling, patterns, quintile, mother tongue

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Introduction and Background

According to Sherwood and Makar (2024), many learners are gripped with fear when faced with abstract mathematical ideas and despite years of research in mathematics, the barriers to conceptual understanding of mathematics persist. This is the case even though the United Nations has set up a blueprint for a more prosperous world (Eloff, 2024). Its Agenda for Sustainable Development includes 17 Sustainable Development Goals that the United Nations intends to achieve by the year 2030 in order to end poverty, protect the planet, and leave no one behind (Eloff, 2024). With all the problems surrounding mathematics, it does not seem as if Development Goal 4 regarding quality education and its association with success in teaching and learning will be achieved any time soon.

Several strategies have been used to improve mathematics results all over the world. These include active learning strategies (Vale & Barbosa, 2023), game-based learning (Hui & Mahmud, 2023), the integration of technology in teaching mathematics (Drijvers & Sinclair, 2024), and many others. One wonders if the teaching and learning strategies employed in South African Quintiles 1–3 mathematics classrooms would yield better results if mathematics were taught through storytelling in the mother tongue. In the current study, mathematics teachers reflected on the use of storytelling as a teaching and learning strategy in a Quintile 3 school. In a similar study, educator participants reflected on the benefits stories might offer for at-risk learners within their school context, and they reported that "the indigenous African stories had promoted problem-solving and leadership skills, personal positive strengths and attachment relationships and had stimulated renewed appreciation for resources within the traditional African culture" (Joubert, 2023, p. 10).

Furthermore, a major international study, The Trends in International Mathematics and Science Study (TIMSS), a large-scale international comparative study, has collected data on Grades 4 and 5 learners' knowledge and skills in mathematics and science since 1995 (Guhn et al., 2024). Data are collected every four years. More than 90% of the countries participating in the TIMSS 2019 assessments reached the minimum level of proficiency, however, in the case of South Africa, only 37% of the learners who took the assessment achieved this benchmark (Reddy, 2021).

Several skills shortages have been identified in the education sector in South Africa due to the poor performance in mathematics and other key subjects (Judijanto et al., 2024). Consequently, South Africa faces numerous challenges, which include the lack of capacity of some teachers to provide high-quality education to learners (Judijanto et al., 2024). An observation made by the TIMSS reveals that even though South African educators attended many skills-development initiatives, student performance reveals that these efforts have had no positive effect (Judijanto et al., 2024). While mathematics remains a hurdle in schools worldwide, the teaching and learning of mathematics in Africa have encountered several challenges (Bangura, 2020). These challenges emanate from several sources that include the fact that the

mother tongue has been ignored as an instrument for teaching and learning on the continent, according to Bangura (2020). Referring to the Pacific versus Maori achievement gap in New Zealand, Hunter and Hunter (2023) proposed the retention of cultural identity rather than assimilation for effective learning to occur. Sum et al. (2024) on the other hand, emphasised the effectiveness of storytelling in teaching mathematics to ethnic minorities in East Asia.

Sherwood and Makar (2024) agreed with this view, and emphasised further, the role played by storytelling in integrating language with mathematics content in an authentic manner. These authors further claimed that learners fail to make connections with mathematics and hence cannot make sense of mathematics learning because they do not understand the context in which mathematical ideas are placed. It is for this reason that learners' own contextualised stories might help make sense of their learning (Sherwood & Makar, 2024). They also stated that mathematics teaching is inseparable from language teaching. Moreover, the combined use of context and story using the learner's own language helps learners make sense of mathematics, which in turn, results in more robust learning (Sherwood & Makar, 2024).

This study aimed to obtain mathematics teachers' views on the teaching of mathematics topics using mother-tongue storytelling as a vehicle in a typical Quintiles1–3, isiXhosa mother-tongue classroom context. The South African Schools Act (Republic of South Africa, 1996) provided a quintile ranking system in which Quintile 1 is the group of schools in each province catering to the poorest 20% of learners, Quintile 2 schools cater for the next poorest 20% of schools, continuing to Quintile 5. Quintiles 1–3 schools are no-fee schools and receive a higher state subsidy than the more privileged Quintiles 4–5 schools. According to Spaull et al. (2022), several research studies have suggested that poorly resourced Quintiles 1–3 schools perform badly in mathematics compared to their Quintiles 4–5 counterparts. Sadly, Pournara (2020) made a concerning finding regarding the performance of these schools in mathematics, namely, that Grade 9 learners in well-resourced Quintile 5 schools are approximately four years ahead in mathematics than their counterparts in poorly resourced Quintiles1–3 schools.

Traditional teaching and learning methods in mathematics do not seem to yield any positive results, especially in Quintiles 1–3 schools. Moreover, while storytelling forms an important part of African culture and has been used as a teaching and learning approach for centuries, none of these strategies forms part of what is done in their classrooms today. This is so even though oral tradition has been a prominent teaching style in African communities since time immemorial. Hence, the aim of the study was to explore mathematics teachers' views of using storytelling in the mother tongue to teach mathematics in Quintiles1–3 schools using participatory action research. The study sought to respond to the question:

“What are mathematics teachers’ views on the use of stories to teach school mathematics to Quintiles 1–3 learners in their mother tongue?”

Conceptual Framework

In traditional African communities, people were taught to understand their environment by means of stories, which contrasts with using logical scientific explanations. This was also the case in biblical times, when Jesus used parables to teach his disciples and other Jews about the scriptures, hence the relevance of Bruner's (1985) narrative mode of thought (distinct from the paradigmatic mode) and its use as a lens for the current study. Bruner captured the different ways in which people get to “know” and explain events around them. He described two modes of thought, namely the paradigmatic and the narrative: each “provides a way of ordering experience, and of constructing reality” and they differ greatly in their procedures for establishing truth (Bruner, 1985, p. 97). The paradigmatic mode of thought is characterised by following structured methods and logical processes for determining truth, in contrast to the narrative mode, which centres on context, the human element, and stories to connect experiences with new information to create meaning (Bruner, 1985). Bruner’s theory thus emphasises narrative as a mode of thought that constructs reality through stories that are compelling and emotionally true.

Literature Review

The literature explored in the current study covers the available research evidence of storytelling as an old traditional teaching and learning strategy in Africa, this is followed by a discussion of the benefits of storytelling, by teaching as a pedagogy in both ancient and modern communities, future trends regarding storytelling in education, the role of mentorship in storytelling, as well as teachers’ and learners’ perceptions of storytelling as a teaching and learning strategy.

African Oral Traditional Storytelling

Thoughts and ideas based in an African context can be meaningful and empowering if relevant and locally developed research methodologies are utilised; and, this process could help liberate the captive mind from oppressive conditions (Osei-Tutu, 2023). Osei-Tutu stated further that African cultural practices and beliefs that were suppressed would be restored and developed if strategies such as African oral traditional storytelling were to be employed, which would lead to the advancement of the historically oppressed and former colonised non-Western societies. The story, in African communities, is used as a mode of transmitting knowledge, wisdom, culture, experience, and values (Osei-Tutu, 2023); hence, storytelling could be used as a very powerful weapon for demystifying mathematics in these communities. Storytelling aims to teach and share history and cultural norms (Osei-Tutu, 2023) and of particular importance for this study was that the African narrative approach or storytelling has a participatory element to it. In the

performance of the story, the audience is usually invited to participate in the telling through songs, comments, and other responses (Osei-Tutu, 2023). The audience is thus expected to go beyond the role of mere spectator to the role of participation and ownership. Hence the suitability of a participatory action research methodology for the current study.

The Benefits of Storytelling

The fact that traditional storytelling is not used to teach subjects such mathematics in English second language schools denies learners the opportunity to share their cultural knowledge and values (Hilda & Pelokazi, 2023). Those authors further recommended that traditional stories be included in the school curriculum to improve learners' communication skills. Communication is an essential skill in the teaching and learning of mathematics. In fact, according to Kamaruddin et al. (2023), the learning of mathematics has a great impact on improving mathematical communication skills related to everyday life. Opondo (2023) agreed with the latter view and called for a re-thinking of African education systems where African writers would include culture in what they write.

Traditional storytelling has the potential of restoring the learners' culture and, of particular importance regarding this study, was the fact that the inclusion of traditional stories in the school curriculum could go a long way towards improving learners' communication and digital skills (Hilda & Pelokazi, 2023). This could be achieved by using social media to foster traditional African oral literature (Hautemo & Mushaandja, 2024). Stories teach critical thinking; they can be used to transmit knowledge as well as to impart morals and on a deeper level, oral stories play a role in the construction of the learner as a social being (Cochrane, 2023). Hence, within the context of this study, storytelling was deemed an effective approach to teach mathematics.

Storytelling as Pedagogy

Stories have always been used as a means of teaching in both ancient and modern communities—since humans began communicating—yet the power of storytelling as pedagogy may have been undervalued by educators (Landrum et al., 2019). One reason why students fail to learn subjects such as mathematics effectively is because what is taught lacks relevance and, more importantly, the fact that students cannot connect what is taught with their previous knowledge (Hughes et al., 2024). Those authors posited that storytelling could play an enormous role in closing this gap. To answer the question: "Why use stories to teach?" they asserted that "fun delivery significantly positively impacted student engagement" and further, "not only do stories help students learn, but they also help students connect with others" (Hughes et al., 2024, p. 18). Thus, incorporating storytelling in teaching and learning facilitates access not only to concepts, but also to the deep learning of ideas and connecting with others (Hughes et al., 2024).

Wilbur et al. (2022) made an interesting observation, namely, that storytelling by means of online podcasts can stimulate activism and access to deeper understandings. They concluded in their study that

the podcast created spaces of disruption, public pedagogy, and praxis. This may be something positive to consider for the communication of stories in the future. A podcast can be described as a digital medium that consists of audio (or video) episodes that relate to a specific theme (Wilbur et al., 2022). People record pieces of information and share the audio content over the internet as they would do in auditory blog posts. It would be interesting to see how podcasts could be used as platforms for teaching mathematics and other subjects through storytelling.

Good examples of storytelling as a pedagogical tool can be found in the natural sciences where students are taught about the people behind the discoveries in STEM (science, technology, engineering, and mathematics) subjects. Using stories provides an alternative learning format for students to understand the innovations that impact our society (Collins et al., 2023). However, these authors also claimed that there is a dearth in the literature on what influence storytelling pedagogy could have in the STEM classroom. It is for this reason that a study concerning teacher reflections on the use of mother tongue stories in mathematics education becomes relevant.

Future Trends Regarding Storytelling in Education

Digital storytelling is one strategy that could help enhance the motivation and competencies of students of the future in higher education (Tian & Suki, 2023). Sarıca (2023) noted a relationship between storytelling and emotions in the educational context as well as a steady increase in recent years in studies on digital storytelling and emotion in the educational context (Sarıca, 2023). Such studies have been conducted across various educational levels, ranging from preschool to higher education (Masoga, 2022; Sarıca, 2023). Participants in such studies have mostly been pre-service and university students (Sarıca, 2023), while the current study focuses on teacher reflections about using stories to teach mathematical concepts using the mother tongue.

Mentorship and Storytelling in Education

Following the example of Jesus in the Bible, educators should move beyond teaching methods that promote passive reception of information to those that encourage the application of what is learned in novel situations (Son, 2023). Jesus used parables instead of simple true statements to enable the formation of true connections with what is taught. This was to ensure, that through struggle, effective, transferable learning would take place (Son, 2023). Son believed that academic mentors should emulate the example of Jesus by integrating storytelling into their pedagogical practice. The reason for introducing struggle in the form of storytelling in our teaching approach is that research in the social sciences has shown that results from productive struggle are not only profound, but also useful and transferrable (Son, 2023).

Magbagbeola and Balogun (2023) described storytelling as a powerful tool in motivating the mentee, and stated further, that storytelling creates engagement, builds a trustworthy relationship, and serves as a

reflective medium for the mentors. These qualities of a mentor are those required to ensure an effective teacher–learner relationship in the mathematics classroom

Teachers' and Learners' Perceptions of Storytelling

Chen Hsieh and Lee (2023) did not merely focus on technology-enhanced language learning, which has gained popularity in recent years; they also probed affective domains such as emotion and perception in mathematics education. They noted that interplay between digital storytelling and the affective domain, including learner or teacher feelings towards storytelling as a vehicle for teaching mathematics, has not been researched adequately, particularly in English second language schools. A study conducted by Tecedor (2024) on learners' perceptions of the impact of digital stories on their learning of mathematics indicated two domains in which learners benefited, namely, attitude and self-efficacy towards mathematics. There are however, some problems related to using digital stories to teach mathematics to very young learners (Van Doan & Quyen, 2023). These problems relate to lack of adequate vocabulary on the part of very young learners taught mathematics by means of a foreign language such as English.

Emotions play an important role in learning, hence digital storytelling which is also often filled with emotion, can contribute immensely towards the learner's ultimate understanding of mathematical concepts (Sarıca, 2023). An important question, however, is whether storytelling in the mother tongue can replace traditional classroom instruction as a means of teaching mathematics to Quintiles 1–3 learners in the classroom. Teachers' perceptions on these matters are of paramount importance given that teachers occupy the frontline of the education experience for the child.

Research Methodology

Participatory Action Research Design

English foreign language storytelling is conceived as a socio-critical and participatory practice (Mora & Coyle, 2023). Hence, a participatory action research design was adopted for the current study whose focus was on obtaining Quintiles 1–3 teachers' views on the use of storytelling to teach mathematics in isiXhosa to second-language speakers of English. Cornish et al. (2023) described participatory action research as a research approach that emphasises the importance of daily experiences in people's lives where inequality exists and replaces them with better alternatives. In the current study, inequality exists in the form of many learners in South African classrooms being taught mathematics through a foreign language, using traditional teacher-centred methods that are not based in an Indigenous context. An important daily experience in many African communities is that storytelling is often used as a teaching and learning strategy. Hence, this research study advocates for a change in favour of storytelling as a mathematics teaching strategy in Grades 8 and 9 in Quintiles 1–3 schools in South Africa.

Moreover, the people experiencing issues, the teachers in such schools, took centre stage and participated fully in conducting the research to emancipate themselves (Cornish et al., 2023). The knowledge generated in this manner brought about the required change. Accordingly, the study aimed to generate knowledge by enabling teachers to advocate for change regarding teaching mathematics using mother-tongue stories as a vehicle for conceptual understanding. This knowledge has helped schools implement leadership lessons to improve their learners' academic outcomes (Bada et al., 2024). The mathematics teachers who participated in the study took the position of both study co-leaders and co-authors.

The participating mathematics teachers in the study not only built relationships in the current study but also established working practices and a shared understanding of the issue; observed, gathered and generated materials; and engaged in collaborative analysis, planning, and acting through creating mathematics stories of their own based in a Grade 8 and 9, Quintiles 1–3 curriculum context. The latter are the building blocks for participatory action research project design, as explained by Cornish et al. (2023).

Kagola and Khau (2020) showed that engaging in participatory methodologies can provide a platform for the transformation of discourses towards equitable and socially just societies. In the same way, the current study can be used in courageous conversations with mathematics teacher communities about the implementation of storytelling in disadvantaged schools. Similarly, De Oliveira (2023) defined participatory action research as a qualitative research approach where researchers and participants collaborate to investigate social issues and take action to bring about social change. That author also noted that participatory research has a disadvantage in that it introduces power relations within the research process. However, its advantages outweigh its disadvantages because it does bring collective critical consciousness among the participants into practice, leading to democratising the research process (De Oliveira, 2023). Participatory action research is a qualitative research methodology that involves researchers and participants collaborating to understand social issues and take action to bring about social change. It is an umbrella term for all research approaches that engage stakeholders in each step of the research process (De Oliveira, 2023).

To explore mathematics teachers' perceptions of storytelling as a teaching and learning strategy, I portrayed the lived experiences and perceptions of the mathematics teachers, as Gomiole et al. (2024) suggested. My study aimed to understand mathematics teachers' lived experiences regarding how storytelling could be used to teach mathematics. Hence, an in-depth understanding of the subjective realities and meanings that individual teachers assigned to their lived experiences was sought. Moreover, a critical paradigm was adopted for the study, allowing the interpretation of the underlying themes that emerged from the data.

Action research encourages democracy and abolishes the notion of the all-knowing, all-powerful academic "expert" by recognising that knowledge is context-bound, created in collaboration with others and that interpretations are fluid and changing (Feekery, 2024). Wood, in the editorial of the inaugural issue of *Educational Research for Social Change* journal, stated that "participants are regarded as practitioner-researchers perfectly capable of finding workable ways to improve their educational situations" (2012, p. 2). Participatory action research promotes critical reflection and dialogue as the basis for research and action (Hensler et al., 2023). In other words, people are not treated as objects to be studied; instead, Hensler et al. described them as co-actors and co-constructors of knowledge.

Sampling and Sampling Technique

Two mathematics teachers from one Quintile 2 school based in Gqeberha, Eastern Cape, South Africa, participated in this research study. The teachers had to reflect on their experience of working with learners when working on a mathematics problem presented as a story written in their mother tongue. Purposive sampling was used to select the study participants. Both teachers were involved in a mathematics initiative organised by the alumni of the school that participated in the study. The reason for using purposive sampling was that it better suited the study's sample and the research aim, thus improving the study's rigour and the trustworthiness of the data and results (Campbell et al., 2020). Qualitative research is about selecting participants (the teachers) or sites (the schools) that would best help the researcher understand the problem and the research question (Creswell, 2013).

Data Collection Instruments

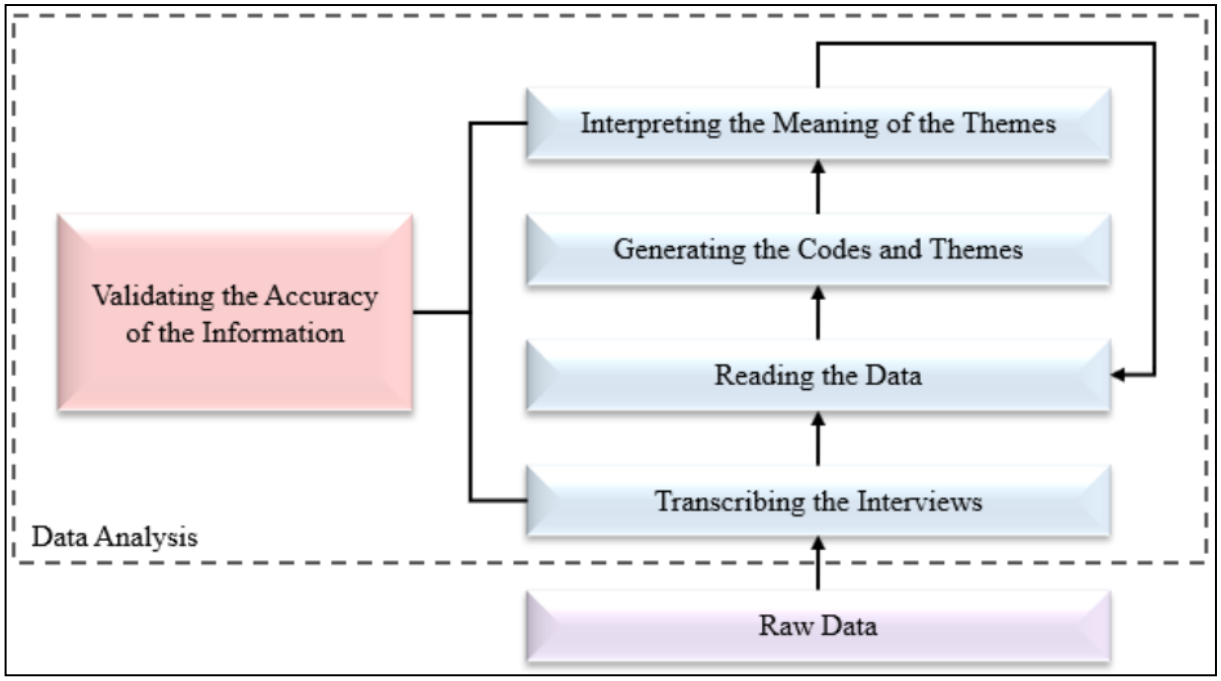
The primary data collection instruments were the reflective journals that the two mathematics teachers at the school under study had to keep. The researcher collected the two teachers' perspectives regarding their experience of working with learners to teach mathematics using stories. Another instrument was one unstructured open-ended question that was asked during the interview, namely: "What are mathematics teachers' perceptions of the use of stories to teach mathematics in their classrooms?" The researcher then probed deeper to obtain more detailed information about the phenomenon being explored.

Data Analysis

Common themes in the data were identified using Creswell and Zhang's (2009) steps (Image 1). After obtaining the raw data from the interviews with the mathematics teachers and other data-gathering tools, the interviews were transcribed, the transcriptions read, and themes identified. The transcriptions were read several times until the emerging themes accurately represented what occurred. The researcher then interpreted the meaning of the themes. All this was done to validate the accuracy of the data.

Image 1

Qualitative Data Analysis Steps (adapted from Creswell & Zhang, 2009, p. 185)



Ethical Procedure

The Belmont Report protects all participants from any harm that might come from the research project. The mathematics teachers who participated in the study were not only co-researchers but also co-authors of the research project. The mathematics teachers participating in the project were told that participation was voluntary. Informed consent was obtained from every participant before beginning the project. In addition, confidentiality for the participants and their school was ensured by using pseudonyms. For reporting purposes, the school and individual teachers were referred to using unique identifiers (S, T1, & T2), respectively. Site permission was obtained from the principals and the Department of Basic Education office in Gqeberha. Participants were informed of their rights to participate in the research study and were made aware that they could withdraw from the study at any time, for any reason, as autonomous individuals (Capili & Anastasi, 2024).

The Research Project

The alumni of the participating school intended to improve mathematics results at the school, and a programme was launched by me (first author), an alumnus and former mathematics teacher at the school, together with other fellow alumni. Currently, I am a mathematics lecturer at Nelson Mandela University, working hand in hand with some Nelson Mandela University students who took the role of tutors in the project. The members of the alumni association, many of whom occupy prominent positions in government and the private sector in South Africa, identified mathematics as one of the key areas needing immediate attention at the school.

I obtained Teaching Development Innovation Funding at Nelson Mandela University where learners from the school came to the university every Friday afternoon and Saturday morning to attend mathematics classes. Working with four Nelson Mandela University student tutors and two mathematics teachers from

the school, we implemented several strategies to improve performance. One of these strategies involved using isiXhosa stories to teach problems involving patterns, sequences, and series. For this study, two mathematics teachers were asked to perform three tasks:

1. Ask the learners to read the story of Gauss, which involved calculating the sum of natural numbers from 1 to 100.
2. The teacher would let the learners struggle with the puzzle at first, before offering hints and guided assistance if necessary.
3. The two mathematics teachers would then reflect on their experience of interacting with learners as they were trying to solve the problem.

The intention of this exercise was to determine teachers' perceptions of using storytelling in the mother tongue as a strategy to teach mathematics.

The Story

Teacher reflections were obtained on their perceptions of learner behaviour when solving a well-known problem in mathematics. The problem was contained in the story of Gauss, a child prodigy who was born in 1777 in the town of Braunschweig in Germany. What makes the story particularly interesting is that this is a real-life story and that Gauss is a well-known mathematician who contributed significantly to the field of advanced mathematics.

As punishment for misbehaviour in class, Gauss was told to add up all the numbers from 1 to a hundred: 1 + 2 + 3 + 4 + 5 + . . . + 100. This story was shared with Grade 8 and 9 learners at the Quintile 1 school. Gauss found the solution to this problem in a few minutes—but how? Both teachers who participated in the study had taught the mathematics topic—Patterns, Sequences, and Series—using the traditional lecture method, in the past. Now, for the first time, they were exposed to a strategy that involved introducing the topic by means of a story based in a Quintiles 1–3 context. Moreover, the story was written in isiXhosa—the learners' as well as the teachers' mother tongue.

Issues to Consider When Implementing a Short Story

It is essential to consider effective ways of reading stories to learners depending on their age and their cultural and socio-economic backgrounds. Stories that are too long may discourage slower or younger learners. Similarly, stories that are based on a foreign context may not lead to true understanding of mathematical concepts.

Themes That Emerged During the Discussion

Four main themes emerged during the unstructured focus group interviews with the mathematics teachers, namely, language issues in mathematics education, children's constitutional rights, cognitive and emotional benefits of storytelling, and the pedagogical role of stories in traditional African communities. One of the researchers in the study was the current Grades 8–12 mathematics teacher at the school that participated in the study. He was a Bachelor of Science and Bachelor of Education Honours graduate well

versed with matters related to politics, education, and children's rights in South Africa. The other co-researcher was a 3-year diploma, experienced graduate teacher of mathematics, who did not always view the research question from a political but rather, from a conceptual understanding perspective.

Language Issues in Mathematics Education

With regard to the first theme, Co-researcher 1 said:

> Let me put it this way Sir: The very fact that this story is based on an everyday life context in the learners' mother tongue makes a huge difference already.

Co-researcher 1, who seemed to be passionate about this subject, stated further:

> As I was reading the story of Gauss to them, I could see that the learners were really enjoying the story and I think because of two reasons, namely, the context in which the story is based (a typical classroom situation) and more importantly, the fact that the story was being read to them in isiXhosa, their mother tongue.

Co-researcher 1, who did not seem to want to stop when talking about language issues in education, stated further:

> The only problem, however, is that the story was a bit too long for some of the learners. Hence, towards the end of the story, those who had a shorter attention span seemed to lose interest.

Probed further about his stance on language issues in education and the role played by education in modern society, Co-researcher 1 said

> English has an important role to play in modern society, however, but this should not get precedence over their own mother tongue. If we are not careful, Indigenous languages will become extinct and all the wisdom that Africans have acquired over the years through their languages, will disappear.

Co-researcher 1 stated further:

> It is not true that proficiency in English will automatically lead to proficiency in mathematics or other subjects. Furthermore, it is also important to remember that South Africa has become more multilingual than ever before, hence it may not be always possible to focus only on using isiXhosa in the classroom.

Co-researcher 1 claimed that a study he conducted for his honours degree had shown beyond reasonable doubt that:

> If learners master their own language first, it will be easy for them to learn other languages. . . . Learners understand mathematics better when we teach it in isiXhosa, their mother tongue. They participate more in the lesson if we teach mathematics in their mother tongue. They find it easy to give their own examples from their own backgrounds if we speak isiXhosa in class. This ensures that they understand mathematical concepts better.

The two co-researchers had strong views about teaching strategies used in their schools:

> Children find it difficult to understand the maths jargon. (Co-researcher 2)
>
> Are you surprised they are lost and do not understand the mathematical concepts? (Co-researcher 1)

In fact, the CAPS document itself should be written in the mother tongue. Learners can learn better if a firm foundation is formed where learners learn in their mother tongue. Children get bored easily when English is used instead of isiXhosa. Other countries that use their mother tongues as media of instruction have excelled in mathematics. Right here at home, Afrikaans learners who learn mathematics through their mother tongue have also produced excellent mathematics results over the years.

Children's Constitutional Rights

Several views on this emerged from the discussion with the teachers participating in the study:

> We have 11 official languages in South Africa and all of them are equally important. Why must people be taught mathematics in a foreign language? (Co-researcher 1)
>
> We are facing a dangerous situation here. These Indigenous languages might end up becoming extinct or will be so transformed that they might not be usable as media of instruction and yet it is their constitutional right to be taught in their own language. (Co-researcher 2)
>
> It is the role of the state to make sure that these languages do not just continue to exist but are also developed in various ways. Everyone is equal before the law, and nobody deserves to have their rights trampled upon. Section 29 of the Constitution of the Republic of South Africa states quite categorically, that everyone needs to have their language respected. (Co-researcher 1)
>
> Letting learners use their language gives them a sense of pride which will certainly have an impact on their performance in class. All children deserve to be taught in their mother tongue. (Co-researcher 1)

Cognitive and Emotional Benefits of Storytelling

With regards to the theme of the cognitive and emotional benefits of storytelling, the co-researchers said:

> Learners are usually excited about stories, as they seemed to be when listening to the story teachers read to them in class. They listened attentively as the story was being read or told to them. I like the trickiness of stories, the fact that you don't always know what is going to follow next because nothing is as it appears at face value. Stories really get them to think out of the box. Unlike teaching in the traditional classroom, where learners sometimes become tired of listening to the teacher going on and on about mathematics concepts that are not placed in any specific context. Hence, they find it difficult to connect to ideas presented in a foreign language. (Co-researcher 1)

> Many of the stories our grandparents told us made us laugh, sometimes they made us sad, and we would feel very sorry for a certain character in the story. Moreover, we would wonder why things were happening as they were unfolding in the story. For example, was the boy character treated so badly because he was an orphan, because he was Black or because he came from a poor family? (Co-researcher 2)

> When the older people told us stories it was always to teach us something. Sometimes the characters would be animals as is the case in a book such as *Animal Farm* by George Orwell, but there were always lessons that could be learned by children from the behaviour of those animals. Examples of such stories were *uDyakalahle noMvolf* [The Jackal and the Wolf] and many others such as Goldilocks and the Three Bears told in isiXhosa. The fact that I still remember those stories up to this day, shows the power of stories told in your language, from a pedagogical point of view. I have forgotten many of the mathematical ideas that were taught to me by my teachers, when using the traditional, teacher-dominated lecture approach. (Co-researcher 2)

Pedagogical Role of Stories in Traditional African Communities

Regarding this theme, the Co-researcher 1 had the following to say:

> Our grandparents always used stories to teach us very important lessons about life and to warn us about some of the dangers we would face when we were older. Mathematical stories help the learners to have an enquiring mind and to think out of the box. *Ityala Lama Wele* is an example of a book that required high levels of critical thinking [This book was written by Samuel Edward Krune Mqhayi and published in 1914, by the Lovedale Press]. The stories were told to us in our own language. I am convinced that if they were told in a different language, they would not have had the same appeal.

Discussion and Recommendations

The discussion of the current study was conducted according to the four themes that emerged during the unstructured interview with the participants who also assumed the role of co-researchers. This was followed by recommendations for each theme for the way forward regarding the use of storytelling as a strategy for mathematics teaching and learning.

The two co-researchers confirmed the importance of the mother tongue as a medium of instruction in underperforming Quintiles 1–3 schools in South Africa. This view is strongly supported by Sherwood and Makar (2024) who emphasised the close relationship that exists between mathematics teaching and language teaching. Moreover, these authors preferred the mother tongue as medium of instruction, not merely because the learner's own language helped them make sense of mathematics, but because being

taught through your mother tongue results in more robust learning. Moreover, learning in your mother tongue results in better understanding of mathematics concepts. Mother-tongue instruction is closely related to Bruner's (1985) narrative mode, which centres on context and the human element. Stories told in the mother tongue will help to connect learners' experiences with new mathematics information to create meaning (Bruner, 1985).

Bruner's (1985) theory emphasised narrative as a mode of thought that constructs reality through stories that are compelling and emotionally true. The participating teachers dispelled the notion that using a foreign language as a medium of instruction resulted in better acquisition of the foreign language. On the contrary, teaching and learning in the mother tongue made acquisition of a second language easier. While the teachers had strong views about the use of the mother tongue as a medium of instruction in mathematics classrooms, they admitted that English had an important role to play in modern society. Perhaps both the mother tongue and English could be used (translanguaging) to teach mathematics in Quintiles 1–3 schools. However, translanguaging can only be effective if sufficient training of teachers is implemented. The issue is when and how each one of the two languages would be used in the classroom. A similar study conducted by Sultana and Fang (2024) in China revealed that teachers could face significant challenges in communicating their mindset and values if they were to teach in a language other than their mother tongue.

There was also a strong feeling amongst the participants that teaching learners using a foreign language as a medium of instruction is tantamount to violating their constitutional rights—"Why must children be taught in a foreign language?" they asked. The dilemma that the teachers faced, in the same way that most people do, is whether epistemological access that resulted from mother-tongue instruction should be prioritised over the dominance of the English language in the modern world. One of the teachers said during the unstructured interview: "English has an important role to play in modern society." Clearly, there are some advantages to learning mathematics, or any other subject for that matter, in your mother tongue. However, the argument for the acquisition of strong English skills in the 21st century is equally convincing.

Storytelling has significant cognitive benefits for the learners, according to the teachers who participated in the study. Co-participant 1 referred to the "trickiness of stories" during the unstructured interview. Probed further about this statement they said: "Stories really get them to think out of the box." Cochrane (2023) claimed that stories impart critical thinking skills and can be used to transmit knowledge.

A study carried out by Sarıca (2023) suggested that there is a relationship between storytelling and emotions in the educational context. Similarly, Medne (2023) noted the effectiveness of storytelling as a form of support for promoting students' emotional well-being. The emotional impact of storytelling is

confirmed by the teachers' statements during the unstructured interview in the current study. For example, one participant referred to learners being "excited about stories" and the fact that "stories evoke feelings within us." One participant stated: "Stories told to us by our parents and grandparents made us laugh and sometimes cry." Hence, this seems to be an important, yet missing, element of the education scenario in our schools.

In African communities, storytelling has always been used as an engagement strategy. Not only do the teaching and learning strategies employed by educators need to be relevant, but they should offer them some practical connection to what they already know (Hughes et al., 2024). Storytelling has the potential to achieve this goal according to the research participants of the current study. It is therefore recommended that teachers incorporate strategies that are based on an African context when teaching mathematics to isiXhosa learners, especially in Quintiles 1–3 schools. One way of doing this is by utilising storytelling in the mother tongue as a pedagogical strategy.

Clearly, stories based in an everyday life context in the learners' mother tongue, results in better comprehension of mathematical concepts. However, if the story is too long, learners in a lower grade might get bored and hence no effective learning would take place. Every child has a constitutional right to be taught mathematics in their mother tongue through stories based in their context, because such stories have both cognitive and emotional benefits.

Stories are not just fun to listen to; they also encourage better retention of what is being taught. Those that are told in the mother tongue are more meaningful than those taught in a foreign language. Storytelling has always been used as a pedagogical strategy to instil good values and to create awareness of the world in traditional African communities. Moreover, it helps learners develop an enquiring mind and to think out of the box. Because of the important role that English plays in the 21st century, translanguaging might be the way to go. However, professional development to guide teachers on how to use two or more languages in one classroom is essential.

Conclusion

To decolonise the curriculum in South Africa, we should not lose sight of the position that English occupies the language of trade and commerce in the modern world. At the same time, we should always prioritise epistemological access through mother-tongue instruction or translanguaging in largely familiar mathematics education contexts. In this way, we observe the learner's constitutional rights. Based on the statements of the teachers participating in the study and recent available literature, utilising storytelling as a pedagogical strategy in mathematics could yield significant educational benefits, which could lead to

better retention of mathematical concepts, enhanced enjoyment of the subject, and the development of an enquiring mind, amongst other benefits.

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