Exploring Mathematics Teachers' Attitudes towards Indigenizing Pedagogies in Mathematics Education in Southern Province, Kalomo; Zambia

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ABSTRACT

This research study aimed to investigate the attitudes of mathematics teachers towards indigenizing pedagogies in mathematics education in the Southern Province of Kalomo, Zambia. The study employed a pragmatic approach, which is suitable for mixed methods research as it focuses on using the most effective methods to answer the research questions. This approach allows for a flexible combination of both quantitative and qualitative methods. The study also utilized a Sequential Exploratory Design, starting with quantitative data collection and analysis, followed by qualitative data collection and analysis. This design is particularly useful when the research is in an exploratory phase and aims to understand a phenomenon in-depth before quantifying.

The study was grounded in pragmatism and involved a total of 343 participants, including 55 mathematics teachers and 271 Grade 12 pupils. while the qualitative component involves 17 participants from community members, the District Education Board Secretary's office, and school administrators. Various data collection methods were employed, including surveys, interviews, focus group discussions, observations, and document analysis. The collected data were analyzed using descriptive and inferential statistics, which were validated through a pilot study and reliability assessment using Cronbach's Alpha.

The results of the study indicated that teachers in Kalomo District favored indigenized teaching methods in mathematics education. This finding is significant as it highlights the potential of indigenizing pedagogies in enhancing educational quality in Zambia. The study emphasized the impact of indigenized pedagogies on student engagement, performance, and cultural identity. Specifically, the findings revealed that students were more engaged and performed better when taught using indigenized pedagogies. This suggests that incorporating local cultural knowledge and practices into mathematics education can lead to more meaningful learning experiences for students.

Furthermore, the study underscored the importance of curriculum reform, teacher training, collaboration with local communities, and interdisciplinary cooperation for a comprehensive indigenized mathematics curriculum. These findings support the global movement towards recognizing diverse knowledge systems in education, promoting culturally inclusive pedagogies, and ensuring equitable educational experiences. The study provides valuable insights for policymakers, curriculum developers, and educators in Zambia and other countries seeking to incorporate indigenous knowledge and practices into their mathematics education systems. These findings have implications for educational policies and practices, supporting the global movement towards culturally inclusive pedagogies and equitable educational experiences.

Keywords: Indigenizing pedagogies, Mathematics education, Attitudes of mathematics teachers, Cultural identity

INTRODUCTION

In the Southern Province of Zambia, Kalomo District, mathematics education is undergoing a transformative

shift towards indigenizing pedagogies. Indigenizing pedagogies involve incorporating local cultural knowledge and practices into the teaching and learning of mathematics. This approach aims to enhance educational quality, student engagement, performance, and cultural identity. However, the attitudes of mathematics teachers towards these pedagogies play a crucial role in their successful implementation.

Imagine a mathematics classroom in Kalomo District, where students are actively engaged in learning mathematical concepts through culturally relevant examples and activities. The teacher seamlessly integrates local traditions, customs, and language into the lessons, making mathematics more relatable and meaningful to the students. This real-world example illustrates the potential impact of indigenizing pedagogies in mathematics education.

To understand the attitudes of mathematics teachers towards indigenizing pedagogies in Kalomo District, this research study aims to investigate their perspectives. The study explored the teacher's attitudes towards indigenizing mathematics pedagogies and practices in teaching mathematics, with a focus on the Southern Province of Kalomo, Zambia.

The existing literature provides valuable insights into the indigenization of education and mathematics pedagogy. Studies have highlighted the significance of teachers' content knowledge and pedagogical content knowledge for high-quality instruction and student progress in mathematics (Baumert et al., 2010). Additionally, research has emphasized the need to address gaps in teachers' knowledge and experiences related to Indigenous pedagogies (Funk & Woodroffe, 2023). Indigenous teachers' experiences with designing and implementing culture-based mathematics activities have also been explored (Nutti, 2013).

However, there is a gap in the existing literature regarding the attitudes of mathematics teachers towards indigenizing pedagogies specifically in the Southern Province in Kalomo, Zambia. This research aims to fill this gap by providing a comprehensive understanding of the attitudes of mathematics teachers in this specific context. By comparing and contrasting the findings of this study with existing research, we can gain insights into the unique challenges and opportunities faced by mathematics teachers in Kalomo District.

The main argument and contribution of this research study is to investigate the attitudes of mathematics teachers towards indigenizing mathematics pedagogies and practices in teaching mathematics in the Southern Province in Kalomo, Zambia. By exploring the perspectives of mathematics teachers, this study aims to provide empirical evidence on the feasibility and effectiveness of indigenizing pedagogies in enhancing educational quality, student engagement, performance, and cultural identity.

This research study addresses the gap in the existing literature by examining the attitudes of mathematics teachers towards indigenizing pedagogies in the Southern Province of Kalomo, Zambia. By investigating their perspectives and preferences, this study contributes to the understanding of the potential ways of indigenizing mathematics pedagogies and practices in teaching mathematics. The findings of this research would inform educational policies and practices.

Statement of the Problem

Despite the growing recognition of the importance of indigenizing pedagogies in mathematics education, there is a lack of research specifically examining the attitudes of mathematics teachers towards these pedagogies in the Southern Province of Kalomo, Zambia. While existing literature has explored the significance of teachers' content knowledge and pedagogical content knowledge for high-quality instruction in mathematics, there is a need to understand how mathematics teachers perceive and engage with indigenizing pedagogies in their teaching practices. Furthermore, studies have highlighted the potential of indigenizing education to enhance cultural relevance and student engagement, but there is limited empirical evidence on the attitudes of mathematics teachers towards these pedagogies in the specific context of

Kalomo District (Funk & Woodroffe, 2023).

This research study aims to address this gap in the literature by investigating the attitudes of mathematics teachers towards the potential ways of indigenizing mathematics pedagogies and practices in teaching mathematics in the Southern Province of Kalomo, Zambia. By exploring the perspectives of mathematics teachers, this study sought to provide empirical evidence on the feasibility and effectiveness of indigenizing pedagogies in enhancing educational quality, student engagement, performance, and cultural identity. The findings of this research would contribute to the understanding of the attitudes of mathematics teachers towards indigenizing pedagogies in Kalomo District and inform educational policies and practices in the region.

This research study aims to investigate the attitudes of mathematics teachers towards the potential ways of indigenizing mathematics pedagogies and practices in teaching mathematics in the Southern Province of Kalomo, Zambia.

Research Objectives

This research aims to:

1. investigate the attitudes of mathematics teachers towards indigenizing mathematics pedagogies and practices in teaching mathematics Top of FormTop of Form

Research Question

To address the above objective, this research sought to answer to the following key questions:

1. What are the attitudes of mathematics teachers towards indigenizing mathematics pedagogies and practices in teaching mathematics Top of Form Top of Form?

LITERATURE REVIEW

The literature reviewed explores the multifaceted dimensions of indigenizing pedagogies in mathematics education, with a specific focus on the state of mathematics education in Zambia. The article delves into the teachers' attitudes towards the integration of indigenous knowledge and pedagogical approaches, the impact of cultural context on mathematics education, and the consequences of different pedagogical strategies on student performance and learning outcomes. It also critically examines the existing policy and curriculum frameworks related to indigenizing pedagogies in mathematics education in Zambia and highlights gaps in the current body of literature.

Indigenizing Pedagogies in teaching Mathematics Education

Indigenizing pedagogies in mathematics education is a concept that has gained attention in the field of education. It involves incorporating Indigenous knowledge, perspectives, and ways of learning into the teaching and learning of mathematics. This approach recognizes the importance of cultural relevance and the need to create inclusive and equitable learning environments for Indigenous students. One study by Brant (2014) explores the tensions faced by Indigenous learners in mainstream education and emphasizes the significance of decolonizing education. The author highlights the need for Indigenous students to have their own space and sense of place within the educational system. This aligns with the goal of indigenizing pedagogies, which aims to create educational experiences that are culturally responsive and affirming for Indigenous students.

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Another study by Biermann and Townsend-Cross (2008) discusses the challenges and potential solutions for incorporating Indigenous pedagogy into education. The authors highlight the importance of going beyond the classroom and integrating Indigenous pedagogy into various educational settings. This aligns with the idea of indigenizing pedagogies in mathematics education, as it emphasizes the need to incorporate Indigenous ways of knowing and learning into the teaching of mathematics.

The concept of culturally responsive pedagogy is also relevant to indigenizing pedagogies in mathematics education. Boon and Lewthwaite (2015) developed an instrument to measure culturally responsive pedagogy and found that it is a unidimensional latent trait. This suggests that culturally responsive pedagogy can be a key component of indigenizing pedagogies in mathematics education, as it involves adapting teaching practices to meet the cultural and linguistic needs of Indigenous students.

Furthermore, the study by Gillispie (2021) discusses the importance of culturally responsive language and literacy instruction for Native American children. The author emphasizes the need to combine evidence-based reading instruction with cultural-based educational practices. This aligns with the goals of indigenizing pedagogies in mathematics education, as it highlights the importance of integrating Indigenous culture and language into the teaching of mathematics.

Indigenizing pedagogies in mathematics education involves incorporating Indigenous knowledge, perspectives, and ways of learning into the teaching and learning of mathematics. This approach recognizes the importance of cultural relevance and aims to create inclusive and equitable learning environments for Indigenous students. The literature supports the significance of decolonizing education, going beyond the classroom, and integrating culturally responsive pedagogy in order to achieve the goals of indigenizing pedagogies in mathematics education.

State of Mathematics Education in Zambia

In Zambia, particularly in the Southern Province and Kalomo, the state of mathematics education is influenced by various factors. One of the recent challenges faced in mathematics education is the impact of the COVID-19 pandemic and the subsequent school closures. A study by Mukuka et al. (2021) investigated the experiences of secondary school students with remote learning during the COVID-19 school closure. The study highlighted the challenges associated with remote learning, including limited access to resources and difficulties in understanding mathematical concepts without face-to-face interaction. These findings have implications for mathematics education in the region, as they highlight the need for effective strategies to support remote learning and address the learning gaps caused by the pandemic.

In terms of curriculum frameworks, the integration of mathematics and science education has been a focus in Zambia. Huntley (2018) discusses the design and implementation of a framework for defining integrated mathematics and science education. The framework aims to provide clarity and coherence in the teaching of mathematics and science, promoting interdisciplinary connections and real-world applications. This integrated approach to mathematics education can enhance students' understanding and engagement with the subject. However, there are also challenges specific to mathematics education in Zambia. A study by Malambo et al. (2018) examined the case of Zambian mathematics education students and identified issues within the education system. The study highlighted issues such as inadequate teacher training, limited resources, and a lack of support for students with learning difficulties. These challenges can impact the quality of mathematics education and hinder students' learning outcomes.

The state of mathematics education in Zambia, particularly in the Southern Province and Kalomo, is influenced by various factors. The COVID-19 pandemic has posed challenges for remote learning in mathematics education. The integration of mathematics and science education has been a focus in curriculum

frameworks, aiming to promote interdisciplinary connections. However, there are also challenges such as inadequate teacher training and limited resources that need to be addressed to improve the quality of mathematics education in the region.

Teachers' Attitudes towards indigenizing pedagogies in Mathematics Education.

Teachers' attitudes towards pedagogical approaches, particularly indigenizing pedagogies, are influenced by various factors. One factor that influences teachers' attitudes is their prior knowledge and beliefs about teaching (Watzke, 2007). Teachers' attitudes towards control in the classroom and their instructional goals for daily lessons also play a role in shaping their pedagogical approaches (Watzke, 2007). Additionally, teachers' attitudes towards the integration of migrant students and their cultural understandings can impact their attitudes towards indigenizing pedagogies (Biasutti et al., 2021; Funk & Woodroffe, 2023).

There are studies that explore changes in teachers' attitudes over time. For example, a study found that pre-service teachers' pedagogical beliefs changed over the course of their teacher education program (Biasutti et al., 2021). Another study investigated the impact of presenting communicative traits of writing through cooperative learning on trainee teachers' pedagogical knowledge and attitudes towards a 'traits of writing' approach (Hussien, 2020). The results showed that the intervention had a positive impact on the trainee teachers' pedagogical knowledge and attitudes.

Furthermore, teachers' attitudes towards the implementation of innovative technologies in schools can also influence their pedagogical approaches. Research has shown that teachers' attitudes towards change and their technological-pedagogical content knowledge are positively correlated (Avidov-Ungar and Eshet-Alkalai, 2011). Similarly, teachers' openness to change and their attitudes towards ICT can support pedagogical changes (Blau and Peled, 2012).

Teachers' attitudes towards pedagogical approaches, including indigenizing pedagogies, are influenced by factors such as prior knowledge, beliefs about teaching, attitudes towards control in the classroom, instructional goals, attitudes towards the integration of migrant students, and attitudes towards the implementation of innovative technologies. There are studies that explore changes in teachers' attitudes over time, indicating that attitudes can be influenced and modified through various interventions and experiences. Understanding these factors and changes in attitudes is crucial for promoting effective pedagogical practices and supporting teachers in their professional development.

Impact of Cultural Context and Indigenous Knowledge on Mathematics Education

The cultural context has a significant impact on mathematics education. Several studies have explored the integration of indigenous knowledge into the curriculum to make mathematics more relevant and meaningful for students. One study by Utami et al. (2021) highlights the importance of incorporating indigenous contexts into mathematics education. It suggests that culturally relevant pedagogy can support learning among indigenous students by leveraging their indigenous knowledge, which naturally facilitates understanding and meaningful learning of mathematics.

Similarly, Lestari et al. (2018) discuss the development of learning materials based on realistic mathematics education (RME) with the Malay culture context. This approach aims to improve students' mathematical communication ability and self-efficacy while increasing their knowledge about their culture. The authors argue that integrating the local cultural context into mathematics learning can have positive effects on students' communication skills, motivation, and cultural awareness.

Incorporating indigenous students' values, beliefs, and traditions into mathematics education is also

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emphasized in the study by (Han, 2019). The author suggests that by incorporating indigenous students' cultural perspectives, educators can enhance their interest and enjoyment in learning mathematics. This approach not only promotes cultural inclusivity but also helps to make mathematics more engaging and relevant for indigenous students.

Furthermore, the study by Mendrofa et al. (2022) explores mathematics learning based on multicultural education. It argues that integrating multicultural values into mathematics education can optimize learning achievement while fostering awareness, understanding, tolerance, and mutual understanding among students. By inserting various Indonesian cultural content and contexts into learning activities, mathematics education can become more culturally situated and meaningful for students.

Overall, these studies highlight the importance of integrating indigenous knowledge and cultural contexts into mathematics education. By doing so, educators can make mathematics more relevant, engaging, and meaningful for students, particularly those from indigenous or diverse cultural backgrounds.

Impact of different pedagogical approaches on student performance and learning outcomes in mathematics

There is indeed research on the impact of different pedagogical approaches on student performance and learning outcomes in mathematics. Several studies have explored this topic and provided valuable insights. One study by Hardman (2019) reviewed studies conducted between 2008 and 2018 to investigate the impact of using Information and Communication Technologies (ICTs) as teaching tools in mathematics. The findings indicated that student achievement in mathematics can be positively impacted using technology, depending on the pedagogical practices employed by teachers. It was noted that technology alone does not have a significant impact on student attainment.

Another study by Verschaffel et al. (2019) focused on meta-cognitively oriented ICT-based learning environments for mathematics. The authors emphasized the need for more research attention to the affective and motivational aspects of mathematics learning. They found that studies investigating the effect of ICT or metacognitive pedagogy on motivational-affective outcomes in mathematics were rare, despite the well-documented problems in this area.

Hall and Miro (2016) conducted a study to investigate the effectiveness of innovative approaches to STEM education, including mathematics, on student achievement and interest in STEM careers. They found that introducing a mathematics-infused engineering and technology education curriculum had a significant positive effect on students' mathematics performance. The students who participated in the curriculum viewed mathematics as more important and interesting compared to the control group.

Nolan (2011) explored the field of mathematics teacher education and the impact of different pedagogical approaches. The study focused on producing more egalitarian classrooms, enhancing pedagogical effectiveness through inquiry-based approaches, and encouraging the development of reflective practitioners. The research aimed to learn from prospective secondary mathematics teachers as they construct and are constructed by official pedagogical discourses embedded in mathematics classrooms.

Tambunan (2021) investigated the impact of mathematical resilience and teacher performance in building mathematical literacy on student learning outcomes in mathematics. The study found that mathematical resilience is related to learning outcomes, and the teacher's performance in building mathematical literacy has a high impact on students' mathematical resilience and, consequently, their learning outcomes.

The research indicates that different pedagogical approaches can have varying impacts on student

performance and learning outcomes in mathematics. The use of technology, metacognitive pedagogy, innovative STEM education approaches, and building mathematical resilience and literacy through effective teaching practices have been shown to positively influence student achievement and interest in mathematics.

Policy and Curriculum on Indigenizing pedagogies in mathematics education in Zambia

Indigenizing pedagogies in mathematics education in Zambia are influenced by various policies, guidelines, and curriculum documents. The analysis of relevant references provides insights into the support or hindrance of indigenizing pedagogies in the Zambian context.

Serpell (2011) highlights that the curriculum of institutionalized public basic schooling in Zambia primarily focuses on the cultivation of knowledge and cognitive skills, neglecting the social responsibility dimension of intelligence. This suggests that the current curriculum may hinder the implementation of indigenizing pedagogies that emphasize the integration of indigenous knowledge and values into mathematics education.

On the other hand, the education policy document "Educating our Future" (1996) and the Education Act (2011), Kapalu (2020) in Zambia support the education of persons with disabilities, including learners with learning disabilities. While this reference does not directly address the implementation of indigenizing pedagogies, it indicates a commitment to inclusive education, which could potentially create an environment conducive to the integration of indigenous perspectives in mathematics education.

The study by Malambo et al. (2018) focuses on the difficulties experienced by Zambian mathematics education students in explaining and justifying their reasoning. Although this study does not explicitly discuss indigenizing pedagogies, it suggests a need for the development of effective teaching strategies that can enhance students' understanding and reasoning abilities. Indigenizing pedagogies could potentially contribute to addressing these challenges by incorporating culturally relevant examples and contexts in mathematics instruction.

The comparative review of literature by Busaka et al. (2021) examines the integration of soft skills in mathematics curricula in Kenya, Rwanda, and Zambia. While the focus is not specifically on indigenizing pedagogies, the review highlights the acknowledgment of mathematics as a subject in which soft skills should be integrated. This recognition of the importance of holistic development aligns with the principles of indigenizing pedagogies, which emphasize the integration of indigenous knowledge, values, and skills in education.

The analysis of the relevant references suggests that the current mathematics education policies, guidelines, and curriculum documents in Zambia may have both supportive and hindering aspects for the implementation of indigenizing pedagogies. While the curriculum primarily focuses on cognitive skills and knowledge acquisition (Serpell, 2011), there are indications of support for inclusive education Kapalu (2020) and the integration of soft skills in mathematics education (Busaka et al., 2021). However, there is a need for further research and policy development specifically addressing the integration of indigenous knowledge and perspectives in mathematics education in Zambia.

Cross-Cultural Comparative Studies on Pedagogical Approaches in Mathematics Education

Cross-cultural comparative studies in mathematics education aim to examine the effectiveness of different pedagogical approaches across diverse cultural contexts. These studies shed light on the impact of cultural factors on teaching and learning mathematics and provide insights into how to design more effective instructional strategies. One study by Krain et al. (2014) explores the potential for cross-national pedagogical innovations in international studies. The authors identify three critical themes: culture and cross-

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national education, collaboration across contexts, and the need for systematic assessment. This study emphasizes the importance of considering cultural differences when designing pedagogical approaches in mathematics education.

Artemeva and Fox (2011) conducted a study that examined the central pedagogical genre of the undergraduate mathematics lecture classroom across different linguistic, cultural, and educational backgrounds. They found that pervasive pedagogical genres, such as writing out a mathematical narrative on the board while talking aloud, override local differences across contexts of instruction. This suggests that certain pedagogical approaches may be effective across diverse cultural contexts.

Arani (2016) conducted a comparative analysis of a seventh-grade mathematics lesson in Iran and Japan, focusing on the oral teaching tradition in Iran and the literal teaching tradition in Japan. The study employed qualitative research methods, including cross-cultural lesson analysis meetings and semi-structured interviews. The findings highlight the importance of understanding and considering different teaching traditions in different cultural contexts.

Blömeke et al. (2017) conducted a study in the United States that examined the relationship between preschool teacher education and preschool teachers' knowledge in mathematics. The study found that domain-specific opportunities to learn mathematics during teacher education programs were scarce, indicating a need for more focused and culturally responsive mathematics education training for teachers.

Nielsen et al. (2008) discuss culturally responsive mathematics pedagogy through complexivist thinking. They argue for the inclusion of historical approaches that examine specific mathematical knowledge and practices of different cultural groups within a given society. This approach challenges traditional western knowledge structures and aims to empower all students through the development of mathematical understanding.

FitzSimons and Boistrup (2017) propose a model for an educational context that promotes collaboration between vocational subject areas and mathematics. The model emphasizes the re-contextualization of mathematics in vocational settings and highlights the need for mathematics teachers to become familiar with vocational knowledge objects. This approach recognizes the importance of integrating mathematics into real-world contexts and cultural practices.

The cross-cultural comparative studies in mathematics education provide valuable insights into the effectiveness of different pedagogical approaches across diverse cultural contexts. These studies emphasize the importance of considering cultural factors, understanding different teaching traditions, and promoting collaboration between subject areas to enhance mathematics education. By incorporating culturally responsive pedagogical strategies, educators can create more inclusive and effective learning environments for students from diverse cultural backgrounds.

Gaps in the Literature Reviewed

The research on Exploring Mathematics Teachers' Attitudes Towards Indigenizing Pedagogies in Mathematics Education in Southern Province, Kalomo; Zambia appears to be a valuable contribution to the field of mathematics education with a focus on indigenous pedagogies. However, there are several research gaps and connections that can be identified when comparing this study to other related research studies.

All the studies emphasize the influence of teachers' attitudes and beliefs on pedagogical approaches. However, there is a need to bridge the gap by investigating how specific teacher attitudes and beliefs influence their acceptance and adoption of indigenizing pedagogies specifically. What are the key factors

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that shape teachers' attitudes toward integrating indigenous knowledge into mathematics education? While other studies align with the goals of indigenizing pedagogies, there's a gap in understanding how language plays a role in indigenizing mathematics education in different cultural contexts. A research gap exists in understanding how sustained professional development and training programs might influence teachers' attitudes towards indigenizing pedagogies in mathematics education in Zambia.

In summary, while the studies reviewed contributes to our understanding of indigenizing pedagogies in mathematics education, there are several research gaps and opportunities for further exploration, including the intersection of culturally responsive and indigenizing pedagogies, the role of language, technology integration, policy alignment, and the practical strategies for incorporating indigenous knowledge into math instruction in diverse cultural contexts. Top of Form

METHODOLOGY

Research Design

The study used a Sequential Exploratory Design which allows for collection and analysis of qualitative and quantitative data in two distinct phases. In a Sequential Exploratory Design, the initial quantitative phase is followed by a. qualitative phase This design is particularly useful in research when the phenomenon under investigation is not well understood or when there is limited existing literature. The first quantitative phase involves collecting numerical data to test and validate the theories or hypotheses generated. The findings from this phase then inform the design of the qualitative phase.

Study population

The study population consists of mathematics teachers in Kalomo District, selected through a purposive sampling procedure. The selection criteria for the participants include their experience and expertise in teaching mathematics, as well as their willingness to participate in the study. By selecting mathematics teachers who are actively involved in the teaching of mathematics in Kalomo District, the study aims to capture a representative sample of the population and gain insights into their attitudes towards indigenizing pedagogies.

The study involved a diverse set of participants, carefully selected to ensure comprehensive coverage of perspectives within the research context. The quantitative sample size was N=326, consisting of 55 mathematics teachers and 271 Grade 12 pupils. The qualitative Sample involved in the study was (N=17): A selection of community members was included to provide a community perspective on the integration of indigenous pedagogies. The District Education Board Secretary's office was represented to offer insights into the institutional perspective. School administrators were included to understand the viewpoint of those responsible for educational administration at the school level. The participants' characteristics and roles were diverse, to ensure that the study captures a broad range of perspectives related to indigenous mathematics education.

Data collection methods

Data collection methods used in this study encompass a variety of approaches to gather rich and comprehensive data. Lewis (2015) argues that data collection methods are an essential component of research, as they determine how data is gathered and provide the basis for analysis and interpretation. Quantitative data was collected through structured questionnaire surveys administered to mathematics teachers and Grade 12 pupils. These surveys included closed-ended questions to quantify participants' perceptions, experiences, and attitudes toward indigenous pedagogies.

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Qualitative data was gathered through in-depth interviews with community members, the DEBS representative, and school administrators. These semi-structured interviews allowed for open-ended discussions and exploration of participants' perspectives. Focus group discussions were conducted with selected participants to facilitate group dynamics and elicit collective insights. Observations of mathematics classes were carried out to assess the practical implementation of indigenous pedagogies and to observe the level of student engagement and participation in these classes. Relevant documents, including curriculum materials, policy documents, and educational resources were analyzed to provide contextual information and support the interpretation of findings.

Data analysis

Zhang and Ramos (2023) contends that data analysis in a quantitative study involves the systematic examination and interpretation of numerical data collected during the research process. It aims to uncover patterns, relationships, and trends within the data to answer research questions or test hypotheses. Data analysis involves systematic procedures to make sense of the collected data. The quantitative data from the surveys was subjected to descriptive statistical analysis. This involved calculating measures such as mean, and frequency distributions to summarize and interpret quantitative findings. Various statistical tests such as t-tests, and ANOVA were used to analyze quantitative data.

Reeping et. al (2019) articulates that data analysis in a qualitative study involves the systematic examination and interpretation of non-numerical data collected through interviews, focus group discussions, and document analysis. The study used reflexive thematic analysis to analyze the qualitative data. Reeping et. al (2019) states that thematic analysis is a commonly used approach in qualitative data analysis, which involves identifying patterns, themes, and categories within the data. This process involved identifying recurring themes, patterns, and narratives within the qualitative data, allowing for a deeper understanding of participants' perspectives and experiences.

Credibility, reliability, and trustworthiness

Creswell and Plano (2017) argues that credibility, reliability, and trustworthiness stand as paramount considerations when evaluating the quality and validity of data derived from a mixed methods study. Credibility, at its core, pertains to the degree to which the data can be deemed believable and authentic. In the context of this study, credibility received a significant boost through the deliberate utilization of multiple data sources and varied research methods, thereby establishing a triangulation of findings. By drawing from diverse perspectives and sources, the researcher succeeded in achieving convergence and consistency in the findings, thereby elevating the overall credibility of the study.

Johnson and Onwuegbuzie (2004) contends that trustworthiness, on the other hand, encompasses the concept of the data's integrity and dependability. Within the confines of this study, trustworthiness was bolstered through two pivotal avenues: transparency and reflexivity. Triangulation, recognized as a cornerstone strategy in mixed methods research, was instrumental in fortifying credibility, reliability, and trustworthiness. This method entails the deployment of multiple data sources, various research techniques, and a multitude of viewpoints to corroborate and substantiate findings. Through the process of comparing and contrasting distinct data types, the researcher was able to augment the study's overall validity and trustworthiness.

Tashakkori and Teddlie (2010) argues that reflexivity, as an integral component of trustworthiness, refers to the researcher's conscientious recognition of their personal biases, presumptions, and vantage points that could potentially exert influence on the research process. The researcher actively engaged in an ongoing practice of self-reflection and critical self-awareness to ensure that the inherent biases did not exert undues way over the data collection and analysis phases. This proactive approach bolstered the study's

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trustworthiness by acknowledging and proactively addressing potential sources of bias.

Morse (2015) emphasizes the importance of transparency in research, asserting that it plays a crucial role in establishing the credibility, reliability, and trustworthiness of data. To achieve transparency, researchers should offer clear and thorough explanations of their research design, data collection methods, and analytical approaches. This transparency allows readers to assess the study's rigor and validity, ultimately enhancing the trustworthiness of the data.

Ethical considerations

Ethical considerations play a pivotal role in every stage of this research. Participants were provided with clear, written information about the study's purpose, procedures, potential risks, and benefits. They were requested to provide voluntary, informed consent before participating. Participants' identities were protected through the use of pseudonyms, and all data were securely stored to ensure confidentiality. Given the cultural context of the research, cultural sensitivities and local protocols were observed during data collection and analysis to avoid any inadvertent harm or offense. The study aimed to benefit the local educational community by contributing to the improvement of mathematics education practices and promoting cultural inclusivity.

RESULTS AND DISCUSSION

This section presents the results and discusses the key findings of the study on mathematics teachers' attitudes towards the integration of indigenous pedagogies and practices into their instructional methods. In this section, we explored into the findings derived from our research and discuss the results following the research objective of this article, providing insights into the receptiveness of mathematics teachers to this pedagogical shift. Furthermore, we examined the challenges faced by educators and explore potential opportunities that arise from the incorporation of indigenous pedagogies and practices. The results were presented following the research object of the study.

The attitudes of mathematics teachers in Zambia towards the potential ways of indigenizing mathematics pedagogies and practices

The results presented in Table 1 provide insights into the views of participants regarding the attitudes of mathematics teachers in Zambia towards indigenizing mathematics pedagogies and practices. The table includes descriptive statistics such as the number of participants (N) and the mean scores for each item.

Table1 summarizes the results emerged from the participants using descriptive statistics.

Table 1: Views of participants on the attitudes of mathematics teachers in Zambia towards indigenizing mathematics pedagogies and practices

SN	Descriptive Statistics	N	Mean
1	I am familiar with the concept of indigenizing mathematics pedagogies and practices	55	3.44
2	Indigenizing mathematics pedagogies and practices in schools in Zambia is very important	55	3.95
3	I am willing to incorporate indigenous knowledge and practices into my mathematics lessons	55	4.15
4	Indigenizing mathematics pedagogies and practices can enhance students'cultural relevance and engagement in the subject	55	4.05

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5	Integrating indigenous mathematical knowledge can improve students' understanding and appreciation of the subject	55	4.13
6	I believe that indigenizing mathematics pedagogies and practices can contribute to students' academic achievement	55	3.98
7	Adopting indigenous perspectives in mathematics teaching can promote cultural diversity and inclusivity in the classroom	55	3.98
8	Incorporating indigenous mathematical knowledge can help students connect mathematics to their daily lives and experiences.	55	4.2
9	Indigenizing mathematics pedagogies and practices can enhance students' motivation and interest in learning mathematics	55	4.25
10	Including indigenous perspectives in mathematics teaching can foster a sense of pride and cultural identity among students.	55	4.00
11	The current mathematics curriculum in Zambia adequately reflects the cultural and historical context of the country	55	2.98
12	The current mathematics curriculum in Zambia adequately prepares students for the demands of the 21st century.	55	3.62
	Grand Mean	**55**	**3.894167**

Overall, the participants expressed positive attitudes towards indigenizing mathematics pedagogies and practices. The mean scores for items 2 to 10 ranged from 3.95 to 4.25, indicating a general agreement with the importance and benefits of incorporating indigenous knowledge and practices into mathematics lessons. These results suggest that the participants recognize the potential of indigenizing mathematics to enhance students' cultural relevance, engagement, understanding, appreciation, academic achievement, motivation, interest, and sense of pride and cultural identity.

Battiste (2013) argued that indigenizing teaching methods refers to the incorporation of indigenous knowledge, perspectives, and pedagogies into educational practices. This approach recognizes the importance of indigenous cultures, histories, and ways of knowing, and aims to create a more inclusive and culturally responsive learning environment. In recent years, there has been growing recognition of the advantages of indigenizing teaching methods. This article would show several key advantages of indigenizing teaching methods, drawing on scholarly literature and research.

The study revealed that teachers strongly support the use of indigenized teaching methods for mathematics education. This finding offers a promising opportunity to enhance math education in the region. However, it also underscores the need for increased awareness and education in this area to fully leverage the potential of indigenized pedagogies. There were several reasons given by the teachers as to why they supported the use of indigenized teaching methods for mathematics education.

Firstly, it makes education more pertinent to the local context, bridging the gap between abstract math concepts and students' daily lives. By incorporating traditional knowledge, cultural practices, and local examples into the math curriculum, it not only enhances engagement but also demonstrates the practical applications of math within their communities. Furthermore, indigenized teaching methods help students connect with their cultural heritage, bolstering their sense of identity and self-esteem.

The other advantage revealed as to why teachers supported the use of indigenized teaching methods for mathematics education was that Indigenizing teaching methods provide students with an opportunity to learn about their own cultural heritage and identity. Kovach (2010) argued that by incorporating indigenous knowledge and perspectives into the curriculum, students are able to see themselves reflected in the material being taught. This can lead to increased engagement, motivation, and a sense of pride in one's cultural heritage. Furthermore, indigenizing teaching methods empower indigenous students by validating their

knowledge and ways of knowing, which can contribute to improved self-esteem and academic success.

The participants supported the use of indigenous teaching methods because this approach promotes a deeper understanding of the subject matter and encourages critical thinking, problem-solving, and creativity.

Smith (2012) argued that Indigenous pedagogies often emphasize a holistic approach to learning, which recognizes the interconnectedness of all aspects of life. Indigenizing teaching methods incorporate experiential learning activities, such as storytelling, land-based learning, and community engagement, which allow students to engage with the material in a meaningful and hands-on way.

The other advantage revealed by the participants as to why they supported the use of indigenous teaching methods was that such methods provide an opportunity to address the historical and ongoing impacts of colonization on indigenous communities. Smith (2012) argued that by incorporating indigenous perspectives and histories, educators can challenge dominant narratives and promote a more accurate and inclusive understanding of history. This can help to counteract the erasure and marginalization of indigenous knowledge and contribute to the process of decolonization.

The participants supported the use of indigenous teaching methods because Indigenized teaching methods promote intercultural understanding and respect by fostering dialogue and collaboration between indigenous and non-indigenous students. By learning about indigenous cultures, histories, and ways of knowing, non-indigenous students can develop a greater appreciation for diversity and challenge stereotypes and prejudices. This can contribute to the development of more inclusive and equitable societies.

Moreover, these methods can strengthen the ties between schools and the local community. Parents and community members are more likely to get involved in their children's education when they see that the curriculum respects and values their culture, potentially leading to greater support for education initiatives and improved learning outcomes.

The study also points to the need for teacher training programs to enhance familiarity with indigenizing mathematics pedagogies. Workshops and training sessions can help educators better understand and implement these methods, including integrating local traditions, history, and ways of knowing into math lessons. Additionally, there is a call to revise the mathematics curriculum to include indigenized elements. Collaboration between curriculum developers, education authorities, local communities, and experts is crucial to creating a curriculum that aligns with the unique cultural context of Kalomo District. This may involve developing teaching materials, resources, and lesson plans that adhere to indigenized pedagogies.

These findings align with existing literature on the importance of culturally responsive pedagogy in mathematics education. Scholars argue that incorporating indigenous knowledge and practices can make mathematics more meaningful and relevant to students' lives, as well as promote cultural diversity and inclusivity in the classroom (Gay, 2010). The positive attitudes towards indigenizing mathematics pedagogies and practices in this study support the notion that teachers recognize the value of incorporating students' cultural backgrounds and experiences into their mathematics instruction.

However, the results also reveal some gaps and challenges in the current mathematics curriculum in Zambia. The mean scores for items 11 and 12 were relatively lower compared to the other items, indicating that participants felt that the current curriculum does not adequately reflect the cultural and historical context of the country (mean = 2.98) and does not sufficiently prepare students for the demands of the 21st century (mean = 3.62). These findings suggest a need for curriculum reform and the inclusion of more culturally relevant and future-oriented content in mathematics education in Zambia.

The implications of these results are significant for mathematics education in Zambia. They highlight the importance of promoting indigenization in mathematics pedagogies and practices to enhance students'

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engagement, motivation, and achievement in the subject. The findings also underscore the need for curriculum revision to ensure that it reflects the cultural and historical context of the country and prepares students for the challenges of the 21st century.

The results of this study indicate positive attitudes towards indigenizing mathematics pedagogies and practices among participants in Zambia. These findings align with existing literature on culturally responsive pedagogy in mathematics education. However, the results also reveal gaps in the current mathematics curriculum, suggesting a need for curriculum reform to better reflect the cultural context and prepare students for the future. These findings have important implications for mathematics education in Zambia and highlight the potential benefits of incorporating indigenous knowledge and practices into mathematics instruction.

The results presented in Table 2 show the students' views on the attitudes of mathematics teachers towards indigenizing mathematics pedagogies and practices. The table provides information on various constructs related to the teachers' willingness to adapt their teaching methods, their understanding of local cultural practices, their beliefs about the benefits of indigenous mathematical pedagogies, and the students' willingness to learn about indigenous mathematics and its integration into the curriculum.

Table 2 shows the descriptive statistics from students on their views over teachers' attitudes towards indigenizing the pedagogies and practices in the teaching of mathematics.

Table 2: Students' views on the attitudes of mathematics teachers towards indigenizing mathematics pedagogies and practices

SN	CONSTRUCT	N	Mean	Std
1	Teachers are willing to adapt their teaching methods to include indigenous knowledge and practices in mathematics education	271	3.56	1.055
2	Mathematics teachers have a good understanding of local cultural practices to effectively teach mathematics	271	3.45	1.143
3	Teachers believe that indigenous mathematical pedagogies can promote a sense of cultural identity and pride among students	271	3.35	1.164
4	Teachers believe that indigenizing mathematics pedagogies can improve students' overall academic performance in mathematics	271	3.76	1.132
5	I am willing and interested to learn about Indigenous mathematics and its integration into the mathematics curriculum	271	3.82	1.203
6	I am comfortable with incorporating Indigenous knowledge and ways of knowing into the mathematics curriculum	271	3.69	1.198
7	I am willing to learn mathematics using indigenous methods and practices	271	3.74	1.202
8	Indigenizing mathematics pedagogies and practices can benefit the academic success of local students	271	3.73	1.141
9	The integration of Indigenous mathematics into the curriculum can help foster a more inclusive and diverse learning environment	271	3.46	1.115
10	The use of indigenous mathematics pedagogies and practices can enhance my understanding of mathematics	271	3.65	1.085
	Grand Mean	271	3.621	1.1438

Overall, the mean scores for each construct range from 3.35 to 3.82, indicating a moderate level of agreement among the students. The construct with the highest mean score is "I am willing and interested to learn about Indigenous mathematics and its integration into the mathematics curriculum" (mean = 3.82), suggesting that students are open to incorporating indigenous knowledge into their mathematics education.

On the other hand, the construct with the lowest mean score is "Teachers believe that indigenous mathematical pedagogies can promote a sense of cultural identity and pride among students" (mean = 3.35), indicating a slightly lower level of agreement among the students.

These results have important implications for the field of mathematics education. They suggest that students recognize the potential benefits of indigenizing mathematics pedagogies and practices, such as promoting cultural identity and pride, improving academic performance, and creating a more inclusive and diverse learning environment. These findings align with previous research that has shown the positive impact of integrating indigenous knowledge in the curriculum, not only in mathematics but also in science education (Naidoo, 2021).

However, it is important to note that there are still some gaps between this study and other studies in the literature. For example, the study does not provide information on the specific indigenous knowledge and practices that students would like to see incorporated into their mathematics education. Further research could explore the specific cultural practices and knowledge that students find most relevant and meaningful in the context of mathematics learning.

Additionally, while the students express a willingness to learn about indigenous mathematics and its integration into the curriculum, it is unclear how this translates into actual classroom practices. Future studies could investigate the implementation of indigenizing mathematics pedagogies and practices in real classroom settings and examine their impact on students' learning outcomes.

The results of this study highlight the importance of considering students' perspectives and attitudes towards indigenizing mathematics pedagogies and practices. The findings suggest that students are open to incorporating indigenous knowledge into their mathematics education and recognize the potential benefits of doing so. However, further research is needed to explore the specific cultural practices and knowledge that students find most relevant and meaningful, as well as to investigate the implementation and impact of indigenizing mathematics pedagogies and practices in real classroom settings.

This section of the study explores into the qualitative results pertaining to the attitudes of mathematics teachers in Zambia towards potential ways of indigenizing mathematics pedagogies and practices. Below is a figure that summarized the themes that were generated during the study.

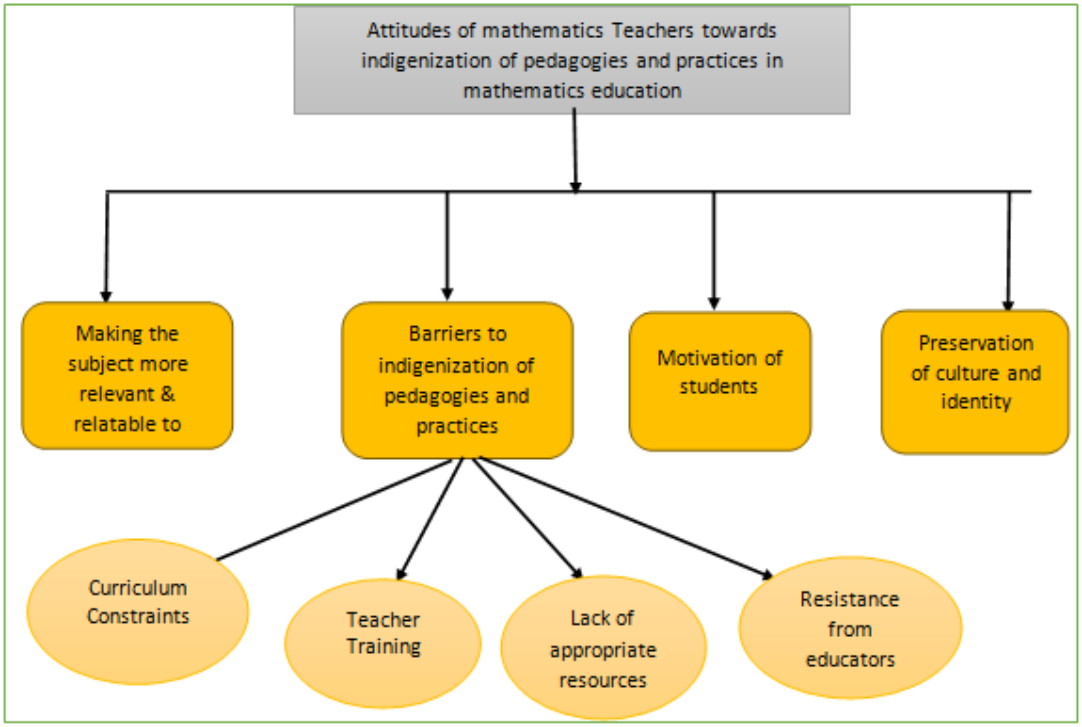

Figure 1: Themes generated from the attitudes of mathematics teachers towards indigenization of

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pedagogies and practices in mathematics education

The results presented in the qualitative analysis of the attitudes of mathematics teachers towards the indigenization of pedagogies and practices in mathematics education reveal several themes.

The first theme that emerged from the qualitative results was that of the perceptions of teachers towards the indigenization of mathematics teaching approaches. It was noted that most of the participants involved in the study demonstrated a positive attitude towards the potential ways of indigenizing mathematics pedagogies and practices in teaching mathematics.

One of the participants stated that he believed that indigenizing mathematics pedagogies was a crucial step towards making the subject more relevant and relatable to our diverse student population in the schools in Zambia.

Participant 4: *"incorporating indigenous knowledge and perspectives can foster a deeper understanding and appreciation for the subject among our students." "I've always been interested in exploring different teaching approaches. Indigenizing mathematics offers a chance to make the subject more engaging and meaningful to students who may struggle with its abstract nature."*

The majority of the participants in the study were willing and open to incorporate and explore new approaches in teaching mathematics. one the teachers had the following to support:

Participant 9 *stated that "Indigenizing mathematics teaching approaches is a fantastic idea! It's a way to break away from traditional Western-centric methods and foster cultural pride among our students. I'm excited to explore how we can integrate local knowledge and examples into our lessons."*

However, some of the participants were worried that indigenizing the teaching pedagogies could dilute the core mathematical concepts. As a result, these participants were for the idea of creating a balanced approach between preserving the integrity of the subject while acknowledging and appreciating the indigenous contributions.

Participant 4: *"I'm open to exploring new approaches in teaching mathematics, but I worry that incorporating indigenous elements might dilute the core mathematical concepts. We need to strike a balance between preserving the integrity of the subject while acknowledging and appreciating indigenous contributions."*

The first theme that emerged is the positive attitude of teachers towards indigenizing mathematics teaching approaches. Participants expressed the belief that incorporating indigenous knowledge and perspectives can make the subject more relevant and relatable to the diverse student population in Zambian schools. This finding aligns with existing literature that emphasizes the importance of incorporating local cultural practices and knowledge into mathematics education to enhance students' engagement and understanding.

Battiste (2013) argued that indigenizing teaching methods refers to the incorporation of indigenous knowledge, perspectives, and pedagogies into educational practices. This approach recognizes the importance of indigenous cultures, histories, and ways of knowing, and aims to create a more inclusive and culturally responsive learning environment. In recent years, there has been growing recognition of the advantages of indigenizing teaching methods. This article would show several key advantages of indigenizing teaching methods, drawing on scholarly literature and research.

The study revealed that teachers strongly support the use of indigenized teaching methods for mathematics education. This finding offers a promising opportunity to enhance math education in the region. However, it also underscores the need for increased awareness and education in this area to fully leverage the potential

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of indigenized pedagogies. There were several reasons given by the teachers as to why they supported the use of indigenized teaching methods for mathematics education.

Firstly, it makes education more pertinent to the local context, bridging the gap between abstract math concepts and students' daily lives. By incorporating traditional knowledge, cultural practices, and local examples into the math curriculum, it not only enhances engagement but also demonstrates the practical applications of math within their communities. Furthermore, indigenized teaching methods help students connect with their cultural heritage, bolstering their sense of identity and self-esteem.

The other advantage revealed as to why teachers supported the use of indigenized teaching methods for mathematics education was that Indigenizing teaching methods provide students with an opportunity to learn about their own cultural heritage and identity. Kovach (2010) argued that by incorporating indigenous knowledge and perspectives into the curriculum, students are able to see themselves reflected in the material being taught. This can lead to increased engagement, motivation, and a sense of pride in one's cultural heritage. Furthermore, indigenizing teaching methods empower indigenous students by validating their knowledge and ways of knowing, which can contribute to improved self-esteem and academic success.

One participant highlighted the potential of indigenizing mathematics pedagogies to foster a deeper understanding and appreciation for the subject among students. This sentiment reflects the idea that by incorporating local knowledge and examples, mathematics can become more engaging and meaningful, particularly for students who may struggle with its abstract nature. This finding is consistent with previous research that has shown the positive impact of culturally relevant pedagogies on students' learning outcomes and motivation.

However, it is important to note that some participants expressed concerns about the potential dilution of core mathematical concepts when indigenizing teaching pedagogies. These participants emphasized the need for a balanced approach that preserves the integrity of the subject while acknowledging and appreciating indigenous contributions. This concern reflects a tension between the desire to incorporate indigenous knowledge and the need to maintain the rigor and coherence of mathematics education. This tension has been discussed in the literature, with scholars advocating for a careful integration of indigenous knowledge without compromising the disciplinary nature of mathematics.

There are several research studies that show the potential dilution of core mathematical concepts when indigenizing teaching pedagogies. These studies provide insights into the tension between incorporating indigenous knowledge and maintaining the disciplinary nature of mathematics education. They discuss the need for a balanced approach that acknowledges and appreciates indigenous contributions while preserving the integrity of core mathematical concepts.

The works of Setati (2005) explore the integration of indigenous knowledge in mathematics education, emphasizing the importance of cultural perspectives and the challenges of maintaining mathematical rigor. Radford (2014) discusses the role of gestures in mathematics education and how they can embody cultural meanings.

D'Ambrosio (2001) and Greer (2002) provide broader perspectives on ethnomathematics and the cultural aspects of mathematics. These references contribute to the understanding of the tension and the need for careful integration of indigenous knowledge in mathematics education.

The findings of this study contribute to the existing literature by providing insights into the attitudes of mathematics teachers towards indigenizing pedagogies and practices. The positive attitude expressed by most participants suggests a willingness to explore new approaches in teaching mathematics and a recognition of the potential benefits of incorporating indigenous knowledge. However, the concerns raised

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by some participants highlight the need for further research and dialogue to develop a balanced approach that effectively integrates indigenous perspectives while maintaining the integrity of the subject.

The importance of these findings lies in their potential to inform curriculum development and teacher training programs. By understanding the attitudes and perspectives of mathematics teachers, policymakers and curriculum developers can design strategies and resources that support the indigenization of mathematics pedagogies in a way that aligns with teachers' concerns and aspirations. This can lead to the creation of a more culturally responsive and inclusive mathematics education system that better meets the needs of diverse learners.

The second theme that emerged was that of teacher's beliefs and attitudes towards indigenization of mathematics teaching approaches. The participants were in support of indigenization of mathematics teaching approaches. One of the participants investigated stated that indigenization of pedagogies and practices could be the best ways to make mathematics more relatable and meaningful to Indigenous students.

Participant 6: *"At first, I was skeptical about incorporating Indigenous perspectives into mathematics teaching. But as I learned more about their rich mathematical traditions and cultural knowledge, I realized how important it is to include these in the curriculum. It can make mathematics more relatable and meaningful to Indigenous students."*

Teachers argued that the use of indigenous examples has the potential to increase student engagement and increase their curiosity in the learning of mathematics. The teachers involved in the study reviewed that the use of local examples could be effective in the teaching of mathematics.

Participant 3:*"I was hesitant to change my teaching approach initially, fearing it might deviate from the prescribed curriculum. However, I've noticed that using Indigenous examples and contexts has increased student engagement and sparked curiosity about different cultures."*

The results of the study indicate that the participants were supportive of the indigenization of mathematics teaching approaches. They believed that incorporating Indigenous perspectives, pedagogies, and practices into the curriculum could make mathematics more relatable and meaningful to Indigenous students (Li & Ma, 2010). This aligns with previous research that has shown the positive impact of integrating indigenous knowledge in the curriculum, not only in mathematics but also in science education (Naidoo, 2021).

The teachers in the study also mentioned that using indigenous examples and contexts in mathematics teaching had increased student engagement and sparked curiosity about different cultures (Li & Ma, 2010). This finding is consistent with the literature that emphasizes the importance of using culturally relevant examples and contexts in mathematics education to enhance student engagement and learning outcomes (Moloi et al., 2021).

The participants' initial skepticism about incorporating Indigenous perspectives into mathematics teaching is not uncommon. Research has shown that teachers' beliefs about the nature of mathematics and its teaching and learning can influence their instructional practices (Beswick, 2011). However, as the participants in this study learned more about the rich mathematical traditions and cultural knowledge of Indigenous communities, they recognized the importance of including these perspectives in the curriculum (Li & Ma, 2010). This highlights the need for professional development and ongoing support for teachers to enhance their knowledge and understanding of Indigenous cultures and mathematics.

The study also revealed that the use of indigenous examples and the indigenization of mathematics teaching approaches have the potential to increase student engagement and curiosity. This finding is consistent with research that has shown the positive impact of student engagement on learning outcomes in mathematics

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education (Yang et al., 2020). It suggests that incorporating Indigenous perspectives can not only make mathematics more relatable and meaningful to Indigenous students but also enhance the learning experiences of all students.

The study explored the challenges and obstacles that mathematics teachers might face when trying to incorporate indigenous elements into their teaching approaches. One of the participants highlighted a crucial challenge faced by educators in the research study.

Participant 1: *"One of the biggest challenges we faced as mathematics teachers was finding appropriate resources and materials that were culturally relevant to our indigenous students. The standard curriculum and textbooks often lacked representation of our students' cultures, which made it difficult to engage them in the learning process."*

The primary concern of one of the participants revolved around the lack of culturally relevant teaching materials, which hindered effective engagement and connection with their students.

Participant 4: *"One of the main challenges I faced as a mathematics teacher while trying to indigenize pedagogies was the lack of culturally relevant teaching materials. Most of the existing textbooks and resources were based on Western mathematical concepts and examples, which made it difficult to connect with my indigenous students. I had to spend a lot of time searching for or creating materials that incorporated traditional knowledge and perspectives."*

One of the participants offered valuable information on the challenges faced while incorporating indigenous practices into the math curriculum and the efforts undertaken to overcome resistance from students and parents.

Participant 11*: "Indigenizing pedagogies in mathematics was met with resistance from some students and even parents. They were accustomed to the traditional Western-style teaching methods and were skeptical about incorporating indigenous practices. It required extensive communication and collaboration with the community to gain their trust and show the value of incorporating their cultural heritage into the math curriculum."*

The study explored the challenges and obstacles that mathematics teachers might face when trying to incorporate indigenous elements into their teaching approaches. One of the participants highlighted a crucial challenge faced by educators in the research study/

Participant 1 mentioned that one of the biggest challenges faced by mathematics teachers was finding appropriate resources and materials that were culturally relevant to indigenous students. The standard curriculum and textbooks often lacked representation of their students' cultures, making it difficult to engage them in the learning process. This finding aligns with previous research that has highlighted the importance of culturally relevant teaching materials in mathematics education. It suggests that the lack of culturally relevant resources can hinder effective engagement and connection with indigenous students. Studies have found that when learning materials are aligned with students' cultural backgrounds, they are more likely to understand and retain the information presented. This can lead to higher levels of achievement, (Lee, 2007).

Participant 4 also emphasized the challenge of the lack of culturally relevant teaching materials. They mentioned that most existing textbooks and resources were based on Western mathematical concepts and examples, making it difficult to connect with indigenous students. As a result, they had to spend a significant amount of time searching for or creating materials that incorporated traditional knowledge and perspectives. This finding underscores the need for the development and availability of culturally relevant

teaching materials that reflect the diverse cultural backgrounds of students.

Furthermore, Participant 11 highlighted the resistance faced when trying to incorporate indigenous practices into the math curriculum. Some students and parents were accustomed to traditional Western-style teaching methods and were skeptical about incorporating indigenous practices. Overcoming this resistance required extensive communication and collaboration with the community to gain their trust and demonstrate the value of incorporating their cultural heritage into the math curriculum. This finding suggests that addressing resistance and fostering community involvement are crucial steps in successfully integrating indigenous practices into mathematics teaching.

The challenges identified in this study highlight the gaps between the current practices and the desired goal of indigenizing mathematics teaching approaches. They emphasize the need for curriculum developers, textbook authors, and educational policymakers to prioritize the development and inclusion of culturally relevant teaching materials in mathematics education. Additionally, professional development programs for teachers should focus on equipping them with the knowledge and skills necessary to incorporate indigenous perspectives and practices into their teaching.

The implications of these findings are significant. By addressing the challenges and obstacles faced by mathematics teachers, educators can create a more inclusive and culturally responsive learning environment for indigenous students. This, in turn, can enhance student engagement, motivation, and achievement in mathematics. Moreover, incorporating indigenous perspectives can contribute to the preservation and revitalization of indigenous cultures and knowledge systems.

Further research is needed to explore effective strategies for developing and implementing culturally relevant teaching materials in mathematics education. Additionally, studies should investigate the long-term impact of indigenizing mathematics teaching approaches on student learning outcomes and attitudes towards mathematics.

The other theme that was generated was about teacher preparedness towards indigenizing the pedagogies and practices in the teaching of mathematics. The study revealed whether additional training or support is required to enhance teacher preparedness in this regard.

Participant 6: *"I'm not really sure how to incorporate indigenous elements into my math lessons. I haven't received much training or resources on this, and I worry that I might misrepresent or misunderstand the cultural aspects."*

This finding suggests that additional training and support may be necessary to enhance teacher preparedness in incorporating indigenous perspectives into mathematics teaching. This aligns with previous research that emphasizes the importance of professional development programs for teachers to acquire the knowledge and skills needed for culturally responsive teaching (Mahmud et al., 2022).

However, it is important to note that the specific challenges and training needs of teachers in indigenizing mathematics teaching may vary depending on the context and cultural diversity of the students. Further research is needed to explore effective strategies for providing training and support to teachers in this area, taking into account the specific needs and cultural contexts of different communities.

CONCLUSION

In conclusion, this study sheds light on the positive attitudes of participants towards indigenizing mathematics pedagogies and practices. The participants demonstrated a strong agreement on the importance and benefits of incorporating indigenous knowledge and practices into mathematics education. This

recognition underscores the potential of indigenizing mathematics to enhance various aspects of students' learning experiences, including cultural relevance, engagement, understanding, appreciation, academic achievement, motivation, interest, and cultural identity.

The findings highlight the significance of indigenizing teaching methods, emphasizing the incorporation of indigenous knowledge, perspectives, and pedagogies into educational practices. This approach aims to create a more inclusive and culturally responsive learning environment, recognizing the importance of indigenous cultures, histories, and ways of knowing. It aligns with a growing recognition of the advantages of such methods in recent years.

Furthermore, the study reveals strong support from teachers for the use of indigenized teaching methods in mathematics education. This presents a promising opportunity to enhance math education in the region. However, it also emphasizes the need for increased awareness and education in this area to fully harness the potential of indigenized pedagogies.

Teachers expressed several reasons for their support. Firstly, indigenized teaching methods bridge the gap between abstract math concepts and students' daily lives, making education more relevant to the local context. This incorporation of traditional knowledge and local examples not only enhances engagement but also demonstrates the practical applications of math within their communities. Additionally, indigenized teaching methods help students connect with their cultural heritage, strengthening their sense of identity and self-esteem.

Moreover, indigenizing teaching methods offer an opportunity for students to learn about their own cultural heritage and identity. By incorporating indigenous knowledge and perspectives, students see themselves reflected in the material being taught, leading to increased engagement, motivation, and a sense of pride in their cultural heritage. It also empowers indigenous students by validating their knowledge and ways of knowing, contributing to improved self-esteem and academic success.

These methods also promote a deeper understanding of the subject matter, encouraging critical thinking, problem-solving, and creativity. Indigenous pedagogies often emphasize a holistic approach to learning, recognizing the interconnectedness of all aspects of life. This approach incorporates experiential learning activities, such as storytelling, land-based learning, and community engagement, allowing students to engage with the material in a meaningful and hands-on way.

Furthermore, indigenized teaching methods provide an opportunity to address the historical and ongoing impacts of colonization on indigenous communities. By incorporating indigenous perspectives and histories, educators can challenge dominant narratives and promote a more accurate and inclusive understanding of history. This contributes to the process of decolonization, countering the erasure and marginalization of indigenous knowledge.

Additionally, indigenized teaching methods promote intercultural understanding and respect by fostering dialogue and collaboration between indigenous and non-indigenous students. This learning about indigenous cultures, histories, and ways of knowing can lead to a greater appreciation for diversity, challenging stereotypes and prejudices. Ultimately, this can contribute to the development of more inclusive and equitable societies.

These methods can also strengthen the ties between schools and the local community. When parents and community members see that the curriculum respects and values their culture, they are more likely to become involved in their children's education, potentially leading to greater support for education initiatives and improved learning outcomes.

However, the study also reveals some challenges in the current mathematics curriculum in Zambia. Participants felt that the current curriculum does not adequately reflect the cultural and historical context of the country and does not sufficiently prepare students for the demands of the 21st century. This suggests a need for curriculum reform and the inclusion of more culturally relevant and future-oriented content in mathematics education.

In conclusion, the study's findings have significant implications for mathematics education in Zambia. They emphasize the importance of promoting indigenization in mathematics pedagogies and practices to enhance students' engagement, motivation, and achievement in the subject. The results also highlight the need for curriculum revision to ensure that it reflects the cultural and historical context of the country and prepares students for the challenges of the 21st century.

RECOMMENDATIONS

Based on the findings of this study, several recommendations can be made to further enhance the incorporation of indigenous knowledge and practices into mathematics education:

- **Curriculum Revision and Development**: Collaborate with curriculum developers, education authorities, local communities, and experts to revise the mathematics curriculum. Ensure that it includes indigenized elements that align with the unique cultural context of the region.
- **Culturally Relevant Teaching Materials**: Develop and provide culturally relevant teaching materials, resources, and lesson plans that reflect the diverse cultural backgrounds of students. These materials should incorporate traditional knowledge, cultural practices, and local examples.
- **Teacher Training and Professional Development**: Offer workshops, training sessions, and professional development programs to enhance educators' familiarity with indigenizing mathematics pedagogies. Equip them with the knowledge and skills necessary to effectively integrate local traditions, history, and ways of knowing into math lessons.
- **Community Engagement and Collaboration**: Foster dialogue and collaboration between schools, teachers, parents, and local communities. This collaboration is crucial to gaining support for indigenized teaching methods and ensuring their successful implementation.
- **Diversity and Inclusion in Teaching Resources**: Encourage the creation of textbooks, supplementary materials, and educational resources that incorporate diverse cultural perspectives, including those of indigenous communities.
- **Balanced Approach to Teaching**: Emphasize the importance of striking a balance between preserving the integrity of core mathematical concepts and incorporating indigenous contributions. This ensures that the subject matter remains rigorous while being inclusive of diverse perspectives.
- **Continuous Communication and Collaboration**: Maintain open communication channels between teachers, students, parents, and the community to address any concerns or resistance towards indigenizing teaching approaches. Work together to demonstrate the value and benefits of incorporating cultural heritage into the math curriculum.
- **Research and Development**: Encourage further research on effective strategies for developing and implementing culturally relevant teaching materials in mathematics education.

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