

Indigenizing Mathematics Education in Zambia: Challenges and Perspectives

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ABSTRACT

This study examined the challenges associated with implementing indigenized mathematics education in Southern Province, Zambia. Using a sequential explanatory mixed-methods design, quantitative data were collected from 55 mathematics teachers through stratified random sampling and qualitative data from 15 purposively selected teachers through semi-structured interviews. The quantitative findings showed that the most strongly perceived challenge was the lack of research and documentation on Indigenous mathematical pedagogies ($M = 4.25$, $SD = 0.87$), followed by limited collaboration between mathematics educators and Indigenous communities ($M = 4.09$, $SD = 0.95$) and inadequate teacher training and professional development ($M = 4.02$, $SD = 0.92$). One-way ANOVA results indicated that educational background significantly influenced teachers' perceptions of selected challenges, whereas teaching experience did not produce statistically significant differences. Qualitative findings deepened these patterns by revealing the dominance of Western-oriented textbooks, the absence of culturally relevant teaching materials, limited linguistic resources for expressing mathematical concepts in local languages, and the exclusion of Indigenous knowledge holders from curriculum processes. The study concludes that the barriers to indigenizing mathematics education are systemic rather than individual, rooted in weak knowledge infrastructure, insufficient professional preparation, and limited school-community collaboration. It argues that meaningful indigenization requires stronger documentation of Indigenous mathematical knowledge, more robust institutional support, and culturally grounded teacher education.

Keywords: Indigenous mathematics, curriculum indigenization, culturally responsive pedagogy, teacher training, language barriers, Zambia

INTRODUCTION

Education systems worldwide are increasingly recognizing the need to be more inclusive and culturally responsive, particularly in diverse societies. Indigenized education integrates Indigenous knowledge, languages, and cultural practices into formal curricula, creating a learning environment that reflects students' lived experiences and enhances their engagement (Smith, 2012). In Zambia's Southern Province, efforts to indigenize the mathematics curriculum aim to boost student interest and performance by aligning mathematical concepts with students' cultural contexts (Kadonsi, 2025).

Indigenized mathematics education in Zambia incorporates local languages, cultural practices, and Indigenous knowledge systems into the teaching process. By linking mathematical concepts to real-life cultural experiences, students find learning more meaningful and accessible (Kadonsi, 2023). For example, Kadonsi's study on mathematics teachers' attitudes towards indigenized pedagogies highlights the potential benefits of integrating local knowledge into math instruction, reinforcing the idea that culturally relevant education fosters deeper understanding and engagement.

However, despite these potential benefits, significant barriers hinder the effective implementation of indigenized mathematics education. Resistance to change remains a challenge, as some educators and policymakers remain reluctant to move away from traditional Western-oriented curricula (Ajani & Gamede,

2021). Additionally, limited resources, lack of teacher training, and inadequate teaching materials present further obstacles. Research by Photo & McKnight, (2024) emphasizes the need for inclusive educational provisions, particularly for students with disabilities, while Kadonsi (2023) found that students generally have positive perceptions of culturally sustaining mathematics education. Broader systemic issues, such as low digital literacy among teachers (Ajani & Gamede, 2021), further complicate efforts to reform the curriculum.

To overcome these challenges, targeted interventions such as teacher training programs in interculturality and ethnomathematics are crucial. Studies suggest that incorporating mathematical creativity and character education into teacher preparation programs enhances educators' ability to link Indigenous knowledge with formal mathematical instruction (Utami et al., 2021). Similarly, Averill & McRae (2021) emphasize the importance of culturally sustaining pedagogies, while Ajani and Gamede (2021) advocate for the decolonization of STEM education to prevent the alienation of Indigenous students.

This study seeks to explore mathematics teachers' perspectives on the challenges and opportunities in implementing indigenized mathematics education in Southern Province, Zambia. Understanding teachers' experiences is crucial for developing strategies to bridge the gap between Indigenous knowledge and formal mathematics instruction. The findings will contribute to ongoing efforts to create a more effective, inclusive, and culturally responsive education system in Zambia, ensuring that Indigenous knowledge is not only preserved but actively integrated into mathematics education.

Problem Statement

The integration of Indigenous knowledge into mathematics education is increasingly recognized as a critical step toward fostering culturally responsive and inclusive learning environments. In Southern Province, Zambia, efforts to indigenize the mathematics curriculum aim to enhance student engagement and performance by aligning instruction with learners' cultural knowledge and lived experiences. Despite these efforts, systemic barriers persist, hindering effective implementation and limiting the potential impact of this approach.

Existing research (e.g., Kadonsi, 2023) has examined teachers' attitudes toward indigenizing pedagogies, yet there remains a critical gap in understanding the practical challenges that teachers face in executing this transition. Key barriers include curriculum rigidity, inadequate teacher training, limited access to culturally relevant teaching materials, and weak collaboration between educators and Indigenous knowledge holders. Additionally, linguistic barriers pose a major constraint, as many mathematical concepts lack direct equivalents in Indigenous languages, leading to an overreliance on English and reduced student engagement (Poudel et al., 2022).

Furthermore, while some studies have explored students' perceptions of culturally responsive mathematics education, there is limited research on teachers' real-world experiences in navigating the complexities of this educational shift. As primary implementers of curriculum reforms, teachers require adequate preparation, institutional support, and pedagogical resources to integrate Indigenous knowledge effectively. However, little is known about how teacher characteristics, such as experience and educational background, shape their ability to overcome these challenges. Understanding these factors is crucial for designing targeted professional development programs and policy interventions that support the indigenization of mathematics education.

Without addressing these systemic barriers, the potential benefits of culturally responsive mathematics education will remain unrealized, leaving Indigenous students disengaged and at risk of continued educational inequities. Additionally, the absence of systematic documentation of Indigenous mathematical traditions risks further marginalization of local knowledge systems. Therefore, this study seeks to examine the barriers to implementing indigenized mathematics education in Southern Province, Zambia, with a particular focus on curriculum structure, teacher preparedness, linguistic constraints, and community involvement. The findings will provide evidence-based recommendations for curriculum reforms, teacher training initiatives, and policy strategies to foster a more inclusive and culturally relevant mathematics education system.

Objectives

This paper aims at exploring the challenges that teachers face in the implementation of indigenized mathematics education in Southern Province, Zambia.

Research Questions

What are the main difficulties that teachers experience in incorporating indigenized mathematics education in Southern Province, Zambia?

Hypothesis

- H0: There are no important variations in the perception of the challenges as a function of teacher characteristics such as teaching experience and educational level.
- H1: There are significant differences in the perception of challenges as a function of teacher characteristics such as teaching experience, and educational background.

Significance of the Study

This research is significant in multiple ways, offering valuable contributions to educational practices, policy-making, and cultural inclusivity. By integrating Indigenous knowledge systems into the mathematics curriculum, this study seeks to bridge the gap between students' cultural backgrounds and their learning experiences. When students see their cultural heritage reflected in their education, they are more likely to engage with the material, fostering greater interest, participation, and academic success.

A key aspect of this research is addressing the challenges faced by teachers in implementing indigenized mathematics education. By examining these challenges, the study provides insights that can inform the development of culturally responsive teaching strategies. Equipping teachers with appropriate methodologies and resources can enhance students' understanding of mathematics, particularly in a subject often seen as abstract and difficult. Beyond classroom practice, this research has policy implications. Understanding teachers' experiences allows for the development of professional learning communities and better-targeted support systems. The findings can guide policymakers in designing educational policies that promote culturally responsive curricula, inclusive teaching materials, and systematic evaluation frameworks. With these insights, education systems can become more inclusive, equitable, and reflective of Indigenous knowledge.

Moreover, this study supports the recognition and preservation of Indigenous cultural identity by advocating for the decentralization of education and the inclusion of Indigenous knowledge in formal schooling. Promoting cultural inclusion benefits not only students but also strengthens and sustains Indigenous traditions. This research contributes to global discussions on decolonizing education by offering a case study from Southern Province, Zambia, which may serve as a reference for similar initiatives in other regions. The study's findings are also relevant to broader educational challenges, such as limited resources and resistance to change. By providing practical recommendations, this research supports the creation of a more adaptable, culturally responsive education system. Ensuring that educational practices continuously evolve to meet the needs of diverse student populations is essential for building an inclusive and sustainable learning environment.

LITERATURE REVIEW

This review of the literature explores the existing research on indigenized education across the globe and in Zambia. It tries to reveal major conclusions, good practices, and the most important aspects that should be considered when implementing the concept. The review aims to contribute to the understanding of teachers' views on indigenized mathematics education in Southern Province, Zambia and reveals gaps in the existing research to inform the present study.

Current Studies on Indigenized Education

Indigenized education integrates indigenous knowledge and cultural practices into formal curricula, making education more relevant and inclusive. This study examines global and Zambian debates on indigenized education, exploring its successes, best practices, and key components for effective implementation. By focusing on teachers' perspectives on indigenized mathematics education in Southern Province, Zambia, the study identifies gaps in the existing research to inform its investigation.

Across the world, research highlights the positive impact of indigenized education on student engagement and academic performance. Studies have shown that integrating cultural elements into teaching helps students connect with learning, leading to better attendance, participation, and achievement. In Canada, Battiste (2013) found that embedding cultural knowledge into the curriculum improved student outcomes, reinforcing the importance of culturally responsive education. Similarly, in Australia, Burgess et al., (2020) analyzed the Yirrkala School's approach to indigenous knowledge integration and found that it enhanced student literacy and numeracy, bridging the gap between the school environment and students' cultural identities. These findings demonstrate that when education aligns with students' lived experiences, learning becomes more meaningful and effective.

Despite these successes, little research exists on how teachers perceive and implement indigenized education, particularly in mathematics. While studies confirm that students benefit from culturally relevant teaching, there is limited exploration of teachers' challenges in applying these approaches. Kadonsi (2023) investigated mathematics teachers' perspectives in Southern Province, Zambia, revealing that cultural integration enhances students' learning and enthusiasm. However, the study also highlighted key barriers, including a lack of culturally relevant teaching materials and insufficient teacher training to support the effective implementation of indigenized mathematics education.

Further research in Zambia reinforces the benefits of indigenized education. Acharya et al., (2021) found that students in culturally responsive programs were more engaged and performed better than their peers in conventional education settings. The inclusion of local languages and cultural practices helped students connect their school experiences with their daily lives, making education feel more natural and accessible. However, while student-focused studies emphasize the value of this approach, there is a lack of research on how teachers navigate the challenges of indigenized mathematics instruction.

This gap highlights the need to understand teachers' perspectives what obstacles they face, how they adapt their teaching strategies, and what support they require to effectively integrate indigenous knowledge into mathematics education. By addressing these questions, this study aims to extend existing research and provide insights that can inform teacher training, curriculum development, and educational policies in Zambia and beyond.

Positive Outcomes of Indigenized Curriculum: Case Studies

The following examples of the effective adoption of culturally relevant teaching strategies demonstrate the effectiveness of the indigenized curriculum. In New Zealand, the Te Kotahitanga program has been developed to enhance the effectiveness of teachers to work with Maori students in a culturally sensitive manner and has been connected to higher achievement and reduced dropout rates (Bishop et al., 2009). This programme pays much attention to the need for teachers to embrace the Maori cultural perspective and include it in their teaching. Te Kotahitanga is a good example of how culturally sensitive education can produce very positive results for students, with better academic performance and higher levels of attendance being some of the results.

A number of schools in Zambia have also incorporated local languages and cultural practices into their curricula. For instance, the Macha International Christian School has adopted a curriculum that incorporates local languages and cultural practices and has, in turn, registered improved student performance and higher levels of community involvement (Photo & McKnight, 2024). The school's approach also shows that for indigenized education to be effective, the community has to play a role in supporting it. Another good practice

is the Chikankata School, which has integrated indigenous knowledge systems into its science and mathematics teaching. This approach has enhanced student's interest and achievement in class (Munshya, 2024). The success of the Chikankata School reveals the potential of indigenized education to enhance student performance through making the learning process more meaningful and interesting. Nevertheless, these case studies do not capture the particular problems from the viewpoint of teachers who are involved in indigenized mathematics education. It is crucial to conduct further studies which focus on the professional experiences of teachers, their needs and the ways in which they can be assisted to achieve successful indigenized education in mathematics.

Components for Effective Implementation of Indigenized Education

The use of local languages as means of teaching is very important in indigenized education. Previous studies have established that mother-tongue education has better language and learning achievements than other forms of education (Poudel et al., 2022). In Zambia, it is possible to include local languages in the mathematics curriculum, which will help students to understand the concepts easily since they will be using their first language. However, there is no sufficient research on how teachers view the use of local languages in mathematics teaching and learning and the problems that arise from it. The inclusion of cultural practices and traditions in the curriculum enhances the comprehensibility and interest in the learning process. This may entail the use of stories, dramas, and dances, as well as games that are culturally sensitive to implement various topics (Utami et al., 2021). In Zambia, cultural practices can be incorporated in to mathematics education to make concepts more easily understood. The current literature does not offer a detailed analysis of how teachers view the integration of cultural practices in mathematics education and the challenges of implementing this approach.

Enhancing the recognition and acceptance of indigenous knowledge systems within the formal schooling system enhances the learning process. This includes showcasing of local knowledge in areas such as environmental management, healing and traditional mathematics to offer new viewpoints and nurture problem solving skills (Photo & McKnight, 2024). In Zambia, it is possible to combine indigenous knowledge systems with the mathematics curriculum so that the two systems can meet the students' cultural knowledge. Nonetheless, there is little knowledge on how teachers view the integration of indigenous knowledge systems in mathematics teaching and the possibilities that exist. Community participation in the educational system is crucial to guarantee that the curriculum is culturally sound and appropriate. This allows for the sharing of information and experiences, resulting in a more inclusive and nurturing learning environment (Photo & McKnight, 2024). Success stories in Zambia show that community engagement is vital for the success of indigenized education. Nevertheless, there is a lacking insight concerning the role of community input in shaping teachers' perspectives on indigenized mathematics education. More research is needed to establish how community engagement can assist teachers and help in the achievement of indigenized education.

METHODOLOGY

Research Design

This study employed a sequential explanatory mixed-methods design. In this design, quantitative data were collected and analysed first, and the results were subsequently followed by qualitative data collection and analysis. The design was considered appropriate because the study sought not only to identify the major challenges faced by mathematics teachers in implementing indigenized mathematics education in Southern Province, Zambia, but also to explain those patterns in greater depth through qualitative inquiry. The quantitative phase provided measurable trends regarding the prevalence and relative strength of the challenges under investigation, while the qualitative phase generated richer explanations of teachers' lived experiences, interpretations, and classroom realities. The design therefore enabled the study to combine breadth and depth and to move beyond numerical patterns to a more contextually grounded understanding of the barriers to curriculum indigenization in mathematics education.

Target Population

The target population comprised mathematics teachers drawn from selected schools in Southern Province, Zambia. Mathematics teachers were considered the most suitable participants because they are the direct implementers of the curriculum and are responsible for translating policy expectations into classroom practice. Their perceptions, experiences, and pedagogical decisions are central to understanding the practical, institutional, and professional obstacles associated with integrating indigenous knowledge into mathematics education. By focusing on mathematics teachers, the study generated evidence from those directly involved in instructional delivery and curriculum enactment.

Sample Size

The study involved both quantitative and qualitative samples. In the quantitative phase, 55 mathematics teachers participated by completing a structured questionnaire. In the qualitative phase, 15 mathematics teachers were purposively selected for semi-structured interviews in order to provide more detailed insights into their experiences and perspectives. The overall sample therefore comprised 70 participants. The quantitative sample was considered adequate for generating descriptive and inferential evidence on the major challenges associated with implementing indigenized mathematics education, while the qualitative sample was appropriate for yielding in-depth explanatory data relevant to the quantitative findings.

Sampling Techniques

A mixed sampling strategy was employed in line with the mixed-methods design. For the quantitative phase, stratified random sampling was used to ensure representation across different levels of teaching experience. Participants were grouped into three strata: teachers with less than 5 years of teaching experience, those with 5 to 15 years of experience, and those with more than 15 years of experience. Thereafter, participants were randomly selected from each stratum. This approach enhanced representativeness and made it possible to examine whether teachers at different experience levels perceived the challenges of indigenized mathematics education differently.

For the qualitative phase, purposive sampling was employed to select 15 teachers who were judged to be information-rich participants. Selection was based on participants' experience in mathematics teaching, familiarity with issues relating to indigenous knowledge and culturally responsive pedagogy, and willingness to provide detailed reflections on curriculum implementation. This approach was appropriate because it enabled the study to obtain deeper and more nuanced interpretations of the issues that emerged from the quantitative phase. The combined use of stratified random sampling and purposive sampling strengthened the study by providing both broad representation and in-depth understanding.

Data Collection Instruments

Data were collected using two instruments: a structured questionnaire for the quantitative phase and a semi-structured interview guide for the qualitative phase. The questionnaire was administered to 55 mathematics teachers to obtain quantitative data on their perceptions of the major challenges associated with implementing indigenized mathematics education in selected schools in Southern Province, Zambia. The questionnaire contained Likert-scale items covering the main dimensions of the study, namely lack of research and documentation on indigenous mathematical pedagogies, limited collaboration with indigenous communities, and inadequate teacher training and professional development. These dimensions were derived from the study objectives and from issues frequently highlighted in the literature on decolonized and culturally responsive mathematics education.

The questionnaire was subjected to expert review before administration in order to enhance content relevance, clarity, and alignment with the objectives of the study. In addition, the instrument was pilot-tested with a small group of mathematics teachers from schools outside the main study area in order to assess item clarity, wording, and suitability. Feedback from the pilot exercise was used to refine ambiguous items and improve the structure of the instrument. Internal consistency reliability was then assessed using Cronbach's alpha

coefficient for all multi-item constructs. The reliability analysis showed that the construct measuring research and documentation challenges yielded a Cronbach's alpha of 0.82, the construct measuring collaboration with indigenous communities yielded a Cronbach's alpha of 0.79, and the construct measuring teacher training and professional development yielded a Cronbach's alpha of 0.85. The overall questionnaire yielded a Cronbach's alpha of 0.83, indicating good internal consistency. These coefficients suggested that the instrument was sufficiently reliable for use in the study.

For the qualitative phase, semi-structured interviews were conducted with 15 mathematics teachers. The interview guide contained open-ended questions designed to elicit detailed accounts of teachers' experiences, perceptions, classroom practices, and views regarding the integration of indigenous pedagogies and knowledge systems into mathematics teaching. The semi-structured format provided flexibility, allowing participants to elaborate on issues they considered important while ensuring that discussion remained aligned with the objectives of the study.

Response Rate and Non-Response Bias

To improve transparency in the quantitative phase, the study reported the questionnaire response rate. A total of 65 questionnaires were distributed to eligible mathematics teachers, of which 55 were completed and found usable for analysis, yielding a response rate of 84.6%. This response rate was considered satisfactory for survey-based educational research because it suggested a high level of participant engagement and provided an adequate basis for quantitative analysis.

The possibility of non-response bias was also considered. To assess this, the characteristics of the final respondents were examined against the intended sample frame using observable variables such as teaching experience and educational background. No marked variations were observed in these characteristics, suggesting that the final respondent group was broadly consistent with the intended sample. This reduced the likelihood that non-response substantially distorted the findings. Nevertheless, because not all questionnaires distributed were returned, the possibility of some residual non-response bias cannot be entirely excluded.

Data Analysis

Both quantitative and qualitative data were analysed in a manner consistent with the sequential explanatory mixed-methods design. Quantitative data obtained from the questionnaires were entered into SPSS for cleaning, coding, and analysis. Preliminary data screening was conducted to check for completeness, consistency, and entry errors. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' demographic characteristics and their perceptions of the challenges associated with implementing indigenized mathematics education.

Inferential statistics were used to test whether selected background variables were associated with differences in teachers' perceptions. Because teaching experience was categorized into three groups, a one-way analysis of variance (ANOVA) was used to determine whether perceptions of the challenges differed significantly across the three experience categories. One-way ANOVA was also used to examine whether teachers' educational background significantly influenced their perceptions. Where statistically significant differences were found, post hoc comparisons using Tukey's Honestly Significant Difference test were conducted to identify the specific group differences. This analytical approach was more appropriate than an independent samples t-test because the study compared more than two groups on the relevant background variables.

To further strengthen the quantitative analysis, internal consistency reliability was assessed using Cronbach's alpha coefficients for the multi-item constructs. The results showed alpha values of 0.82 for research and documentation challenges, 0.79 for collaboration with indigenous communities, and 0.85 for teacher training and professional development. The overall Cronbach's alpha for the questionnaire was 0.83, indicating good reliability for the purposes of the study.

Because the quantitative data were collected using a self-report questionnaire, the possibility of common method bias was examined using Harman's single-factor test. The analysis indicated that the first unrotated

factor accounted for 38.4% of the total variance. Since this value was below the commonly accepted threshold of 50%, common method bias was not considered a serious threat to the findings.

Qualitative data from the semi-structured interviews were audio-recorded with participants' consent, transcribed verbatim, and analysed using thematic analysis. The analysis began with repeated reading of the transcripts in order to achieve familiarity with the data. Initial codes were then generated and similar codes were grouped into categories. From these categories, broader themes were developed, reviewed, refined, and interpreted in relation to the research question and the quantitative findings. The qualitative phase was used primarily to explain, deepen, and contextualize the results obtained from the quantitative analysis.

To enhance the trustworthiness of the qualitative findings, the study employed member checking and peer debriefing. Member checking involved returning selected interpretations to participants for confirmation of accuracy, while peer debriefing involved discussing the coding and thematic structure with knowledgeable colleagues in order to reduce individual researcher bias and strengthen interpretive credibility. Through this combination of quantitative and qualitative analytic procedures, the study developed a comprehensive understanding of teachers' perspectives on the implementation challenges of indigenized mathematics education in Southern Province, Zambia.

Limitations of the study

This study provides important insights into the challenges associated with implementing indigenized mathematics education in Southern Province, Zambia; however, certain limitations should be considered when interpreting the findings. The study relied primarily on teachers' self-reported data collected through questionnaires and interviews. While teachers were the most appropriate participants due to their direct role in curriculum implementation, self-reported data are inherently subject to personal interpretation, recall constraints, and the possibility of socially desirable responses. Efforts were made to minimize these effects through careful instrument design, assurances of confidentiality, and the integration of qualitative data to provide deeper contextual understanding. Nevertheless, some degree of response bias cannot be entirely excluded.

The scope of the study was limited to teachers' perspectives and did not incorporate student-level data. As a result, the findings do not directly reflect learners' experiences, levels of engagement, or academic outcomes in relation to indigenized mathematics instruction. Including student voices would have provided a more comprehensive understanding of how such pedagogical approaches influence learning processes and outcomes. Future research may benefit from integrating student surveys, focus group discussions, or performance-based measures to complement teacher-reported data.

The absence of classroom observations represents another limitation. The study captured reported practices and perceptions but did not include direct observation of teaching and learning processes in real classroom settings. Observational data would have strengthened the study by enabling a comparison between reported practices and actual instructional behaviour, thereby enhancing methodological triangulation and validity.

Although the study explored challenges related to collaboration with indigenous communities, it did not include perspectives from Indigenous knowledge holders, community elders, or cultural practitioners. This omission means that the analysis is largely framed from a school-based perspective and does not fully represent the community dimension that is central to the indigenization of education. Engaging these stakeholders in future studies would contribute to a more inclusive and culturally grounded understanding of curriculum transformation.

The cross-sectional nature of the study also limits the ability to capture changes over time. Data were collected at a single point, which provides a snapshot of existing conditions but does not reflect how challenges and practices may evolve in response to policy reforms, professional development initiatives, or institutional changes. Longitudinal approaches would offer deeper insights into the dynamics of implementing indigenized mathematics education.

The study was confined to selected schools in Southern Province, Zambia, which may limit the generalizability of the findings to other regions with different socio-cultural and educational contexts. While the study offers valuable context-specific insights, caution should be exercised when extending the conclusions beyond the study setting. Future research could adopt a broader geographical scope to allow for comparative analysis across different provinces or national contexts.

Ethical Considerations

The study adhered to established ethical principles in order to protect the rights, dignity, and welfare of participants. Ethical clearance was obtained from the relevant institutional ethics authority before the commencement of data collection. Permission to conduct the study was also obtained from the appropriate educational authorities and participating schools.

Participants were informed about the purpose of the study, the procedures involved, the voluntary nature of participation, and their right to withdraw from the study at any stage without penalty. Written informed consent was obtained from all participants prior to their involvement in the study.

Confidentiality and anonymity were maintained throughout the research process. Questionnaire responses and interview transcripts were de-identified, and participants were represented using codes rather than names. Electronic data were securely stored in password-protected files, while hard-copy materials were kept in locked storage accessible only to the researcher. Care was taken to ensure that quotations used in the presentation of findings did not reveal participants' identities or expose the identities of their institutions.

Participants were also informed of any possible risks associated with the study, including mild emotional discomfort that could arise when reflecting on professional challenges or instructional limitations. These risks were minimized by maintaining a respectful and non-threatening research environment and by allowing participants to decline to answer any question they found uncomfortable. The study upheld transparency and integrity in data collection, analysis, and reporting, and all findings were presented honestly and responsibly in accordance with accepted standards of educational research.

Presentation of Results

This section presents the findings of the study on the challenges that teachers face in implementing indigenized mathematics education in Southern Province, Zambia. In line with the sequential explanatory mixed-methods design adopted in the study, the findings are presented in two interrelated phases. First, the quantitative results are presented to identify the major challenges and to determine whether teachers' perceptions differ significantly according to selected background characteristics, namely teaching experience and educational background. Second, the qualitative findings are presented to explain, deepen, and contextualize the quantitative patterns. The section therefore advances one coherent argument: that the implementation of indigenized mathematics education is constrained primarily by structural and institutional barriers, and that educational background, more than teaching experience, shapes how some of these barriers are perceived.

The results are presented in response to the research question: What are the main challenges that teachers face in implementing indigenized mathematics education in Southern Province, Zambia? In addressing this question, the study also tested the following hypotheses:

H₀: There are no significant differences in teachers' perceptions of challenges based on teaching experience and educational background.

H₁: There are significant differences in teachers' perceptions of challenges based on teaching experience and educational background.

Quantitative Analysis of Challenges in Indigenizing Mathematics Education

The quantitative phase identified the major challenges faced by mathematics teachers in implementing indigenized mathematics education in Southern Province, Zambia. The analysis was based on responses from

55 mathematics teachers and focused on three major dimensions reflected in the questionnaire and later explored qualitatively: lack of research and documentation on Indigenous mathematical pedagogies, limited collaboration between mathematics educators and Indigenous communities, and inadequate teacher training and professional development. Descriptive statistics were used to determine the relative severity of these challenges, while one-way analysis of variance was employed to examine whether teachers' perceptions differed significantly according to educational background and teaching experience.

Table 1: Descriptive Statistics and ANOVA Results for Challenges in Indigenizing Mathematics Education

Challenge	Mean (M)	SD	Rank	ANOVA by Educational Background	p-value	ANOVA by Teaching Experience	p-value	N
Lack of research and documentation on Indigenous mathematical pedagogies	4.25	0.87	1	$F(2, 52) = 3.61$	0.03	$F(2, 52) = 1.59$	0.21	55
Limited collaboration between mathematics educators and Indigenous communities	4.09	0.95	2	$F(2, 52) = 3.18$	0.05	$F(2, 52) = 1.26$	0.29	55
Lack of teacher training and professional development	4.02	0.92	3	$F(2, 52) = 2.79$	0.07	$F(2, 52) = 1.10$	0.34	55

The findings show that the most strongly perceived challenge in implementing indigenized mathematics education was the lack of research and documentation on Indigenous mathematical pedagogies ($M = 4.25$, $SD = 0.87$). This was followed by limited collaboration between mathematics educators and Indigenous communities ($M = 4.09$, $SD = 0.95$), while lack of teacher training and professional development, although still highly rated, ranked third ($M = 4.02$, $SD = 0.92$). The pattern suggests that teachers viewed the major barriers less as isolated classroom difficulties and more as broader institutional and knowledge-related constraints affecting curriculum implementation.

The inferential results further indicate that educational background significantly influenced teachers' perceptions of selected challenges. Statistically significant differences were found in perceptions of lack of research and documentation on Indigenous mathematical pedagogies, $F(2, 52) = 3.61$, $p = 0.03$, and limited collaboration between mathematics educators and Indigenous communities, $F(2, 52) = 3.18$, $p = 0.05$. However, no statistically significant difference was found in relation to lack of teacher training and professional development, $F(2, 52) = 2.79$, $p = 0.07$. These findings suggest that teachers' academic qualifications shape how they interpret some of the structural barriers associated with indigenizing mathematics education.

By contrast, teaching experience did not significantly influence perceptions of any of the three challenge dimensions. No statistically significant differences were observed for lack of research and documentation on Indigenous mathematical pedagogies, $F(2, 52) = 1.59$, $p = 0.21$, limited collaboration between mathematics educators and Indigenous communities, $F(2, 52) = 1.26$, $p = 0.29$, or lack of teacher training and professional development, $F(2, 52) = 1.10$, $p = 0.34$. This pattern indicates that the challenges associated with indigenizing mathematics education were perceived relatively consistently across teachers with different levels of teaching experience.

Hypothesis Testing Results

To assess whether teachers' perceptions of the identified challenges differed according to teaching experience and educational background, the null hypothesis stated that there were no significant differences in perceptions based on these background characteristics. Since both variables were examined across more than two categories, one-way analysis of variance was used.

Table 2: Summary of Hypothesis Testing Results

Variable	Result	Decision
Educational background	Significant differences were found for selected challenge dimensions	H ₀ rejected for educational background
Teaching experience	No significant differences were found across the challenge dimensions	H ₀ retained for teaching experience

The findings show that the null hypothesis was rejected with respect to educational background, but retained for teaching experience. This indicates that teachers’ academic qualifications influenced perceptions of some challenges associated with indigenized mathematics education, whereas years of teaching experience did not produce statistically significant differences. These results provide additional support for the view that differences in professional interpretation are shaped more by academic preparation than by length of service alone.

Influence of Educational Background on Teachers’ Perceptions of Challenges

Further analysis was conducted to examine whether teachers’ educational background influenced their overall perceptions of the challenges associated with implementing indigenized mathematics education. The one-way analysis of variance revealed a statistically significant difference, $F(2, 52) = 3.20, p = 0.049$, indicating that perceptions of the identified challenges varied significantly across qualification levels. To establish where these differences occurred, a Tukey HSD post hoc test was performed.

Table 3: Influence of Educational Background on Teachers’ Perceptions of Challenges

Statistical Test	Test Statistic	p-value	Decision
One-way ANOVA	$F(2, 52) = 3.20$	0.049	H ₀ rejected
Tukey HSD: Bachelor’s vs. Master’s	—	0.120	H ₀ retained
Tukey HSD: Bachelor’s vs. Doctorate	—	0.048	H ₀ rejected
Tukey HSD: Master’s vs. Doctorate	—	0.624	H ₀ retained

The post hoc analysis showed that the statistically significant difference was located between teachers with Bachelor’s degrees and those with Doctorate qualifications ($p = 0.048$). Teachers with Doctorate qualifications reported significantly fewer challenges than those with Bachelor’s degrees. No statistically significant differences were observed between Bachelor’s and Master’s degree holders ($p = 0.120$) or between Master’s and Doctorate degree holders ($p = 0.624$).

Qualitative Analysis of Challenges in Indigenizing Mathematics Education

The qualitative findings were used to explain, deepen, and contextualize the quantitative results. While the survey data identified lack of research and documentation, limited collaboration with Indigenous communities, and inadequate teacher training and professional development as the principal challenges, the interview data revealed how these barriers are experienced in school and classroom practice. The interviews also brought out related concerns, particularly scarcity of culturally relevant teaching materials and language barriers, which illuminate the practical consequences of the broader structural constraints identified in the quantitative phase. Rather than introducing unrelated issues, these themes demonstrate how the quantitatively identified barriers are translated into everyday pedagogical realities.

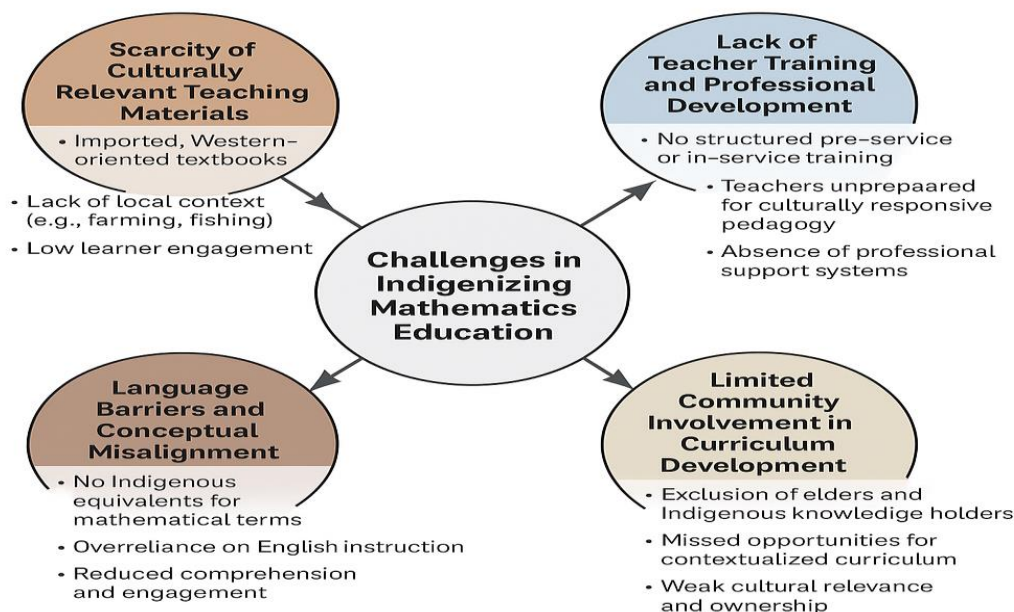


Figure 1: Thematic Mind Map showing the challenges in Indigenizing Mathematics Education

The qualitative findings were used to explain, deepen, and contextualize the quantitative results. While the survey data identified lack of research and documentation, limited collaboration with Indigenous communities, and inadequate teacher training and professional development as the principal challenges, the interview data revealed how these barriers are experienced in school and classroom practice. The interviews also brought out related concerns, particularly scarcity of culturally relevant teaching materials and language barriers, which illuminate the practical consequences of the broader structural constraints identified in the quantitative phase. Rather than introducing unrelated issues, these themes demonstrate how the quantitatively identified barriers are translated into everyday pedagogical realities.

Lack of Research, Documentation, and Culturally Relevant Teaching Materials

The strongest challenge identified quantitatively was the lack of research and documentation on Indigenous mathematical pedagogies. The qualitative findings show that this challenge operates at both conceptual and practical levels. Teachers did not merely describe an abstract absence of scholarship; they emphasized that the limited documentation of Indigenous mathematical ideas leaves them without usable classroom resources, examples, and pedagogical reference points. In this sense, the problem is not only epistemic, but also instructional. Where knowledge has not been systematically documented, it becomes difficult to translate it into lesson content, teaching materials, or assessment tasks.

This challenge was further expressed through concern about the dominance of imported and Western-oriented textbooks. Teachers indicated that many available materials are detached from learners’ lived realities and therefore fail to support meaningful contextualization of mathematical concepts. One participant stated:

“Most of our textbooks are imported, and they do not reflect the realities of our students. How can they relate to snow and skyscrapers when their daily experiences involve farming, fishing, and trade?”

This response suggests that the scarcity of culturally relevant materials is not a peripheral issue, but a core factor shaping how mathematics is presented and understood in the classroom. The absence of local context weakens the connection between formal mathematical knowledge and everyday experience, thereby reducing opportunities for learners to see mathematics as meaningful, familiar, and socially grounded. The qualitative data therefore deepen the quantitative finding by showing that lack of research and documentation has direct implications for pedagogical relevance, classroom engagement, and the legitimacy of the curriculum in the eyes of learners.

Inadequate Teacher Training and Professional Development

Although inadequate teacher training and professional development ranked third quantitatively, the interview data suggest that this challenge remains deeply embedded in the implementation process. Teachers consistently reported that they had received little or no structured preparation in how to integrate Indigenous knowledge into mathematics instruction. This was described as a gap in both pre-service teacher education and in-service professional development. The problem, therefore, is not simply the absence of occasional workshops, but a broader lack of institutional preparation for culturally responsive mathematics pedagogy.

One participant captured this concern directly:

“I want to include Indigenous knowledge in my lessons, but I was never trained to do so. I don’t even know where to start.”

This statement reflects a tension between willingness and capacity. Teachers may be positively disposed toward indigenized approaches, yet still feel professionally constrained by limited pedagogical knowledge, insufficient curricular guidance, and the absence of support structures. This helps explain why the challenge was broadly acknowledged irrespective of teaching experience. The issue appears to stem less from individual reluctance and more from institutional failure to equip teachers with the conceptual tools, methodological confidence, and professional support needed for effective implementation. Thus, the qualitative evidence strengthens the interpretation that the difficulty lies not in teachers’ attitudes alone, but in the weak systemic preparation surrounding curriculum reform.

Language Barriers as a Practical Expression of Curriculum Misalignment

Although language barriers did not appear as a separate quantitative dimension in the survey table, they emerged strongly in the qualitative phase as a practical manifestation of the broader structural barriers already identified. Teachers explained that many mathematical terms do not have clear or standardized equivalents in local languages, forcing them to depend heavily on English even in contexts where learners are more comfortable expressing meaning through Indigenous languages. This creates conceptual strain and can weaken learners’ participation in mathematical discussion.

As one participant noted:

“Many mathematical terms do not exist in our local languages, so we are forced to explain in English. This creates confusion and reduces engagement.”

This theme is analytically important because it shows that curriculum indigenization is not only about inserting local examples into teaching, but also about the language through which mathematical meaning is mediated. Where indigenous mathematical concepts are not documented, localized terminology is underdeveloped, and teachers are not trained in multilingual pedagogies, language becomes a site where epistemic and pedagogical exclusion are reproduced. The interviews therefore show that language barriers are closely connected to the lack of documentation and training identified quantitatively. They are not isolated classroom problems, but indicators of deeper curriculum misalignment between school mathematics and the linguistic realities of learners.

Limited Collaboration with Indigenous Communities in Curriculum Development

The second-highest challenge in the quantitative findings was limited collaboration between mathematics educators and Indigenous communities. The qualitative data strongly reinforce this result by showing that teachers perceive community exclusion not as a minor administrative gap, but as a missed intellectual and pedagogical opportunity. Participants emphasized that Indigenous elders, knowledge holders, and cultural practitioners possess rich mathematical understandings embedded in local systems of measurement, trade, agriculture, architecture, and problem-solving practices. Yet these community-based knowledge resources remain largely disconnected from formal curriculum processes.

One participant explained:

“Our elders have rich mathematical knowledge, but they are never involved in designing the curriculum. We are missing an opportunity to create a meaningful learning experience.”

This quotation underscores that the challenge is not the absence of Indigenous knowledge, but the absence of institutional mechanisms for recognizing, validating, and integrating it within formal education. The exclusion of community voices weakens cultural ownership of the curriculum and limits the possibility of producing mathematics education that is locally grounded and socially responsive. In this sense, limited collaboration reflects a broader structural divide between school-based knowledge and community-based knowledge. The qualitative data therefore explain why this issue ranked so highly in the quantitative phase: teachers see collaboration not merely as consultation, but as a necessary condition for meaningful curriculum indigenization.

DISCUSSION OF FINDINGS

The findings of this study show that the barriers to implementing indigenized mathematics education in Southern Province, Zambia, are perceived as both substantial and structurally embedded. The quantitative results are especially important in this regard because they establish a clear hierarchy of challenges. Among the three dimensions examined, the lack of research and documentation emerged as the most strongly perceived barrier, followed by limited collaboration with Indigenous communities and, closely thereafter, inadequate teacher training and professional development. This pattern suggests that teachers locate the primary difficulty not at the level of personal disposition, but at the level of knowledge systems, institutional support, and professional capacity. Rather than interpreting indigenization as a matter of teacher reluctance, the data indicate that educators experience it as a reform agenda constrained by a weak evidentiary base, insufficient pedagogical guidance, and limited structures for knowledge exchange between schools and communities.

The fact that lack of research and documentation received the highest mean score is analytically significant. It suggests that teachers perceive the integration of Indigenous mathematical knowledge not merely as a curricular aspiration, but as a task for which the necessary intellectual and pedagogical groundwork remains underdeveloped. In other words, the challenge is not simply that teachers do not know enough; it is that the system has not sufficiently produced, validated, and circulated the knowledge resources required for meaningful implementation. This finding aligns with recent scholarship arguing that the marginalization of Indigenous knowledge in formal education often persists through the absence of systematic documentation, curriculum translation, and pedagogical frameworks capable of converting community knowledge into teachable school content (Allen & Trinick, 2021; Gebre et al., 2021; Photo & McKnight, 2024). Within the present study, the qualitative findings help explain this quantitative pattern. Teachers' accounts of limited materials, weak scholarly guidance, and uncertainty about how to align Indigenous knowledge with formal mathematics indicate that the high rating of this challenge reflects more than frustration; it reflects an epistemic vacuum in which policy expectations are not matched by usable instructional resources.

The statistical significance associated with educational background in relation to this challenge further strengthens this interpretation. The data indicate that teachers' academic qualifications shape how they perceive the barriers to indigenized mathematics education, with more highly qualified educators appearing to recognize these constraints differently from those with lower academic qualifications. This suggests that academic preparation may influence not only content knowledge, but also teachers' epistemic awareness of what is missing from the curriculum and why those absences matter. The post-hoc finding that doctorate holders perceived fewer challenges than bachelor's degree holders is especially revealing. One plausible interpretation is that advanced academic training provides greater exposure to curriculum theory, decolonial debates, research processes, and culturally responsive pedagogical frameworks, thereby equipping some teachers with broader conceptual tools for navigating reform. This interpretation is consistent with studies showing that teachers with stronger academic and reflective preparation are often better positioned to engage contested knowledge domains, particularly where curriculum reform involves epistemological shifts rather than routine technical adjustments (Acharya et al., 2021; Trinick & Allen, 2024). At the same time, this does

not imply that higher qualifications remove structural barriers; rather, it indicates that academic preparation may mediate how teachers understand and respond to such barriers.

The finding that collaboration with Indigenous communities was also rated highly as a barrier points to another crucial dimension of the implementation challenge. Quantitatively, this result indicates that teachers perceive weak school-community engagement as a major obstacle to indigenized mathematics education. This is important because it shows that teachers do not view Indigenous knowledge as something that can be integrated from textbooks or policy directives alone. Instead, they appear to recognize that authentic indigenization requires sustained engagement with the people and practices from which that knowledge emerges. The qualitative data illuminate why this challenge was rated so strongly. Teachers described the limited involvement of elders, cultural custodians, and community practitioners in curriculum development and instructional processes, thereby revealing a gap between formal schooling and local knowledge systems. This gap matters because indigenization depends not only on content inclusion, but also on relational legitimacy. Knowledge that is detached from its social and cultural custodians risks becoming superficial, fragmented, or tokenistic.

This interpretation is supported by recent literature emphasizing that Indigenous curriculum reform is most meaningful when communities are not treated as symbolic reference points but as co-constructors of educational knowledge (Utami et al., 2021; Photo & McKnight, 2024). In mathematics education specifically, the absence of collaboration can weaken both authenticity and pedagogical relevance, because the cultural logic embedded in counting systems, spatial reasoning, measurement practices, and local problem-solving traditions cannot be fully understood through decontextualized curricular insertion alone. The present findings therefore suggest that the challenge of collaboration is not merely administrative; it is epistemological and relational. It reflects the persistence of a curriculum model in which schools remain the dominant site of knowledge authority, even when the reform agenda calls for recognizing knowledge that originates outside formal institutions.

The quantitative finding that educational background also influenced perceptions of collaboration challenges adds further analytical depth. It suggests that teachers with different academic qualifications do not perceive community engagement in the same way. This may indicate that teachers with greater exposure to scholarly debates on culturally responsive education and Indigenous knowledge are more likely to recognize collaboration as a necessary condition for authenticity, rather than an optional supplement to classroom practice. Such a reading fits with broader educational research showing that teacher capacity for culturally grounded curriculum work is shaped not only by experience in schools, but by the conceptual frameworks through which teachers understand knowledge, pedagogy, and community participation (Acharya et al., 2021; Photo & McKnight, 2024). In this study, then, the significance of educational background reinforces the idea that indigenized mathematics education requires forms of professional preparation that help teachers think beyond subject delivery toward partnership, mediation, and epistemic inclusion.

By contrast, the lack of statistically significant differences based on teaching experience across the challenge dimensions is one of the most important findings in the study. Analytically, this result suggests that the barriers identified are not confined to novice teachers who are still developing professionally, nor are they resolved through prolonged service in the classroom. Instead, the absence of significant variation by teaching experience indicates that these challenges are systemic and widely shared across the profession. This is a powerful finding because it shifts the interpretation away from individual teacher deficiency and toward institutional conditions. If both less experienced and more experienced teachers perceive similar constraints, then experience alone is insufficient to prepare educators for the demands of indigenized mathematics education. The issue, therefore, is not simply one of time in service, but of the kinds of professional learning opportunities, curricular resources, and policy supports that teachers encounter throughout their careers.

This finding challenges a common assumption in educational reform that experienced teachers are naturally better positioned to absorb and implement new approaches. In the case of indigenized mathematics education, the reform appears to demand capacities that ordinary experience in conventional schooling may not develop. Teachers may accumulate years of practice in syllabus coverage, assessment preparation, and classroom management without necessarily acquiring the epistemological and cultural competencies needed to bridge

Western mathematics and Indigenous knowledge systems. Recent literature supports this interpretation by noting that Indigenous and culturally grounded education requires deliberate preparation in areas such as local language mediation, task contextualization, community-based knowledge engagement, and critical reflection on dominant curricular assumptions (Allen & Trinick, 2021; Trinick & Allen, 2024). The non-significance of teaching experience in this study thus strengthens the argument that systemic professional redesign is more important than relying on professional longevity.

The quantitative findings on teacher training and professional development reinforce this conclusion. The high mean score for this dimension indicates that teachers widely perceive inadequate training as a serious obstacle, while the absence of statistically significant differences by either educational background or teaching experience suggests that this concern cuts across demographic categories. In interpretive terms, this pattern implies that the training deficit is deeply institutionalized. It is not a challenge limited to less educated teachers, nor one that can be overcome through accumulated classroom experience. Instead, it is a profession-wide issue pointing to a common gap in both pre-service and in-service teacher development. The qualitative findings provide important explanatory depth here, as teachers consistently expressed uncertainty about how to incorporate Indigenous mathematical knowledge in pedagogically meaningful ways. Their concern was not merely about willingness, but about competence, confidence, and methodological clarity.

This pattern is strongly echoed in recent scholarship on Indigenous and culturally responsive teacher education. Research has shown that even in contexts where curriculum reform formally acknowledges Indigenous knowledge, teacher education programs often fail to equip educators with the conceptual, linguistic, and pedagogical tools needed for implementation (Trinick & Allen, 2024; Utami et al., 2021). The implication of the current study is that indigenized mathematics education requires a rethinking of teacher preparation itself. Teachers need more than general encouragement to contextualize learning; they need structured exposure to Indigenous knowledge systems, models of culturally grounded lesson design, opportunities for collaborative curriculum development, and professional support in navigating epistemological tensions between local knowledge and formal mathematics. Without such support, indigenization may remain rhetorical rather than operational.

An additional issue that emerged qualitatively, but can be more clearly interpreted in light of the quantitative trends, is the role of language. Although language was not one of the three principal quantitative dimensions, it appeared in teacher narratives as a mechanism through which other barriers are intensified. The difficulty of explaining mathematical concepts in Indigenous languages, particularly where standardized mathematical terminology is limited, helps explain why research gaps, collaboration deficits, and training deficiencies are experienced so acutely. In effect, language operates as a mediating factor that compounds implementation difficulties. If teachers lack documented resources, have weak access to Indigenous knowledge holders, and have not been professionally prepared for culturally responsive instruction, then the linguistic burden of classroom translation becomes even heavier. This interpretation aligns with international work in Indigenous mathematics education showing that language is inseparable from epistemology and pedagogy, especially where minority or Indigenous languages have historically been excluded from formal mathematical discourse (Allen & Trinick, 2021; Trinick & Allen, 2024). Thus, while language was not quantified as a standalone variable in this study, its qualitative prominence helps explain the structural nature of the barriers identified statistically.

The integrated findings suggest that the implementation of indigenized mathematics education in Southern Province, Zambia, is constrained by an interlocking set of institutional weaknesses rather than isolated classroom problems. The quantitative results establish the pattern of these constraints by showing which challenges are most strongly perceived and which teacher characteristics significantly shape those perceptions. The qualitative findings then clarify how these barriers are lived in practice, revealing frustration over limited resources, minimal community engagement, weak training, and linguistic difficulty. Read together, the two strands produce a coherent interpretation: indigenized mathematics education remains difficult not because teachers reject it, but because the system has not yet created the knowledge structures, professional supports, and collaborative relationships necessary for its sustained implementation.

This interpretation carries important implications for curriculum reform and educational policy. First, the prominence of research and documentation as the highest-rated barrier suggests an urgent need for systematic scholarship on Indigenous mathematical practices in Zambia, including their identification, conceptual analysis, and translation into curriculum-relevant resources. Second, the significance of collaboration challenges indicates that curriculum reform must move beyond school-based decision-making and create institutional pathways for meaningful engagement with Indigenous communities. Third, the widespread recognition of inadequate training underscores the need to redesign teacher education and professional development so that indigenization is treated as a core area of professional competence rather than an optional enrichment agenda. These implications are consistent with recent calls for culturally grounded, community-engaged, and epistemically inclusive approaches to STEM education in African and other postcolonial contexts (Photo & McKnight, 2024; Utami et al., 2021).

The study also contributes conceptually to debates on decolonizing mathematics education by showing that implementation barriers are not simply pedagogical in nature; they are tied to the politics of knowledge in schooling. The significance of educational background, the non-significance of teaching experience, and the ranking of the challenge dimensions together point to a broader conclusion: what is at stake in indigenized mathematics education is not just instructional method, but epistemic legitimacy. Teachers appear to be working within a system where Indigenous mathematical knowledge is valued in discourse but insufficiently institutionalized in curriculum materials, teacher education, language development, and community partnership structures. As a result, indigenization remains aspirational rather than fully embedded.

Although the study offers important insights, its interpretation should be made with appropriate caution. Because the inquiry was conducted in Southern Province, the findings are most directly applicable to that regional and cultural context. In addition, the reliance on self-reported perceptions means that the study captures how teachers understand implementation challenges, though not necessarily the full complexity of what happens in classrooms. Nevertheless, these limitations do not diminish the significance of the findings. Rather, they point toward future research that could combine teacher perceptions with classroom observation, curriculum analysis, intervention studies, and comparative regional inquiry. Such work would be especially valuable in determining whether the same statistical and thematic patterns hold across other regions of Zambia and in assessing how targeted reforms in training, documentation, and collaboration affect practice over time.

The discussion demonstrates that the challenge of implementing indigenized mathematics education in Zambia is best understood as a systemic issue located at the intersection of curriculum, teacher preparation, knowledge production, and school-community relations. The quantitative results make clear that teachers perceive the barriers as serious and patterned, while the qualitative findings reveal why those barriers persist in practice. In this sense, the study does more than identify obstacles; it shows that meaningful indigenization requires structural transformation in how mathematics knowledge is researched, authorized, taught, and connected to lived cultural realities. That is the deeper significance of the findings.

CONCLUSION

This study has shown that the implementation of indigenized mathematics education in Southern Province, Zambia, is constrained by structural and epistemic barriers rather than by teacher unwillingness. By integrating quantitative and qualitative evidence, the study demonstrates that the most pressing obstacles lie in the limited research and documentation of Indigenous mathematical knowledge, weak collaboration between schools and Indigenous communities, and inadequate teacher preparation for culturally responsive mathematics instruction. The significance of educational background, alongside the non-significance of teaching experience, further suggests that the challenge is not resolved through years of classroom service alone but requires more deliberate forms of academic and professional preparation.

The study therefore contributes to current debates on decolonizing mathematics education by showing that indigenization cannot be achieved through symbolic curriculum inclusion alone. Meaningful reform requires the production of contextually grounded knowledge resources, the redesign of teacher education and professional development, and the creation of institutional mechanisms through which Indigenous knowledge holders can participate more directly in curriculum and pedagogy. In this sense, the study highlights that the

question of indigenized mathematics education is not only pedagogical, but also one of epistemic justice, curriculum legitimacy, and educational relevance.

The findings suggest that if mathematics education in Zambia is to become more inclusive, meaningful, and culturally responsive, reform efforts must move beyond rhetorical support for Indigenous knowledge and toward systemic transformation in how mathematics is researched, taught, and connected to learners' lived realities. Future work should build on this foundation through classroom-based, comparative, and intervention-oriented studies that can further illuminate how indigenized mathematics education may be more effectively implemented across diverse educational settings.

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