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Research Article

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Exploring Teachers' Perspectives and Influential Factors in Math instruction for Goodhope

Dr. End Salani[1*] and Mr Shimmy Sethukge[2]

[1]Department of Primary Education, University of Botswana, Private Bag 00702, Gaborone, Botswana
[2]Ministry of Education, Private Bag 005, Gaborone, Botswana

[*]**Corresponding author:** Dr. End Salani, Department of Primary Education, University of Botswana, Private Bag 00702, Gaborone, Botswana. Tel: +267 3552253; E-mail: salanie@ub.ac.bw; Co-author: Tel: +267 355253 E-mailssethukge@gmail.com (SS)

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Abstract

In this research, we delve into the perspectives of teachers and influential factors shaping math instruction in upper primary schools within the Goodhope region of Botswana. Recognizing the significance of mathematics education and the diverse learning needs of students, understanding effective teaching strategies becomes paramount. The study aims to authenticate various teaching and learning strategies employed by teachers to enhance performance in upper primary classes. The specific objectives include identifying teachers' perceptions of strategy efficacy, determining influencing factors on teaching strategies, and examining the impact of different teaching strategies on learners' performance. Guided by Critical and Constructivism theories, the research aims to uncover the nature of problems contributing to low learner performance (Critical theory) and explore engaging strategies for individual learners (Constructivism theory). The literature review underscores the study's foundation, showcasing how prior research informs the current investigation. Employing an embedded mixed methods approach, the study involved thirty teachers from ten selected schools in the Goodhope sub-region. Data collection utilized questionnaires and semi-structured interviews, while analysis employed descriptive statistics and thematic content analyses. Findings indicate that teachers employ a variety of effective teaching strategies, including incorporating games, relating mathematics to real-life situations, and using spoken and written praise. These strategies were perceived as key contributors to improving learner performance. Additionally, the study highlights the importance of satisfying learners' needs and interests for success. The recommendation emphasizes the application of diverse learner-centered teaching strategies and activities to enhance mathematics learning outcomes.

Keywords: *Mathematics instruction, Teaching strategies, Learner performance, Critical theory, Constructivism theory.*

Introduction and Background to the Study

Introduction

The study explores teachers' perceptions of teaching strategies in upper primary math classes in Botswana, aiming to enhance learners' performance. Examining diverse teaching approaches, the research delves into strategies' implementation, seeking improvement in fundamental aspects of teaching. The National Center for Education Evaluation [1] has probed instructional methods and learners' achievement, yet uncertainties persist in determining the most effective practices [1]. As educational research continually scrutinizes teaching and learning effectiveness [2], the study underscores the necessity for teachers to employ varied strategies, methods, and techniques to elevate mathematics teaching quality.

Recent studies link learners' low performance to ineffective teaching methods [3,4], emphasizing the pivotal role of teachers in transforming learners' mindsets. Recognizing mathematics as a foundational subject, its effective teaching extends beyond academic performance, influencing success in science and technology-related fields [5,6]. Mathematics, integral to societal development, extends into various sectors, including science, technology, economics, and agriculture [7]. The study addresses the critical need for effective math education in Botswana, highlighting the impact on learners' career choices, economic competitiveness, and national development.

Background of the Study

Botswana, since gaining independence in 1966, has prioritized education, with significant policy reviews in 1977 and 1994 aimed at elevating educational standards, particularly in mathematics and science [8]. Despite these concerted efforts, learners' poor performance in mathematics remains a significant concern [9], as recognized by education authorities [10,11]. The critical role of mathematics in Botswana's socio-economic development underscores the urgency for effective teaching strategies and policy implementation to address these academic challenges, in alignment with national visions such as Vision 2016 and Vision 2036. This study endeavors to provide insights that could enhance mathematics education, bridging the gap between policy intent and academic outcomes in Botswana.

The persistent unsatisfactory performance of students in mathematics, as evidenced by PSLE results in Table 1, raises significant concerns [12]. Academic achievement in mathematics is crucial, as it correlates strongly with overall learner performance and future opportunities [13]. Addressing this issue requires a thorough investigation into teachers'

perceptions of the efficacy of various teaching strategies [11]. Despite significant government investments in education [11], the achievement levels in mathematics have not met expectations. Efforts to develop an effective mathematics curriculum have not yet translated into improved performance [11].

Some literature supports the need for such studies. For instance, the strategic use of diverse teaching methodologies is shown to enhance student engagement and understanding [14]. Research by Clements and Sarama (1999) [15] underscores the importance of practical tools like rulers in improving students' mathematical reasoning and performance. Similarly, Ekwueme, Ekon and Ezenwa-Nebife (2015) [16] advocate for hands-on activities to bridge the gap between theoretical knowledge and practical application, enhancing cognitive abilities. However, the reluctance to integrate calculators and educational technology remains a debated issue, with studies suggesting both potential benefits and drawbacks [17,18]. This study aims to provide a comprehensive analysis of teaching strategies in upper primary mathematics education at Good hope sub-region, Botswana, examining teachers' perceptions, influencing factors, and the impact on learner performance. By doing so, it seeks to inform policy and practice, contributing to the broader goal of improving mathematics education and student outcomes in Botswana.

Table 1: PSLE Performance of learners obtained grade A to C in Mathematics.

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
% mean score	65.2	70.6	69.7	53.3	55.1	58.4	60.5	62.9	66.4	65.9	69.1	64.6	66.3	63.4	61.7

The international context further underscores Botswana's mathematics performance challenges, with Grade eight students ranking among the lowest performers globally [19,20]. Ineffective teaching strategies may contribute to low performance [21]. While teachers play a crucial role, external factors like grade level and prior ability also influence learner achievement [22,23]. Teachers, armed with proper knowledge, are key to implementing effective teaching strategies [21]. Hence, investigating teachers' perceptions of these strategies becomes essential for meaningful mathematics learning [25]. Post-independence, Botswana prioritized education, introducing policy reviews in 1977 and 1994 [8]. The policies aimed at elevating educational standards, focusing on mathematics and science [9]. The current seven-year primary education system, followed by Junior and Senior Secondary levels, shapes Botswana's education landscape [8]. Despite these efforts, challenges persist in rural-urban disparities, teaching quality, and facilities for learners with special needs (ETSSP 2015-2020, 2015a). The recent educational initiatives, such as the One-Year Reception Class Programme, reflect ongoing reforms [25]. Primary education aims to provide cognitive, affective, and motor skills to all children (NCAF, Republic of Botswana, 2015b). Mathematics education aligns with broader goals, emphasizing communication, reasoning, and connections to real-world examples [26,]. However, challenges persist in rote learning, underutilization of resources, and a lack of relevance to daily life contexts (NCAF, Republic of Botswana, 2015b).

Botswana's primary education faces challenges, including rural-urban disparities, dropouts, poor teaching, inadequate facilities, and declining educational quality (ETSSP 2015-2020, 2015a). These challenges affect learners' performance, especially in core subjects like mathematics (ETSSP 2015-2020, 2015a). The study's focus on the rural Goodhope area aims to uncover teaching strategies amidst resource disparities. Underperformance in mathematics, indicated by TIMSS reports [11], prompted this investigation into teachers' perceptions of teaching strategies in upper primary classes. Recognizing the importance of mathematics in Botswana's development, the study addresses the urgency to identify effective instructional methods for improvement [9]. Challenges in teaching methods and resource utilization contribute to learners' underperformance [4]. Addressing these issues is crucial for national development, aligning with Botswana's aspirations for self-sufficiency in science and technology [27].

The study aims to investigate teachers' perceptions of the efficacy of teaching strategies in upper primary mathematics classes. Specific objectives include to identify teachers' perceptions of the efficacy of various teaching strategies in mathematics education at the upper primary school level; determine the factors that influence the choice and implementation of teaching strategies by mathematics teachers and to examine the impact of different teaching strategies on learners' performance in mathematics. Research questions center on the nature of teaching strategies, factors influencing efficacy, and teachers' views on strategy impact and are as follows: (i) How do upper primary school teachers perceive the efficacy of different teaching strategies in improving students' learning outcomes in mathematics? (ii) What factors influence the selection and implementation of teaching strategies by upper primary school mathematics teachers? (iii) What is the impact of diverse teaching strategies. The research seeks to provide insights into effective teaching strategies for mathematics in Botswana's primary schools, offering recommendations for improvement. By examining high-performing classes in the Goodhope area, the study aims to assist teachers in adapting and refining their strategies.

The findings are expected to inform curriculum development, teacher training, and policy formulation in Botswana. Teachers will benefit from insights into efficient teaching strategies, addressing challenges in mathematics education. The study also contributes to narrowing achievement gaps, fostering improved performance in mathematics.

Limitations include the study's confinement to ten schools in the Goodhope Sub-region, impacting generalization. Some Senior Teacher 1 cadres may not be mathematics specialists, affecting the sample's representativeness. Time constraints and budgetary limitations restricted broader coverage of primary schools in the region.

Theoretical Framework

The research was theoretically framed by two overarching perspectives: the critical theory and the constructivism theory. The critical theory, as expounded by Basit (2010) [28], regards respondents as individuals deserving liberation from constraining circumstances, emphasizing the need for freedom and democratic principles. Applied to this study, the critical theory was instrumental in comprehending the root causes of learners' underperformance in mathematics. It posits that disempowered individuals, including teachers criticized for lower learner performance, can be empowered by addressing challenges and fostering competencies aligned with desired knowledge, skills, and values. Wellington [29] notes that the critical theory aids in exploring perspectives, shared meanings, and gaining insights into educational contexts, aligning with the study's objective of understanding the challenges impacting learners' performance in the context of Batswana expectations and educational goals. On the other hand, constructivism, as articulated by Jonassen and Roher-Murphy (1999) [30], is a learning theory urging teachers to reconsider how learners acquire knowledge. It highlights the importance of processes, emphasizing documenting change and transformation. Constructivism encourages teachers to engage learners individually, fostering rich environments and addressing challenges through model building efforts. Atherton (2010) [31] argues that knowledge is actively constructed by learners, combining previous experiences with contributions from the social group. In the realm of mathematics teaching and learning, constructivism posits that teachers should guide pupils by posing questions that lead to independent problem-solving. The learning environment, as per Jonassen and Roher-Murphy (1999) [30], should be designed to support and challenge learners' thinking, emphasizing authenticity and relevance. Teachers, in this constructivist framework, act as facilitators, promoting reflection, evaluation, and holistic development—covering emotional, academic, and social aspects of learning. The study, by incorporating both critical and constructivist lenses, aimed to comprehensively explore the challenges and possibilities within the context of mathematics education in Botswana.

Literature Review

This literature review systematically examines various aspects of teaching strategies in mathematics education, focusing on their impact on learner performance. The review is organized around key research questions and includes teaching strategies, factors influencing their application, and teachers' perceptions of their efficacy. Teaching strategies, defined as techniques facilitating learning and achieving objectives, are crucial for effective education. Antony and Walshaw (2009) [32] explain that these strategies include activities both in and out of the classroom, such as lesson organization, learner arrangement, content delivery, and communication. The selection of efficient teaching and learning styles is critical for successful math education, emphasizing learner motivation and performance enhancement [14]. Incorporating strategies that meet educational and psychological needs is deemed essential for favorable outcomes [33].

Recent literature on strategies used in Botswana primary schools to teach mathematics reveals a strong emphasis on learner-centered approaches and technology integration. Studies, such as one by Mogapi, Kagiso and Gabajesane (2023) [34] emphasizes the role of digital tools and resources in making classroom instruction more accessible and engaging. However, challenges such as inadequate teacher training and limited access to resources, particularly in rural areas like Goodhope, hinder the effective implementation of these strategies. Ncube, Phiri and Mbhele (2022) [35] note that while teachers generally view innovative methods positively, their effectiveness is often hampered by systemic issues such as large class sizes and insufficient educational support. Furthermore, research by Lwin and Oo (2020) [36] and Muhangwa (2023) [37] highlight the adoption of interactive and participatory teaching methods, including group work and problem-solving activities, to enhance student engagement and understanding. Overall, while the strategies show promise, their success depends on addressing these underlying issues.

Salani's (2023) [38] study explored the instructional challenges faced by junior secondary school teachers in teaching algebraic equations, noting the prevalence of teacher-centered methods. Significant obstacles, such as large class sizes and syllabus congestion, hinder interactive learning and comprehensive understanding of algebraic concepts. Additionally, poorly prepared lesson plans lead to missed opportunities for addressing students' misconceptions. To mitigate these issues, the study recommended collaborative efforts among teachers to reflect on teaching practices and develop effective strategies for teaching algebraic equations. Organized workshops for policymakers and curriculum designers were also suggested to enhance curriculum implementation and promote active learning. Although Salani's study focused on junior secondary schools, the findings and recommendations are relevant to exploring teachers' perspectives and influential factors in math instruction at Goodhope Upper Primary schools in Botswana.

One promising strategy is incorporating games in teaching mathematics. Games, defined as rule-guided activities with no real-world consequences, enhance cognitive processes in mathematics learning [39,40]. Lach and Sakshaug (2005) [41] demonstrate that game-based learning motivates and engages learners, leading to improved performance. Indigenous games, which incorporate cultural relevance, help overcome learners' fear of mathematics and create connections between cultural and classroom activities [42]. The instructional effectiveness of computer games is emphasized, with research by Ke and Grabowski (2007) [43] suggesting diverse options for enhancing mathematical understanding. Nisbet and Williams (2009) [44] showcase a project involving probability games, revealing increased motivation, comprehension, and confidence among learners. The integration of technology into mathematics education is essential for advancing mathematical sense-making, reasoning, problem-solving, and communication [45]. Gadanidis and Geiger (2010) [46] highlight the supportive role of technology in procedural skills, problem-solving, and reasoning. Tools like calculators and online assessments provide self-paced learning and immediate feedback [47,48]. Handheld

game consoles demonstrate significant improvements in learners' mathematical calculations [49].

Manipulatives, physical objects aiding hands-on learning, are pivotal tools in mathematics education [50,48]. Their use facilitates the connection between real-world situations and mathematical symbolism, enhancing learners' confidence and problem-solving skills [51]. Bouck and Flanagan (2010) [52] affirm that manipulatives improve mathematics achievement, particularly in visualizing abstract concepts like fractions. Additionally, the affordability and accessibility of manipulatives make them practical instruments for fostering mathematical understanding [53]. Linking mathematics to real-life situations is instrumental in overcoming learners' negative attitudes and fostering a positive learning environment [54]. Teachers play a crucial role in demonstrating the relevance of mathematics in everyday scenarios, making the subject more engaging and relatable [55]. Real-world applications serve as catalysts for learners' appreciation of mathematical concepts, ensuring a meaningful and less tedious learning experience [56].

Differentiated instruction, tailored to learners' readiness, interests, and preferences, is a strategic approach to addressing diverse learning abilities [57,58]. By acknowledging individual differences, teachers create a supportive learning environment that fosters motivation and performance in mathematics [59]. Ongoing assessment informs the adaptation of instructional methods, ensuring a personalized approach that caters to learners' unique needs [60]. Bose, Tsamaase, and Seetso's (2013) [61] study examined mathematics and science education in Botswana pre-schools, aiming to uncover teachers' knowledge base, content and process activities, and the availability and usage of resources. The study found that many teachers, despite lacking formal Early Childhood Education (ECE) training, possessed some knowledge of mathematics and science, emphasizing pedagogy over content. It highlighted the predominance of mathematics activities over science, frequent use of outdoor activities, and underutilization of designated mathematics and science corners. Challenges included the necessity for specialized ECE training, which teachers believed would enhance their knowledge base. This underscores the critical need for professional training, particularly in mathematics and science, to improve instructional quality and resource utilization in pre-schools.

Mosekiemang's (2019) [62] investigation into upper primary classes in Botswana's Kweneng region identified several challenges: lack of resources, packed syllabus objectives, high teacher-learner ratios, lack of parental involvement, inappropriate teaching methods, limited in-service education, and insufficient use of technology. These issues hinder effective mathematics instruction and learning. Mosekiemang recommended strengthening in-service mathematics teacher education to help teachers manage difficult concepts and acquire new skills, thereby improving mathematics performance. This aligns with the broader consensus that continuous professional development is essential for enhancing teaching quality and learner outcomes. Rudhumbu and Rudhumbu (2018) [63] explored the implementation of the mathematics curriculum in Botswana's primary schools, identifying significant challenges such as large class sizes, inadequate professional training, heavy workloads, and teachers' anxiety towards mathematics. These issues lead to low confidence and a preference for teacher-centered strategies, resulting in low epistemic quality in mathematics instruction. The study found that teachers in private schools implemented the curriculum more effectively than those in public schools, and higher educational levels correlated with better curriculum implementation. Improving teachers' professional training and reducing class sizes are crucial steps toward effective curriculum implementation. Salani and Maphane's (2014) [64] study on primary school teachers' beliefs about motivational strategies in mathematics instruction revealed that most teachers viewed these strategies as instrumental in enhancing classroom practices. They promoted learner-centered approaches to sustain students' interest and improve relational understanding and critical skills. However, some teachers, particularly those without positions of responsibility, failed to provide timely and constructive feedback, adversely affecting students' mathematical achievement. The study recommended school-based training on effective motivational strategies to empower teachers and improve classroom instruction.

Recent studies continue to highlight the importance of innovative teaching strategies and professional development in mathematics education. For instance, Ncube et al. (2022) [35]. Emphasize the need for adequate teacher training and resource provision to effectively implement learner-centered approaches. Similarly, Lwin and Oo (2020) [36] and Mogapi et al. (2023) [34] stress the integration of digital tools to enhance student engagement and understanding, although they note the challenges posed by resource limitations. The literature presents a comprehensive overview of various strategies to improve mathematics instruction in Botswana's primary schools, yet it also reveals persistent systemic challenges. The predominance of teacher-centered methods, as noted by Rudhumbu and Rudhumbu (2018) [63], is a significant barrier to effective learning. This is compounded by large class sizes, insufficient training, and resource shortages, particularly in rural areas like Goodhope.

To address these challenges, it is essential to focus on continuous professional development for teachers, as emphasized by Mosekiemang (2019) [62] and supported by Salani and Maphane (2014) [64]. Ensuring teachers are equipped with the necessary skills and knowledge to implement innovative strategies is crucial. Additionally, addressing resource disparities, particularly in rural areas, is vital for equitable education. Furthermore, the integration of technology, as highlighted by recent studies, offers promising avenues for enhancing mathematical understanding and engagement. However, the digital divide remains a significant obstacle that needs to be addressed through targeted policies and investments. In conclusion, while current strategies hold significant potential, their effectiveness depends on systemic support and addressing the unique challenges faced by teachers in Botswana. By focusing on professional development, resource provision, and the integration of technology, Botswana can enhance its

mathematics instruction and improve learner outcomes, thereby fostering a more robust educational environment. The strategic use of games also significantly contributes to learners' mathematical performance and understanding. While innovative strategies like game-based learning show significant promise, addressing systemic issues such as teacher training and resource availability is crucial for their successful implementation. These arguments support the aim of the current study by highlighting good practices in math instruction and suggesting ways to overcome existing challenges in Botswana's primary schools. The reviewed literature presents a comprehensive overview of various strategies that can improve mathematics instruction in Botswana primary schools. However, the implementation of these strategies is often hindered by systemic challenges such as large class sizes, inadequate teacher training, and limited resources, especially in rural areas like Goodhope. While the adoption of manipulatives, real-life applications, differentiated instruction, technology, and games shows significant promise in enhancing learners' performance, the success of these strategies is contingent upon addressing these underlying issues. To improve math instruction in Botswana, it is essential to provide ongoing professional development for teachers, ensuring they are equipped with the skills and knowledge to effectively implement innovative strategies. Additionally, policymakers and curriculum designers should work collaboratively to create a supportive infrastructure that includes adequate resources and a flexible curriculum that allows for the integration of diverse teaching methods. Workshops and continuous training programs for teachers, as recommended by Salani (2023) [38], can foster a reflective practice and encourage the adoption of best practices in math instruction. Addressing these challenges will not only enhance the effectiveness of math instruction but also ensure that learners in Botswana receive a high-quality education that equips them with essential mathematical skills. Overall, while current strategies hold significant potential, their effectiveness will depend on systemic support and addressing the unique challenges faced by teachers in Botswana. These improvements are crucial for fostering an educational environment where innovative teaching methods can thrive and significantly enhance students' mathematical understanding and performance.

A study by Kasule and Mapolelo (2005) [65] sheds light on the teaching strategies employed in northern Botswana, particularly in multilingual classrooms. In overcoming syllabus-induced challenges related to the abstract nature of mathematics, teachers emphasized the use of certain strategies to make learning enjoyable and profoundly moving. English emerged as a crucial language of instruction, fostering improved learning of both English and mathematics content [65]. Additionally, the study emphasizes the significance of a strategies-based approach to teaching and learning mathematics in multilingual settings [66]. Moreover, hands-on activities are pivotal in making abstract mathematical concepts tangible, thereby enhancing learners' understanding and cognitive abilities [16]. This approach aligns with findings that such activities bridge the gap between theoretical knowledge and practical application. Similarly, the strategy of instructing learners to measure objects using tools like rulers, as underscored by Clements and Sarama (1999) [15], plays a crucial role in enhancing reasoning skills and connecting abstract concepts to real-world applications. Individual and group demonstrations further facilitate a thorough understanding of mathematical concepts through interactive learning. However, it is crucial to balance teacher involvement to avoid dominating discussions, as cautioned by Kasule and Mapolelo (2005) [65], and to encourage active learner engagement [67]. Conversely, the hesitancy to use calculators reflects concerns about dependency, supported by Hong, Thomas, and Kiernan (2000) [17], who highlight the potential negative impact on problem-solving skills. However, integrating technology effectively remains a debated topic, with potential benefits noted by other studies. In a study by Mogwe and Balotlegi (2020) [68] that sought to understand barriers associated with its adoption in primary education in Botswana, it was established that a low rate of ICT utilization, lack of basic ICT skills, lack of infrastructure was amongst the key barriers to ICT adoption and utilization in the primary education system. Incorporating these strategies thoughtfully can address diverse learning needs, enhance engagement, and improve overall performance in mathematics education for primary school learners.

Research Methodology

Research Methodology serves as the foundation for effective research, connecting research methods to outcomes. As stated by Creswell (2009) [69], it encompasses the selection and application of research methods, instruments, procedures, and techniques for data collection and analysis. Kothari (2004) [70] adds that it goes beyond methods, delving into the rationale behind the chosen methods within the research context. This chapter outlines the research design, population, sampling, and ethical considerations for a study exploring teachers' perceptions of teaching strategies and their impact on learners' performance in upper primary mathematics.

Research Philosophy

Research philosophy, defined by Saunders, Lewis, and Thornhill (2015) [71] as a system of beliefs shaping knowledge reality, guides the approach to data collection and analysis. This study adopts a pragmatism philosophy, recognizing the compatibility of quantitative and qualitative methods. The ontological assumption underlying this choice is that both approaches contribute to understanding teachers' perceptions of effective teaching strategies in mathematics [72,73].

Research Design and Mixed-Methods Approach

Research design, crucial in addressing research questions, is approached through a mixed-methods design. This combines both quantitative and qualitative methodologies. The study follows an explanatory sequential mixed-methods design [74], where quantitative data from questionnaires inform the selection of participants for qualitative interviews. This approach allows for a comprehensive exploration of teaching strategies' effectiveness [74].

Population and Sample for the Study

The study targets upper primary class teachers in the Goodhope Sub-region, encompassing both semi-urban and rural settings. With 45 primary schools, the population comprises 414

teachers. Ten schools, five each from high and low performing categories based on PSLE Mathematics results, are purposively selected. The sample includes 30 teachers, with 10 Senior Teachers 1 (Mathematics and Science) participating in interviews. The rationale for this selection is to gather diverse perspectives and insights.

Sampling Procedure and Data Collection

Purposive selection is employed to select schools based on PSLE Mathematics performance. From these schools, 30 teachers are purposively chosen. A questionnaire gathers quantitative data from all participants, while qualitative insights are derived from interviews with 10 Senior Teachers 1. The mixed-methods approach allows for triangulation and a comprehensive understanding of teaching strategies in upper primary mathematics [75,76]. The study navigates between pragmatism philosophy, mixed-methods design, and purposive selection, providing a robust framework for investigating the complex relationship between teaching strategies and learners' performance in mathematics.

Research Instruments

Research instruments, crucial for data collection in scientific studies, were deployed in the form of a self-administered questionnaire and a semi-structured interview. The questionnaire, a printed set of questions aimed at collecting facts and opinions, facilitated communication with upper primary class teachers [77,78]. The decision to use a questionnaire was driven by its ability to cover a large population across a wide geographical area, providing a cost-effective means while maintaining respondent anonymity [79]. Closed-ended questions offered standardized responses for easier data analysis, but limitations in gathering detailed information led to the incorporation of interviews [80]. The questionnaire was designed in five sections, covering demographic information, teaching strategies, factors influencing teaching, perceptions on teaching strategies' impact, and the motivational aspect of teaching strategies. A Likert scale with a five-point gradation was employed for respondents to express their agreement or disagreement. A semi-structured interview guide, aligning with research objectives and questionnaire items, was employed for the qualitative research component. This served to cross-validate quantitative data obtained from the questionnaire. Open-ended questions in the interview guide ensured flexibility and depth in exploring various topics with Senior Teacher 1 mathematics and science. The interview process involved careful consideration of factors such as securing permission for tape recording, maintaining eye contact, and positioning the tape recorder strategically. The interviews were conducted with Senior Teachers 1 Mathematics and Science, recording data on audiotapes for later transcription and analysis. This approach aimed to ensure the interviewees comprehensively addressed the research questions and to facilitate probing for specific answers [81].

Process of Recording Interview Data

Data collected through interviews were recorded on audiotapes, transcribed, and analyzed for emerging themes and sub-themes. Key quotations were extracted to give voice to participants' responses.

Validity and Reliability of Research Instruments

Ensuring validity and reliability, the instruments underwent scrutiny by colleagues, friends, graduate students, and a supervisor with expertise in mathematics and instrument design. The instruments were adjusted to cover the required content, attaining acceptable face and content validity. To maintain reliability, multiple individuals participated in this validation process [82].

Data Collection Procedure

Ethical considerations were paramount throughout the study. Institutional review board approval was obtained, and informed consent was sought from participants and relevant authorities. Confidentiality and voluntary participation were emphasized, and participants retained the right to withdraw at any time. Additionally, a series of letters were submitted for ethical clearance and permission from the Ministry of Basic Education and school principals.

Data Analysis

Data analysis involved systematically arranging, organizing, and categorizing information obtained from questionnaires and interviews. Quantitative data were processed using SPSS, calculating mean, mode, standard deviation, and percentages from frequency distribution tables. Qualitative data were analyzed by identifying themes and sub-themes through careful reading and transcription, aligning them with quantitative findings.

Ethical Considerations in Data Collection

Ethical considerations were rigorously adhered to, starting with the submission of a research proposal for ethical clearance. Participants were provided with detailed information on the study's purpose, and informed consent was obtained. Confidentiality, voluntary participation, and the right to withdraw were maintained throughout the study. Permissions were secured from relevant authorities, and participants' identities were protected through coding. The study prioritized the well-being and rights of participants at every stage, ensuring a morally and responsibly conducted research project.

Discussion of Results

In this section, the analysis, presentation, and interpretation of both quantitative and qualitative data addressing objectives 1, 2, and 3 are presented. The data, collected through a questionnaire and interviews with 31 teachers and 10 senior teachers, respectively, underwent descriptive analysis using SPSS version 25. The response rate for the questionnaires was 100%, with 31 out of 31 respondents completing and returning the surveys. The qualitative data from interviews were thematically analyzed through narrative description, aligning with the study's objectives, particularly focusing on teaching strategies and their effectiveness.

Table 2: Teaching strategies used in the teaching of mathematics.

Item	Section B Statements/measure	A %	SA %	D %	SD %	N %	MEAN	STD DEV	MODE
1	I use games as teaching strategies	67.7	9.7	9'7	0.0	12.9	3.77	.762.	4
2	I use manipulatives to explain mathematical concepts	51.6	25.8	12.9	0.0	9.7	3.90	.944	4
3	I ask the learners to present/explain concepts to each other using manipulatives	40.0	40.0	6.7	0.0	13.3	4.13	.900	4
4	I use models and charts in mathematics classroom	51.6	41.9	3.2	0.0	3.2	4.32	.762	4
5	I ask the learners to measure objects using tools such as rulers, scales or protractors	25.8	74.2	0.0	0.0	0.0	4.74	.445	5
6	I assess learners' performance tasks or events (e.g. hands on activities)	64.5	35.5	0.0	0.0	0.0	4.35	.486	4
7	I use individual/ group demonstration or presentation	48.4	45.2	0.0	0.0	6.5	4.39	.615	4
8	I allow learners to use calculators and use other educational technology to understand concepts	6.5	3.2	38.7	25.8	25.8	2.23	1.023	2
9	I allow/encourage learners to use calculators to solve difficult problems	6.5	0.0	54.8	32.3	6.5	1.87	.806	2
10	I use real life applications in teaching mathematics	51.6	38.7	0.0	3.2	6.5	4.23	.845	4

Average Mean Score = 3.79

For Objective No. 1, which explores teaching strategies employed by teachers in teaching mathematics, respondents were asked to express their agreement levels with various statements on teaching strategies. The average mean scores of 3.79 (See Table 2) indicates a generally positive inclination toward the use of diverse teaching strategies at the upper primary school level. Most respondents reported using different strategies, with most measures scoring above 75%. The most frequently employed strategies included asking learners to measure objects using tools like rulers and assessing learner performance tasks (both at 100%), followed closely by hands-on activities and individual/group demonstration or presentation (both at 95%). This robust utilization of diverse strategies aligns with the observation that the techniques learners employ to master lesson content are as vital as the content itself [14]. It suggests that the motivation to enhance learning and performance drives mathematics teachers to incorporate a variety of teaching strategies.

Secondly, all 31 (100%) participants acknowledged employing the strategy of instructing learners to measure objects using tools such as rulers. This strategy received the highest mean score of 4.74, establishing it as the most widely utilized teaching approach for mathematics in upper primary classes. Of those who concurred with this statement, 74.2% expressed strong agreement, reflecting a substantial consensus among respondents. This prominent emphasis on instructing learners to measure objects aligns with the findings of Clements and Sarama (1999) [15], whose study underscored measurement as a crucial real-world application of mathematics, bridging the conceptual gap between mathematical geometry and tangible numbers. The study further asserted that the use of rulers in measurement, compared to non-standard tools like strings, significantly contributes to learners' effective reasoning, resulting in a doubled performance when measurement is introduced.

Table 1 further illustrates that all 31 (100%) respondents affirmed using hands-on activities as a teaching strategy for mathematics at the upper primary school level, garnering a mean score of 4.35 and solidifying its position as one of the primary strategies employed by teachers. Among those in agreement, 64.5% concurred, while 35.5% strongly agreed, indicating a notable consensus among respondents. This observation aligns with the findings of Ekwueme, Ekon and Ezenwa-Nebife (2015) [16] and who advocate for hands-on learning as a comprehensive approach that nurtures critical thinking skills and enhances learners' overall cognitive abilities. The study suggests that hands-on activities make abstract mathematical concepts more tangible and concrete, thereby contributing to improved understanding and academic achievement.

A significant majority of respondents (93.6%) acknowledged employing individual/group demonstration or presentations as a teaching strategy for mathematics at the upper primary school level, receiving a mean score of 4.39. This underscores the importance of this strategy in ensuring a thorough understanding of the subject matter. However, caution is advised by Kasule and Mapolelo (2005) [65], who caution that the effectiveness of classroom discussions may be limited if teachers dominate the discourse, hindering learners' initiative. Le Roux (1996) [67] adds that a teacher-centered strategy can restrict learners from actively exploring concepts on their own terms.

Contrastingly, Table 2 further indicates that a majority of respondents (87.1%) disagreed with allowing or encouraging learners to use calculators to solve difficult problems, with a mean score of 1.87, positioning it as the least favored strategy among teachers. This hesitation to incorporate calculators may be rationalized by Hong, Thomas, and Kiernan (2000) [17], who found that overreliance on calculators by weaker students could hinder their ability to solve mathematical problems independently. Similarly, Thomas and Hong (2004) [83] suggested that the use of calculators might lead some initially unmotivated learners to become overly dependent on this technology.

Finally, it is revealed in Table 2 that more than half of the respondents (64.5%) disagreed with allowing learners to use calculators and other educational technology to understand

concepts, indicating a reluctance to embrace these tools in the teaching of mathematics at the upper primary level. This finding is at odds with the existing literature advocating for the beneficial integration of calculators and educational technology in mathematics education. The hesitancy among teachers might stem from a lack of research into the decision-making processes regarding the use of calculators and technology, warranting further investigation. Additionally, concerns about technology-induced distractions, as highlighted by Kelley (2018) [18], could contribute to teachers' reservations about its implementation.

Table 3: Thematic Analysis - Teaching strategies used by Teachers of Mathematics in upper primary classes.

Theme	Sub-themes (categories)	Codes
Teaching strategies (Theory)	Teaching methods – Theoretical	Quizzes
		Tests and tag
		Mental arithmetic
		Remedial work
		Demonstration
		Peer-teaching
		Lecture
		Discussion
		Guide and discovery
		Teaching aids
		Presentation
		Question and answer
Teaching strategies (Practice)	Teaching Methods – Practical	Hands-on activities
		Real-life experience
		Demonstration
		Discovery
Teaching strategies (Organizational)	Organizational approach/method	Individualization
		Pairing
		Group work
		Use of time-table
Teaching strategies (Games and Simulation)	Games and Simulation	Sudoku
		PAES activities
		Simulation

Source: Interview field data

Table 3 provides an overview of teaching strategies identified by interviewees, categorized into four themes: theory, practice, organizational, and games and simulations. Strategies under the theory category encompass quizzes, tests and tag, mental arithmetic, remedial work, demonstration, peer-teaching, lecture, discussion, guide and discovery, use of teaching aids, presentation, and question and answer. In the practice category, strategies like hands-on activities, real-life experiences, demonstration, and discovery were highlighted. The organizational category included strategies such as individualization, pairing, group work, and adhering to a timetable. Strategies falling under the games and simulation category comprised Sudoku, PAES activities, and simulation. Teachers and learners employed these diverse strategies to enhance learners' performance.

These findings align with the argument presented by Grimes and Stevens (2009) [58], emphasizing that a variety of instructional methods cater to the diverse needs and abilities of learners. Teachers' use of various strategies stems from the belief that diverse approaches positively impact learners' motivation and performance. Moreover, these findings support the constructivist theory, asserting that learners differ in aptitude, intelligence, learning styles, and previous experiences [84,85,30,31]. Consequently, mathematics teachers must recognize learner diversity and create opportunities, through different strategies, for acquiring mathematical skills [57,58], emphasizing the need for a varied approach to motivate learners and enhance performance.

In assessing the most effective teaching strategies in upper primary mathematics, respondents highlighted the prominence of learner-centered approaches, particularly group work and discussions. Reasons provided included the opportunity for learners to find answers independently, express themselves effectively, share ideas, and experience high motivation and engagement. The learner-centered approach, emphasizing a variety of methods and shifting the teacher's role to that of a facilitator, aligns with contemporary educational trends. Studies by Cheang et al. (2009) [87] and Darsih (2018) [88] corroborate the effectiveness of the learner-centered approach in promoting motivation, critical thinking, and metacognitive self-regulation among students.

Within the learner-centered approach, group discussions and presentations emerged as highly effective. Participants emphasized the benefits of learners discovering answers independently, expressing themselves better, and experiencing a deeper understanding of objectives. This trend aligns with the current educational focus on learner-centered approaches. Studies such as the one by Hake (1998) [89] highlight the effectiveness of group discussions in promoting active

participation, enhancing communication skills, generating interest, and fostering interactive learning. Group discussions also facilitate independent learning, problem-solving, and improved retention of knowledge, as noted in various studies

Objective No. 2: Determinants of Teaching Strategy Selection in Mathematics Classrooms

The study's second objective aimed to investigate the factors influencing the choice of teaching strategies employed by teachers. Participants were requested to express their level of agreement with statements regarding factors impacting teaching strategies, utilizing a scale ranging from (1) strongly disagree to (5) strongly agree. The analysis outcomes revealed several factors influencing the strategies employed by teachers in upper primary school mathematics classrooms. The ensuing Table 4 provides a breakdown of the analysis pertaining to the factors influencing the teaching strategies implemented by mathematics teachers.

Table 4: Factors affecting teaching strategies teachers use in teaching mathematics.

Item	Section E Statements/measure	A %	SA %	D %	SD %	N %	MEAN	STD DEV	MODE
1	Teachers' attitude affects mathematics teaching strategies	43.3	40.0	0.0	3.3	10.0	4.27	.944	4
2	Teacher qualification affects mathematics teaching strategies	45.2	35.5	6.5	0.0	12.9	4.10	.810	4
3	Teacher preparation affects mathematics teaching strategies	41.9	32.3	12.9	0.0	12.9	3.94	.998	4
4	Teacher perception affect mathematics teaching strategies	45.2	38.7	6.5	0.0	9.7	4.16	.860	4
5	Teaching resources affect mathematics teaching strategies	41.9	58.1	0.0	0.0	0.0	4.58	.502	5
6	Teachers' experience affects mathematics teaching strategies	41.9	22.6	12.9	3.2	19.4	3.68	1.077	4
7	Teacher training affects mathematics teaching strategies	51.6	25.8	9.7	0.0	9.7	4.06	1.031	4

Average Mean = 4.11

The predominant factors influencing the selection of teaching strategies in mathematics classrooms were identified as teaching resources, teacher motivation, teacher attitude, and teacher qualifications. All 31 respondents (100%) unanimously acknowledged the impact of teaching resources on mathematics teaching strategies, with a mean score of 4.58, highlighting its significance as the primary factor affecting teaching strategies in upper primary classes (Table 4).

Teachers' perceptions emerged as another influential factor, with the majority of respondents (26 or 83.9%) agreeing that teachers' perceptions significantly affected mathematics teaching strategies (mean score of 4.11). Similarly, teacher attitudes were recognized by 28 respondents (80.6%) as a key factor impacting teaching strategies, with a mean score of 4.11 (Table 4). This underscores the importance of teachers' attitudes in shaping their approach to teaching mathematics.

Moreover, teacher qualifications were identified as a noteworthy factor affecting teaching strategies, with 80.6% of respondents acknowledging its impact (mean score of 4.10) (Table 4). The analysis of responses on teacher qualifications is detailed in Table 4, showcasing its role in influencing the strategies employed by teachers in upper primary mathematics classes.

The breakdown of respondents' opinions on teaching resources, teachers' perceptions, attitudes, and qualifications is presented in Table 4 above. The table illustrates the distribution of responses and highlights the significant role these factors play in shaping teaching strategies.

In addition to these factors, the study delved into factors such as teacher experience, teacher preparation, and the choice of teaching strategy. Notably, teacher experience garnered agreement from 64.5% of respondents, emphasizing its perceived importance (mean score of 3.68) (Table 4). Similarly, teacher preparation, although rated lower by 74.2% of respondents, still contributed to the influencing factors, earning a mean score of 3.94 (Table 4).

The study extended its inquiry to senior teachers through interviews, revealing additional factors affecting the choice of teaching strategies. These factors encompassed learners' reactions, the type of topic, learners' abilities, confidence levels, structure of assessments, and the nature of the subject itself. Both mathematics teachers and senior teachers emphasized the multifaceted nature of the decision-making process for selecting teaching strategies, with numerous factors at play. This aligns with existing literature emphasizing the context-specific nature of teaching methods and the need for teachers to consider various factors in their decision-making process [90-92]

Objective No. 3: Teachers' perceptions on the effectiveness of different types of teaching strategies

Objective 3 aimed to determine teachers' views regarding the effectiveness of various teaching strategies on learners' performance in upper primary schools. Respondents were requested to express their agreement or disagreement with statements related to teaching strategies. The subsequent data analysis scrutinized teachers' perceptions of the impact of mathematics teaching strategies. The findings of this examination are presented in Table 5, which details the analysis of teachers' perceptions regarding the effectiveness of different mathematics teaching strategies in enhancing learners' performance.

Table 5: Research question 3: Teachers' perceptions on the different types of teaching strategies that can improve learners' performance/

Item	Section E Statements/measure	A %	SA %	D %	SD %	N %	MEAN	STD	MODE
1	Using magical mathematics problems entices students to learn the subject	51.6	19.4	9.7	0.0	19.4	3.81	.873	4
2	Using puzzles to teach make mathematics more interesting	45.2	51.6	0.0	0.0	3.2	4.48	.570	5
3	Using manipulatives makes mathematics more interesting	53.3	43.3	0.0	0.0	0.0	4.40	.563	4
4	Incorporating music in mathematics lessons makes mathematics more fun	25.8	48.4	0.0	0.0	25.8	4.23	.845	5
5	The incorporation of games in the teaching of mathematics can improve learners' performance	38.7	58.1	0.0	0.0	0.0	4.65	.551	5
6	Relating mathematics to real life situations improves learners' performance	38.7	61.3	0.0	0.0	0.0	4.61	.495	5
7	Telling learners exactly what the lesson wants to accomplish improves performance	38.7	51.6	0.0	0.0	9.7	4.42	.672	5
8	When learners are challenged intellectually, they react with enthusiasm	51.6	22.6	9.7	3.2	12.9	3.81	1.014	4
9	Using spoken and written praise in commending the learners will improve their performance	41.9	58'1	0.0	0.0	0.0	4.58	.502	5
10	Capitalizing on the arousal of discovery and curiosity perform better in mathematics	54.8	38.7	3.2	0.0	3.2	4.29	.693	4

Average Mean Score = 4.33

The results from table 5 above reveal that teachers overwhelmingly perceive the incorporation of games in mathematics teaching as a strategy that can enhance learners' performance. A staggering 96.8% of respondents agreed with the statement supporting the integration of games into mathematics education. This strategy received resounding support, particularly among teachers in Good Hope, with a mean score of 4.65, making it the highest-rated strategy. Teachers firmly believed that leveraging games could significantly improve learners' performance in mathematics, as depicted in Table 5. Similarly, relating mathematics to real-life situations emerged as another crucial strategy in teachers' perception, with unanimous agreement from all 31 respondents (100%). The mean score for this strategy was 4.61, positioning it as the second most important teaching strategy for enhancing learners' performance in mathematics. A significant majority of respondents, 61.3%, strongly agreed that incorporating real-life situations into mathematics teaching would have a positive impact, as shown in Table 5. Further, Table 5 above underscores the overwhelming support for incorporating games into mathematics teaching, with 58.1% strongly agreeing and 38.7% agreeing. This consensus suggests that teachers believe this strategy holds substantial potential for improving learners' performance, aligning with the findings of Pulos and Sneider (1994) [93], who emphasized the motivational and cognitive benefits of didactical games. Moreover, the importance of relating mathematics to real-life situations is supported by the literature, with Colgan (2014) [54] and Farren (2008) [56] asserting that such connections are vital to engage learners and foster a positive attitude towards mathematics.

Table 5 above illustrates that all respondents unanimously agreed that using spoken and written praise on learners is an effective strategy to improve their performance. This strategy received strong endorsement, with 58.1% of respondents strongly agreeing and 41.9% agreeing. The high mean score of 4.58 reinforces its significance as one of the main strategies perceived by mathematics teachers to enhance learners' performance. However, not all strategies received uniform support. Magical mathematics problems, while acknowledged by 71.0% of respondents as potentially enticing learners to study mathematics, ranked as the least popular strategy with the lowest mean score of 3.81 (Table 5 above). This suggests that, despite some recognition, this strategy did not resonate as strongly with teachers compared to others. Finally, challenging learners intellectually received agreement from 74.2% of respondents, positioning it as the second least popular strategy with a mean score of 3.81 (Table 5 above). Despite its lower rating, it is noteworthy that challenging students intellectually has been identified in the literature as a motivational factor for learning, as indicated by Colgan (2014) [54] and Akey (2006) [94]. The exploration of teachers' perceptions regarding various teaching strategies and their impact on learners' performance in mathematics extended beyond the quantitative data obtained through questionnaires. In order to provide a comprehensive and balanced understanding of the phenomenon, the researcher conducted interviews with senior teachers, aiming to capture insights from both senior teachers and mathematics teachers. In contrast to the predominantly positive perceptions evident in the quantitative data, the interviews with senior teachers unveiled a more nuanced perspective. Many senior teachers emphasized the prevalence of negative perceptions among teachers regarding different teaching strategies and their impact on learners' performance. A recurring theme in their comments revolved around challenges related to inadequate teaching materials, which hindered effective teaching. One interviewee expressed concern, stating, "Teachers are not happy because of the inadequate teaching materials in schools," emphasizing the

need for accurate resources like scales for practical demonstrations.

Furthermore, the interviews highlighted a prevalent negative attitude among teachers towards teaching mathematics. Some participants conveyed that teachers perceive mathematics as a difficult subject to teach, leading to discomfort and reluctance. This unfavorable attitude, as stated by an interviewee, "affects results," implying potential repercussions on learners' academic performance. Concerns were raised about teachers' lack of love and experience in teaching mathematics, which, in turn, contributes to a detrimental attitude passed on to students. Expressions such as "Teachers have bad attitude toward mathematics" and "Teachers believe that mathematics is a difficult subject to teach learners" underscored the prevalent negativity associated with teaching mathematics. The interviews pointed to a cascading effect where teachers' negative attitudes were transmitted to students, creating an environment where learners may develop a dislike or fear of the subject. However, amidst the predominantly negative perceptions, some interviewees acknowledged positive aspects. A participant mentioned that the school's goal of ensuring children pass mathematics could motivate teachers to overcome negative attitudes. Another interviewee presented a more nuanced view, stating, "Some teachers accept mathematics while some have a negative attitude toward it," reflecting the diversity of perspectives among teachers. The findings from the interviews suggest a complex landscape of teachers' perceptions regarding different teaching strategies and their impact on learners' performance in mathematics. The negative perceptions highlighted by senior teachers may contribute to the observed high failure rates in mathematics in Botswana. The influence of teachers' attitudes on learners is a well-documented phenomenon in educational literature, emphasizing the need for a holistic approach to address both classroom and administrative factors

Discussion of Major Findings

Teaching Strategies Used by Mathematics Teachers

The findings reveal a diversity of teaching strategies employed by mathematics teachers in upper primary classes. Noteworthy strategies include using tools like rulers for measurement, hands-on activities to assess performance, and individual/group presentations. These strategies, as affirmed by Orlich et al. (2009) [14], are perceived as effective and motivational, contributing to enhanced learner engagement and performance. The teachers' belief in catering to diverse learning abilities aligns with the principles of differentiated instruction [58]. This approach resonates with constructivist theories emphasizing learner-centered problem-solving [30,85]. However, the reluctance to endorse calculator use or educational technology reflects concerns about potential drawbacks, including distractions, cheating, and unequal access [95,18]. Contrary to researchers advocating for technology integration [46], the study shows a cautious approach among teachers. Despite the advantages highlighted by the National Council of Teachers of Mathematics (2011) [45], teachers seem to weigh potential disadvantages more heavily. The findings underscore the need for a balanced perspective, considering both benefits and challenges. Teachers, according to Ontario Ministry of Education (2005) [47], should view calculators and computers as valuable problem-solving tools. While the study raises skepticism about technology, other research emphasizes its potential in improving performance [96,97]. Thus, educators should navigate a middle ground, guiding students in responsible technology use [98].

Factors Influencing Teaching Strategies

Factors influencing teaching strategies encompass teaching resources, teacher motivation, attitude, and qualification. Teachers emphasize the importance of these factors for creating a conducive learning environment and stimulating learner engagement. These findings correlate with research indicating a positive correlation between teacher qualifications and learner academic performance [99,100]. Similarly, teacher attitudes, influenced by their own experiences and training, significantly impact learner perceptions and outcomes [56,101]. The identification of mathematics anxiety and negative attitudes among teachers aligns with Osena's (2007) [102] findings, emphasizing the need for a positive teacher outlook. The study suggests that teachers' attitudes can inadvertently shape learner attitudes, emphasizing the crucial role of teacher support and motivation [103].

Teachers' Perceptions on Teaching Strategies

Teachers' perceptions on teaching strategies are varied, with strong endorsements for strategies involving games, real-life applications, and praise. The perceived positive impact of these strategies on learner interest, motivation, and self-efficacy is supported by Bandura's (1994) [104] social cognitive theory. Incorporating games and real-life examples aligns with literature emphasizing their motivational and conceptual benefits [41,54].

However, the lower ratings for magical mathematics problems and intellectual challenges highlight a disconnect between teacher beliefs and research suggesting the positive impact of intellectual challenges on motivation and learning [94,105]. Bridging this gap may require professional development focused on the benefits of intellectual challenges and a deeper understanding of their positive impact.

Conclusions

Teaching strategies used by mathematics teachers in upper primary classes.

The study concludes that while mathematics teachers employ a diverse range of teaching strategies in upper primary classes, the most frequently utilized methods include instructing learners to measure objects using tools such as rulers, evaluating learner performance through hands-on activities, and employing individual/group demonstrations or presentations. Notably, teachers strongly believe in the effectiveness of these strategies in enhancing learner motivation and engagement. Conversely, the study suggests hesitancy among teachers to embrace technology, as evidenced by a reluctance to allow learners to use gadgets like calculators, reflecting a lingering skepticism toward technology as a viable teaching strategy in mathematics.

Factors that influence the type of teaching strategies used by teachers in mathematics classes.

The study concludes that several factors impact the strategies employed by teachers in teaching mathematics, with adequate teaching resources, strong qualifications, motivation, and a positive attitude toward teaching and learning mathematics contributing positively to learner engagement and performance. Additionally, teacher attitudes towards mathematics play a pivotal role in shaping learners' attitudes, emphasizing the need to address and foster positive perceptions among educators.

Teachers' perceptions on the impact of different types of teaching strategies in mathematics.

Regarding teachers' perceptions of the impact of different teaching strategies in mathematics, the study finds varying opinions. Incorporating games, relating mathematics to real-life situations, and utilizing spoken and written praise are perceived as key strategies for improving learner performance. However, strategies involving magical mathematics problems and intellectual challenges are rated lower in teachers' perceptions.

Implications

The study's findings have significant implications for educational theories, policies, and practices. Critical and constructivist theories receive support, affirming their relevance for educators in planning and executing activities. Teachers are encouraged to prioritize popular and effective strategies, such as hands-on activities and presentations. Moreover, the study highlights the importance of incorporating technology, emphasizing the need for policies that support continuous professional development, flexibility in teaching strategies, and the adoption of technology in upper primary classes.

Recommendations

Recommendations for specific topics suggested from the findings of the study for in-servicing teachers.

The government should actively promote and support mathematics teachers in upper primary classes to employ a diverse range of teaching strategies. This can be achieved by organizing workshops and seminars aimed at providing effective training on technology use, specifically addressing teachers' reservations about allowing learners to use calculators and other devices. Policies need to be formulated to facilitate ongoing professional development for mathematics teachers, placing emphasis on the flexibility to explore various teaching strategies, including the integration of technology. It is crucial to expose teachers to a multitude of strategies during their training to cultivate positive perceptions and enhance adaptability. Teacher colleges should prioritize building teachers' confidence in teaching mathematics, thereby contributing to a positive overall attitude towards the subject. Furthermore, there is a need for additional research to comprehend the reasons behind teachers' reluctance to permit the use of calculators and other educational technologies in the teaching of mathematics.

Recommendations for further studies

Conducting further studies is imperative to pinpoint the most effective and engaging strategies for teaching mathematics in upper primary classes. Additionally, investigations should delve into the effectiveness of delivering captivating lessons by incorporating tools such as calculators and other technologies. It is essential to explore the distinct perceptions of male and female students concerning various teaching strategies. Furthermore, research efforts should be directed towards examining potential correlations between the selection of teaching strategies and teachers' perceptions. To ensure a comprehensive understanding, studies should be conducted in a variety of schools, across different regions, and at various grade levels, facilitating thorough comparisons of data and contributing to a more nuanced comprehension of effective teaching methods in mathematics.

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