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EDUCATION

ASSESSMENT OF PERCEPTIONS ON DETERMINANTS INFLUENCING ACADEMIC PERFORMANCE AMONG DEAF STUDENTS IN SECONDARY SCHOOLS IN WESTERN KENYA

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ABSTRACT

Statement of the Problem: There is limited understanding of the determinants affecting academic performance among deaf students in Western Kenya, which has hindered the development of effective strategies to address their unique learning needs.

Purpose of the Study: The study aimed to assess perceptions of deaf students and key stakeholders on factors influencing academic performance, specifically focusing on attitudes of teachers, teaching-learning strategies, resource adequacy, and the role of language of instruction in mathematics education.

Research Methodology: A descriptive survey design was employed, targeting deaf students, teachers, and parents in secondary schools in Western Kenya. A sample of 322 respondents was selected, and data were collected using validated questionnaires and interviews, analyzed using both qualitative and quantitative methods.

Results and Discussion: Findings revealed that teaching strategies were perceived as inadequate (M = 3.29), with insufficient accommodations and accessible resources (M = 2.74). Teachers needed more support (M = 2.56), and the misalignment between the language of instruction and the preferred communication mode (M = 2.69) further hindered learning.

Conclusion: The study concluded that effective academic performance among deaf learners requires inclusive teaching strategies, accessible resources, and specialized teacher training, particularly in mathematics education.

Recommendation: The study recommends enhanced teacher training, integration of inclusive instructional methods, provision of adapted learning resources, and alignment of instructional language with students' communication needs.

Keywords: *Perceptions, Determinants Academic Performance, Deaf Students, Secondary Schools*

BACKGROUND OF THE STUDY

The prevalence of performance struggles among deaf students is more widespread compared to hearing children, however, perception the determinants of their challenges vary. Paul (2005), highlighted the importance of language and communication as a key determinant of academic performance, particularly for deaf students. Further, deaf students, like any other learners, are subject to the same social and psychological influences on learning. According to Foster and Foster (2015), deaf students face unique challenges when it comes to their academic performance. This is because academic performance of deaf students is greatly influenced by various determinants, such as their access to educational resources, the quality of instruction they receive, the attitudes of their peers and teachers, and the availability of support services. From a global level, research indicates that deaf students' academic performance is inconclusive. While some studies suggest that deaf students have better academic performance than their hearing peers, other studies have found that their performance is lower. According to Lemaitre and Marschark (2010), academic performance of deaf students is affected by a number of factors such as their access to educational resources, the quality of instruction they receive, the attitudes of their peers and teachers, and the availability of support services. However, Liu and Tang (2007), noted that the determinants affecting performance of students with hearing impairment vary based on social cultural backgrounds within which such students come from.

Understanding the perception on determinants of performance of deaf students will enable all stakeholder within the education sectors to establish the best strategies for improve academic performance. Kamau (2019 argued that deaf students across the globe are particularly disadvantaged, as they are often unable to access the educational resources they need uniformly. The lack of access is compounded by difference in attitudes of prejudice and discrimination that deaf students often face in different parts. As a result, academic performance of deaf students largely depends on the prevailing determinants on performance within the specific setting thus need to assess in the context of secondary schools in Western Kenya. According to Government of Kenya (2011), Kenya is home to an estimated 1.2 million deaf people and with the enactment of the 2010 Constitution, the Kenyan government pledged to implement the rights of persons with disabilities, including those of deaf persons. One of the components of this commitment was to ensure access to education for those with disabilities. However, the education of deaf students has been largely ignored, and their academic performance has been affected by a range of social, economic and educational factors (Kibet &Chepngetich, 2018). In recent years, there has been a growing body of research into academic performance of deaf students in secondary schools in Kenya. A number of studies have examined the determinants of academic performance among deaf students, such as language proficiency, access to appropriate teaching materials, family background, and socio- economic status (Yeboah, 2016). However, little research has been conducted on the perceptions of deaf students themselves, teachers and parents on the factors influencing their academic performance.

In Western Kenya, research point to a lower academic performance of deaf students in the region compared to their hearing peers. Kibuchi et al. (2014), attributed such lower performance to several factors which include lack of access to appropriate instructional materials and resources, lack of support from teachers, and lower levels of parental involvement as indicated by studies. Furthermore, study by Mburu and Ocharo (2012) pointed that deaf students in the region face social barriers as a result of negative attitudes and stereotypes, which has led to feelings of isolation and marginalization. Despite, the many studies done in the region, little knowledge on perceptions is available to guide strategic

formulation to improve the performance of these student specifically.

In order to better understand the determinants of academic performance among deaf students in the region, it is therefore essential to assess the perceptions of deaf students, teachers, and parents on these issues. This assessment can provide valuable insights into the challenges facing deaf students and the potential solutions to improve their academic performance. Additionally, it can help identify any gaps in resources and support available to deaf students and can inform policy makers on how to better support these students. Ultimately, this assessment will help to ensure that deaf students in the region have the necessary resources and support to achieve academic excellence.

STATEMENT OF THE PROBLEM

According to ministry of education KCSE performance for the last five years, the academic performance of deaf students in secondary schools in western Kenya has long been viewed as a major concern by educators as shown in table 1.1 with a downward trend (Ministry of education, 2022). Existing research point to limited understanding of the perceptions of deaf students on the determinants influencing academic performance in secondary schools in western Kenya. As a result, there is a lack of effective strategies developed to improve the academic performance of deaf students in the region. Thus, the research aims to assess the perceptions on the determinants influencing academic performance among deaf students in secondary schools in Western Kenya. Specifically, this research seeks to understand the factors that impede or enhance the academic performance of deaf students in secondary schools in Western Kenya. It explored the perspectives of the deaf students themselves, as well as their teachers, parents, and other relevant stakeholders, such as administrators and policy makers. Further, this research investigated how deaf students' academic performance can be improved by providing appropriate resources and support. The results of this study will be used to inform the development of strategies to improve the academic performance of deaf students in the region.

PURPOSE OF THE STUDY

The purpose of the study was to determine the perceptions of stakeholders on determinants influencing academic performance in mathematics among deaf students in western Kenya.

Specific Objectives of the Study

i. Examine attitude of teacher in influencing academic performance in mathematics among deaf learners

ii. Establish teaching-learning strategies influencing academic performance in mathematics among deaf learners

iii. Determine perceptions of stakeholders on teaching-learning resources influencing academic performance in mathematics.

iv. Examine how language of instruction influence academic performance in mathematics among deaf learners.

RESEARCH QUESTIONS

i. How does attitude of teacher in influencing academic performance in mathematics among deaf learners?

ii. What is the stakeholder's perception on how teaching-learning strategies influencing academic performance in mathematics among deaf learners?

iii. What are the perceptions of stakeholders on teaching-learning resources influencing academic performance in mathematics?

iv. What is the stakeholders' perception on how language of instruction influences academic performance in mathematics among deaf learners?

LITERATURE REVIEW

Teacher attitudes significantly influence the academic performance of deaf students in mathematics education, with research consistently demonstrating that positive educator dispositions create more inclusive and effective learning environments. Smith (2015) explored deaf learners' perceptions of their mathematics teachers' attitudes and found that positive teacher attitudes fostered inclusive learning environments, encouraged active participation, and enhanced student motivation, resulting in increased confidence and improved academic performance. Similarly, Yeo and Ang (2019) demonstrated that teachers with positive attitudes toward mathematics positively impacted students' motivation, interests, and overall performance, while negative attitudes created hostile learning environments that hindered academic progress. Garcia (2018) further examined the consequences of negative teacher attitudes, revealing that when educators held low expectations, displayed limited patience, or lacked effective communication strategies for deaf students, learners experienced diminished self-confidence and reduced academic effort. However, Garcia (2018) also found that teachers who received specialized training in teaching mathematics to deaf learners demonstrated increased confidence and more positive attitudes, suggesting that continuing professional development programs such as workshops and seminars can positively influence educator perspectives and effectiveness.

Effective teaching-learning strategies specifically designed for deaf learners have emerged as critical determinants of mathematical achievement, with visual communication methods and multisensory approaches showing particular promise. Smith and Jones (2017) conducted a quasi-experimental study comparing deaf students taught with visual aids versus those taught without, revealing that visual aids significantly improved academic performance in mathematics among deaf learners. Brown and Johnson (2015) examined deaf learners' perceptions of sign language use in mathematics classrooms through qualitative research, finding that students expressed strong preferences for sign language instruction as it facilitated better understanding and comprehension of mathematical concepts. Williams et al. (2019) investigated the effectiveness of interactive computer programs and applications for teaching mathematics to deaf students, discovering that these technological tools increased engagement, motivation, and understanding, leading to improved academic performance. Additionally, Higginbotham and York (2018) explored multisensory teaching strategies and found that incorporating tactile, visual, and auditory elements in mathematics instruction significantly improved understanding and retention of mathematical concepts among deaf students.

The quality and accessibility of teaching-learning resources represent fundamental factors influencing mathematical achievement among deaf students, with stakeholder perceptions highlighting both opportunities and significant gaps in current educational provisions. Johnson et al. (2015) found that teachers recognized the importance of diverse resources including manipulatives, technology-based tools, textbooks, and worksheets in positively impacting student understanding and engagement, while emphasizing the need for professional development to effectively incorporate these resources into instructional practices. Turner and Barcelona (2012) revealed that student perceptions of teaching-learning resources varied considerably, with some learners finding manipulatives, visual aids, and technology-based tools beneficial for understanding abstract concepts, while others preferred traditional

resources such as textbooks and workbooks due to familiarity and comfort. Goldman et al. (2014) demonstrated that parents valued resources such as online platforms, games, and interactive software for enhancing their children's understanding and enjoyment of mathematics, particularly appreciating real-world applications and problem-solving activities that bridged classroom learning with practical life situations. Brown et al. (2017) indicated that educational administrators recognized the positive impact of resources on student achievement and emphasized the importance of appropriate resource allocation and funding to ensure equitable access to quality materials.

Language of instruction emerges as a pivotal factor determining academic success in mathematics among deaf learners, with research consistently demonstrating the superiority of sign language-based approaches over traditional spoken language methods. Marschark et al. (2007) identified two prevalent language approaches in deaf education—sign language and spoken language—with American Sign Language (ASL) proving highly beneficial due to its visual and spatial medium that aligns effectively with mathematical concepts, facilitating better understanding and engagement among students. Conversely, van Gurp (2001) found that spoken language approaches, including lip-reading and auditory instruction, created significant barriers for deaf learners in mathematics classrooms due to reduced access to information, lack of visual cues, and lip-reading difficulties that contributed to lower academic performance. Antia et al. (2009) and Mukari et al. (2007) explored stakeholder perceptions regarding language of instruction, revealing varied perspectives among teachers, parents, and deaf students based on individual experiences and cultural backgrounds, with some educators advocating for sign language as the primary instructional medium while others supported incorporating written or spoken English to bridge gaps between deaf and hearing students. However, many parents expressed concerns about limited access to sign language interpreters and specialized mathematics instruction, highlighting systemic challenges that hinder their children's academic success and emphasizing the need for comprehensive language policy development in deaf education.

CONCEPTUAL FRAMEWORK

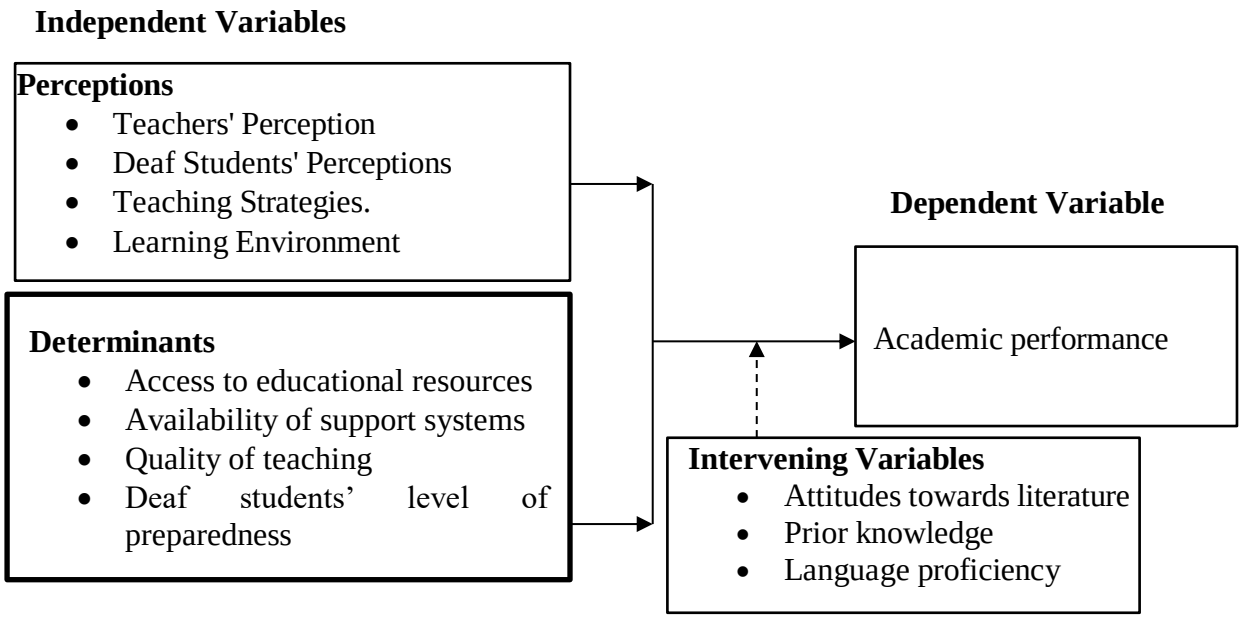

Figure 1: Conceptual Framework

RESEARCH METHODOLOGY

This study adopted a descriptive survey design employing mixed methods to collect both quantitative and qualitative data on determinants influencing academic performance among deaf students in Western Kenya. The region was selected due to the concentration of secondary schools serving deaf learners. The target population included 900 students, 200 teachers, and 900 parents, totaling 2,000 individuals, from which a representative sample of 322 respondents was determined using Kothari's (2004) finite population formula. Proportional stratified sampling was used, followed by simple random selection to ensure inclusivity across counties and schools. Data collection tools included structured questionnaires and interview guides. The instruments were validated through expert review by faculty from Maseno University and pre-tested for reliability using the test–retest method, with a Pearson coefficient of 0.7 deemed acceptable. Ethical clearance was obtained from Maseno University's Ethics and Review Committee (MUER), and all relevant education officers and school principals were consulted. Participants gave informed consent, and confidentiality was strictly maintained. Data analysis involved thematic analysis for qualitative data and descriptive and inferential statistics (e.g., correlation and regression) for quantitative data, ensuring a comprehensive understanding of the research problem.

RESULTS AND DISCUSSIONS

Attitude of teacher in influencing Academic Performance in Mathematics

The first objectives of the study sought to establish teaching-learning strategies influencing academic performance in mathematics among deaf learners in secondary schools in western Kenya. The responses were measured using a five Likert scale where strongly agree- 5, agree-4, neutral- 3, disagree- 2 and strongly disagree-1. The results were presented in tables using frequencies, percentages and means. The study findings for these objectives are presented in Table 1.

Table 1: Statements regarding Attitude of teacher in influencing Academic Performance in Mathematics

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean
	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	
Teachers are supportive in assisting deaf students	42 (13%)	69 (21%)	207 (64%)	4 (1%)	0 (0%)	2.47
Teachers are motivated in helping deaf students	75 (23%)	169 (52%)	76 (24%)	2 (1%)	0 (0%)	3.08
Teachers often use inclusive teaching strategies	29 (9%)	84 (26%)	198 (61%)	8 (3%)	2 (1%)	2.64
Teachers communicate well regarding student progress	29 (9%)	43 (13%)	232 (72%)	18 (6%)	0 (0%)	2.52
Students feel confident seeking assistance	39 (12%)	77 (24%)	177 (55%)	28 (9%)	0 (0%)	2.87
Teachers normally implement individualized plans	49 (15%)	40 (12%)	228 (71%)	5 (1%)	0 (0%)	2.66
Teachers provide clear instructions	0 (0%)	28 (9%)	63 (19%)	229 (71%)	2 (1%)	1.37
Parents are satisfied with teachers' efforts	51 (16%)	96 (30%)	162 (50%)	12 (4%)	0 (0%)	2.89
Overall Average						**2.56**

The mean scores across the various statements provide insight into the perceptions of teachers' supportiveness, motivation, use of inclusive teaching strategies, communication, implementation of individualized plans, and clarity of instructions, as well as students' confidence in seeking assistance and parents' satisfaction with teachers' efforts in assisting deaf students. On average, the respondents rated teachers' motivation in helping deaf students the highest (Mean = 3.08), indicating general agreement that teachers are motivated in supporting deaf students. This is followed by parents' satisfaction with teachers' efforts (Mean = 2.89) and students' confidence in seeking assistance (Mean = 2.87), suggesting a generally positive perception of teachers' efforts and the level of support available for deaf students.

However, the results also indicate areas for improvement. While teachers are perceived to be supportive and motivated, there seems to be less agreement on whether teachers provide clear instructions (Mean = 1.37). This is a significant concern, as clear instructions are crucial for effective learning, especially for deaf students who may rely more heavily on visual cues. Additionally, while teachers are generally seen as supportive and motivated, there is less consensus on whether they use inclusive teaching strategies (Mean = 2.64) or implement individualized plans (Mean = 2.66). This suggests that there may be room for improvement in tailoring teaching methods to better accommodate the needs of deaf students. Further, while communication regarding student progress is generally perceived to be adequate (Mean = 2.52), there is still some room for improvement in ensuring that parents are well informed about their child's progress. Overall, the average mean for all statements is 2.56, indicating a neutral stance in general. It is clear that there are areas for improvement, particularly in terms of supportiveness, motivation, use of inclusive teaching strategies, and satisfaction of parents. These results can help guide discussions and interventions to address these concerns and improve the educational experience for deaf students.

In addition to the quantitative findings, qualitative findings from the interviews were presented:

"The teachers at my school rarely use inclusive teaching strategies for deaf students in mathematics. They mostly rely on outdated methods that do not consider the learning needs of these students. This creates a significant disadvantage for deaf students, as they struggle to

understand and keep up with the material. It is incredibly frustrating and discouraging for us to constantly feel like we are being left behind in math class" ***TEACHER OF MATHEMATICS, SCHOOL 1***.

"I feel that most teachers are not supportive at all when it comes to helping deaf students understand mathematical concepts. They often lack the necessary knowledge and resourcesto effectively communicate and explain these concepts to the students. It's frustrating and discouraging, and it greatly impacts their academic performance in mathematics." ***PARENT/GUARDIAN, SCHOOL 2***.

The findings above highlight the perceptions of teachers regarding the lack of inclusive teaching strategies for deaf students in mathematics in secondary schools in Western Kenya. The teachers believe that the methods used by most of their colleagues are outdated and do not cater to the specific learning needs of deaf students. As a result, these students struggle to understand and keep up with the material, leading to frustration and discouragement. The teachers express their frustration with the lack of support from their colleagues in helping deaf students understand mathematical concepts. They believe that most teachers lack the necessary knowledge and resources to effectively communicate and explain these concepts to the students. This lack of support greatly impacts the academic performance of deaf students in mathematics.

The results were consistent with findings by Rendish & Nodzak (2017), which highlight that the systemic barriers that deaf students face in accessing quality education. The reliance on outdated teaching methods and the lack of inclusive strategies create a significant disadvantage for these students. This not only affects their understanding of mathematical concepts but also their overall academic performance. Therefore, emphasizing on the importance of inclusive education and the need for teachers to be equipped with the necessary knowledge and resources to effectively support deaf students. Inclusive teaching strategies should be implemented to ensure that all students, including those with disabilities, have equal opportunities to learn and succeed. Furthermore, the finding suggests that there is a need for professional development and training for teachers to enhance their understanding and ability to effectively teach deaf students in mathematics. This can help bridge the gap in knowledge and improve the support given to deaf students.

Teaching-learning strategies in influencing Academic Performance in Mathematics

The second objectives of the study sought to examine attitude of teacher in influencing academic performance in mathematics among deaf learners in secondary schools in western Kenya. The responses were measured using a five Likert scale where strongly agree- 5, agree-4, neutral- 3, disagree- 2 and strongly disagree-1. The results were presented in tables using frequencies, percentages and means. The study findings for these objectives are presented in table 2.

Table 2: Statements regarding teaching-learning strategies in influencing Academic Performance in Mathematics

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean
	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	
Teaching strategies in mathematics are impactful	21 (6%)	25 (8%)	13 (4%)	252 (78%)	11 (3%)	2.36
Current teaching strategies in mathematics are satisfying	46 (14%)	238 (74%)	8 (3%)	12 (4%)	18 (6%)	3.99
Teaching strategies effectively cater for the specific needs	51 (16%)	223 (69%)	4 (1%)	33 (10%)	12 (4%)	3.83
Teaching strategies are aligned with the learners' unique needs	89 (28%)	191 (59%)	0 (0%)	35 (11%)	7 (2%)	3.99
Teaching strategies facilitate understanding of math concepts	98 (30%)	146 (45%)	6 (2%)	51 (16%)	22 (7%)	3.76
Math support provided to teachers is satisfying	30 (9%)	65 (20%)	0 (0%)	180 (56%)	47 (15%)	2.53
Teaching strategies in math involve parents	52 (16%)	201 (63%)	13 (4%)	42 (13%)	13 (4%)	2.26
Teaching strategies impact performance in math compared to other subjects	41 (13%)	207 (64%)	5 (1%)	29 (9%)	40 (12%)	3.56
Overall Average						**3.29**

The survey results indicate that while there is a general agreement that teaching strategies in mathematics are impactful (mean = 2.36), there is a dissatisfaction with the current teaching strategies (mean = 3.99). Respondents seem to feel that the current strategies do not effectively cater to the specific needs (mean = 3.83) or align with the unique needs of learners (mean = 3.99). However, there is a more positive perception regarding whether teaching strategies facilitate the understanding of mathematical concepts (mean = 3.76). Despite this, there seems to be a lack of satisfaction with the math support provided to teachers (mean = 2.53). Furthermore, the involvement of parents in teaching strategies is seen as lacking (mean = 2.26). While teaching strategies are perceived to impact performance in math compared to other subjects (mean = 3.56), the overall average satisfaction level remains relatively neutral (mean = 3.29). The average mean for all statements is 3.29, suggesting a relatively neutral perception of teaching strategies in mathematics. This indicates that while there are some positive aspects, there are also areas that need improvement to better cater to the needs of learners and enhance their understanding of mathematical concepts.

In addition to the quantitative findings, qualitative findings from the interviews were presented:

"The mathematical support and resources provided to teachers for implementation of teaching-learning strategies are far from satisfying. The materials and resources given to us are outdated and lacking in depth. It is difficult for us as teachers to effectively teach mathematics when we don't have access to up-to-date resources that align with current learning strategies. This lack of support directly impacts our ability to effectively educate our students in mathematics and ultimately hinders their academic performance." ***TEACHER OF MATHEMATICS, SCHOOL 4****.*

"The current teaching-learning strategies in mathematics for deaf students are not satisfying. The strategies lack appropriate and sufficient accommodations for deaf students, which inhibits their ability to fully understand and comprehend mathematical concepts. The use of traditional teaching methods that heavily rely on oral communication and auditory content greatly disadvantage deaf students who primarily rely on visual communication. The lack of accessible resources, such as sign language interpreters or captioned instructional materials, further hinders their learning experience. Moreover, there is a lack of specialized training and support for mathematics teachers in effectively catering to the needs of deaf students, resulting in a limited range of instructional techniques and strategies. Consequently, many deaf students struggle to fully engage, participate, and excel in math classes, leading to a significant achievement gap between them and their hearing peers. Overall, the current teaching-learning strategies in mathematics for deaf students are far from satisfying and require substantial improvements to ensure equitable educational opportunities for all students" ***TEACHER OF MATHEMATICS, SCHOOL 5***

Further, regarding the current teaching-learning strategies in mathematics for deaf students, Higginbotham & York (2018), noted that strategies often fail to provide sufficient accommodations and support for deaf students, who primarily rely on visual communication. The heavy reliance on oral communication and auditory content in traditional teaching methods creates a disadvantage for deaf students, as they cannot fully understand and comprehend mathematical concepts without appropriate accommodations. This highlights the need for inclusive and accessible teaching strategies that cater to the unique needs of deaf students. Additionally, the lack of accessible resources, such as sign language interpreters or captioned instructional materials, further exacerbates the learning challenges faced by deaf students (Mburu & Ocharo, 2012).

It is also evident from these findings that there is a lack of specialized training and support for mathematics teachers in effectively teaching deaf students. This results in a limited range of instructional techniques and strategies, further hindering the engagement and participation of deaf students in math classes. Teachers may lack the necessary skills and knowledge to adapt their teaching methods to accommodate the needs of deaf students effectively (Smith, 2015). Therefore, there is a clear need for professional development opportunities and support for teachers to enhance their understanding of inclusive pedagogy for deaf students in mathematics.

Perceptions of stakeholders on teaching-learning resources in influencing Academic Performance in mathematics

The third objectives of the study sought to determine perceptions of stakeholders on teaching-learning resources influencing academic performance in mathematics in secondary schools in western Kenya. The responses were measured using a five Likert scale where strongly agree- 5, agree- 4, neutral- 3, disagree- 2 and strongly disagree-1. The results were presented in tables using frequencies, percentages and means. The study findings for this objective are presented in table 3.

Table 3: Statement regarding Perceptions of stakeholders on teaching-learning resources in influencing Academic Performance in mathematics

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	
Statement	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	**Count (%)**	**Mean**
Teaching resources used in math are of high quality	42 (13%)	58 (18%)	37 (12%)	177 (55%)	7 (2%)	2.85
Teaching resources cater for student specific needs	13 (4%)	53 (16%)	98 (30%)	158 (49%)	0 (0%)	2.76
Teaching resources available for math are satisfactory	0 (0%)	51 (16%)	40 (12%)	228 (71%)	4 (1%)	2.43
Teaching resources for math are available at ease	0 (0%)	28 (9%)	0 (0%)	254 (79%)	40 (12%)	2.06
I am knowledgeable about the various teaching resources available	49 (15%)	134 (42%)	69 (21%)	70 (22%)	0 (0%)	3.49
Parent's involvement in teaching resources improves performance in math	53 (16%)	59 (18%)	5 (1%)	205 (64%)	0 (0%)	2.87
Average						**2.74**

Based on the results above, regarding the quality and availability of teaching resources in math, as well as the perception of their effectiveness. The mean values of responses to each statement range from 2.06 to 3.49, with an average mean of 2.74 across all statements. Regarding the quality of teaching resources, the mean response indicates a moderate agreement (2.85) that teaching resources used in math are of high quality. However, there is a slightly lower mean agreement (2.76) regarding whether these resources cater to the specific needs of students. When it comes to the availability of teaching resources, respondents generally agree that resources for math are satisfactory (mean = 2.43), but there is a higher level of agreement (mean = 2.06) that these resources are easily available. In terms of awareness, the mean response is relatively high (mean = 3.49) regarding respondents' knowledge of the various teaching resources available.

Finally, there is a moderate agreement (mean = 2.87) that parental involvement in teaching resources improves performance in math. The average mean score for all statements combined is 2.74 out of 5, indicating a neutral to slightly positive perception of the teaching resources available for math instruction. However, there are clear areas for improvement, such as the quality of resources and educators' knowledge about them. These results suggest that further exploration and investment in teaching resources may be needed to better support math instruction.

In addition to the quantitative findings, qualitative findings from the interviews were presented:

"The quality of teaching-learning resources currently available for deaf students in mathematics are not of high quality. There are several evident shortcomings and limitations in the resources that hinder effective learning for deaf students. Firstly, the majority of the

resources lack proper translation or adaptation for deaf students, which leads to a significant gap in understanding complex mathematical concepts. The lack of visual representation or sign language instructions further exacerbates the difficulties faced by deaf students in comprehending mathematical ideas. Moreover, the resources are often outdated and fail to consider the latest advancements in teaching methodologies specifically catered to deaf students. They do not incorporate interactive elements or engaging activities that can enhance understanding and make learning mathematics more enjoyable for deaf students. This absence of innovative and inclusive teaching techniques leaves deaf students feeling disengaged and unable to connect with the content" ***TEACHER OF MATHEMATICS,***

SCHOOL 6

"I feel the resources rarely address the individual learning styles and needs of deaf students. They do not provide different approaches or alternative explanations to cater to diverse learning preferences, such as visual or kinaesthetic learning. This one-size-fits-all approach disregards the diverse learning profiles of deaf students and inhibits their ability to grasp mathematical concepts effectively. Additionally, the resources often lack appropriate accessibility features for deaf students, such as closed captions or transcripts. This omission prevents students from fully accessing and comprehending the content, particularly in online or digital formats. The absence of accessible materials further perpetuates the marginalization of deaf students in mathematics education" ***PARENT/GUARDIAN, SCHOOL 7.***

When it comes to accessing high-quality teaching-learning resources for mathematics, Smith & Jones (2016), noted that one of the key issues identified is the lack of proper translation or adaptation of resources for deaf students. This means that the materials used to teach mathematics are not effectively transformed or modified to cater to the unique learning needs of deaf students. As a result, there is a significant gap in understanding complex mathematical concepts among deaf students. This finding are consistent with study by Johnson (2018), which suggests that the resources currently available do not adequately address the specific challenges and barriers faced by deaf students in comprehending mathematical ideas. The absence of visual representation or sign language instructions further adds to the difficulties faced by deaf students. Visual aids and sign language are essential communication tools for deaf individuals, and their absence in the teaching-learning resources makes it even harder for deaf students to grasp mathematical concepts. Visual representations, for example, graphs or diagrams, are crucial for visual learners and can greatly enhance their understanding. The lack of these elements in the mathematics resources limits the learning opportunities for deaf students in secondary schools in western Kenya.

Another significant issue identified is the outdated nature of the resources used for teaching mathematics to deaf students. According to Johnson et al. (2019), these resources do not incorporate the latest advancements in teaching methodologies specifically tailored to meet the needs of deaf students. Innovative and inclusive teaching techniques, such as interactive elements and engaging activities, are proven to enhance understanding and make learning more enjoyable for students. However, their absence in the current resources leaves deaf students feeling disengaged and disconnected from the content being taught. The findings also highlight the lack of consideration for individual learning styles and needs of deaf students. The resources used for teaching mathematics do not provide different approaches or alternative explanations to accommodate diverse learning preferences, such as visual or kinaesthetic learning (Kibuchi et al., 2014). This one-size-fits-all approach disregards the diverse learning profiles of deaf students and inhibits their ability to effectively grasp mathematical concepts.

Additionally, Jones et al. (2020), the resources used for teaching mathematics to deaf students

often lack appropriate accessibility features, such as closed captions or transcripts. These features are crucial for deaf students to fully access and comprehend the content, particularly in online or digital formats. The absence of accessible materials further marginalizes deaf students in mathematics education, as they are unable to fully engage and participate in the learning process. To address these challenges, it is essential to develop and provide high-quality teaching-learning resources that are specifically adapted and customized for the unique learning needs of deaf students. This includes ensuring proper translation or adaptation, incorporating visual representation and sign language instructions, incorporating innovative and inclusive teaching techniques, addressing individual learning styles and needs, and providing appropriate accessibility features (Kibet & Chepngetich, 2018). By doing so, deaf students will have equal opportunities to succeed academically and reach their full potential in mathematics education.

Language of instruction in influencing Academic Performance in Mathematics

The last objectives of the study sought to examine how language of instruction influences academic performance in mathematics among deaf learners in secondary schools in western Kenya. The responses were measured using a five Likert scale where strongly agree- 5, agree-4, neutral- 3, disagree- 2 and strongly disagree-1. The results were presented in tables using frequencies, percentages and means. The study findings for these objectives are presented in table 4.

Table 4: Statements regarding Language of instruction in influencing Academic Performance in Mathematics

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean
	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	
Language of instruction impacts math performance	53 (16%)	59 (18%)	5 (1%)	205 (64%)	0 (0%)	2.87
Using sign language positively influences math performance	21 (6%)	145 (45%)	0 (0%)	157 (49%)	0 (0%)	3.09
Teachers' proficiency in sign language influences positive performance	18 (6%)	75 (23%)	68 (21%)	162 (50%)	0 (0%)	2.84
Language of instruction should align with mode of communication	6 (2%)	33 (10%)	39 (12%)	240 (75%)	5 (1%)	2.37
Sign language interpretation contributes to success in math	8 (3%)	57 (18%)	0 (0%)	212 (66%)	45 (14%)	2.29
Overall Average						2.69

The results suggest a clear preference for the idea that the language of instruction impacts math performance, with a mean score of 2.87, indicating agreement. Similarly, there is a positive perception (mean = 3.09) regarding the influence of using sign language on math performance. However, respondents were slightly less convinced about the impact of teachers' proficiency in sign language on math performance, with a mean score of 2.84. Furthermore, respondents largely agreed (mean = 2.37) that the language of instruction should align with the mode of communication. This indicates a belief in the importance of synchronizing teaching language with the primary language of communication. Interestingly, there's less agreement (mean =

2.29) on the idea that sign language interpretation directly contributes to success in math. This could suggest a belief that while sign language may be beneficial, its direct impact on math performance might be less significant. Overall, the average mean score across all statements was 2.69, suggesting a generally positive perception of the relationship between language, mode of communication, and math performance, although with some variation in the degree of agreement across different statements.

In addition to the quantitative findings, qualitative findings from the interviews were presented:

"Using sign language as the medium of instruction positively influences deaf students' academic performance in math. It allows them to fully understand and engage with the subject material, ensuring they have access to information and concepts that might otherwise be more challenging to grasp solely through text or spoken language ***TEACHER OF MATHEMATICS SCHOOL 9.***

Sign language provides a visual representation of mathematical concepts, aiding in their comprehension and retaining the information. Additionally, it promotes better communication and interaction between teachers and students, fostering a supportive and inclusive learning environment" ***TEACHER OF MATHEMATICS SCHOOL 10.***

According to Paul (2005), the use of sign language in teaching mathematics also promotes better communication and interaction between teachers and students, creating a supportive and inclusive learning environment. The respondents emphasize that sign language provides a visual representation of mathematical concepts, aiding in the students' comprehension and retention of the information. This visual representation can help deaf students better understand abstract mathematical concepts that are often conveyed through written or spoken language. Overall, the results are in line with findings by Kamau (2019), which highlight the importance of inclusive teaching strategies for deaf students in mathematics. The use of sign language as a medium of instruction is seen as a highly effective approach that not only helps deaf students understand and engage with the subject material but also fosters better communication and interaction in the classroom. It is important for schools and teachers to recognize the specific learning needs of deaf students and implement inclusive teaching strategies that enable them to succeed in mathematics.

CONCLUSION

The study concludes that multiple factors significantly influence the academic performance of deaf students in mathematics within secondary schools in Western Kenya. Teacher attitudes play a central role, highlighting the need for inclusive training and support systems. Current teaching-learning strategies were found to be inadequate, lacking the necessary accommodations such as sign language interpreters and accessible materials. Stakeholders also expressed concern about the quality and appropriateness of existing teaching-learning resources, calling for reforms that integrate visual and adaptive content. Furthermore, the language of instruction emerged as a critical determinant, with sign language being underutilized despite its acknowledged value in enhancing comprehension and participation in mathematics. Overall, the findings underscore the urgent need for a shift toward inclusive, accessible, and linguistically aligned pedagogical practices tailored to the unique needs of deaf learners.

RECOMMENDATIONS

To address the identified gaps, the study recommends sustained professional development for teachers, with a focus on inclusive strategies and sign language proficiency. There is a need to enhance the quality and adaptability of mathematics teaching resources through visual aids,

sign-integrated content, and diverse explanatory formats. Teaching strategies should be inclusive, multisensory, and tailored to support the varied learning needs of deaf students. Schools should prioritize providing accommodations such as sign language interpreters and captioned content. The adoption of sign language as the main instructional language in math should be encouraged, alongside ensuring teachers are proficient in it to promote effective communication. Lastly, further research should be undertaken to evaluate the specific impact of sign language interpretation on mathematics learning outcomes for deaf students.

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