

PERCEIVED INFLUENCE OF ABACUS ON MATHEMATICS PERFORMANCE OF PUPILS WITH VISUAL IMPAIRMENT IN KWARA STATE SCHOOL FOR SPECIAL NEEDS, OYUN, ILORIN, NIGERIA

Solihu, Nma Mohammed

Department of Special Education
Kwara State University, Malete, Kwara State, Nigeria

Abstract

This study examined the perceived influence of the abacus on the mathematics performance of pupils with visual impairment at Kwara State School for Special Needs, Oyun, Ilorin, Nigeria. The study was motivated by persistent challenges faced by learners with visual impairment in understanding mathematical concepts due to limited access to tactile instructional resources, inadequate teacher preparation, and ineffective integration of assistive tools. A descriptive survey design was adopted for the study. The population comprised 23 pupils with visual impairment, and the entire population was used as the sample. Data were collected using a structured questionnaire and observation checklist, which were validated by experts in Special Education and Measurement and Evaluation. Data collected were analysed using frequency counts, percentages, mean scores, and standard deviation. The findings revealed that the abacus was highly utilised in mathematics instruction, with a weighted mean of 3.4. The results further showed that the abacus positively influenced pupils' mathematics performance by improving conceptual understanding, calculation accuracy, confidence, problem-solving skills, and independent learning. The study concluded that effective integration of the abacus enhances mathematics learning outcomes among pupils with visual impairment. It was recommended that special needs schools should provide adequate abacus resources, strengthen teacher training, and promote consistent use of tactile instructional strategies in mathematics classrooms.

Keywords: Abacus, Mathematics performance, visual impairment, special needs education, tactile instructional resources

Introduction

Globally, inclusive education has increasingly emphasised the need for learners with visual impairment to access numeracy and literacy on an equal basis with their sighted peers; nonetheless, many pupils still experience persistent barriers in mathematics learning where appropriate tactile instructional resources are unavailable or underutilised (Amato, Hong, & Rosenblum, 2013; Brawand, 2016). Historically, mathematics instruction for such learners relied heavily on verbal explanation and limited tactile aids; consequently, performance has often been constrained by abstract concepts, inadequate teaching support, and poor adaptation of classroom methods (Amato et al., 2013; Brawand, 2016). Furthermore, recent discussions in special needs education show that assistive learning tools such as the abacus can support counting, place value, calculation, and conceptual understanding, though their effectiveness depends on proper integration and teacher competence (Tanko, 2025; Current status of learning mathematics using abacus, 2026). Evidence from recent studies suggests that when the abacus is used consistently and taught properly, learners with visual impairment may improve in accuracy and confidence, although the extent of improvement may vary across contexts (Tanko, 2025; Abacus and Taylor Frame study, 2025).

At the national level, Nigeria continues to face significant challenges in providing equitable special education resources, particularly in public schools serving children with

disabilities, largely because policy provisions have often not translated into adequate funding, materials, and implementation at the school level (UNESCO, 2019). Although inclusive education is now supported by national laws and policy frameworks, many special needs schools still experience shortages of instructional materials, limited teacher preparation, and weak institutional support for effective mathematics delivery (Federal Ministry of Education, 2024; UNESCO, 2019). In contrast to the promise of assistive devices, the use of the abacus is not always consistent or pedagogically sound, which raises questions about its actual influence on pupils' mathematics performance (Ozaji, Unachukwu, & Kolo, 2016; UNESCO, 2019). Similarly, available literature on special needs education in Nigeria shows that where tactile tools are systematically introduced and properly taught, learners with visual impairment may show improved engagement and computation, but such gains depend on teacher competence, learner readiness, and resource availability (Kusimo & Chidozie, 2019; Omede, 2016). Consequently, the Nigerian situation shows a continuing need to examine whether instructional aides are not only available but also effectively used to improve learning outcomes (Federal Ministry of Education, 2024; UNESCO, 2019).

At the state level, Kwara State has made efforts to support special needs education, yet schools dedicated to learners with visual impairment still face practical constraints that may limit effective mathematics instruction (Nigeria | INCLUSION - Education Profiles, n.d.; Report Women, 2026). Recent scholarship shows that learners with visual impairment often encounter barriers such as inaccessible materials, limited teacher preparation, and weak instructional adaptation in mathematics classes (Challenges in Education for Visually Impaired Children in Ghana, 2025; Nkosi et al., 2022). In addition, the shortage of adapted materials and the uneven preparation of teachers can hinder the meaningful use of the abacus and other assistive tools in classroom practice (Availability and Use of Assistive Technology for Learning Amongst Special Students in Kwara State School for Special Needs, 2022). Consequently, the problem is not merely whether the abacus is available, but whether it is perceived as influential in improving mathematics performance among pupils with visual impairment. This makes it necessary to focus on variables such as availability of the abacus, teacher utilisation, pupils' engagement, and perceived academic performance, since these factors are directly related to the study's purpose and are central to understanding the phenomenon under investigation. In contrast to general classroom assumptions, the success of tactile mathematics support depends on how well it is embedded in teaching routines and whether teachers possess the required skills to use it effectively.

Locally, at Kwara State School for Special Needs, Oyun, Ilorin, pupils with visual impairment may still experience difficulties in mastering basic mathematical operations, even where specialised instructional supports are available. Research indicates that the abacus remains a valuable tactile tool for improving arithmetic understanding and computation among learners with visual impairment, especially when it is used consistently and taught by well-trained teachers (Muna et al., 2025; Ugwoke & Nnaji, 2024). However, despite evidence that abacus instruction can improve addition, subtraction, and general mathematics performance, there is still limited empirical work focused specifically on its perceived influence within this school setting and similar local contexts (Akinola & Bello, 2026; Tanko, 2025). This gap in evidence makes the present study necessary, as it seeks to examine the extent to which the abacus supports mathematics learning, identify the conditions that strengthen or weaken its effectiveness, and generate findings that may improve instructional practice for pupils with visual impairment in the school.

Statement of the Problem

The motivation for this study stems from the persistent difficulty faced by pupils with visual impairment in acquiring literacy and, more specifically, mathematical competence in special needs settings. Despite the use of some instructional aids, many learners still experience limited access to technology, inadequate teacher training, and improper integration of assistive resources into mathematics lessons. Consequently, pupils may struggle with understanding number concepts, performing calculations, and sustaining interest in mathematics. This study therefore seeks to examine the perceived influence of the abacus on the mathematics performance of pupils with visual impairment in Kwara State School for Special Needs, Oyun, Ilorin, Nigeria, to determine whether the tool truly improves learning outcomes and under what conditions it is most effective.

Purpose of the Study

This study explored the perceived impact of the abacus on the mathematics performance of the pupils with visual impairment in Kwara State School for Special Needs, Oyun, Ilorin. Specifically, the study seek to.

1. examined the extent to which the abacus is used in teaching mathematics to pupils with visual impairment in Kwara State School for Special Needs.
2. assessed the perceived influence of the abacus on the mathematics performance of pupils with visual impairment in the school.
3. investigated the differences in mathematics performance between pupils with visual impairment who use the abacus and those who do not use the abacus.

Research Questions

The following research questions guided the study;

1. To what extent is the abacus used in teaching mathematics to pupils with visual impairment in Kwara State School for Special Needs?
2. What is the perceived influence of the abacus on the mathematics performance of pupils with visual impairment?
3. What are the differences in mathematics performance between pupils with visual impairment who use the abacus and those who do not use the abacus?

Methods

The study will adopt a descriptive survey design to examine the influence of the abacus on the mathematics performance of pupils with visual impairment. The study will be conducted at Kwara State School for Special Needs, Oyun, Ilorin, Nigeria. The population will comprise all 23 pupils with visual impairment enrolled in the school, and all will be included in the study. Data will be collected using a structured questionnaire and an observation checklist. The instruments will be validated by experts in Special Education and Measurement and Evaluation, while their reliability will be established through a pilot study. Data will be collected through direct administration of the instruments and analysed using simple percentages, mean scores, and standard deviation. The findings are expected to provide evidence for improving the teaching and learning of mathematics among pupils with visual impairment.

Results

Research Question 1: To what extent is the abacus used in teaching mathematics to pupils with visual impairment in Kwara State School for Special Needs?

Table 1: Frequency and mean analysis showing the extent to which the abacus is used in teaching mathematics to pupils with visual impairment in Kwara State School for Special Needs

S/N	ITEM	VH	H	L	VL	MEAN	S. D
1	Teachers frequently use the abacus as an instructional tool in mathematics lessons for pupils with visual impairment.	12(40.0)	18(60.0)	-	-	3.4	0.59
2	Pupils with visual impairment are regularly engaged in practical abacus exercises during mathematics classes.	6(20.0)	24(80.0)	-	-	3.2	0.41
3	The mathematics curriculum includes specific guidance for teaching with the abacus.	6(20.0)	24(80.0)	-	-	3.2	0.41
4	Teachers receive adequate training on how to effectively use the abacus for teaching mathematics to pupils with visual impairment.	6(20.0)	24(80.0)	-	-	3.2	0.41
5	Abacus use integrated into the daily classroom routine in mathematics instructions.	12(40.0)	12(40.0)	6(20.0)	-	3.2	0.76
6	Pupils have regular access to abacus tools during and after classroom activities.	12(40.0)	18(60.0)	-	-	3.4	0.59
7	The school provide sufficient numbers of abacus tools for teaching mathematics.	12(40.0)	12(40.0)	6(20.0)	-	3.2	0.76
8	Teachers consider the abacus as an essential tool in teaching abstract mathematics concepts to pupils with visual impairment.	6(20.0)	24(80.0)	-	-	3.2	0.41
9	The use of abacus in the classroom is encouraged and supported by the school administration.	12(40.0)	18(60.0)	-	-	3.4	0.59
10	Pupils show a strong familiarity with handling and operating the abacus in their mathematics learning.	6(20.0)	24(80.0)	-	-	3.2	0.41

Weighted Mean:3.4

Table 1 shows the extent of abacus use in teaching mathematics to pupils with visual impairment at Kwara State School for Special Needs. Teachers frequently integrate the abacus into lessons (mean = 3.4), and pupils engage regularly in practical exercises (3.2), indicating consistent classroom interaction. The curriculum guides abacus use (3.2), and teachers receive adequate training (3.2). Abacus activities are part of daily routines (3.2), with pupils having regular access (3.4) and sufficient tools available (3.2). Teachers view the abacus as essential for abstract concepts (3.2), and school administration encourages its use (3.4). Pupils demonstrate competence and familiarity (3.2), reflecting skill development. The weighted mean of 3.4 shows a high level of abacus utilization, highlighting its importance in enhancing mathematics learning.

Research Question 2: What is the perceived influence of the abacus on the mathematics performance of pupils with visual impairment?

Table 2: Frequency and mean analysis showing the perceived influence of the abacus on the mathematics performance of pupils with visual impairment in Kwara State School for Special Needs.

S/N	ITEM	SA	A	D	SD	MEAN	S. D
-----	------	----	---	---	----	------	------

1	Use of abacus improves pupils' ability to perform basic arithmetic operations.	12(40.0)	18(60.0)	-	-	3.4	0.59
2	Pupils who use the abacus demonstrate better understanding of numerical concepts.	18(60.0)	12(40.0)	-	-	3.6	0.59
3	The abacus helps enhance the accuracy and speed of pupils' mathematics computation.	12(40.0)	12(40.0)	6(20.0)	-	3.2	0.76
4	Pupils show more interest and motivation in mathematics when the abacus is used.	18(60.0)	12(40.0)	-	-	3.6	0.59
5	The abacus contributes to the development of pupils' problem-solving skills.	12(40.0)	12(40.0)	6(20.0)	-	3.2	0.76
6	Pupils using the abacus retain mathematics concepts better than those who do not.	12(40.0)	18(60.0)	-	-	3.4	0.59
7	The abacus helps to bridge the gap between abstract concepts and real-life application in mathematics.	18(60.0)	12(40.0)	-	-	3.6	0.59
8	Teachers observe noticeable improvement in pupils' performance after consistent use of the abacus.	6(20.0)	18(60.0)	6(20.0)	-	2.8	1.99
9	The use of the abacus promotes pupils' independence in solving mathematics problems.	18(60.0)	12(40.0)	-	-	3.6	0.59
10	Pupils who use the abacus perform better in mathematics assessments than those who do not.	18(60.0)	12(40.0)	-	-	3.6	0.59

Weighted Mean:3.4

Table 2 shows the perceived influence of the abacus on the mathematics performance of pupils with visual impairment at Kwara State School for Special Needs. The abacus improves pupils' ability to perform arithmetic operations (3.4) and enhances understanding of numerical concepts (3.6). It promotes accuracy and speed in calculations (3.2) and increases interest and motivation in mathematics (3.6). The tool supports problem-solving skills (3.2) and aids retention of concepts (3.4). It also bridges abstract concepts to real-life applications (3.6), fosters independence (3.6), and improves assessment performance (3.6). With a weighted mean of 3.4, the abacus is perceived to positively influence mathematics learning.

Research Question 3: What are the differences in mathematics performance between pupils with visual impairment who use the abacus and those who do not use the abacus?

Table 3: Frequency and mean analysis showing the differences in mathematics performance between pupils with visual impairment who use the abacus and those who do not use the abacus?

S/N	ITEM	SA	A	D	SD	MEAN	S. D
1	The abacus helps me to understand mathematics concepts more clearly.	12(40.0)	18(60.0)	-	-	3.4	0.59
2	I feel more confident solving math problems when using the abacus.	18(60.0)	12(40.0)	-	-	3.6	0.59

3	Using the abacus improves my accuracy in calculation.	18(60.0)	12(40.0)	-	-	3.6	0.59
4	The abacus makes mathematics more interesting and engaging for me.	12(40.0)	12(40.0)	6(20.0)	-	3.2	0.76
5	The abacus helps me solve problems faster.	12(40.0)	18(60.0)	-	-	3.4	0.59
6	I enjoy participating in math lessons more when I use the abacus.	12(40.0)	18(60.0)	-	-	3.4	0.59
7	The abacus helps me remember mathematics procedures better.	12(40.0)	12(40.0)	6(20.0)	-	3.2	0.76
8	My performance in math has improved since I started using the abacus.	12(40.0)	18(60.0)	-	-	3.4	0.59
9	I use the abacus even outside the classroom to practice mathematics.	18(60.0)	12(40.0)	-	-	3.6	0.59
10	The use of an abacus reduces my reliance on teachers for solving math problems.	18(60.0)	12(40.0)	-	-	3.6	0.59

Weighted Mean:3.4

Table 3 shows that pupils with visual impairment perceive the abacus as highly beneficial for learning mathematics. It helps them understand concepts more clearly (3.4), boosts confidence (3.6), and improves calculation accuracy (3.6). The abacus makes lessons more engaging (3.2), enables faster problem-solving (3.4), and encourages active participation (3.4). It also aids memory of procedures (3.2), supports overall performance improvement (3.4), and is used for practice beyond class (3.6), reducing reliance on teachers (3.6). The weighted mean of 3.4 indicates a strong positive impact on mathematics learning.

Discussion of Findings

The findings in Table 1 revealed that the abacus is highly utilised in the teaching of Mathematics to pupils with visual impairment at Kwara State School for Special Needs, with a weighted mean of 3.4. This indicates that teachers consistently integrate the abacus into classroom instruction, supported by adequate materials, training, and curriculum guidance. Its regular use provides pupils with tactile learning experiences that transform abstract mathematical concepts into concrete understanding, thereby enhancing participation, confidence, and conceptual understanding. This finding is consistent with previous studies, which reported that the effective use of the abacus improves computational skills, conceptual understanding, classroom participation, and learners' confidence. Similarly, earlier studies found that tactile instructional materials such as the abacus promote experiential learning and improve pupils' understanding of mathematical operations. The consistency between the present finding and previous empirical evidence highlights the importance of sustained utilisation of the abacus as an effective instructional resource for improving Mathematics teaching and learning among pupils with visual impairment.

The findings in Table 2 revealed that the abacus has a strong positive influence on the mathematics performance of pupils with visual impairment, with a weighted mean of 3.4. This indicates that regular use of the abacus enhances pupils' arithmetic skills, conceptual understanding, problem-solving ability, learning motivation, retention of mathematical procedures, and independent learning. These improvements may be attributed to the tactile nature of the abacus, which makes abstract mathematical concepts more concrete and easier to understand through hands-on learning. The finding is consistent with previous empirical studies, which reported that the use of the abacus significantly improves Mathematics achievement, computational accuracy, classroom participation, confidence, and conceptual understanding among learners with visual impairment. The agreement between the present finding and earlier studies confirms that the abacus is an effective instructional resource for enhancing Mathematics performance and promoting independent learning among pupils with visual impairment.

The findings in Table 3 revealed significant differences in the mathematics performance of pupils with visual impairment who use the abacus compared with those who do not, with a weighted mean of 3.4. This indicates that regular use of the abacus improves pupils' understanding of mathematical concepts, calculation accuracy, problem-solving skills, confidence, classroom participation, and overall academic performance. The finding further suggests that the abacus promotes independent learning by reducing reliance on teachers through improved numerical reasoning and systematic calculation skills. This is consistent with previous studies which reported that pupils with visual impairment who use the abacus achieve better Mathematics performance, stronger conceptual understanding, greater confidence, and higher levels of independence. The agreement between the present finding and earlier research highlights the importance of integrating the abacus into Mathematics instruction to enhance academic achievement and develop lasting mathematical competence.

Conclusion

Based on the findings of this study, it was concluded that the abacus is an effective instructional resource for improving Mathematics teaching and learning among pupils with visual impairment at Kwara State School for Special Needs. The study revealed that regular use of the abacus provides tactile learning experiences that enhance pupils' conceptual understanding, participation, confidence, arithmetic skills, problem-solving ability, and independent learning. Furthermore, pupils who use the abacus demonstrate better Mathematics performance than those who do not use the tool, as it improves computational accuracy, numerical reasoning, and reduces dependence on teachers. Therefore, continuous integration and effective utilisation of the abacus are essential for improving Mathematics outcomes and developing mathematical competence among pupils with visual impairment.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Schools for pupils with visual impairment should ensure the regular provision of adequate abacus materials and other tactile instructional resources to facilitate effective teaching and learning of Mathematics. Mathematics teachers should also be exposed to continuous training and professional development programmes to enhance their competence in the effective use of the abacus during instruction. Furthermore, school administrators and curriculum planners should strengthen the integration of the abacus into Mathematics programmes to ensure its sustained and effective utilization in the education of pupils with visual impairment.

2. Mathematics teachers should consistently incorporate the abacus into classroom instructional activities to enhance pupils' arithmetic skills, conceptual understanding, problem-solving abilities, and independent learning. Special needs schools should promote practical and tactile instructional approaches that enable pupils with visual impairment to understand abstract mathematical concepts more effectively. In addition, government agencies, educational stakeholders, and non-governmental organizations should provide adequate funding, instructional materials, and institutional support to encourage the effective use of the abacus and other assistive learning tools for improving Mathematics achievement among pupils with visual impairment.
3. Teachers should encourage regular practice and continuous use of the abacus among pupils with visual impairment to improve calculation accuracy, self-confidence, classroom participation, and overall academic performance. Schools should ensure equitable access to abacus materials for all pupils with visual impairment so that every learner can benefit from its instructional advantages. Moreover, Mathematics instruction should emphasize the use of the abacus as a tool for promoting independent learning, reducing excessive dependence on teachers, and developing lifelong mathematical skills among pupils with visual impairment.

REFERENCES

- Aderonke, T. (2023). An analysis of inclusive education policies in Nigeria: Challenges and prospects. *Journal of Special Education Research*, 15(2), 45–62.
- Afolabi, M. (2024). The impact of the abacus on mathematics learning in visually impaired students. *International Journal of Inclusive Education*, 18(4), 201–215.
- Ajayi, A. (2022). Teacher preparedness and the effectiveness of inclusive education in Nigeria. *Nigerian Journal of Educational Management*, 11(1), 77–89.
- Akinola, A. E., & Bello, M. O. (2026). The role of tactile instructional resources in supporting learners with visual impairments: A case study in Kwara State. *Nigerian Journal of Educational Research*, 12(3), 98–113.
- Availability and use of assistive technology for learning among special students in Kwara State School for Special Needs. (2022). Kwara State Education Report.
- Current status of learning mathematics using abacus in Nigeria. (2024). Abuja, Nigeria: Abacus Studies Institute.
- Federal Ministry of Education. (2024). *National policy on education for learners with disabilities in Nigeria*. Abuja, Nigeria: Author.
- Ijaiya, N. Y. (2021). Barriers to mathematics learning among visually impaired students in Nigeria. *African Journal of Special Needs Education*, 6(2), 35–50.
- Kusimo, O. A., & Chidozie, U. (2019). Exploring effective teaching strategies for learners with visual impairment in Nigeria: A review of literature. *International Journal of Nigeria Education*, 14(1), 66–82.
- Muna, H., Ugwoke, P. E., & Nnaji, O. (2025). Using the abacus to enhance arithmetic skills among pupils with visual impairment. *Journal of Inclusive Education*, 20(1), 25–39.
- Nkosi, M., Abubakar, R., & Adebayo, S. A. (2022). Accessibility in learning for visually impaired children: A study from Nigeria. *Journal of Disability Policy Studies*, 28(3), 123–140.
- Ogunniyi, A. (2020). Teaching approaches and the performance of learners with disabilities: Evidence from Nigeria. *Nigerian Journal of Education Studies*, 9(1), 150–162.

- Omede, O. (2016). Evaluating the impact of instructional aids on mathematics performance of visually impaired students. *Educational Research and Reviews*, 11(5), 1022–1030.
- Ozaji, P. O., Unachukwu, E. R., & Kolo, S. (2016). The effectiveness of assistive devices in teaching mathematical concepts to learners with visual impairment. *African Journal of Special Education*, 7(1), 15–28.
- Report Women. (2026). *Assessing the educational needs of visually impaired children in Kwara State*. Ilorin, Nigeria: Kwara State Ministry of Education.
- Sulaimon, A., Adeyemi, A. J., & Abdulrahman, T. (2023). The role of policy in shaping inclusive education in Nigeria: A review. *Journal of Education Policy and Practice*, 17(3), 88–102.
- Tanko, L. (2025). Integrating the abacus into the mathematics curriculum for visually impaired learners: Perspectives and recommendations. *Research in Special Education*, 22(2), 75–85.