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Effects of an Inclusive Education Programme on Mathematics Computation Achievement Among Primary Five Pupils in Bosso Local Government Area of Niger State, Nigeria

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Abstract

This study investigated the effect of an inclusive education programme on the computation achievement of Primary Five pupils in Bosso Local Government Area of Niger State. The study adopted a quasi-experimental one-group pretest-posttest design involving 52 Primary Five pupils selected through purposive sampling from a population of one hundred and five pupils. Data were collected using the Mathematics Computation Achievement Test (MCAT), which was validated by experts in Mathematics Education, Special Education, and Measurement and Evaluation. The reliability coefficient of the instrument was established at 0.70. The intervention consisted of inclusive instructional strategies, including cooperative learning, peer tutoring, differentiated instruction, and the use of instructional materials over six weeks. Data were analyzed using the mean, standard deviation, and paired-sample t-test at a 0.05 level of significance. Findings revealed that pupils' mean computation achievement score increased from 18.90 during the pretest to 31.80 during the posttest. The paired-sample t-test indicated a statistically significant difference between pretest and posttest scores ($p < .05$). The study concluded that inclusive education programmes significantly improve mathematics computation achievement among primary school pupils. It was recommended that teachers adopt inclusive instructional strategies in mathematics classrooms and that educational authorities should provide adequate support for the implementation of inclusive education practices

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Keywords: Computation Achievement, Differentiated Instruction, Inclusive Education, Mathematics Education, Primary School Pupils

Introduction

Mathematics is universally recognized as a fundamental subject that contributes significantly to scientific advancement, technological development, economic growth, and everyday problem solving. At the primary school level, learning mathematics requires a lot of patience, follow-up, and feedback (Abasi and Umoinyang,2020). Among the various aspects of mathematics, computation skills remain central because they provide the foundation upon which more complex mathematical concepts are built. Despite its importance, mathematics achievement among primary school pupils in Nigeria continues to be unsatisfactory. Several studies have reported persistent difficulties among pupils in performing basic arithmetic operations such as addition, subtraction, multiplication, and division (Adebisi, Liman and Longpoe, 2015). These challenges have been attributed to inadequate instructional approaches, insufficient learner engagement, lack of instructional resources, and failure to address learners' diverse educational needs. The emergence of inclusive education has provided a framework for addressing learner diversity within mainstream classrooms. Inclusive education emphasizes equitable participation, access, and achievement for all learners regardless of ability, disability, gender, socio-economic status, or learning characteristics (UNESCO, 2020). Through the use of differentiated instruction, cooperative learning, peer tutoring, and individualized support, inclusive education seeks to create learning environments that accommodate diverse learner needs and maximize academic outcomes. Recent studies have demonstrated that inclusive instructional strategies improve learner engagement, motivation, and academic

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achievement (Jütte and Lüken, 2021; Radzi and Mahmud, 2024). However, empirical evidence on the effect of inclusive education programmes on mathematics computation achievement among primary school pupils in Niger State remains limited. This study therefore investigated the effect of an inclusive education programme on mathematics computation achievement among Primary Five pupils in Bosso Local Government Area of Niger State.

Statement of the Problem

Despite efforts by educational stakeholders to improve mathematics achievement among primary school pupils, poor performance in computation remains a persistent concern. Many pupils continue to experience difficulties in performing basic arithmetic operations, thereby limiting their academic progress and future opportunities. Although inclusive education has been promoted as a strategy for improving learning outcomes through equitable and learner-centred instruction, limited empirical evidence exists regarding its effectiveness in improving mathematics computation achievement among primary school pupils in Bosso Local Government Area of Niger State. This study therefore sought to determine whether participation in an inclusive education programme would significantly improve pupils' computation achievement.

Purpose of the Study

The purpose of this study was to determine the effects of an inclusive education programme on mathematics computation achievement among Primary Five pupils in Bosso Local Government Area of Niger State.

Specifically, the study objectives were:

1. Determine the pretest mathematics computation scores of primary school pupils before exposure to the inclusive education programme.
2. Determine the posttest mathematics computation scores of primary school pupils after exposure to the inclusive education programme.
3. Examine the difference between pupils' pretest and posttest mathematics computation scores primary school pupils after the implementation of the inclusive education programme.

Research Questions

The following research questions guided the study:

1. What are the pretest computation scores of primary school pupils before exposure to the inclusive education programme?
2. What are the posttest computation scores of primary school pupils after exposure to the inclusive education programme?
3. What difference exists between the pretest and posttest mathematics computation scores of primary school pupils exposed to the inclusive education programme?

Research Hypothesis

The null hypothesis below was tested at the 0.05 level of significance:

Hypothesis one: There is no significant difference between the pretest and posttest computation scores of primary school pupils exposed to the inclusive education programme in Bosso Local Government Area.

Literature Review

Concept of Inclusive Education

Inclusive education is a philosophy and practice that seeks to ensure that all learners, regardless of their abilities, disabilities, socio-economic status, gender, ethnicity, or learning characteristics, have equal opportunities to participate and succeed in regular educational settings. The concept is founded on the principles of equity, participation, diversity, and social justice. According to UNESCO (2020), inclusive education involves identifying and removing barriers that prevent learners from accessing, participating in, and benefiting from quality education. It encompasses curriculum adaptation, teaching methods, assessment procedures, and learning environments designed to meet the needs of all learners. The global movement toward inclusive education gained momentum through international frameworks such as the Salamanca Statement, the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), and Sustainable Development Goal Four (SDG 4), which advocates for inclusive and equitable quality education for all. UNESCO's Global Education Monitoring Report emphasized that inclusion is not merely about placement in regular classrooms but about ensuring meaningful participation and achievement for every learner. In Nigeria, inclusive education has been adopted as a national educational strategy through the National Policy on Inclusive Education. The policy seeks to provide equitable educational opportunities for learners with diverse needs and promote the participation of all children in regular schools. However, challenges such as inadequate teacher preparation, limited instructional resources, overcrowded classrooms, and insufficient policy implementation continue to affect the realization of inclusive education goals. (Federal Republic of Nigeria, FRN,2023).

Theoretical Framework

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Social Constructivist Theory

This study is anchored on Vygotsky's Social Constructivist Theory. Vygotsky (1978) posited that learning occurs through social interaction and collaboration with more knowledgeable others. Central to the theory is the concept of the Zone of Proximal Development (ZPD), which refers to the gap between what learners can accomplish independently and what they can achieve with support. Inclusive education aligns with this theory because it encourages collaborative learning environments where learners interact, share ideas, and support one another's learning. Strategies such as peer tutoring, cooperative learning, and differentiated instruction provide opportunities for scaffolding that enable pupils to achieve higher levels of understanding and competence in Mathematics. The theory suggests that pupils' computation skills can be enhanced when they engage in collaborative activities and receive instructional support tailored to their individual learning needs. Therefore, the use of inclusive instructional strategies is expected to improve Mathematics computation achievement among primary school pupils.

Mathematics Computation Achievement

Mathematics computation achievement refers to learners' ability to accurately and efficiently perform mathematical operations such as addition, subtraction, multiplication, and division. Computation skills form the foundation upon which higher-order mathematical reasoning and problem-solving abilities are built. According to the National Council of Teachers of Mathematics (NCTM), computational fluency requires conceptual understanding, procedural knowledge, strategic competence, and adaptive reasoning. Pupils who possess strong computation skills are more likely to succeed in advanced mathematical tasks and related academic disciplines. (NCTM,2014). Despite its importance, mathematics achievement remains a challenge in our schools. Research indicates that many primary school pupils experience difficulties in computation due to inadequate instructional approaches, mathematics anxiety, lack of instructional materials, and insufficient opportunities for active learning. Consequently, educational researchers continue to explore innovative teaching methods and packages capable of improving pupils' mathematics achievement(Jutte and Luken,2021).

Inclusive Instructional Strategies and Learning Mathematics

Inclusive education promotes the use of instructional strategies that accommodate learner diversity and encourage active participation. Among the most widely used strategies within the purview of this study are cooperative learning, peer tutoring, differentiated instruction, and the use of instructional materials. (Radzi and Mahmud,2025)

Cooperative Learning: Cooperative learning involves organizing learners into small groups where they work together to achieve common academic goals. Research has consistently shown that cooperative learning enhances academic achievement, social interaction, and learner motivation. Johnson and Johnson (2017) reported that cooperative learning improves mathematical understanding by encouraging pupils to explain concepts, share strategies, and solve problems collaboratively. Peer Tutoring: Peer tutoring involves pairing learners so that more competent pupils assist those experiencing learning difficulties. This strategy provides individualized support and promotes active engagement in learning. Studies have shown that peer tutoring improves academic achievement and increases learners' confidence in mathematics. Differentiated Instruction: Differentiated instruction refers to adapting teaching methods, content, learning activities, and assessment procedures to meet learners' diverse needs. Tomlinson (2017) argued that differentiated instruction enables teachers to address individual learning differences and maximize learning outcomes. Within inclusive classrooms, differentiated instruction helps ensure that all learners can access and engage meaningfully with mathematical content.

Studies on Inclusive Mathematics Education

Recent studies have continued to highlight the importance of inclusive pedagogical practices in improving mathematics achievement among learners. A comprehensive systematic review conducted by Radzi and Mahmud (2025) examined inclusive mathematics pedagogy in primary schools and found that inclusive instructional practices significantly improved learner engagement, accessibility, and mathematics achievement. The review further revealed that professional development programmes focused on inclusive teaching enhanced teachers' instructional effectiveness and learners' academic outcomes. Similarly, Jütte and Lüken (2021) reviewed developments in inclusive mathematics instruction at the primary school level and concluded that inclusive teaching approaches contribute positively to learners' mathematical understanding and participation. Their findings emphasized the importance of adapting instructional methods to accommodate learner diversity and promote equitable access to mathematics learning. UNESCO's recent reports continue to emphasize that inclusive educational environments improve learners' participation, achievement, and sense of belonging. Inclusive teaching practices that focus on equity and learner-centred approaches have been associated with improved educational outcomes across diverse contexts. Research further suggests that inclusive learning environments promote academic achievement by enhancing learners' self-confidence, motivation, and participation. Studies on equitable learning environments have shown that when learners experience a sense of belonging and recognition within the

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classroom, their academic performance improves significantly. Recent educational research also highlights the role of technology and innovative pedagogies in supporting inclusive mathematics education. Interactive learning platforms, virtual simulations, and adaptive learning tools have been found to improve accessibility and engagement among learners with diverse educational needs.(UNESCO,2020). Several Nigerian studies have examined the effectiveness of inclusive education in promoting academic achievement. Ajuwon (2017) found that inclusive educational practices enhanced learners' participation and achievement in mainstream classrooms. Similarly, Obi and Ashi (2016) reported that inclusive learning environments improved classroom engagement and academic outcomes among pupils with diverse learning needs.Furthermore, Adebisi, Liman, and Longpoe (2015) emphasized the importance of instructional support and assistive technologies in enhancing learning outcomes among learners with special educational needs. Their findings suggest that appropriate support mechanisms can improve academic performance within inclusive educational settings. Although these studies provide valuable insights into inclusive education in Nigeria, limited empirical evidence exists regarding the effect of inclusive education programmes on mathematics computation achievement among primary school pupils in Bosso Local Government Area of Niger State. This gap necessitates further investigation. The reviewed literature indicates that inclusive education has positive effects on learners' participation, engagement, and academic achievement. International studies have demonstrated the effectiveness of inclusive pedagogies in improving mathematics learning outcomes, while Nigerian studies have largely focused on participation, policy implementation, and general academic achievement. However, few studies have specifically examined the effect of inclusive education programmes on mathematics computation achievement among primary school pupils in Niger State. In particular, empirical evidence regarding the use of inclusive instructional strategies such as cooperative learning, peer tutoring, and differentiated instruction in improving computation skills remains limited. This study therefore seeks to fill this gap by investigating the effect of an inclusive education programme on the computation achievement of Primary Five pupils in Bosso Local Government Area of Niger State.

Methodology

The study adopted a quasi-experimental research design, specifically the one-group pretest–posttest design. In this design, a single group of pupils is tested before and after exposure to the inclusive education programme in order to determine the effect of the intervention on their computation achievement. This design allows the researcher to measure the difference between pupils' computation scores before and after exposure to the inclusive education programme. The study was conducted in Bosso Local Government Area. Bosso Local Government Area is one of the major local government areas in Niger State. The area hosts several public and private primary schools and has a diverse population of pupils with varying academic abilities. Primary schools in the area operate inclusive classroom environments where pupils with different learning abilities learn together. The choice of Bosso Local Government Area is based on its accessibility and the presence of primary schools implementing inclusive classroom practices. The population of the study consisted of one hundred and five (105) Primary Five pupils in Yahaya Bawa Bosso primary schools in Bosso Local Government Area of Niger State. The sample for this study was made up of one intact class of Primary Five pupils in the primary school numbering fifty-two (52). A purposive sampling technique was used to select the school that practices inclusive classroom instruction. The intact class was then used for the study without altering the existing class composition. The use of an intact class is appropriate for classroom-based experimental studies because it allows the researcher to observe the effect of the instructional intervention within a natural classroom setting. The instrument used for data collection in this study was the Mathematics Computation Achievement Test (MCAT) developed by the researcher. The MCAT consisted of structured items designed to measure pupils' ability to perform basic arithmetic computations of addition, subtraction, multiplication, and division. The test contained multiple-choice and short-answer questions appropriate for Primary Five pupils. The instrument was used for both the pretest and posttest in order to measure pupils' computation performance before and after the intervention. The Mathematics Computation Achievement Test was subjected to face and content validation by experts in Mathematics Education, Special Education, and educational measurement and evaluation. These experts examined the instrument to ensure that the test items adequately measure pupils' computation skills and are appropriate for the level of the pupils. Their suggestions and corrections were incorporated into the final version of the instrument. To determine the reliability of the Mathematics Computation Achievement Test, the instrument was administered to a group of pupils outside the study sample but with similar characteristics. The scores obtained were analyzed using the test–retest method reliability technique. A reliability coefficient of 0.70 was obtained and considered adequate for the study. The researcher obtained permission from the school authorities before conducting the study. The pretest (MCAT) was administered to the selected intact class in order to determine pupils' initial computation ability. Thereafter, the researcher implemented the inclusive education instructional programme using strategies as cooperative learning, peer tutoring, differentiated instruction, use of instructional materials as contained in the package. The instructional intervention was conducted for a period of six weeks. After the intervention period, the posttest was

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administered to the pupils using the same MCAT. The pretest and posttest scores were collected for statistical analysis. Data collected for this study were analyzed using both descriptive and inferential statistics. Mean and standard deviation were used to answer the research questions by describing pupils' pretest and posttest computation scores, and a paired-sample t-test at the 0.05 level of significance to determine whether there is a significant difference between the pupils' pretest and posttest computation scores was used in testing the hypothesis. The decision rule was: If $p \leq 0.05$, reject the null hypothesis, and if $p > 0.05$, accept the null hypothesis.

Result and Discussion

The results were presented according to the research questions and hypothesis.

Research question 1: What are the pretest computation scores of primary five school pupils before exposure to the inclusive education programme?

Table 1. Mean and standard deviation scores of pretest scores.

N	Mean	SD
52	18.9	2.10

Table 1 above shows that the mean score of pupils is 18.9, with a standard deviation of 2.10. This shows that the pupils had a relatively low computation score before intervention.

Research question 2

What are the posttest computation scores of primary five pupils after exposure to the inclusive education programme?

Table 2: Mean and standard deviation scores after intervention

N	mean	standard deviation
53	31.8	2.75

Table 2 revealed that the mean post-test scores of pupils were 31.8 with a standard deviation of 2.75. This indicates a substantial improvement in pupils' computation performance after exposure to the inclusive education programme.

Research question 3

What is the mean difference between pre-test and post-test computation scores?

Table 3 shows the mean difference between pre-test and post-test computation scores.

Test	N	Mean	Mean Difference
Pretest	52	18.9	
Posttest	52	31.8	12.9

Table 3 shows a mean difference of 12.9 between the pretest and posttest scores. This indicates that pupils' computation scores improve substantially after the intervention.

Test of hypothesis

Hypothesis one

H0: There is no significant difference between the pretest and posttest computation scores of pupils.

Table 4. Paired sample t test analysis of pretest and posttest computation scores of pupils.

Variable	N	Mean	sd	DF	t cal.	P-value	decision
Pretest	52	18.9	21.0	51			
Posttest	52	31.8	2.75	51	32.45	0.000	reject H0

Table four shows that the calculated t value is 32.45 with a P value of 0.000, which is less than the critical value of t at the given degree of freedom and level of significance. Therefore, the hypothesis is rejected.

Discussion of Findings

The findings of this study revealed that pupils' computation achievement significantly improved after exposure to the inclusive education programme. The mean score increased from 18.9 during the pretest to 31.8 during the posttest, indicating that the intervention had a positive effect on pupils' mathematics achievement. This finding suggests that inclusive instructional strategies such as cooperative learning, peer tutoring, differentiated instruction, and individualized support contributed to improved understanding of mathematical concepts and enhanced computation skills. The finding agrees with Johnson and Johnson (2017), who reported that cooperative learning promotes active engagement and enhances academic achievement by encouraging pupils to learn collaboratively. Through interaction with peers, learners develop confidence and acquire problem-solving skills that contribute to improved mathematics performance. The result is also consistent with the work of Florian and Black-Hawkins (2011), who argued that inclusive pedagogical approaches create opportunities for all learners to participate actively in classroom activities regardless of their individual differences. Such participation enhances learning outcomes by providing equitable access to instruction and support.

Furthermore, the finding supports Ajuwon's (2017) assertion that inclusive educational practices improve academic achievement and classroom participation among Nigerian learners. The significant improvement

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observed in this study demonstrates that inclusive education can serve as an effective instructional approach for addressing learning diversity and improving mathematics outcomes. The statistically significant difference found between pupils' pretest and posttest scores corroborates the findings of Haug (2017), who reported that inclusive educational environments positively influence learners' academic achievement when appropriate teaching strategies are implemented. Similarly, Mastropieri and Scruggs (2018) observed that inclusive classrooms foster collaboration, peer support, and individualized instruction, which collectively contribute to improved academic performance. The findings may also be explained by Vygotsky's (1978) Social Constructivist Theory, which emphasizes the importance of social interaction in learning. Through cooperative learning and peer tutoring activities, pupils were able to learn from one another and receive guidance within their Zone of Proximal Development, thereby improving their computation skills. Overall, the findings indicate that inclusive education programmes can significantly improve pupils' mathematics computation achievement and provide an effective framework for addressing diverse learning needs within primary school classrooms.

Recommendations of the Study

The findings of this study have several implications for educational practice, policy, and research. Therefore, the following recommendations were forwarded:

First, the study demonstrates that inclusive instructional practices can significantly enhance mathematics achievement among primary school pupils. This suggests that teachers should move beyond traditional teacher-centred approaches and adopt learner-centred strategies that accommodate diverse learning needs. Second, the findings highlight the importance of teacher capacity building in inclusive pedagogy. Effective implementation of inclusive education requires teachers to possess competencies in differentiated instruction, cooperative learning, classroom management, and individualized support. Third, educational policymakers should strengthen the implementation of inclusive education policies by providing adequate instructional materials, teacher training opportunities, and monitoring mechanisms to ensure effective classroom practice. Finally, the study contributes to the growing body of literature on inclusive education in Nigeria by providing empirical evidence on its effectiveness in improving mathematics achievement among primary school learners.

Conclusion

This study examined the effect of an inclusive education programme on the computation achievement of Primary Five pupils in Bosso Local Government Area of Niger State. The findings revealed that pupils exposed to the inclusive education programme demonstrated significantly higher computation achievement scores after treatment than before the intervention. The substantial improvement observed in pupils' performance suggests that inclusive instructional strategies such as cooperative learning, peer tutoring, differentiated instruction, and individualized support can effectively enhance mathematics learning outcomes. The study therefore concludes that inclusive education programmes provide an effective framework for improving mathematics computation achievement among primary school pupils. By promoting active participation, collaboration, and learner-centred instruction, inclusive educational practices create opportunities for all learners to succeed academically regardless of their individual differences. Consequently, the adoption and effective implementation of inclusive education programmes should be encouraged in primary schools as a means of improving mathematics achievement and promoting equitable educational opportunities for all learners.

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