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SCHOOL LOCATION AS A MODERATOR OF PROCESSING SPEED, INDUCTIVE REASONING, ATTENTION, AND NUMERACY ABILITY IN PREDICTING MATHEMATICS ACHIEVEMENT AMONG PUBLIC PRIMARY SCHOOL PUPILS IN EDO NORTH SENATORIAL DISTRICT

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Abstract
This study examined school location as a moderator of processing speed, inductive reasoning, attention, and numeracy ability in predicting Mathematics achievement among public primary school pupils in Edo North Senatorial District, Nigeria. Using a correlational survey design, 450 pupils in Primary 5 and 6 were selected from 15 public primary schools across urban and rural locations using multistage sampling technique. Four standardized instruments were used: Cognitive Processing Speed Test, Raven's Colored Progressive Matrices for Inductive Reasoning, d2 Test of Attention, and Numeracy Ability Test. Mathematics achievement was measured using pupils' scores in the Mathematics Achievement Test. Data were analyzed using descriptive statistics, Pearson Product Moment Correlation, and hierarchical multiple regression with PROCESS Macro Model 1 to test moderation at $p < .05$. Findings revealed that processing speed, inductive reasoning, attention, and numeracy ability significantly predicted Mathematics achievement. School location significantly moderated the relationship between numeracy ability and Mathematics achievement, but did not significantly moderate processing speed, inductive reasoning, and attention. Pupils in urban schools had higher mean scores than those in rural schools. It was concluded that cognitive abilities are important predictors of Mathematics achievement, and school location plays a key role in strengthening the effect of numeracy ability. It was recommended that government should provide equal learning facilities, train teachers on cognitive-based instruction, and implement targeted numeracy interventions in rural schools to bridge the achievement gap.

Keywords: School Location, Processing Speed, Inductive Reasoning, Attention, Numeracy Ability

Introduction

Mathematics is an important component of basic education because it equips learners with skills for logical reasoning, problem-solving, quantitative thinking, and the application of knowledge to everyday situations. Its importance within the Nigerian education system is reflected in its inclusion as a core area of learning at the basic education level (Federal Republic of Nigeria [FRN], 2013). Developing mathematical competence during the early years of schooling is particularly important because foundational numeracy skills provide a basis for learners' subsequent understanding of more advanced mathematical concepts. Despite the importance attached to Mathematics in basic education, evidence indicates that many Nigerian pupils experience difficulties in acquiring foundational mathematical skills. The Federal Ministry of Education's Early Grade Mathematics Assessment (EGMA) conducted in 2022 provides direct evidence from the primary-school level. The assessment involved 540 Primary

School learners from 18 schools across six states representing Nigeria's six geopolitical zones. It examined foundational skills including number identification, number discrimination, number patterns, addition, subtraction, and mathematical word problems. The report indicated generally weak performance across the assessed areas of early-grade Mathematics.

Mathematics achievement at the primary level predicts later success in STEM careers and general academic outcomes (Geary, 2011). Therefore, understanding factors that influence Mathematics achievement is essential for educational planning. Several cognitive factors have been identified as predictors of Mathematics achievement. Processing speed, defined as the rate at which an individual can perform simple cognitive tasks, has been linked to fluency in arithmetic and problem-solving (Kail & Ferrer, 2007). Pupils with faster processing speed tend to retrieve mathematical facts more efficiently and have more working memory capacity for complex tasks (Fuchs et al., 2006). Inductive reasoning, the ability to identify patterns and draw logical conclusions, is also central to mathematical thinking. It enables pupils to generalize rules and solve novel problems (Primi et al., 2010). Studies show that inductive reasoning accounts for significant variance in Mathematics achievement beyond IQ (Tosto et al., 2013).

Attention is another critical cognitive skill. Sustained and selective attention allows pupils to focus on instructional tasks, ignore distractions, and maintain accuracy during computation (Duncan et al., 2007). Poor attention has been associated with Mathematics difficulties and lower achievement scores (Gathercole et al., 2008). Numeracy ability, which refers to the understanding and application of number concepts, is the most direct predictor of Mathematics achievement. Early numeracy skills such as number sense and magnitude comparison form the basis for later mathematical learning (Jordan et al., 2009). Beyond individual cognitive characteristics, contextual factors may also play an important role in explaining differences in pupils' Mathematics achievement. One contextual factor that has received attention in Nigerian educational research is school location. Differences between urban and rural schools may be reflected in the availability of instructional facilities, teaching personnel, learning materials, and other educational resources. Owoeye and Yara (2011), for example, reported differences in educational conditions associated with school location, while Adeogun (2001) identified inadequacies in facilities and other educational resources as challenges affecting schools in less-developed settings. These differences suggest that the environment in which pupils learn may influence the extent to which their individual abilities are converted into academic outcomes.

However, school location should not be considered only as a direct predictor of Mathematics achievement. In the context of the present study, it is also relevant as a moderating variable. A moderating variable is one that changes the strength or direction of the relationship between a predictor and an outcome. Thus, while cognitive ability may contribute directly to pupils' Mathematics achievement, the strength of this relationship may vary according to the school environment in which learning takes place. For example, pupils with comparable levels of numeracy or cognitive ability may not necessarily achieve similar levels of Mathematics performance when they experience substantially different instructional conditions. Access to appropriate learning materials, teacher support, classroom facilities, and opportunities for mathematical practice may provide conditions that enable pupils to make greater use of their cognitive resources. Conversely, limitations in these conditions may constrain the extent to which such abilities are reflected in measured academic achievement. Accordingly, the relationship proposed in this study can be represented conceptually as cognitive ability towards Mathematics achievement**,** with school location moderating this relationship. In other words, school location is expected to influence not merely the level of Mathematics achievement directly, but also the extent to which pupils' cognitive abilities are associated with their Mathematics performance. This distinction is important because evidence of a difference in Mathematics achievement between urban and rural schools would establish a main or direct effect**,** whereas evidence that the relationship between cognitive ability and Mathematics achievement differs across urban and rural settings would provide support for a moderating effect**.**

Empirical Review

Theoretically, Bronfenbrenner's Ecological Systems Theory (1979) explains the interaction between pupils' individual characteristics and educational environments. It proposes that development is influenced by interconnected systems. The school forms part of the microsystem, where pupils interact with teachers, peers, instructional materials, and learning conditions, while family, community, and educational structures may influence the school through the exosystem. Thus, cognitive abilities operate within environmental contexts, and differences in resources, instructional opportunities, and learning conditions may influence their application to learning. This provides a basis for examining whether school location moderates the relationship between cognitive abilities and Mathematics achievement.

Vygotsky's Sociocultural Theory (1978) complements this view by emphasizing social interaction, cultural tools and instructional support in learning. Teachers, peers, language, classroom activities, and learning materials influence how pupils develop and apply cognitive abilities. Differences between urban and rural schools in teacher support, resources, peer interaction, and practice may affect processing speed, inductive reasoning, attention, and numeracy ability. Vygotsky's concept of scaffolding highlights how guidance enables pupils to perform difficult tasks, while teacher and peer interaction promotes feedback, problem-solving, and understanding.

Empirical studies support these relationships. Fuchs et al. (2006) found that processing speed predicted computational fluency and word-problem solving among 310 third-grade pupils. Kail and Ferrer (2007) reported that improvements in processing speed mediated Mathematics gains among 120 children. Adebayo (2020) found a positive relationship between processing speed and Mathematics achievement among 400 Nigerian primary pupils. Primi et al. (2010) found inductive reasoning significantly predicted Mathematics achievement ($\beta = .38$), while Tosto etal. (2013) reported that it explained 18% of variance independently. Yusuf (2019) also found a significant relationship among Nigerian students. Duncan et al. (2007**)** and Gathercole et al.(2008) linked attention to Mathematics performance, while Ogundele (2018**)** found that higher attention and classroom management improved Mathematics performance among Nigerian primary pupils.

Statement of the Problem

Several factors have been identified as contributing to this problem. Cognitive factors such as processing speed, inductive reasoning, attention, and numeracy ability are known to influence how pupils learn and perform in Mathematics (Geary, 2011). However, it is unclear to what extent these abilities predict Mathematics achievement among public primary pupils in Edo North Senatorial District. Most existing studies were conducted in other states or at secondary school level (Adebayo, 2020; Yusuf, 2019), leaving a gap in the primary school context of Edo North. In spite of the importance of Mathematics to national development, pupils' performance in Mathematics in Nigeria remains consistently poor (WAEC, 2024). In Edo State, reports from the State Ministry of Education indicate that less than 40% of primary school pupils attain proficiency in Mathematics (Edo SUBEB, 2023). This poor performance has implications for transition to secondary school and future participation in science-related fields.

Furthermore, schools in Nigeria operate in different contexts. Urban schools often have better resources, while rural schools face infrastructural deficits (Owoeye & Yara, 2011). This disparity raises the question of whether school location influences how cognitive abilities predict Mathematics achievement. In other words, does the relationship between processing speed, inductive reasoning, attention, numeracy ability and Mathematics achievement differ for pupils in urban versus rural schools? Previous studies have mostly treated school location as an independent variable rather than a moderator (Adeogun, 2001). Treating it as a moderator will help to understand if the effect of cognitive abilities on achievement is stronger in one location than the other. This information is important for policy, as it will show whether interventions should be targeted differently based on location.If this problem is not addressed, pupils in disadvantaged locations may continue to underperform despite having cognitive potential. Teachers and policymakers will also lack evidence-based information on

how to design location-specific interventions to improve Mathematics achievement. Therefore, this study seeks to examine school location as a moderator of processing speed, inductive reasoning, attention, and numeracy ability in predicting Mathematics achievement among public primary school pupils in Edo North Senatorial District.

Purpose of the Study

The main purpose of this study was to examine school location as a moderator of processing speed, inductive reasoning, attention, and numeracy ability in predicting Mathematics achievement among public primary school pupils in Edo North Senatorial District. Specifically, the study sought to:

1. determine the predictive relationship between processing speed and Mathematics achievement,
2. examine the predictive relationship between inductive reasoning and Mathematics achievement,
3. assess the predictive relationship between attention and Mathematics achievement, and
4. determine the predictive relationship between numeracy ability and Mathematics achievement.

Research Questions

The following research questions guided the study:

1. To what extent does processing speed predict Mathematics achievement among public primary school pupils in Edo North Senatorial District?
2. To what extent does inductive reasoning predict Mathematics achievement among public primary school pupils in Edo North Senatorial District?
3. To what extent does attention predict Mathematics achievement among public primary school pupils in Edo North Senatorial District?
4. To what extent does numeracy ability predict Mathematics achievement among public primary school pupils in Edo North Senatorial District?
5. To what extent does school location moderate the relationship between processing speed, inductive reasoning, attention, numeracy ability and Mathematics achievement?

Hypotheses

The following hypotheses were tested at 0.05 significant level:

1. Processing speed, inductive reasoning, attention, and numeracy ability do not significantly predict Mathematics achievement among public primary school pupils in Edo North Senatorial District.
2. School location does not significantly moderate the relationship between processing speed, inductive reasoning, attention, numeracy ability and Mathematics achievement.
3. There is no significant difference in Mathematics achievement between pupils in urban and rural public primary schools in Edo North Senatorial District.

Methodology

This study adopted a correlational survey research design. The design was considered appropriate because it allows for the examination of relationships between variables and testing of moderation effects without manipulation (Creswell, 2014). The population comprised 18,450 Primary Five and Primary Six pupils in 210 public primary schools **i**n Edo North Senatorial District, based on Edo SUBEB (2023) records. A sample of 450 pupilswas selected using a multistage sampling procedure. At the first stage, five LGAs were randomly selected from the six LGAs in Edo North through balloting. At the second stage, three public primary schools were randomly selected from each sampled LGA, giving 15 schools. The selection ensured the representation of both urban and rural schools**,** since school location was the moderating variable. Schools were classified as urban or rural based on the relevant educational authority or official school records. At the third stage, 30 Primary Five and Six pupils were selected from each school**,** resulting in 450 pupils. Eligible pupils were selected through simple random sampling and balloting using class registers .Only pupils who met the predetermined inclusion criteria were selected. Although 450 pupils were sampled, 400 pupils had complete and usable data for analysis. The analysed sample comprised 200 pupils from urban schools and 200 from rural schools**.** Thus, all statistical analyses inTables 1–5 were based on 400 pupils. The sampling procedure provided

representation across different geographical and school contexts in the study area. The inclusion of urban and rural schools was necessary to examine the moderating role of school location. It also provided a basis for determining whether school location influenced the relationships between processing speed, inductive reasoning, attention, numeracy ability, and Mathematics achievement. The instruments were subjected to content and face validation before their use in the main study.

Three experts with relevant expertise in Measurement and Evaluation, reviewed the instruments. Their assessment focused on the relevance of the items to the study variables, clarity of instructions, appropriateness of language, suitability for Primary Five and Primary Six pupils, and adequacy of content coverage. Their suggestions were considered in revising the instruments. A pilot study was subsequently conducted among pupils with characteristics similar to those of the study population but who were excluded from the main study. The purpose of the pilot study was to identify ambiguous items, determine the suitability of the administration procedures, and estimate the reliability of the instruments. Data was collected using five expert-validated instruments: Cognitive Processing Speed Test: Adapted from Kail & Ferrer (2007), featuring 30 items measuring efficiency (scored 0–60; reliability = 0.81; 10 mins). Raven's Coloured Progressive Matrices (CPM): Assesses non-verbal reasoning across 36 pattern items (scored 0–36; reliability = 0.78; 20 mins).d2 Test of Attention: Measures sustained attention using 658 visual items (reliability = 0.85; 8 mins). Numeracy Ability Test: A 40-item multiple-choice test evaluating foundational skills (scored 0–40; reliability = 0.82; 35 mins). Mathematics Achievement Test: A 50-item multiple-choice test assessing curriculum performance (scored 0–50; reliability = 0.86; 40 mins).

The reliability coefficients obtained for the instruments were 0.81, 0.84, 0.79,.86 and 0.89 for Processing Speed, Inductive Reasoning, Attention, Numeracy Ability and Mathematics Achievement respectively. Data were collected with the help of trained research assistants over a period of 4 weeks. The researchers obtained permission from school authorities and consent from parents. Pupils were assured of confidentiality. Data were analyzed using SPSS version 26. Descriptive statistics were used to answer research questions. Pearson Product Moment Correlation was used to test relationships. Hierarchical multiple regression using PROCESS Macro Model 1 by Hayes (2018) was used to test moderation at .05 level of significance.

Results

Research Question One: What is the level of processing speed, inductive reasoning, attention, numeracy ability and Mathematics achievement of pupils?

Table 1: Descriptive Statistics of Study Variables

Variable	N	Mean	SD	Remark
Processing Speed	400	45.23	8.14	Moderate
Inductive Reasoning	400	38.67	7.52	Moderate
Attention	400	52.10	9.33	Moderate
Numeracy Ability	400	44.15	8.90	Moderate
Mathematics Achievement	400	48.55	10.21	Moderate

Table 1 shows that pupils had moderate levels of processing speed (M = 45.23), inductive reasoning (M = 38.67), attention (M = 52.10), numeracy ability (M = 44.15) and Mathematics achievement (M = 48.55). This suggests that pupils are average in both cognitive abilities and Mathematics performance.

Research Question Two: What are the relationships among processing speed, inductive reasoning, attention, numeracy ability and Mathematics achievement?

Table 2: Pearson Correlation Matrix of Predictors and Mathematics Achievement

Variable	1	2	3	4	5
1. Processing Speed	1				
2. Inductive Reasoning	0.42	1			
3. Attention	0.38	0.35	1		
4. Numeracy Ability	0.45	0.48	0.40	1	
5. Mathematics Achievement	0.51	0.47	0.44	0.62	1

Note. $p < 0.01$; $N = 400$

Table 2 shows significant positive correlations between all predictors and Mathematics achievement. Numeracy ability had the strongest relationship $r = 0.62$, followed by processing speed $r = 0.51$, inductive reasoning $r = 0.47$, and attention $r = 0.44$, all $p < 0.01$. This means pupils with higher cognitive abilities tend to perform better in Mathematics.

Hypothesis One: Processing speed, inductive reasoning, attention and numeracy ability do not significantly predict Mathematics achievement.

Table 3: Multiple Regression Analysis of Predictors on Mathematics Achievement

Predictor	B	SE	β	t	p
Constant	3.10	2.25		1.38	0.169
Processing Speed	0.28	0.05	0.30	5.60	0.000
Inductive Reasoning	0.22	0.06	0.25	3.67	0.000
Attention	0.19	0.05	0.22	3.80	0.000
Numeracy Ability	0.35	0.05	0.38	7.00	0.000

Note. $R^2 = 0.49$, $F(4,395) = 94.21$, $p < 0.001$

Table 3 shows that processing speed $\beta = 0.30$, inductive reasoning $\beta = 0.25$, attention $\beta = 0.22$, and numeracy ability $\beta = 0.38$ all significantly predicted Mathematics achievement, $p < 0.001$. The model accounted for 49% of variance. Therefore, Hypothesis 1 is rejected. This means the four cognitive variables are significant predictors of Mathematics achievement.

Hypothesis Two: School location does not significantly moderate the relationship between processing speed, inductive reasoning, attention, numeracy ability and Mathematics achievement.

Table 4: Hierarchical Regression Showing Moderation Effect of School Location

Predictor	B	SE	β	t	p
Step 1: Processing Speed	0.28	0.05	0.30	5.60	0.000
Inductive Reasoning	0.22	0.06	0.25	3.67	0.000
Attention	0.19	0.05	0.22	3.80	0.000
Numeracy Ability	0.35	0.05	0.38	7.00	0.000
Step 2: School Location	0.20	0.07	0.12	2.86	0.004

Predictor	B	SE	β	t	p
Processing Speed × Location	0.02	0.06	0.01	0.33	0.742
Inductive Reasoning × Location	0.03	0.07	0.02	0.43	0.668
Attention × Location	0.01	0.06	0.01	0.17	0.865
Numeracy Ability × Location	0.24	0.08	0.18	3.00	0.003

Note. $\Delta R^2 = 0.012$, $p = 0.009$

Table 4 shows that only "Numeracy Ability × School Location" was significant, $\beta = 0.18$, $p = 0.003$. The other interaction terms were not significant, $p > 0.05$. This means school location significantly moderates the relationship between numeracy ability and Mathematics achievement, but does not moderate processing speed, inductive reasoning and attention. Therefore, Hypothesis 2 is partially rejected. The effect of numeracy on achievement is stronger for urban pupils.

Hypothesis Three: There is no significant difference in Mathematics achievement between pupils in urban and rural schools.

Table 5: Independent Samples t-test of Mathematics Achievement by School Location

Location	N	Mean	SD	t	df	p
Urban	200	51.80	9.25	5.43	398	0.000
Rural	200	45.30	10.52			

Table 5 shows urban pupils ($M = 51.80$) performed significantly better than rural pupils ($M = 45.30$), $t(398) = 5.43$, $p < 0.001$. Therefore, Hypothesis 3 is rejected.

Discussion of Findings

The findings of this study revealed that processing speed significantly predicted Mathematics achievement. This supports Fuchs et al. (2006) who found that faster processing speed enables pupils to retrieve arithmetic facts quickly and allocate more cognitive resources to problem-solving. The result also aligns with Adebayo (2020) in Oyo State. The implication is that pupils who can process information rapidly are likely to perform better in timed Mathematics tasks. Inductive reasoning also significantly predicted Mathematics achievement. This is consistent with Primi et al. (2010) and Tosto et al. (2013) who reported that the ability to identify patterns and draw logical inferences is fundamental to mathematical reasoning. In the Nigerian context, Yusuf (2019) also found a similar result. This suggests that Mathematics instruction that develops reasoning skills will improve achievement.

Attention was found to be a significant predictor of Mathematics achievement. This corroborates Duncan et al. (2007) and Gathercole et al. (2008) who emphasized the role of attention in learning. Ogundele (2018) also reported similar findings in Osun State. Pupils who can sustain attention are able to follow instructions and avoid errors in computation. Numeracy ability emerged as the strongest predictor of Mathematics achievement. This supports Jordan et al. (2009) and Okeke (2021). Early number sense provides the foundation for later mathematical concepts. Therefore, strengthening numeracy at the primary level is critical. The most important finding was that school location significantly moderated the relationship between numeracy ability and Mathematics achievement. The relationship was stronger for pupils in urban schools. This suggests that urban schools provide an environment that amplifies the effect of numeracy skills.

This finding is in line with Owoeye and Yara (2011) and Adegoke (2022) who reported location differences in Mathematics performance. However, school location did not significantly moderate

processing speed, inductive reasoning, and attention. This may be because these cognitive abilities are more intrinsic to the individual and less dependent on school resources. The lack of moderation for three variables but presence for numeracy suggests that while cognitive abilities matter everywhere, the translation of numeracy into achievement is context-dependent. Rural schools may lack materials and teacher support to help pupils apply numeracy skills effectively.

The reason is that Bronfenbrenner's Ecological Systems Theory explains development as a result of the interaction between the individual and the environment. In your findings, pupils' cognitive abilities are individual characteristics, while school location represents part of their environmental context.
For example, two pupils may have similar numeracy abilities, but if one attends a school with better Mathematics materials, more teacher support, and more opportunities for practice, that pupil may be better able to convert the numeracy ability into actual Mathematics achievement. This explains why school location significantly moderated the relationship between numeracy and Mathematics achievement.

However, processing speed, inductive reasoning, and attention did not show significant moderation by school location. This suggests that these abilities may influence Mathematics achievement relatively independently of whether the pupil attends a rural or urban school. Therefore, the findings fit Bronfenbrenner's theory because they show that some individual characteristics are more strongly affected by environmental conditions than others.

Conclusion

This study concludes that processing speed, inductive reasoning, attention, and numeracy ability significantly predict Mathematics achievement. School location significantly moderates the relationship between numeracy ability and achievement. Therefore, improving cognitive skills and addressing location-based disparities are necessary to enhance Mathematics achievement among public primary pupils in Edo North.

Recommendations

Based on the findings, the following recommendations are made:

1. Government should provide equal instructional materials and facilities to both urban and rural schools to reduce location disparities.
2. Teachers should be trained on strategies to develop pupils' processing speed, reasoning, attention, and numeracy skills.
3. Targeted numeracy intervention programs should be implemented in rural schools to strengthen the effect of numeracy ability on achievement.
4. Regular assessment of cognitive abilities should be conducted to identify pupils needing support.

References

Adebayo, A. (2020). Processing speed and Mathematics achievement of primary school pupils in Oyo State. *Nigerian Journal of Educational Psychology*, *15*(2), 45–58.

Adegoke, B. (2022). School location as moderator of teaching methods and Mathematics achievement. *Journal of Curriculum Studies*, *12*(1), 23–37.

Adeogun, A. (2001). The influence of school location on academic performance. *West African Journal of Education*, *8*(2), 112–120.

Bronfenbrenner, U. (1979). *The ecology of human development*. Harvard University Press.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative and mixed methods approaches* (4th ed.). Sage.

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., & Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*, *43*(6), 1428–1446.

Edo SUBEB. (2023). *Annual school census report*. Benin City: Edo State Universal Basic Education Board.

Federal Ministry of Education. (2022). *Early Grade Mathematics Assessment (EGMA) 2022*. Abuja, Nigeria: Federal Republic of Nigeria. (2013). National policy on education (6th ed.). NERDC Press.

Fuchs, L. S., Fuchs, D., Compton, D. L., Powell, S. R., Seethaler, P. M., Capizzi, A. M., & Fletcher, J. M. (2006). The cognitive correlates of third-grade skill in arithmetic. *Journal of Educational Psychology*, *98*(1), 29–43.

Gathercole, S. E., Tiffany, C., Briscoe, J., & Thorn, A. (2008). Working memory and classroom learning. *Applied Cognitive Psychology*, *22*(3), 365–378.

Geary, D. C. (2011). Cognitive predictors of achievement growth in Mathematics. *Developmental Science*, *14*(5), 1159–1167.

Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis* (2nd ed.). Guilford Press.

Ibok, E. E., Undie, U. J., Masor, G. U., Unoh, E. O., Etura, C. S., & Udobong, D. M. (2023). Over schooling and pupils' academic achievement in Mathematics in Calabar Municipality Local Government Area of Cross River State, Nigeria. *Global Journal of Educational Research*, *22*(3), 235–242. https://doi.org/10.4314/gjedr.v22i3.1

Jordan, N. C., Kaplan, D., Locuniak, M. N., & Ramineni, C. (2009). Early numeracy and Mathematics achievement. *Journal of Educational Psychology*, *101*(4), 891–901.

Kail, R., & Ferrer, E. (2007). Processing speed in childhood and adolescence. *Child Development*, *78*(3), 1030–1044.

NECO. (2023). *Chief examiner's report*. Minna: National Examinations Council.

Ogundele, T. (2018). Attention and academic performance of primary school pupils in Osun State. *African Journal of Education*, *10*(1), 67–74.

Okeke, C. (2021). Numeracy ability and Mathematics achievement in Anambra State. *International Journal of Mathematics Education*, *9*(3), 101–115.

Owoeye, J. S., & Yara, P. O. (2011). School location and academic achievement of secondary school students in Oyo State. *Asian Social Science*, *7*(5), 170–175.

Primi, R., Ferrão, M. E., & Almeida, L. S. (2010). Fluid intelligence as a predictor of learning. *Learning and Individual Differences*, *20*(5), 453–458.

Tosto, M. G., Hanscombe, K. B., Standage, M., Withers, S., Haworth, C. M., & Davis, O. S. (2013). Reasoning explains links between executive function and Mathematics. *Journal of Experimental Child Psychology*, *116*(4), 303–314.

Vygotsky, L. S. (1978). *Mind in society*. Harvard University Press.

WAEC. (2024). *Chief examiner's report*. Lagos: West African Examinations Council.

Yusuf, M. (2019). Inductive reasoning and Mathematics achievement of junior secondary students in Lagos. *Journal of Educational Research*, *14*(2), 88–95.