INTERNATIONAL JOURNAL OF LATEST TECHNOLOGY IN ENGINEERING, MANAGEMENT & APPLIED SCIENCE (IJLTEMAS)

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IX, September 2025

Impact of Mental Mathematics Proficiency on Job Performance Among Seconadry Schools Teachers in Emohua and Port Hacourt City

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DOI: https://doi.org/10.51583/IJLTEMAS.2025.1409000005

Received: 13 Sep 2025; Accepted: 22 Sep 2025; Published: 26 September

Abstract: This study investigated the impact of mental Mathematics proficiency on job performance among secondary school teachers. The aim was to determine the influence of mental Mathematics proficiency on teachers' cognitive skills, productivity, and instructional accuracy. The study employed a descriptive research design and it consisted of a population of 1,822 teachers from public senior secondary schools in Emohua and Port Harcourt City, Rivers State. A total of 298 teachers were selected through simple random sampling techniques. Data were collected over three weeks using a self-constructed instrument titled the Mental Mathematics Job Performance Questionnaire (MMJQ), which was structured on a modified 4-point Likert scale. The instrument was validated by experts in Measurement and Evaluation and had a high internal consistency reliability coefficient of 0.88. Data were analyzed using correlation and linear regression, following confirmation of normality via the Kolmogorov-Smirnov test. The results showed a significant positive relationship between teachers' cognitive skills and mental Mathematics proficiency. Mental Mathematics proficiency was found to enhance teachers' productivity significantly and improve instructional accuracy moderately. The study revealed that cognitive and mental computation skills are essential for effective job performance among teachers. It was therefore recommended that mental Mathematics modules should be designed and integrated into teacher education programmes, as well as organizing regular training to enhance teachers' cognitive and mental Mathematical skills.

Keywords: Mental Mathematics Proficiency, Cognitive Skills, Job Performance, and Secondary School Teachers.

I. Introduction

Mathematics is a foundational subject in the school curriculum, supporting disciplines such as engineering, technology, and economics. As George and Charles-Ogan (2023) observed, its relevance spans domestic, professional, and industrial domains, from budgeting and medicine to agriculture and the arts. While teaching strategies in Mathematics have evolved with digital tools and dynamic pedagogy to improve learner outcomes, one area that remains belittled in teacher development is mental Mathematics proficiency. Mental Mathematics, defined as the ability to perform calculations mentally without external aids (Nolividad, 2024), is crucial for both teachers and students. It supports quick decision-making, efficient lesson delivery, and responsive instruction, especially in contexts where access to technological tools is limited. Felix (2023) emphasizes that mental Mathematics includes estimation, memory, and logical reasoning, which are skills that activate both hemispheres of the brain and promote cognitive agility. Teachers proficient in these skills can better model critical thinking, assess students' work more efficiently, and manage classroom activities with greater precision. Nolividad (2024) also notes that mental computation sharpens attention, enhances number sense, and improves instructional clarity.

Job performance among secondary school teachers involves both instructional and non-instructional duties. These include effective classroom teaching, student assessment, lesson planning, attendance, and interaction with stakeholders (Wachira et al., 2017). Teachers' cognitive skills, particularly attention, memory, problem-solving, and critical thinking, play a crucial role in enhancing their mental Mathematics proficiency, which in turn supports job performance. Attentive teachers remain focused during lessons and can carry out mental calculations quickly. A strong memory helps retain mathematical procedures, while problem-solving and critical thinking enable them to respond thoughtfully to student errors and adapt strategies in real time. As DeHaan (2025) notes, teachers with strong mental alertness and quick-thinking skills are more effective in managing instruction and meeting students' needs. Mental Mathematics not only reinforces students' numerical understanding but also boosts teachers' agility and confidence (Matin-ao & Timario, 2021). Teachers skilled in mental computation can diagnose errors instantly, adjust instruction effectively, and maintain classroom control. These cognitive skills also support multitasking and contribute to job performance. Rosyl and Ranti (2021) further highlight the role of perception in teaching accuracy, while Singh et al. (2020) raise concerns about possible reasoning gaps among teachers, suggesting a need to assess their own mental computation skills.

Mental Mathematics proficiency directly influences teachers' productivity and accuracy in classroom delivery. Teachers skilled in mental computation are more efficient in delivering lessons, managing classwork, and performing assessments without over-reliance on calculators. This allows for quicker grading, real-time feedback, and fewer instructional errors. Agbo et al. (2024) found that mental math games enhance students' fluency and engagement, benefits that translate into more productive and interactive teaching practices. Liu et al. (2024) observed that effective mental arithmetic instruction encourages innovation, allowing teachers to manage group tasks and verify student work with greater accuracy. Go et al. (2023) also revealed that mathematical proficiency

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IX, September 2025

is assessed through conceptual understanding, procedural fluency, strategic competence, and adaptive reasoning, domains supported by mental math practice. Wu et al. (2025) emphasized that working memory underpins mental computation, which strengthens teachers' cognitive flexibility and instructional precision.

Despite the growing recognition of mental Mathematics in student learning, limited research exists on how it enhances teacher effectiveness, particularly in resource-constrained settings like Rivers State. In such environments, where access to digital tools is inconsistent, mental Mathematics offers a low-cost yet powerful strategy to improve instructional accuracy and productivity. This study, therefore, focuses on the perception of secondary school teachers regarding cognitive and mental Mathematics proficiency skills for enhancing job performance in Rivers State

Statement of the Problem

Mental Mathematics is a vital skill that supports teachers' ability to think quickly, solve problems efficiently, and guide students with confidence during classroom interactions. It enhances instructional accuracy and enables teachers to respond to unexpected challenges in real time. However, in many secondary schools, the importance of mental Mathematics in improving teachers' job performance has not been given adequate attention. In Rivers State, a large number of teachers have limited training and practice in mental computation. This situation often reduces their effectiveness in lesson delivery, problem-solving, and classroom assessment. While technology offers opportunities for improving teaching and learning, the frequent dependence on calculators and digital devices has weakened the habit of mental calculation among teachers. The problem is further compounded by the lack of structured professional development and institutional support that would encourage regular practice of mental Mathematics. As a result, many teachers struggle to achieve the level of efficiency and responsiveness required in the classroom. It is against this background that this study seeks to examine the impact of mental Mathematics proficiency on the job performance of secondary school teachers.

Aim and Objectives of the Study

This study aims to investigate the impact of mental Mathematics proficiency on the job performance of secondary school teachers in Emohua and Port Harcourt City. Specifically, the study seeks to

1. Determine the influence of mental Mathematics proficiency on secondary school teachers' cognitive skills in Emohua and Port Harcourt City**.**
2. Investigate the impact of mental Mathematics proficiency on the work productivity of secondary school teachers in Emohua and Port Harcourt City
3. Discover the impact of mental Mathematics proficiency on the secondary school teachers' accuracy in classroom delivery in Emohua and Port Harcourt City.

Research Questions

This study formulated and addressed the following research questions:

1. How does mental Mathematics proficiency influence cognitive skills of secondary school teachers in Emohua and Port Harcourt City?
2. What is the impact of mental Mathematics proficiency on the work productivity of secondary school teachers in Emohua and Port Harcourt City?
3. How do mental Mathematics proficiency skills enhance accuracy in classroom delivery among secondary school teachers in Emohua and Port Harcourt City?

Hypothesis

The following null hypotheses were postulated and statistically tested at the 0.05 level of significance.

1. Mental Mathematics proficiency has no significant influence on the cognitive skills of secondary teachers in Emohua and Port Harcourt City.
2. Mental Mathematics proficiency has no significant impact on the work productivity of secondary school teachers in Emohua and Port Harcourt City.
3. Mental Mathematics proficiency does not significantly enhance accuracy in classroom delivery among secondary school teachers in Emohua and Port Harcourt City.

II. Methodology

The study employed a descriptive research design, considered suitable for gathering data from teachers and analyzing their responses to assess the impact of mental mathematics proficiency on job performance. The total population consisted of 1,822 teachers in public senior secondary schools across Emohua and Port Harcourt City in Rivers State. Using the Taro Yamane formula at a 5% margin of error, a sample size of 328 was determined. Accordingly, 328 copies of the questionnaire were distributed through

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both online platforms and face-to-face administration to capture a broad range of responses. Out of the total distributed, 298 questionnaires were successfully returned, properly completed, and deemed usable for analysis. Thus, the actual sample size for this study was 298 respondents. Of these, 30 teachers completed the questionnaire online through Google Forms, while 268 teachers responded through face-to-face administration.

To select the participating schools, the simple random sampling technique was applied. Each school was assigned a number, and the lottery method was used to pick those to be included in the study. This approach ensured that every school had an equal chance of selection, reduced the possibility of bias, and provided a fair representation of the entire population. Questionnaires were administered to teachers in the selected schools, and data for this study were collected across three weeks using a self-designed instrument titled Mental Mathematics Job Performance Questionnaire (MMJQ). The instrument was structured on a modified 4-point Likert scale with response options of Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). It consisted of sections that measured mental Mathematics proficiency, cognitive skills, productivity, and accuracy in classroom delivery. To establish its validity, the questionnaire was reviewed by experts in Measurement and Evaluation who confirmed its relevance and appropriateness. A reliability test conducted using Cronbach's alpha yielded a coefficient of 0.88, which was considered satisfactory and indicative of high internal consistency.

Before carrying out inferential analysis, the normality of the variables (mental Mathematics, cognitive skills, productivity, and accuracy) was tested using the Kolmogorov-Smirnov test. Results indicated no significant deviation from normality ($p > .05$), supporting the assumption that the data were normally distributed. Therefore, parametric analyses were deemed appropriate. Correlation coefficients were used to answer the research questions, while linear regression analysis was employed to test the null hypotheses at the 0.05 level of significance. The study adhered to standard ethical procedures. Participants were first informed of the purpose of the research, after which their consent was obtained. Participation was entirely voluntary, with confidentiality guaranteed, and the information provided was used strictly for academic purposes.

III. Results

Research Question 1: How does mental Mathematics proficiency influence cognitive skills among secondary school teachers in Emohua and Port Harcourt City?

Hypothesis 1: Mental Mathematics proficiency has no significant influence on the cognitive skills of secondary teachers in Emohua and Port Harcourt City.

Table 1: Regression analysis of how Secondary school teachers' mental Mathematics proficiency influences cognitive skills

Variables	n	R	R^2	F	β (Beta)	t	p	Decision
Mental Mathematics Proficiency								**Ho_1 reject**
	298	0.789	0.622	488.073	0.789	4.446	0.001	
Teachers' Cognitive skill								

Table 1 presents the results of a regression analysis examining how secondary school teachers' cognitive skills influence mental Mathematics proficiency in Rivers State. The analysis revealed a strong, positive, and statistically significant relationship between teachers' cognitive skills and mental Mathematics proficiency, $R = 0.789$, $R^2 = 0.622$, $F(1, 296) = 488.073$, $p < .001$. This indicates that approximately 62.2% of the variance in mental Mathematics proficiency is explained by teachers' cognitive skills. The standardized beta coefficient ($\beta = 0.789$) further suggests a strong predictive effect. Given that the p-value is less than .05, the null hypothesis was rejected.

Research Question 2: What is the impact of mental Mathematics proficiency on the work productivity of secondary school teachers in Emohua and Port Harcourt City?

Hypothesis 2: Mental Mathematics proficiency has no significant impact on the work productivity of secondary school teachers in Emohua and Port Harcourt City.

Table 2: Regression analysis of how mental Mathematics proficiency improves secondary school teachers' work productivity

Variables	n	R	R^2	F	β (Beta)	t	P	Decision
Mental Mathematics Proficiency								**Ho_1 reject**
	298	0.769	0.592	429.345	0.769	3.885	0.001	
Teachers' productivity								

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue IX, September 2025

Table 2 presents the results of a regression analysis examining how mental Mathematics proficiency influences secondary school teachers' work productivity. The analysis revealed a strong, positive, and statistically significant relationship between mental Mathematics proficiency and teachers' productivity, $R = 0.769$, $R^2 = 0.592$, $F(1, 296) = 429.345$, $p < .001$. This indicates that approximately 59.2% of the variance in teachers' productivity can be explained by their mental Mathematics proficiency. The standardized beta coefficient ($\beta = 0.769$) also suggests a strong predictive effect. Given that the p-value is less than .05, the null hypothesis was rejected.

Research Question 3: How does mental Mathematics proficiency enhance accuracy in classroom delivery among secondary school teachers in Emohua and Port Harcourt City?

Hypothesis 3: Mental Mathematics proficiency does not significantly enhance accuracy in classroom delivery among secondary school teachers in Emohua and Port Harcourt City.

Table 3: Regression analysis of how mental Mathematics proficiency enhances secondary school teachers' accuracy in classroom delivery

Variables	n	R	R^2	F	β (Beta)	t	P	Decision
Mental Mathematics Proficiency								**Ho_1 reject**
	298	0.382	0.146	50.583	0.382	7.791	0.001	
Teachers' accuracy								

Table 3 presents the results of a regression analysis examining how mental Mathematics proficiency enhances secondary school teachers' accuracy in classroom delivery. The analysis revealed a weak to moderate, positive, and statistically significant relationship between mental Mathematics proficiency and teachers' accuracy, $R = 0.382$, $R^2 = 0.146$ $F (1, 296) = 50.583$, $p < .001$. This indicates that approximately 14.6% of the variance in teachers' accuracy is accounted for by their mental Mathematics proficiency. The standardized beta coefficient ($\beta = 0.382$) indicates a moderate predictive effect. Given that the p-value is less than .05, the null hypothesis was rejected.

IV. Discussion

Table 1 revealed a strong, positive, and significant relationship between secondary school teachers' cognitive skills and their mental Mathematics proficiency in Rivers State. The regression analysis indicates that cognitive skills significantly predicted teachers' ability to perform mental computations. This suggests that as teachers' cognitive capabilities improve, so does their proficiency in handling mathematical tasks mentally. The null hypothesis was therefore rejected, affirming the presence of a meaningful connection between the two variables.

The observed predictive relationship can be attributed to several factors. Teachers with higher cognitive skills tend to exhibit better analytical thinking, memory retention, and decision-making under pressure, all of which are crucial for effective mental computation. Additionally, such cognitive abilities contribute to teachers' confidence and responsiveness, enabling them to handle mathematical challenges more effectively during instruction. These competencies not only improve teaching quality but also support better student engagement and learning outcomes.

This finding is in consonance with the study of Matin-ao and Timario (2021), who observed that mental Mathematics not only strengthens students' numerical understanding but also enhances teachers' agility and confidence in teaching. Teachers who possess well-developed cognitive skills are better equipped to diagnose students' errors instantly, make appropriate instructional adjustments on the spot, and maintain effective classroom control. These skills foster multitasking abilities, which are essential for navigating the dynamic demands of the classroom environment.

Further reinforcing these results, Rosyl and Ranti (2021) emphasized the role of perception in achieving accuracy in teaching, suggesting that teachers with strong mental faculties are more likely to deliver precise and clear explanations. However, Singh et al. (2020) warned that despite having foundational skills, some teachers may still face reasoning gaps in their mental computation processes, highlighting the importance of ongoing self-assessment and skill development in this area.

Table 2 revealed a strong, positive, and significant relationship between secondary school teachers' mental Mathematics proficiency and their productivity at work in Rivers State. The analysis demonstrated that teachers who are more proficient in mental computation tend to perform better in their professional roles. This implies that mental Mathematics skills play a crucial role in enhancing teachers' efficiency, accuracy, and overall effectiveness in classroom management and instructional delivery. As a result, the null hypothesis was rejected, indicating that mental Mathematics proficiency significantly contributes to teachers' productivity. The strong predictive effect observed in this study may be attributed to the multifaceted benefits of mental computation. Teachers who are skilled in this area are likely to experience greater confidence, reduced cognitive load during lessons, and enhanced students' learning processes. Additionally, their ability to multitask and adapt in real time supports better classroom control and a more responsive teaching approach. These attributes ultimately foster a productive learning environment and contribute to improved educational outcomes.

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These results align with Agbo et al. (2024), who emphasized that mental math activities boost students' fluency and participation, outcomes that, in turn, encourage teachers to adopt more dynamic and engaging instructional methods. This dynamic exchange between teacher competence and student engagement results in a more productive classroom environment. Furthermore, Liu et al. (2024) found that teachers proficient in mental arithmetic are better equipped to innovate during instruction. They can manage group tasks effectively, verify student work on the spot, and adjust lesson flow based on real-time understanding of students' needs. Mental Mathematics proficiency has been shown to directly influence teaching productivity, especially in environments where quick thinking and accurate decision-making are essential. Teachers who can compute mentally are more capable of delivering lessons with minimal reliance on calculators, managing time effectively, and providing immediate responses to students' queries. This leads to faster grading, timely feedback, and reduced instructional errors, thereby enhancing the quality of teaching.

The results presented in Table 3 indicate a weak to moderate, but statistically significant, positive relationship between secondary school teachers' mental Mathematics proficiency and their accuracy in classroom delivery. Although the relationship is not as strong as in previous analyses, the findings suggest that mental Mathematics skills do contribute meaningfully to teachers' accuracy in classroom delivery. The analysis indicated that mental Mathematics proficiency accounted for a modest proportion of the variance in accuracy. However, given the statistical significance of the results, the null hypothesis was rejected, confirming that mental computation skills exert a measurable effect on teachers' instructional precision.

The moderate predictive strength observed may be attributed to the fact that while mental computation contributes to accuracy, other factors such as subject mastery, teaching experience, and instructional strategies also play significant roles. However, the presence of a significant relationship revealed the value of mental Mathematics as a foundational skill for improving teaching precision. These findings are consistent with earlier empirical studies that highlight the role of mental Mathematics in enhancing instructional accuracy. Go et al. (2023) emphasized that mathematical proficiency involves several domains: conceptual understanding, procedural fluency, strategic competence, and adaptive reasoning, all of which are reinforced through regular mental math practice. Teachers who engage in mental computation are more likely to internalize these domains, enabling them to explain concepts clearly, perform calculations accurately, and solve problems efficiently in real time.

Moreover, Wu et al. (2025) pointed out the critical role of working memory in mental Mathematics. This cognitive resource allows teachers to manage complex information, hold intermediate steps of a solution in mind, and remain attentive to details while delivering instruction. As a result, teachers with stronger mental Mathematics proficiency are better equipped to maintain instructional accuracy, reduce computational errors, and provide immediate corrective feedback when necessary.

Limitation of the Study

The study was limited to secondary school teachers drawn only from Emohua and Port Harcourt City Local Government Areas in Rivers State, which may affect the generalizability of the findings to other regions with different educational settings. Additionally, the use of both online and face-to-face modes of administering the questionnaire introduced possible inconsistencies, as participants may have interpreted questions differently or been influenced by external conditions. Some teachers did not respond to the questionnaire in either mode, leading to potential non-response bias and affecting the overall reliability and completeness of the data collected.

V. Conclusion

This study examined the extent to which mental Mathematics proficiency and cognitive skills influence secondary school teachers' productivity and accuracy in Rivers State. The findings showed that teachers' cognitive skills significantly enhance their mental Mathematics proficiency. This implies that the stronger a teacher's cognitive capacity, such as memory, attention, and reasoning, the more proficient they are likely to be in executing mental computations which are essential for real-time problem-solving and instructional fluency.

Additionally, the study revealed a strong and statistically significant relationship between teachers' mental Mathematics proficiency and their productivity at work. Teachers with higher proficiency in mental computation were observed to be more effective in managing instructional tasks, providing timely feedback, grading efficiently, and maintaining better classroom control. This suggests that mental computation is not just a mathematical skill but a tool that contributes meaningfully to teaching efficiency and professional performance.

Furthermore, the relationship between mental Mathematics proficiency and teachers' accuracy was found to be moderate but statistically significant. Although mental computation did not account for a large proportion of the variance in instructional accuracy, it still played a vital role in reducing errors, enhancing classroom response time, and improving the precision of instruction. Other contributing factors, such as experience, subject mastery, and teaching methods, may also influence accuracy.

Recommendations

1. Colleges of Education and teacher preparation institutions should incorporate structured mental Mathematics modules into their curricula.
2. Education authorities and school administrators should organize regular workshops and training sessions aimed at enhancing teachers' cognitive skills and mental computational abilities.

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3. Teachers should be encouraged to incorporate mental Mathematics activities into their daily life and classroom routines. This will not only improve their productivity and accuracy but also foster student engagement and number sense.
4. Regular diagnostic assessments should be administered to identify gaps in teachers' cognitive and mental math skills. This would allow for personalized professional support and targeted remediation.
5. Since cognitive skills influence mental proficiency, broader cognitive training, including problem-solving, memory tasks, and logical reasoning, should be incorporated into ongoing teacher professional development programmes.

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