



Correlation between Teachers' Pedagogical Competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State, Nigeria

OBELE, Realman Evans

realmanobele@yahoo.com

08032286955

Department of Mathematics, Isaac Jasper Boro College of Education, Sagbama, Bayelsa State, Nigeria

Abstract

This study investigated the relationship between teachers' pedagogical competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State, Nigeria. A correlational survey research design was adopted. The population comprised 6,735 Senior Secondary II students in public secondary schools in Bayelsa State, from which a sample of 250 students was selected using the simple random sampling technique. Data were collected using a researcher-developed instrument titled Teachers' Pedagogical Competence and Mathematics Problem-Solving Skills Questionnaire (TPCMPSQ). The instrument was validated by experts in Mathematics Education and Measurement and Evaluation, while its reliability was established using Cronbach's Alpha, yielding an overall reliability coefficient of 0.84. Pearson Product Moment Correlation (PPMC) was used to answer the research questions and test hypotheses at the 0.05 level of significance. The findings revealed significant relationships between teachers' instructional strategies, classroom management competence, assessment competence, communication competence, and students' problem-solving skills in Mathematics. The study concluded that teachers' pedagogical competence is a significant predictor of students' problem-solving skills in Mathematics. It was therefore recommended that educational stakeholders should strengthen continuous professional development programmes for Mathematics teachers to enhance their pedagogical competence and improve students' problem-solving abilities.

Keywords: Pedagogical competence, instructional strategies, mathematics problem-solving skills, schools

Introduction

Mathematics is universally recognized as a fundamental discipline for scientific inquiry, technological innovation, economic growth, and sustainable national development. It equips learners with logical reasoning, quantitative thinking, analytical skills, and the capacity to solve real-life problems. Consequently, Mathematics occupies a central position in Nigeria's educational system and is compulsory at the basic and secondary school levels. The objectives of Mathematics education extend beyond computational proficiency to include the development of critical thinking, creativity, and problem-solving competencies that enable learners to function effectively in an increasingly knowledge-driven society (Federal Republic of Nigeria [FRN], 2014). Despite its importance, students' achievement in Mathematics in Nigerian secondary schools has remained a major concern among educators, parents, policymakers, and examination bodies. The persistent poor performance of students in public examinations such as the West African Senior School Certificate Examination (WASSCE) and the National Examinations Council (NECO) has been attributed to several factors, including inadequate instructional practices, ineffective teaching methods, poor classroom management, limited use of learner-centred instructional approaches, and insufficient pedagogical competence among Mathematics teachers (Oribhabor, 2020; Paul et al., 2026).

One of the major goals of Mathematics education is the development of students' problem-solving skills. Problem-solving is regarded as the ability to analyse unfamiliar situations, identify relevant mathematical concepts, formulate solution strategies, implement appropriate procedures, evaluate



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solutions, and communicate mathematical reasoning effectively. It represents a higher-order cognitive process that enables learners to apply mathematical knowledge to practical situations rather than merely recalling formulas or performing routine calculations. Contemporary Mathematics curricula therefore emphasize problem-solving as a core competency necessary for academic success and lifelong learning (Chapman, 2015; Lit, Kool, & Drijvers, 2026). The successful development of students' mathematical problem-solving skills depends largely on the competence of the teacher. Teachers serve as facilitators who design meaningful learning experiences, guide classroom interactions, diagnose students' misconceptions, provide constructive feedback, and create learning environments that encourage critical thinking and independent reasoning. Consequently, improving students' mathematical problem-solving abilities requires teachers who possess not only adequate subject matter knowledge but also sound pedagogical competence (Shulman, 1986, 1987; Chapman, 2015).

Pedagogical competence refers to the knowledge, skills, attitudes, and professional practices that enable teachers to facilitate effective learning. It encompasses lesson planning, instructional delivery, classroom management, learner engagement, assessment practices, communication skills, use of instructional resources, and the ability to adapt teaching strategies to learners' diverse needs. Teachers with high pedagogical competence employ learner-centred instructional strategies that actively engage students in mathematical inquiry, collaboration, exploration, and reflective thinking rather than relying solely on teacher-centred exposition (Shulman, 1987; Sonmark et al., 2017). Shulman (1986, 1987) introduced the concept of pedagogical content knowledge (PCK), emphasizing that effective teaching requires more than mastery of subject matter. According to Shulman, teachers must possess specialized knowledge that enables them to transform complex concepts into forms that are understandable to learners through appropriate explanations, analogies, demonstrations, examples, and representations. In Mathematics education, pedagogical competence enables teachers to anticipate students' misconceptions, select suitable instructional strategies, scaffold learning, and create opportunities for students to develop conceptual understanding and problem-solving proficiency.

In Bayelsa State, successive governments and educational stakeholders have implemented various initiatives aimed at improving the quality of Mathematics education through teacher recruitment, curriculum implementation, capacity-building programmes, and professional development workshops. Despite these efforts, students' performance in Mathematics has remained relatively unsatisfactory in many public senior secondary schools. Researchers have attributed this trend to factors such as inadequate teacher preparation, insufficient pedagogical training, limited integration of innovative teaching strategies, inadequate instructional resources, and weak classroom assessment practices (Oribhabor, 2020). Although numerous studies have investigated teacher effectiveness and students' academic achievement, relatively few have specifically examined the relationship between teachers' pedagogical competence and students' mathematical problem-solving skills among senior secondary schools in Bayelsa State. Most previous studies have focused primarily on students' achievement scores without adequately exploring higher-order cognitive outcomes such as mathematical reasoning, critical thinking, and problem-solving competence. This gap limits the availability of context-specific evidence needed by policymakers, school administrators, and teacher education institutions to strengthen Mathematics instruction within the state. It is against this background that this study investigates the relationship between teachers' pedagogical competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State, Nigeria.



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Statement of the Problem

Mathematics plays a pivotal role in fostering scientific literacy, technological innovation, and economic development. Consequently, the acquisition of mathematical problem-solving skills has become one of the primary goals of Mathematics education globally and in Nigeria. Problem-solving skills enable students to apply mathematical concepts to unfamiliar situations, think critically, make logical decisions, and solve real-life problems. Despite the emphasis placed on problem-solving in the Nigerian Senior Secondary School Mathematics Curriculum, many students continue to demonstrate poor proficiency in solving non-routine mathematical problems, as reflected in their performance in internal and external examinations.

Reports from the West African Examinations Council (WAEC) over the years have consistently shown that a substantial proportion of candidates fail to obtain credit passes in Mathematics, with examiners repeatedly identifying weaknesses in students' reasoning, analytical thinking, and application of mathematical concepts to solve problems. These weaknesses have raised concerns among educators, curriculum planners, and policymakers regarding the effectiveness of Mathematics instruction in Nigerian secondary schools. Although several factors have been associated with students' poor performance in Mathematics, increasing attention has been directed toward teacher-related factors, particularly pedagogical competence, because teachers remain the principal facilitators of learning within the classroom.

In Bayelsa State, government and educational stakeholders have invested in teacher recruitment, curriculum implementation, and professional development programmes aimed at improving the quality of Mathematics education. Nevertheless, students' performance in Mathematics has remained unsatisfactory in many senior secondary schools. Available studies in the state have largely focused on students' academic achievement, instructional materials, ICT integration, or teachers' subject matter knowledge, while relatively little empirical attention has been given to how teachers' pedagogical competence influences students' mathematical problem-solving skills. This creates a significant knowledge gap, especially considering that the ability to solve mathematical problems is a key indicator of meaningful learning and an essential competency for the twenty-first century.

Therefore, the problem of this study is to investigate the relationship between teachers' pedagogical competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State, Nigeria.

Aim and Objectives of the Study

The aim of this study is to investigate the relationship between teachers' pedagogical competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State, Nigeria. Specifically, the study seeks to:

1. Determine the relationship between teachers' instructional strategies and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.
2. Examine the relationship between teachers' classroom management competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.
3. Find out the relationship between teachers' assessment competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.
4. Investigate the relationship between teachers' communication competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.

Research Questions

The following research questions guided the study:



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1. What is the relationship between teachers' instructional strategies and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State?
2. What is the relationship between teachers' classroom management competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State?
3. What is the relationship between teachers' assessment competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State?
4. What is the relationship between teachers' communication competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State?

Null Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

1. There is no significant relationship between teachers' instructional strategies and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.
2. There is no significant relationship between teachers' classroom management competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.
3. There is no significant relationship between teachers' assessment competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.
4. There is no significant relationship between teachers' communication competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.

Review of Related Literature

Students' Problem-Solving Skills in Mathematics

Problem-solving in Mathematics refers to the cognitive process through which learners identify, analyse, and resolve mathematical tasks for which no immediate solution method is apparent. It involves understanding the problem, selecting appropriate mathematical concepts and procedures, implementing suitable strategies, evaluating the correctness of solutions, and communicating the reasoning behind the solution (Polya, 1945 in OECD, 2023). According to Polya (1945), effective mathematical problem-solving follows four systematic stages: understanding the problem, devising a plan, carrying out the plan, and looking back to evaluate the solution. These stages continue to provide the foundation for teaching mathematical problem-solving in classrooms worldwide.

The National Council of Teachers of Mathematics (NCTM, 2018) defines mathematical problem-solving as the process of applying previously acquired mathematical knowledge, skills, and reasoning to solve unfamiliar and meaningful problems. The NCTM further identifies problem-solving as one of the five fundamental process standards that should guide Mathematics teaching and learning, alongside reasoning and proof, communication, connections, and representation. This perspective emphasizes that students should not merely memorize mathematical procedures but should develop the capacity to think critically, reason logically, and apply mathematics creatively in different contexts. Similarly, Schoenfeld (2016) describes mathematical problem-solving as a complex intellectual activity that integrates conceptual understanding, strategic competence, procedural fluency, adaptive reasoning, and productive disposition. According to Schoenfeld, successful problem solvers possess the ability to monitor their thinking, select appropriate strategies, evaluate alternative solutions, and modify their approaches whenever necessary. These competencies enable learners to become independent thinkers capable of solving increasingly complex mathematical problems. The development of mathematical problem-solving skills depends on several instructional and learner-related factors. Among these, teachers' pedagogical competence plays a central role



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because teachers create the learning experiences through which students develop reasoning and analytical abilities. Effective Mathematics teachers employ learner-centred instructional strategies such as inquiry-based learning, problem-based learning, cooperative learning, mathematical investigations, and classroom discussions that actively engage students in solving authentic mathematical problems (Chapman, 2015). These instructional approaches encourage students to explore multiple solution methods, justify their reasoning, and construct mathematical knowledge through active participation.

Teachers' Pedagogical Competence

Teachers' pedagogical competence is widely recognized as one of the most important determinants of effective teaching and students' academic success. It refers to the knowledge, skills, attitudes, and professional practices that enable teachers to facilitate meaningful learning by employing appropriate instructional methods, managing classroom activities effectively, assessing learners' progress, and creating conducive learning environments. Pedagogical competence goes beyond mastery of subject content; it encompasses the ability to transform content knowledge into meaningful learning experiences that accommodate learners' diverse abilities, interests, and needs (Shulman, 1987). The Organisation for Economic Co-operation and Development (OECD, 2020) defines teachers' pedagogical competence as the ability to design, implement, and evaluate instructional activities that promote students' cognitive, affective, and psychomotor development. This competence includes planning effective lessons, employing learner-centred instructional strategies, managing classroom interactions, utilizing assessment information to improve instruction, integrating technology into teaching, and engaging students actively in the learning process. Similarly, the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2019) views pedagogical competence as a combination of professional knowledge, instructional skills, ethical values, and reflective practices that enable teachers to facilitate inclusive, equitable, and quality education. Teachers who possess these competencies are better equipped to foster students' critical thinking, creativity, collaboration, and problem-solving skills. In Mathematics education, pedagogical competence assumes even greater significance because Mathematics is characterized by abstract concepts, symbolic representations, logical reasoning, and problem-solving activities. Effective Mathematics teachers must therefore possess the pedagogical skills required to simplify abstract concepts, promote conceptual understanding, encourage mathematical reasoning, and develop learners' confidence in solving mathematical problems. Chapman (2015) argued that teachers' pedagogical competence determines their ability to facilitate mathematical problem-solving through questioning techniques, guided discovery, classroom discourse, and scaffolding strategies that enable students to construct mathematical knowledge independently.

Contemporary educational reforms have increasingly emphasized learner-centred pedagogy as a hallmark of pedagogical competence. Learner-centred teaching shifts the focus from teacher-directed instruction to active student participation in knowledge construction. Professional development plays a vital role in strengthening teachers' pedagogical competence. Continuous professional learning enables teachers to update their instructional knowledge, acquire innovative teaching strategies, improve assessment practices, and respond to curriculum reforms. Darling-Hammond et al. (2017) maintained that sustained professional development significantly enhances teachers' instructional practices and positively influences students' academic achievement. Teachers who participate regularly in workshops, seminars, mentoring programmes, and professional learning communities are more likely to adopt evidence-based instructional practices that improve students' learning outcomes. Within the Nigerian educational context, pedagogical competence has become



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increasingly important due to the implementation of competency-based curricula and the growing emphasis on developing twenty-first-century skills. The National Policy on Education (Federal Republic of Nigeria [FRN], 2014) emphasizes that teachers should employ innovative teaching methods that promote creativity, critical thinking, communication, collaboration, and problem-solving. However, studies conducted in Nigeria have reported that many Mathematics teachers continue to rely predominantly on traditional lecture methods, limiting students' opportunities to develop higher-order thinking and problem-solving skills (Oribhabor, 2020; Ukeje et al., 2019).

Theoretical Review

Shulman's Theory of Pedagogical Content Knowledge (PCK)

This study is anchored on Shulman's Theory of Pedagogical Content Knowledge (PCK) developed by Lee S. Shulman (1986, 1987). The theory emphasizes that effective teaching requires more than mastery of subject matter; it involves the integration of content knowledge with appropriate pedagogical skills that enable teachers to present concepts in ways that are understandable to learners. According to Shulman (1986), pedagogical content knowledge is the unique combination of subject matter knowledge and teaching strategies that enables teachers to transform complex concepts into meaningful learning experiences. Teachers with strong pedagogical content knowledge are able to select appropriate instructional methods, use relevant examples and illustrations, anticipate students' misconceptions, and employ suitable assessment techniques to enhance learning. Shulman (1987) further explained that effective teachers possess several categories of knowledge, including content knowledge, general pedagogical knowledge, curriculum knowledge, knowledge of learners, and pedagogical content knowledge. Among these, pedagogical content knowledge is considered the most important because it distinguishes professional teachers from individuals who simply possess subject matter expertise. The theory is relevant to this study because the independent variable, teachers' pedagogical competence, reflects the principles of pedagogical content knowledge. Specifically, instructional strategies, classroom management, assessment competence, and communication competence are essential components of effective pedagogy that influence students' learning. It is therefore expected that Mathematics teachers with higher pedagogical competence will be better able to develop students' problem-solving skills.

Constructivist Learning Theory

The study is also underpinned by the Constructivist Learning Theory, developed by Jean Piaget (1972) and further advanced by Lev Vygotsky (1978). The theory posits that learners actively construct knowledge through interaction with their environment rather than passively receiving information from the teacher. Learning occurs when students engage in meaningful activities, explore ideas, solve problems, and connect new knowledge with their prior experiences. Piaget (1972) emphasized that learners construct knowledge through cognitive processes of assimilation and accommodation. According to him, meaningful learning occurs when students actively participate in learning tasks that challenge their existing understanding and enable them to develop higher levels of thinking. In Mathematics, students develop problem-solving skills by exploring mathematical concepts, analysing situations, and discovering relationships through active engagement. Vygotsky (1978) extended the theory by emphasizing the importance of social interaction in learning. He introduced 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 guidance from a more knowledgeable person, such as a teacher or peer. Vygotsky argued that effective teaching involves providing appropriate support, or scaffolding, to help learners gradually develop independent problem-solving abilities.



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The Constructivist Learning Theory is relevant to this study because it emphasizes learner-centred instruction, active participation, collaboration, and guided discovery, which are essential components of effective pedagogical competence. Mathematics teachers who employ inquiry-based learning, problem-based learning, classroom discussions, and collaborative activities create opportunities for students to develop critical thinking and mathematical problem-solving skills. Therefore, the theory supports the view that teachers' pedagogical competence significantly influences students' ability to solve mathematical problems. It provides a suitable theoretical basis for explaining how effective instructional strategies, classroom management, assessment, and communication can enhance students' problem-solving skills in Mathematics.

Empirical Review

Chapman (2015) investigated Mathematics teachers' knowledge for teaching problem-solving through a qualitative review of studies conducted in different educational settings. The study found that teachers with strong pedagogical content knowledge effectively guided students through problem-solving processes by employing questioning techniques, scaffolding, collaborative learning, and reflective discussions. The study concluded that teachers' pedagogical competence significantly enhances students' conceptual understanding and problem-solving abilities. Chapman recommended continuous professional development programmes to strengthen teachers' pedagogical skills for effective Mathematics instruction.

Depaepe, Verschaffel, and Kelchtermans (2013) conducted a systematic review of research on pedagogical content knowledge in Mathematics education. The review synthesized findings from numerous empirical studies and reported that teachers' pedagogical content knowledge positively influences students' mathematical understanding, reasoning, and achievement. The authors observed that teachers who effectively combine subject matter knowledge with appropriate pedagogical strategies create learning environments that promote conceptual understanding and higher-order thinking. They recommended that teacher education programmes should place greater emphasis on developing pedagogical content knowledge alongside subject matter competence. Oribhabor (2020) investigated the effect of activity-based instructional methods on secondary school students' achievement in Mathematics using a quasi-experimental research design. The study involved senior secondary school students who were taught using activity-based and conventional teaching methods. The findings revealed that students exposed to activity-based instruction performed significantly better than those taught using traditional lecture methods. The study concluded that learner-centred instructional strategies, which are important indicators of pedagogical competence, improve students' conceptual understanding and problem-solving skills in Mathematics. Paul et al. (2026) examined the effect of Polya's problem-solving instructional strategy on students' achievement and retention in Mathematics among senior secondary school students in Akwa Ibom State, Nigeria. Using a quasi-experimental design, the researchers found that students taught through Polya's problem-solving model achieved significantly higher scores and demonstrated better retention than students taught using conventional teaching approaches. The study concluded that effective pedagogical strategies that emphasize guided problem-solving significantly enhance students' mathematical reasoning and academic performance.

Research Methodology

The study adopted a correlational survey research design. The choice of this design was informed by the nature of the study, which sought to determine the relationship between teachers' pedagogical competence and students' problem-solving skills in Mathematics without manipulating the variables. Correlational research design is appropriate for establishing the degree and direction of relationship



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among naturally occurring variables (Bhandari, 2021). The population of the study consists 6,735 senior secondary II (SS II) students in public secondary schools in Bayelsa State, Nigeria. A sample size of 250 Senior Secondary II students was selected from the population using the simple random sampling technique. The instrument for data collection was a self-designed questionnaire titled: "Teachers' Pedagogical Competence and Mathematics Problem-Solving Skills Questionnaire (TPCMPSQ)" using the modified 4-point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). Face and content validity were used in this study. Experts in measurement and evaluation examined the items on the instrument and confirmed that they were adequate and suitable for the study. To determine the reliability of the instruments, a pilot study was conducted among 30 Senior Secondary II students from public secondary schools outside the sampled schools but with similar characteristics. The data obtained were analyzed using the Cronbach's Alpha reliability method, which yielded reliability coefficients of 0.84, indicating that the instrument was reliable for the study. Data used in this study were collected through the administration of the questionnaire to senior secondary school students in the selected public secondary schools in Bayelsa State. Pearson Product Moment Correlation was used to answer the research questions and test the hypotheses at 0.05 level of significance.

Presentation of Results

Research Question One: What is the relationship between teachers' instructional strategies and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State?

Hypothesis One: There is no significant relationship between teachers' instructional strategies and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.

Table 1: Pearson Product Correlation Coefficient Table Showing the Relationship Between Teachers' Instructional Strategies and Students' Problem-Solving Skills in Mathematics among Senior Secondary Schools in Bayelsa State

		Teachers' Instructional Strategies	Problem-Solving Skills
Teachers' Instructional Strategies	Pearson product moment Correlation	1	0.682
	Significant 2-tailed		0.000
	N	250	250
Problem-Solving Skills	Pearson Correlation	0.682	1
	Sig. (2-tailed)	0.000	
	N	250	250

** Correlation is significant at the 0.01 level (2-tailed).

Table 1 shows that there is high positive relationship between teachers' instructional strategies and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State ($r = 0.682$). When tested for significant difference, the significant 2-tailed was 0.000 which is lower than the acceptable alpha level of 0.05. Therefore, the null hypothesis is rejected, implying that there is significant relationship between teachers' instructional strategies and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.

Research Question Two: What is the relationship between teachers' classroom management competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State?



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Hypothesis Two: There is no significant relationship between teachers' classroom management competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.

Table 2: Pearson Product Correlation Coefficient Table Showing the Relationship Between Teachers' Classroom Management Competence and Students' Problem-Solving Skills in Mathematics among Senior Secondary Schools in Bayelsa State

		Teachers' Classroom Management Competence	Problem-Solving Skills
Teachers' Classroom Management Competence	Pearson product moment	1	0.615
	Correlation		
	Significant 2-tailed		0.000
	N	250	250
Problem-Solving Skills	Pearson Correlation	0.615	1
	Sig. (2-tailed)	0.000	
	N	250	250

** Correlation is significant at the 0.01 level (2-tailed).

Table 2 shows that there is high positive relationship between teachers' classroom management competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State ($r = 0.615$). When tested for significant difference, the significant 2-tailed was 0.000 which is lower than the acceptable alpha level of 0.05. Therefore, the null hypothesis is rejected, implying that there is significant relationship between teachers' classroom management competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.

Research Question Three: What is the relationship between teachers' assessment competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State?

Hypothesis Three: There is no significant relationship between teachers' assessment competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.

Table 3: Pearson Product Correlation Coefficient Table Showing the Relationship Between Teachers' Assessment Competence and Students' Problem-Solving Skills in Mathematics among Senior Secondary Schools in Bayelsa State

		Teachers' Assessment Competence	Problem-Solving Skills
Teachers' Assessment Competence	Pearson product moment	1	0.653
	Correlation		
	Significant 2-tailed		0.000
	N	250	250
Problem-Solving Skills	Pearson Correlation	0.653	1
	Sig. (2-tailed)	0.000	
	N	250	250

** Correlation is significant at the 0.01 level (2-tailed).

Table 3 shows that there is high positive relationship between teachers' assessment competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State



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($r = 0.653$). When tested for significant difference, the significant 2-tailed was 0.000 which is lower than the acceptable alpha level of 0.05. Therefore, the null hypothesis is rejected, implying that there is significant relationship between teachers' assessment competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.

Research Question Four: What is the relationship between teachers' communication competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State?

Hypothesis Four: There is no significant relationship between teachers' communication competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.

Table 4: Pearson Product Correlation Coefficient Table Showing the Relationship Between Teachers' Communication Competence and Students' Problem-Solving Skills in Mathematics among Senior Secondary Schools in Bayelsa State

		Teachers' Communication Competence	Problem-Solving Skills
Teachers' Communication Competence	Pearson product moment	1	0.704
	Correlation		
	Significant 2-tailed		0.000
	N	250	250
Problem-Solving Skills	Pearson Correlation	0.704	1
	Sig. (2-tailed)	0.000	
	N	250	250

** Correlation is significant at the 0.01 level (2-tailed).

Table 4 shows that there is moderate positive relationship between teachers' communication competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State ($r = 0.704$). When tested for significant difference, the significant 2-tailed was 0.000 which is lower than the acceptable alpha level of 0.05. Therefore, the null hypothesis is rejected, implying that there is significant relationship between teachers' communication competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State.

Discussion of Findings

The findings presented in Table 1 show that there is high positive relationship between teachers' instructional strategies and students' problem-solving skills in Mathematics among senior secondary school students in Bayelsa State, and the null hypothesis was rejected. This implies that the instructional strategies employed by Mathematics teachers significantly influence students' ability to solve mathematical problems. Teachers who adopt learner-centred instructional approaches such as problem-based learning, inquiry-based learning and guided discovery are more likely to develop students' critical thinking and problem-solving skills than those who rely solely on conventional lecture methods. This finding is consistent with the study of Chapman (2015), who reported that teachers' pedagogical knowledge and instructional strategies significantly enhance students' mathematical reasoning and problem-solving abilities. The finding also agrees with Oribhabor (2020), who found that activity-based instructional methods significantly improved students' achievement and problem-solving skills in Mathematics.

The findings presented in Table 2 reveal that there is high positive relationship between teachers' classroom management competence and students' problem-solving skills in Mathematics among



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senior secondary school students in Bayelsa State, and the null hypothesis was rejected. This implies that effective classroom management creates a conducive learning environment where students actively participate in classroom activities, collaborate with peers, and confidently engage in mathematical problem-solving tasks. This finding corroborates the work of Emmer and Sabornie (2015), who observed that effective classroom management positively influences students' engagement, motivation, and academic achievement. It is also in agreement with Hattie (2023), who identified classroom environment and teacher effectiveness as major determinants of students' learning outcomes. The findings in Table 3 indicate that there is high positive relationship between teachers' assessment competence and students' problem-solving skills in Mathematics among senior secondary school students in Bayelsa State, and the null hypothesis was rejected. This implies that teachers who employ appropriate assessment techniques, monitor students' learning progress, and provide timely and constructive feedback contribute significantly to the development of students' mathematical problem-solving abilities. This finding supports the study of Black and Wiliam (2018), who reported that formative assessment and effective feedback significantly improve students' learning and academic performance. The finding also aligns with Shavelson (2010), who emphasized that assessment should be integrated into the teaching-learning process to enhance students' understanding and problem-solving competence.

The findings presented in Table 4 show that there is a significant relationship between teachers' communication competence and students' problem-solving skills in Mathematics among senior secondary school students in Bayelsa State, and the null hypothesis was rejected. This indicates that teachers who communicate mathematical concepts clearly, encourage classroom discussions, ask thought-provoking questions, and provide meaningful explanations significantly enhance students' understanding and problem-solving skills. This finding agrees with Mercer and Dawes (2014), who found that productive classroom dialogue promotes reasoning, critical thinking, and collaborative learning. It also supports the findings of Chapman (2015), who concluded that effective teacher communication and classroom discourse are essential for developing students' mathematical problem-solving abilities.

Recommendations

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

1. Mathematics teachers should adopt learner-centred instructional strategies, such as problem-based learning, inquiry-based learning, and guided discovery, to enhance students' mathematical reasoning and problem-solving skills.
2. The Bayelsa State Ministry of Education and the Post Primary Schools Board (PPSB) should organize regular workshops, seminars, and in-service training programmes to improve Mathematics teachers' pedagogical competence.
3. School administrators should encourage effective classroom management practices by providing a conducive learning environment and monitoring teachers' instructional delivery to promote active student participation and engagement during Mathematics lessons.
4. Mathematics teachers should strengthen their assessment practices by using continuous formative assessment, providing timely and constructive feedback, and designing assessment tasks that emphasize critical thinking and problem-solving rather than rote memorization.

Conclusion

This study examined the relationship between teachers' pedagogical competence and students' problem-solving skills in Mathematics among senior secondary schools in Bayelsa State, Nigeria. The



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findings revealed that teachers' instructional strategies, classroom management competence, assessment competence, and communication competence each had significant positive relationships with students' problem-solving skills. The study reveals the importance of learner-centred instructional practices in fostering students' critical thinking, mathematical reasoning, and problem-solving abilities. Mathematics teachers who employ innovative teaching strategies, maintain conducive classroom environments, implement effective assessment practices, and communicate mathematical concepts clearly are more likely to develop students' confidence and competence in solving both routine and non-routine mathematical problems. Based on these findings, it is concluded that improving teachers' pedagogical competence is essential for enhancing the quality of Mathematics education and promoting students' problem-solving skills in senior secondary schools. Therefore, sustained investment in teacher professional development, continuous pedagogical training, and the adoption of evidence-based instructional practices will contribute significantly to improving students' performance in Mathematics and achieving the goals of mathematics education in Bayelsa State and Nigeria at large.

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