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Effect Of Microsoft Mathematics Software On Students' Ability And Interest In Learning Trigonometry Among Senior Secondary Schools In Sokoto State, Nigeria

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ABSTRACT

This study investigated the effect of Microsoft Mathematics Software (MMS) on students' ability and interest in trigonometry among Senior Secondary Schools in Sokoto State, Nigeria. The objectives aims to determined the students' ability in learning trigonometry using MMS compared to conventional methods, and to assess their level of interest when exposed to the software. The study employed a quasi-experimental non-equivalent control group experimental design involving two purposively selected public secondary schools. One intact class from each school was assigned to the experimental and control groups, respectively. The experimental group received instruction using Microsoft Mathematics Software, while the control group was taught through the conventional method. A total sample of 119 Senior Secondary School II students participated in the study from a population of 32,239 students in Sokoto State. The experimental group consisted of 55 students, while the control group comprised 64 students. Data was collected using two validated instruments, including Students' Trigonometry Ability Test (STAT) and the Students' Trigonometry Interest Questionnaire (STIQ). The instruments had reliability coefficients of 0.83 and 0.88 for STAT and STIQ respectively. A six-week intervention was conducted, during which pre-test and post-test data were collected. Descriptive statistics (frequency count, percentage, mean, and standard deviation) were used to answer the research questions, and inferential statistics (independent sample t-tests) were used to test the null hypothesis in the study. Results showed that students taught with MMS performed significantly better than those taught through conventional methods. Findings also revealed high levels of student interest, with means scores ranging between 2.7 and 3.2 across interest-related items. The outcomes indicate that MMS enhances students' ability, promotes regular practice, and increases enjoyment in learning trigonometry. The study concluded that integrating MMS into mathematics instruction improves both students' ability and interest. The study recommended that mathematics teachers should be given training on the effective use of MMS School administrators should invest in functional ICT infrastructure, and future research should explore the effectiveness of MMS on other mathematics topics like algebra and geometry.

Keywords: Interest, Learning, Microsoft Mathematics Software, Students Ability, Trigonometry

INTRODUCTION

Mathematics is universally recognized as one of the foundational subjects required for scientific, technological, and engineering advancement. In Nigeria, mathematics is a compulsory subject in the Senior Secondary Schools curriculum, and its relevance spans virtually all fields of study, particularly those related to science, medicine, engineering, and technology (Onoshakpokaiye & Avwiri, 2025). Despite its importance, students' ability in mathematics has remained persistently poor, as highlighted in annual reports released by the West African Examination Council (WAEC). One of the areas where students most consistently experience difficulty in trigonometry, as an essential component of the mathematics curriculum that involves the study of triangles, angle relationships, trigonometric ratios, identities, graphs, and their real-life applications (Hatt, 2024).

Trigonometry is taught either as a stand-alone subject or integrated within a broader mathematics curriculum. In Nigeria, it is incorporated into the continuous mathematics curriculum from secondary to higher education, though some schools maintain separate sequences combining algebra, geometry, and advanced mathematical topics (Ross et al., 2011). Despite these differences, there is a universal movement toward strengthening trigonometric thinking through pattern recognition, relationship analysis, generalization, and understanding mathematical change (Stewart et al., 2015). Mastery of mathematical symbolism and a strong foundation in algebra are essential to overcome the abstract nature of trigonometric reasoning (Bello & Hussaini, 2023). As reflected in the Nigerian curriculum, trigonometry remains a vital component of secondary school mathematics (Adebayo, 2023). Trigonometry has consistently been identified as one of the most difficult topics of mathematics for learners across all levels of education. Students frequently struggle with interpreting variable relationships, understanding trigonometric ratios, and applying trigonometry principles to solve problems. Research indicates that students often develop misconceptions and a poor understanding of trigonometric concepts such as sine, cosine, and tangent, as well as their reciprocal functions (Stewart et al., 2006). Its importance is reflected in extensive applications in fields such as engineering, physics, architecture, astronomy, and surveying (Owusu, 2023). Furthermore, trigonometric functions play a crucial role in calculus, particularly in differentiation and integration (Adebayo, 2023). Trigonometry is an essential branch of mathematics taught at the senior secondary school level and forms a foundation for advanced studies in science, engineering, architecture, technology, and related STEM disciplines. As part of the Nigerian Senior Secondary School curriculum, students are introduced to concepts such as trigonometric ratios, angles, identities, graphs, and real-life applications. Despite its importance, many students develop low interest in learning trigonometry, resulting in poor engagement, low motivation, and weak overall performance in mathematics (Owusu, et al,. 2025).

Ability in learning trigonometry refers to the knowledge, skills, and competencies that students demonstrate when engaging with trigonometric concepts, processes, and applications (Juandi et al., 2025). It involves more than memorizing formulas; it reflects a learner's capacity to understand the relationships between angles, sides of triangles, and trigonometric functions such as sine, cosine, and tangent (Mesa, et al., 2023). A student with strong trigonometric ability can interpret problems accurately, apply appropriate formulas, reason logically, and connect trigonometric ideas to real-life contexts such as navigation, heights and distances, engineering, and physics (Namli, 2024). This ability also includes conceptual understanding, which allows learners to grasp why trigonometric rules work; procedural fluency, which enables accurate and efficient problem solving; and visualization skills, which help students represent angles, triangles, and graphs mentally or on paper. Furthermore, ability in trigonometry is influenced by factors such as prior knowledge in geometry and algebra, clarity of instruction, use of visual or technological tools, and students' confidence or attitudes toward mathematics (Gopal, 2025). Students with high trigonometric ability can solve multi-step problems, analyze patterns, and transfer their knowledge to unfamiliar situations (Ramadhan, & Santoso, 2025). Conversely, low ability is often reflected in misconceptions, difficulty applying formulas, and fear of complex problems (Oladele, 2021). Developing students' ability in trigonometry is essential for improving mathematics achievement and preparing learners for STEM-related fields (Mierluş-Mazilu, & Yilmaz, 2023).

Interest plays a crucial role in determining how students approach learning tasks, the effort they put into solving problems, and their willingness to persist when faced with challenges (Kahu, et al., 2017). In recent years, educators and researchers have noted a decline in students' interest toward mathematics generally, with trigonometry identified as one of the topics that students often perceive as difficult, abstract, and irrelevant to everyday life (Kamber, & Takaci, 2018). This perception influences their level of interest, which in turn affects their learning outcomes (Kamber, & Takaci, 2018). Students who show a high level of interest tend to participate actively, explore concepts deeply, use resources beyond the classroom, and perform better academically (Ainley, 2012). Conversely, those with low interest often avoid trigonometric tasks, experience anxiety, and struggle with understanding basic concepts (Zhu, et al., 2024). Interest in learning trigonometry refers to the level of curiosity, motivation, fervor, and positive attitude students exhibit toward understanding trigonometric concepts and applying them to solve problems (Moen, & Jacobsen, 2023). When students are genuinely interested, they are more willing to engage in learning activities, explore challenging ideas, participate actively in class, and persist even when concepts appear difficult (Owens, et al., 2020). Interest plays a crucial role in shaping how students respond to trigonometry, a topic often perceived as abstract and complex (Cetin, 2015). A strong interest in trigonometry encourages learners to ask questions, use additional resources such as mathematical software, and seek real-life applications that make learning more meaningful (Canonigo, 2025). Students with high interest tend to demonstrate increased concentration, deeper understanding, and improved academic performance (Adodo, & Gbore, 2012). They are more likely to view trigonometry as useful in fields like engineering, architecture, aviation, physics, and technology, which further boosts motivation (Osudin, 2022).

Conversely, low interest often results from fear of mathematics, poor foundational knowledge, ineffective teaching methods, or lack of engaging instructional materials (Chand, et al., 2021). Students with little interest may avoid practice, experience anxiety, and struggle to understand key ideas, leading to poor achievement (Sani et al., 2024). Therefore, cultivating students' interest in learning trigonometry is essential for enhancing motivation, improving performance, and encouraging participation in STEM-related disciplines. Understanding students' interest in learning trigonometry is essential for designing effective instructional strategies, integrating technology, and creating learning environments that promote curiosity, motivation, and engagement. Improving students' interest can lead to better achievement and encourage more learners to pursue STEM-related careers.

Developing students' interest in trigonometry is central to improving engagement and performance. Trigonometry not only prepares learners for advanced mathematics but also serves as a gateway to scientific and engineering applications (Vijayaram & Ramya, 2024). Several factors influence learners' interest, including teaching strategies, classroom environment, and opportunities for meaningful engagement (Ramzan et al., 2023). Collaborative learning approaches such as group projects and peer instruction promote shared understanding, encourage discourse, and create supportive learning communities (Roy, 2024; Orhani, 2024). When students explain concepts to one another or solve problems collaboratively, they develop deeper comprehension and greater confidence. Recent advancements in educational technology have significantly transformed the teaching and learning of trigonometry worldwide. Tools such as graphing calculators, GeoGebra, online simulations, and interactive platforms have enhanced students' ability to visualize trigonometric concepts, manipulate functions in real time, and explore the unit circle dynamically (Bhatia & Dani, 2025). In technologically advanced regions, virtual labs, automated feedback systems, and digital assessments support differentiated learning and self-paced mastery, improving students' readiness for real-world applications.

Microsoft Mathematics Software is a comprehensive educational tool designed to support students in learning and solving mathematical problems across various topics, including algebra, geometry, trigonometry, calculus, and basic arithmetic **(**Naganjaneyulu et al,. 2020)**.** Developed by Microsoft, the software provides a powerful and intuitive platform that helps students explore mathematical concepts through visualizations **(**Rabi et al., 2022**)**, interactive features, and step-by-step problem-solving. One of its most valuable components is the advanced graphing calculator, which can plot both 2D and 3D graphs, enabling learners to visualize functions **(**Bakar, 2021). Also shapes, and relationships that are often difficult to understand using traditional methods **(**Sinclair & Moss, 2012).The software's step-by-step solution feature is highly beneficial because it guides students through the processes required to solve equations, inequalities, and trigonometric problems (Niranjan, 2022). This supports concept mastery, enhances procedural understanding, and encourages independent learning (Davrajoo et al., 2010). Microsoft Mathematics also includes additional tools such as unit converters, triangle solvers, equation solvers, matrices, and a comprehensive list of mathematical formulas, making it a versatile resource for both teachers and students (Ochkov, & Bogomolova, 2015). Furthermore, the software promotes increased motivation and interest in mathematics by making challenging topics more accessible and engaging (Sujatha, & Vinayakan, 2023). through integrating technology into instruction, Microsoft Mathematics helps reduce students' anxiety, fosters deeper understanding, and improves problem-solving skills (Pashchenko, et al,. 2024). in particular, it serves as an effective digital tool that enhances mathematics teaching and learning in modern classrooms. However, these innovations are not evenly adopted. Developing countries face obstacles such as inadequate infrastructure, limited teacher training, and insufficient access to digital devices. In Sokoto State, for example, many students lack proficiency with essential technologies, restricting opportunities for interactive learning. Addressing these gaps requires greater investment in digital resources and teacher professional development. According to Rabi et al. (2022),Microsoft Mathematics Software (MMS) presents a practical solution. As a free tool offering step-by-step computation, symbolic manipulation, and 2D/3D visualization, MMS enhances conceptual understanding and problem-solving. Its interactive and user-friendly features help demystify abstract trigonometric concepts and support teachers in integrating technology effectively. This study therefore investigated the effects of MMS on students ability and interest among senior secondary school in sokoto state.

Statement of the Problem

Ideally, the teaching and learning of trigonometry in senior secondary schools promote deep conceptual understanding, high learner engagement, and meaningful application of mathematical ideas. Students are expected to demonstrate strong ability in solving trigonometric problems such as ratios, identities, angles, and real-life applications. In an ideal situation, technology-driven tools like Microsoft Mathematics Software (MMS) would be routinely integrated into mathematics instruction to simplify abstract concepts, visualize complex relationships, and support individualized learning (Sachin, & Abishek, 2025). Teachers should be well-equipped and motivated to use digital tools to enhance students' interest and improve their problem-solving skills in trigonometry (Chake, et al., 2025). However, the real situation in many secondary schools in Sokoto State shows a persistent difficulty in understanding and applying trigonometric concepts (Galadima, & Yusha'u, 2007). Classroom instruction remains dominated by traditional chalk-and-talk methods, with minimal use of technological resources. Many teachers lack adequate training on how to integrate digital tools such as Microsoft Mathematics Software into their lesson delivery (Stein et al., 2020). As a result, students experience trigonometry as an abstract and challenging topic, which reduces their motivation to engage and limits their ability to grasp key concepts effectively.

Evidence from examination bodies such as WAEC and NECO consistently reveals poor performance in mathematics, particularly in trigonometry-related questions. Research reports and school-based assessments also highlight low achievement levels, widespread misconceptions, and procedural errors among students. Observational studies further indicate that students show low interest and anxiety toward trigonometry lessons, largely due to limited visualization, insufficient practical demonstrations, and lack of interactive learning environments. Many students struggle with basic trigonometric calculations and fail to apply concepts correctly during classroom tasks and examinations. These challenges have significant consequences for students and the educational system. Poor ability and declining interest in trigonometry hinder students' overall performance in mathematics, affecting their eligibility for science, technology, engineering, and mathematics (STEM) careers (Cohen, & Kelly, 2020). The continued reliance on outdated teaching methods widens the digital learning gap, leaving students less prepared for modern academic and professional demands. If effective tools like Microsoft Mathematics Software are not adopted, students' difficulties in learning trigonometry may persist, leading to sustained low performance and limiting the academic advancement of secondary school learners in Sokoto State.

Objectives of the Study

The study investigated the effect of using Microsoft Mathematics Software (MMS) on students' ability and interest in learning Trigonometry among Senior Secondary School in Sokoto State, Nigeria. Specifically, this study has the following research objectives that seek to find out

1. the effect of MMS on students' ability for learning trigonometry in both experimental and control groups among Senior secondary school in Sokoto State
2. the effect of Microsoft Mathematics Software (MMS) on students' interest in learning trigonometry among the Senior Secondary School in Sokoto State.

Research Questions

This study set out to answer the following research questions:

1. What is the effect of Microsoft Mathematics Software MMS on students' ability for learning trigonometry in both the experimental and control groups among senior secondary school in Sokoto State?
2. What is the effect of Microsoft Mathematics Software (MMS) on students' interest in learning trigonometry among the senior secondary school in Sokoto State?

Research Hypothesis

There is no significant difference in the effect of MMS on students' ability in learning trigonometry between experimental and control groups among Senior secondary schools in Sokoto, State.

Theoretical Foundation

The theoretical foundation of this study includes two theories Activity Learning and Cognitive Theory of Multimedia Theory, activity theory which emphasizes the critical role of mediating tools in facilitating meaningful learning experiences. The Activity Theory is based on constructivist theory of Vygotsky's that emphasizes on human interactions with the world. This theory is rooted in the ideas of the constructive role of the human mind (Engeström, 1999). According to this theory, learning occurs most effectively when students actively engage with tools, tasks, and social communities. In the context of this study, Microsoft Mathematics Software (MMS) served as a mediating tool that enhanced both collaborative and individual learning processes. Through peer discussions, group problem-solving, and teamwork, students were able to share ideas, clarify misconceptions, and co-construct knowledge, reflecting the social dimension of the theory. Simultaneously, MMS supported individual engagement by allowing students to learn at their own pace, explore trigonometric concepts interactively, and receive immediate feedback, thereby fostering self-regulated learning and enhancing conceptual understanding. This aligns with the theory's principle that meaningful learning occurs through active interaction between the learner, tools, and learning community.

Additionally, the Cognitive Theory of Multimedia Learning (Mayer, 2005) provides a complementary perspective by explaining how students process information through dual channels: visual/pictorial and auditory/verbal. Clark and Mayer (2023) emphasize that each channel has a limited processing capacity, so effective learning occurs when instructional materials are designed to engage both channels without overloading cognitive resources. Microsoft Mathematics Software integrates visual representations, step-by-step solutions, and verbal explanations simultaneously, enabling students to process complex trigonometric concepts efficiently. Through combining interactive multimedia with self-paced exploration, MMS not only enhances students' cognitive understanding but also increases motivation and interest, making learning more engaging and meaningful. Therefore, the integration of Activity Learning Theory and Cognitive Multimedia Learning Theory provides a robust framework for examining the effect of Microsoft Mathematics Software on students' ability and interest in learning trigonometry.

Conceptual Framework

The conceptual framework that guided this study includes the information on technology and trigonometry The conceptual framework is a structured idea that provides a foundation for understanding outline variables or phenomena (Ravitch & Riggan, 2016). It serves as a blueprint for research, guiding the development of hypotheses, data collection, and interpretation. It helps researchers understand and interpret the relationships between variables and phenomena within a particular area of inquiry. Essentially, it serves as the lens through which a study is designed and analyzed (Creswell & Poth, 2017). By defining key concepts and their relationships, it helps to clarify the scope and direction of a study. Overall, it provides a critical foundation for rigorous and meaningful research. (Creswell, 2013). As seen in Figure 2.1 below

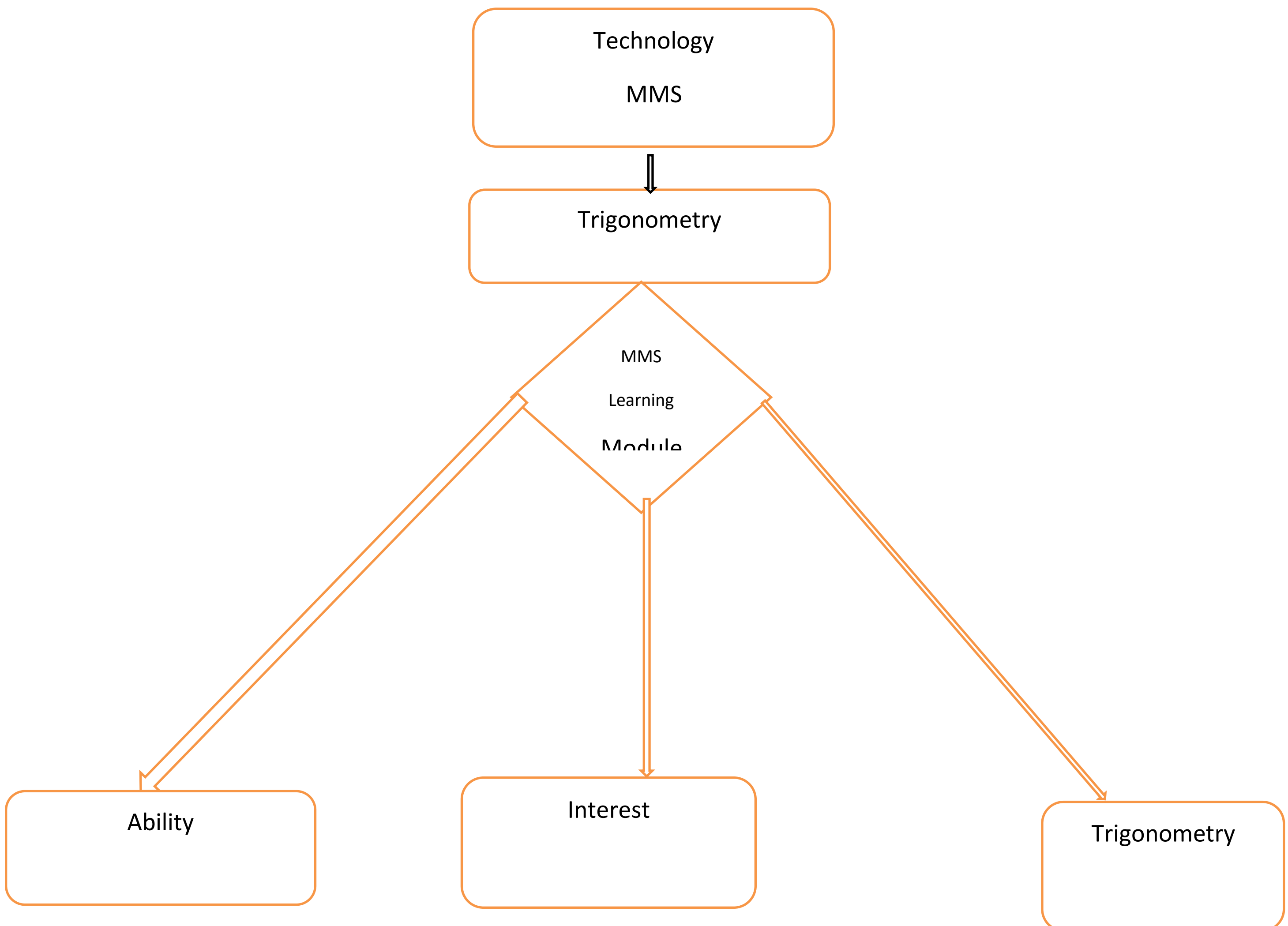

Figure 2.1 Conceptual Framework of the Study

RESEARCH METHODOLOGY

The study adopted a pre-test–post-test quasi experimental research design to investigate the effect of Microsoft Mathematics Software (MMS) on students' ability and interest in learning trigonometry. This design was considered appropriate because it allows for the measurement of students' ability and interest before and after the intervention, thereby providing evidence of the software's effectiveness in comparison to the conventional teaching method. The experimental group consisted of 55 students, while the control group comprised 64. A total of 119 Senior Secondary School (SS II) students were purposively selected from a population of 32,239 students across Sokoto State. The purposive sampling ensured that participants were drawn from schools with similar curriculum structures and that they were suitable for the experimental treatment. Data collection was carried out using two instruments: the Students' Trigonometry Ability Test (STAT) and the Students' Trigonometry Interest Questionnaire (STIQ). Both instruments underwent expert validation to ensure content relevance, clarity, and alignment with the study's objectives. Reliability tests yielded coefficients of 0.83 and 0.88 for the STIQ and STAT, respectively, using Cronbach's alpha and the Pearson Product-Moment Correlation Coefficient (PPMCC), indicating high internal consistency and reliability.

Students in both groups received six weeks of instruction. The experimental group was taught using MMS, which provided interactive visualizations, step-by-step problem-solving guidance, and opportunities for self-paced learning, while the control group was taught using traditional lecture-based methods. Following the instructional period, a post-test was administered to both groups to assess changes in interest and ability in learning trigonometry. Data were analyzed using mean scores and standard deviations to determine differences between groups and the overall effect of MMS. Figure 1 illustrates the schematic representation of the research design employed in this study.

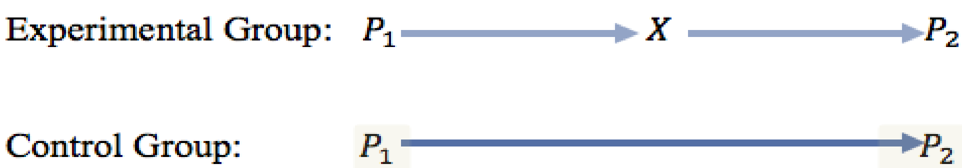

Figure 1 Pre-Test and Post-Test Quasi-Experimental Design

Key: $P_1 = Pre - test, P_2 = Post - testandX =$ Intervention.

RESULTS

The results were presented the analysis from the data collected in the study under the following sub sections: Answering the research questions, testing the hypothesis, The research question for the study were answered and analysed using descriptive statistics of mean, standard deviation and mean difference. below presented the analysis of research questions of the study.

Research Question One: *What is the effect of MMS on students' ability for learning trigonometry in both the experimental and control groups among senior secondary school students in Sokoto State?*

Table 1: Summary of Descriptive Statistics of Students' Ability in learning Trigonometry

Groups	N	Mean	Std. Deviation	Mean Difference
Experimental	55	65.64	12.55	18.92
Control	64	46.72	12.41	

Table 1 showed the mean scores of 65.64 and a standard deviation of 12.55 for the experimental group. Whereas the mean scores of 46.72 and the standard deviation of 12.41 for the control group. The mean difference of the group is 18.92. The results indicated that the experimental group had higher mean scores than the control group. This signified that the experimental group exposed to MMS had a positive effect on students ability in learning trigonometry.

Research Question Two: *What is the effect of Microsoft Mathematics Software (MMS) on students' interest in learning trigonometry among the senior secondary school students in Sokoto State*?

Table 2: Summary of Descriptive Analysis of Students' Interest in Learning Trigonometry using MMS

S/N	Statements	SD(%)	D(%)	A (%)	SA (%)	Mean	SD
1	Microsoft Mathematics is engaging for learning trigonometry	8 (14.5%)	9(16.4 %)	32 (58.2 %)	6 (10.9 %)	2.7	86.53
2	I feel driven to learn trigonometry with Microsoft Mathematics software	8 (14.5%)	9(16.4%)	30 (54.5%)	8 (14.5%)	2.7	90.06
3	Microsoft Mathematics software motivates me to learn trigonometry	5 (9.1%)	4 (7.3%)	28 (50.9%)	18 (32.7%)	3.1	87.89
4	Microsoft Mathematics Software encourages me to practice trigonometry regularly	4 (7.3%)	4 (7.3%)	31 (56.4%)	16 (29.1%)	3.1	81.32
5	MMS is a great tool for making trigonometry more enjoyable	4 (7.3%)	10 (18.2%)	22 (40.0%)	19 (34.5%)	3.2	91.27

Source: field work, 2025

Table 2 showed that the majority of the mean scores were above 3.0, indicating strong agreement with the statements related to interest. The items that agreed with the statement in item 5 of the instrument had a great tool for making trigonometry more enjoyable, recorded the highest mean of 3.2, indicated that 14(25.5%) out of the 55 respondents disagreed, and 41 (74.5%) agreed that MMS effectively supports learning and encourages consistent learning of trigonometry.

Analysis of the Research Hypotheses

H_0There is no statistically significant difference in the ability of students taught using Microsoft Mathematics software and those taught using the conventional method. This null hypothesis was tested using an independent sample t-test for the experimental and control groups.

Table 3: Summary of Independent Sample T Test results of Students' Ability in Learning Trigonometry

Groups	N	Mean	Std. Deviation	*Df*	*t*	*p*-Value	Decision
Experimental	55	65.64	12.55	117	8.249	.000	H_0 rejected
Control	64	46.72	12.41				

$\alpha = 0.05$

Table 3 presented the results of an independent samples t-test analysis between the experimental group taught using MMS and the control group taught using conventional learning methods. The results of the analysis showed that the experimental group had a mean score of 65.64 with a standard deviation of 12.55. The control group had a mean score of 46.72 with a standard deviation of 12.41. This difference indicated that students taught using MMS have a better ability to solve trigonometry problems compared to students taught using conventional methods. The results of the statistical test showed that the value of t = 8.249 with degrees of freedom (df) = 117, and the value of p-value .000 with a α < 0.05. Since the p-value is less than the significance level of 0.05, the result is statistically significant. This revealed that there is a statistically significant difference between the experimental group and the control group. This finding demonstrates that the use of MMS was more effective than traditional instructional strategies in improving students' ability in learning trigonometry.

Summary of the Major Findings

The following are the summary of the major findings of the study.

1. The findings indicated that the experimental group had a higher mean score than the control group. This signified that the experimental group exposed to Microsoft Mathematics Software (MMS) had a positive effect on students in learning trigonometry.

2. The findings revealed that Microsoft Mathematics Software positively influences students' interest, motivation, encouragement, and enjoyment in learning trigonometry at the secondary school level.
3. The findings indicated that the use of MMS is more effective than conventional methods in improving students' ability. of trigonometry intervention applied to the experimental group had a significant positive effect on students' ability compared to the control group.

DISCUSSION OF THE FINDINGS

The findings were discussed based on the objectives of the study. The first finding indicated that students taught trigonometry using Microsoft Mathematics Software (MMS) performed significantly better than those taught through conventional methods. The higher mean scores recorded by the experimental group demonstrate that MMS has a strong positive effect on students' understanding of trigonometric concepts. This supports existing research, which emphasizes that integrating technology improves learning outcomes, enhances instructional quality, and deepens conceptual understanding (Onyema, 2020; Cheung & Slavin, 2013; Rosemary, 2024). The MMS in particular offers visualization tools, dynamic manipulation of trigonometric functions, and step-by-step problem-solving features that help students grasp abstract concepts more easily. These digital affordances align with global trends showing that technology has increasingly transformed the teaching and learning of mathematics. The similarities between this study and the referenced findings lie in their agreement that Microsoft Mathematics Software enhances students' trigonometric understanding and leads to higher performance than conventional teaching methods. Both highlight the role of visualization, dynamic manipulation, and technology-driven instruction in improving learning outcomes. The difference is that the present study examines not only students' ability but also in learning trigonometry, while the referenced findings focus primarily on achievement. Additionally, this study emphasizes MMS's impact on motivation and engagement, extending beyond conceptual comprehension.

Secondly, the findings revealed that the use of MMS significantly improved students' interest in motivation in trigonometry. Interest is a crucial determinant of mathematics achievement, especially in learning trigonometry, which requires strong spatial reasoning and conceptual connections to science and engineering fields. The interactive environment provided by MMS helps students manipulate angles, visualize graphs, and explore relationships dynamically, which makes learning more appealing and reduces anxiety. Research further notes that when technology supports inquiry-based exploration, students are more motivated, persist longer on tasks, and develop greater confidence in problem-solving (Ramzan et al., 2023; Vijayaram & Ramya, 2024). The findings also correspond with studies that highlighted the findings that align with the cognitive theory of multimedia learning, which asserts that combining verbal (equations, explanations) and visual (graphs, diagrams) representations reduces cognitive load and promotes more meaningful learning (Mayer, 2005).The interactive and visually-rich interface of MMS likely made learning more enjoyable, and motivated thereby reducing learners' boredom. The similarities between this study and the referenced findings lie in their agreement that MMS significantly enhances students' interest and motivation in learning trigonometry. Both emphasize that its interactive, visual, and inquiry-based features make learning more engaging, reduce anxiety, and promote deeper understanding. They also align with multimedia learning theory, which supports combining visual and verbal representations. The difference is that this study examines interest alongside ability, while the referenced findings focus mainly on motivation and cognitive engagement. Additionally, this study highlights reduced boredom, whereas other studies emphasize persistence and confidence development.

The findings improve the mathematical ability as the capacity to conceptualize, analyze, and apply mathematical relationships (Semenets et al, 2022). MMS strengthens mathematical ability by enhancing visualization, reasoning, and analytical skills through its interactive features (Zhang et al., 2023; Singh, 2024). Drawing on theories such as activity learning theory and cognitive theory of multimedia learning(Mayer, 2005). Microsoft Mathematics Software supports both logical-mathematical and spatial reasoning by connecting symbolic expressions to graphical representations. Overall, the study confirms that MMS is an effective tool for improving ability, motivation, and conceptual understanding of trigonometry. The similarities between this study and the referenced findings lie in their conclusion that MMS strengthens students' mathematical ability by improving visualization, reasoning, and analytical processes. Both emphasize the role of interactive features and align with theories such as activity learning theory and the cognitive theory of multimedia learning, which support combining symbolic and visual representations. The difference is that the present study examines ability while the referenced findings focus primarily on mathematical ability and cognitive processes. Additionally, this study highlights motivation and conceptual understanding, extending beyond analytical skill development alone.

CONCLUSION

Based on the findings of this study, it can be concluded that MMS is an effective tool for improving both students' ability and interest in learning trigonometry among SSS II students in Sokoto State. The software enhanced instructional strategies, motivation, and enjoyment that provided an interactive and engaging learning environment where abstract trigonometric concepts were visualized and simplified. Findings demonstrated that students exposed to the MMS outperformed their counterparts taught through conventional methods. The research, therefore, concludes that MMS serves as an effective pedagogical tool for teaching trigonometry and making the learning more meaningful and enjoyable for students in Sokoto State.

RECOMMENDATIONS

In line with the findings of this study, the following recommendations were made:

1. Mathematics teachers should be trained and re-trained on the effective use of Microsoft Mathematics Software and other educational technologies to enhance classroom instruction and improve students' learning outcomes.
2. Schools management should integrate Microsoft Mathematics Software into the regular teaching of trigonometry by providing teachers with targeted training on how to effectively use the software during instruction. This will help sustain and further enhance students' motivation, interest, engagement, and enjoyment in learning trigonometry at the secondary school level.
3. Future researchers should explore the effectiveness of MMS on other mathematics topics example, Algebra, Geometry, and different student populations, for example junior secondary schools, colleges, and universities.

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