

Influence of Mobile Learning Approach on Students' Attitude Towards Mathematics in Secondary Schools in Owerri Municipal Council of Imo State

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Abstract

The present study investigated the influence of Mobile Learning Approach (MLA) on students' attitudes towards mathematics in secondary schools. It was carried out in secondary schools in the Owerri municipal council of Imo State, Nigeria. Based on the objectives of the study, two research questions and one hypothesis were generated for the study. The study adopted the descriptive survey research design. A sample of two hundred and fifty-four (254) students was selected from the two co-educational secondary schools purposively selected for the study. The instrument for data collection was a researcher-made 4-point Likert-type questionnaire titled "M-Learning Approach and Students Attitude Towards Mathematics (MASATM)." The instrument had a reliability coefficient of 0.90 determined using Cronbach's alpha formula. The instrument was administered on a face-to-face basis, and the data generated were subjected to analysis using mean and standard deviation to answer research questions, while the hypothesis was tested at a 0.05 level of significance using t-test statistics. The result of the study revealed that the Mobile Learning Approach (MLA) was an effective learning approach to improve secondary school students' attitude towards mathematics. Also, a t-test analysis of students' attitudes responses indicated no statistically significant difference between male and female students, indicating equal benefits to both genders. It simply implies that the mobile learning approach (MLA) improves students' attitudes and achievement in mathematics across gender in secondary schools. Based on the findings, it was recommended that mathematics teachers in secondary schools should apply the mobile learning approach (MLA) in teaching to enhance student's attitude.

Keywords: Mobile Learning Approach, Attitude, Mathematics

Introduction

In Nigeria and other countries, mathematics is an essential subject for anyone pursuing higher education in any capacity. Without a credit pass in mathematics, candidates hardly secure admission to read any course of their choice in any Nigerian university; as such, it's made a compulsory subject in the secondary school curriculum. This singular subject plays a lot of roles in the daily running of any individual in the society. Yeribatuah and Arthur (2023) noted the significance of mathematics as a crucial and fascinating subject everywhere in the world. It is adaptable and mostly utilized in different fields of study, including construction, engineering, statistics, and medicine, among many others. Similarly, Eragbai (2018) indicated that mathematics is not only one of

the most fundamental aspects of human intellect but also one of the oldest subjects of study in the history of humanity. The study of mathematics helps people become more logical thinkers, improve their reasoning skills, and become more spatially adept. Students' attitudes towards this important subject in secondary schools have been of great concern to stakeholders in education, as it has continued to impede their achievement.

Attitude towards mathematics is an important variable that determines students' direction of achievement in the subject in secondary schools. Attitude is a psychological component that influences a persons' behavior, and it includes enjoyment, confidence, anxiety, perceived relevance, and

motivation. It may also be viewed as a psychological trait manifested in varying degrees of liking or dislike based on one's beliefs, emotional state, intentions, and behavior. Allport, cited in Kundu and Ghose (2016) described attitude as a state of the mind and body that is shaped by experience and that guides or affects a person's response to everything and every situation with which it is associated. Wenden, as cited in Oparah et al. (2017), sees attitudes as a type of metacognitive knowledge and characterizes them as learned motivations, valued ideas, evaluations, what one believes is acceptable, or responses geared toward approaching or avoiding. Students' attitudes toward mathematics, whether favorable or unfavorable, are influenced by their beliefs, feelings, self-assurance, and motivating factors for mastering the subject. Zan and Di Martino (2007) viewed students' attitudes towards mathematics as the emotional response, either positive or negative, associated with mathematics, confidence to succeed in studying mathematics, and strategies in coping with mathematical problems. A person's attitude toward mathematics as their feelings, convictions, and values regarding the topic, including their enthusiasm for problem-solving, their appreciation of the subject, and their confidence in its utility (Ashton, 2018; Baah-Duodu et al., 2021). If students have a favorable attitude toward mathematics, they tend to believe that it is important and will work to increase their mathematical learning accomplishment. For instance, Movahedzadeh, cited in Eradgai, stated that a positive attitude towards learning mathematics does not only improve students' achievement but also their achievement in other subjects. Bayram (2004), Etukudo (2006), and Odeleye et al., cited in Akaazua et al. (2017), indicated that a student's favorable attitude toward a subject and the teacher's method of instruction improved meaningful learning and, thus, improved concept development.

Digital technologies have been incredibly integrated into education in the twenty-first century, which has significantly changed how courses like mathematics are taught and learned. Digital technologies in their various forms, such as computers, virtual manipulatives, mobile devices, and many others, bring new opportunities for engagement, personalized learning, and conceptual understanding, which reflects on students' attitudes toward mathematics. The integration of technology in mathematics teaching and learning can positively reflect on students' attitudes towards mathematics as a

result of enhanced engagement, making learning very interactive and fostering deeper understanding of mathematical concepts. Especially, the love and addiction to mobile phones, iPads, and other mobile technologies can predict students' commitment to the application of technologies such as mobile learning in the mathematics classroom, as they reinforce enjoyment and intrinsic engagement, resulting in a positive attitude.

Mobile Learning Approach (MLA) is the application of smartphones, tablets, and other related technological devices in teaching and learning. In mathematics, it offers a flexible, interactive, and student-centered approach that may potentially transform students towards mathematics achievement against the traditional method. Students are reported to have positive attitudes towards ICT in science (Kubiakto, 2010). Well-designed instructional strategies have the potential of affecting students' attitudes towards mathematics. According to Manoucherhri as cited in John and Sincuba (2017) the use of technology in the classroom, especially computer- and mobile phone-supported explorations as contexts for mathematical instruction, is encouraged by certain reform groups in mathematics education. Ong et al. (2010) found that there was a positive correlation between students' attitudes toward the sciences and smart schooling. Students enjoyed practicing and trying new ideas on the computer, which increased their motivation and confidence. The pedagogy employed throughout the learning process, including themes, resources, and evaluation, causes differences in the attitudes of the students. Kahveci and Imamoglu (2007) stated that differentiated learning and evaluation resources are made available by web-based applications, giving students greater control over their education and, thus, boosting their enthusiasm for learning. A study by Bialo and Sivin-Kachala cited in Pellerito (2011) found out that technology had positive impacts on student attitudes towards learning and on student self-concepts. In addition to feeling more successful in school, students who received computer-based instruction also showed more motivation to learn and higher levels of self-esteem and confidence. The inclusion of technology-based activities resulted in an improvement in the students' attitude toward using technology to learn mathematics (Mendezabal & Tindowen, 2018). Ejoh (2020), in a causal-comparative study in three private secondary schools in Nigeria, compared the classrooms with high and low levels of mathematics

technology use. The result revealed that students in the high-technology classroom scored significantly higher on attitude and motivation measures than those in the low-technology classroom, including the attitude towards mathematics inventory, and also had better performance in the examinations. Eragbai (2018), in a survey study of 200 students and 20 teachers in public secondary schools in Ibadan, found that students, irrespective of their teachers holding a skeptical view, developed positive attitudes towards ICT use in mathematics learning. Samuel (2021), in a survey study of 778 senior secondary school students with tablet PCs in Ogbomoso, examining students' accessibility, utilization, competence, and attitudes toward tablet use for pedagogy, found that, although tablets were used more for social and entertainment purposes, students also expressed substantial interest and positive attitudes toward academic use, irrespective of infrastructural challenges like poor electricity and internet connection. Similarly, Mohammed et al. (2025) in a study, found that although digital technology resources were largely unavailable in many schools in Lere LGA, teachers who used digital tools reported improved understanding of mathematical concepts among students, increased student interest, and greater student confidence in tackling mathematics topics.

The part of gender in students' attitudes towards mathematics has not been properly defined at the secondary school level. Some studies suggest that technology such as mobile learning can positively influence students' engagement and attitudes towards mathematics, particularly females; others point towards gender-related disparities due to technology use and confidence. Zogheib et al. (2015), in a study, found no significant gender differences in perceived usefulness, subjective norm, attitude, and behavioral intention towards technology use in math classes but indicated that perceived ease of use significantly influenced attitudes more for males than females. Ursini and Sánchez (2008) reported no significant gender differences in attitudes towards mathematics due to mobile technology use. Similarly, Barkatas et al. (2009) reported that recent research indicates that boys generally express more positive attitudes towards mathematics and technology use than girls. Despite the accruable values of technology in mathematics teaching and learning, teachers still report various challenges that retard their application in the classroom, which range from unavailability, lack of skills and competence, lack of government support,

limited access to resources, and motivation. Akintola et al. (2020) found that among other things, inadequate infrastructure, a shortage of trained ICT specialists, a lack of teacher competency, a lack of attitude among instructors, a lack of ICT tools, a lack of ICT policies, and poor implementation strategies are the main obstacles to science and math teachers' use of ICT. Accordingly, Dogo et al. (2021) reported major issues affecting use of technology in the classrooms to include functional failures, lack of workshops/training, insufficient teacher time, and poor student-to-device ratio.

Irrespective of the relevance and integration of technology in mathematics teaching and learning, students still dread the subject, seeing it as difficult and unengaging. This is blamed on the traditional method of teaching, which fails to address students' characteristics, resulting in negative attitudes towards mathematics, further contributing to poor performance and reduced interest among the students. Numerous studies in other lands have shown the positive impact of the adoption of mobile learning on students' attitudes towards mathematics in secondary schools; there still exists a lack of empirical studies addressing its influence on students' attitudes towards mathematics within the Owerri Municipal Council of Imo State. Also, the associated anxiety and negative perceptions towards mathematics among secondary school students require targeted investigation to determine how mobile learning strategies can redirect these attitudes in a meaningful direction.

Based on the foregoing, the study seeks to investigate the influence of the mobile learning approach (MLA) on students' attitudes towards mathematics in secondary schools in the Owerri Municipal Council of Imo State.

Research Question 1

These research questions directed the study:

1. What is the attitude of students towards mobile learning Approach (MLA) in mathematics?
2. What is the difference between the attitudes response means of male and female students towards mobile learning Approach (MLA) in mathematics?

Hypothesis

The hypothesis below was formulated to direct the study.

H₀₁: There is no significant difference between the attitude response means of male and female students towards Mobile Learning Approach (MLA) in mathematics.

Methodology

The study employed a descriptive survey research design to determine students' attitudes towards mathematics. All 3,266 senior secondary 11 (SS2) students from the nine government-owned secondary schools in Owerri Municipal Council, Imo State, Nigeria, make up the study's population. The sample was made up of one hundred and thirty (130) students selected through stratified random sampling technique from the two co-educational secondary schools purposively selected based on their location and gender mix. This consists of seventy (70) males and sixty (60) females. The data for study was collected through a researcher-made modified 4-point

Likert-type questionnaire titled "*M-Learning Approach and Students Attitude Towards Mathematics (MASATM)*." The instrument was divided into two sections: Section A consists of respondents' demographic variables, while Section B consists of items relevant to the objectives of the study with responses ranging from Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The content validity of the instruments was determined by two experts in mathematics education and an expert in measurement and evaluation. They determined the appropriateness of the questionnaire items to measure the objectives of the study. The instrument was restructured where necessary based on their reports. The Cronbach's alpha formula yielded a reliability coefficient of 0.90 for the instrument. To address the study issues, the generated data was analyzed using the mean and standard deviation. Response means that fell below the instrument criterion mean of 2.50 were rejected, but those that fell within and above that range were approved. The t-test statistical tool was used to assess the hypothesis at the 0.05 level of significance.

Result

Research Question 1: What is the attitude of students towards mathematics after exposure to Mobile Learning Approach (MLA)?

Table 4: Summary of student's responses on attitude towards MLA

S/N	Item	Mean	SD	Remark
1	I like learning mathematics using mobile learning device.	3.25	0.91	Accept
2	Mathematics is enjoyable when thought using mobile learning device.	3.15	0.93	Accept
3	Mobile learning devices enables me to learn mathematics from anywhere.	2.86	1.02	Accept
4	I can learn mathematics anytime with mobile learning device.	2.79	1.13	Accept
5	Mobile learning device allows me to learn at my pace.	3.00	0.90	Accept
6	It makes me to have interest in mathematics.	2.71	1.22	Accept
7	I understand mathematics more when I use mobile learning device.	3.04	0.91	Accept
8	I can solve problems in mathematics with less fear and anxiety using mobile learning device.	3.21	1.00	Accept
9	Mobile learning device helps me develop mathematical skills.	2.69	1.31	Accept
10	It makes learning mathematics a fun.	3.11	0.95	Accept
11	It allows me to share knowledge with my friends.	2.94	1.15	Accept
12	It enhances my creative ability	2.58	1.35	Accept
Average Mean		2.94	1.00	

Table 1 indicates that, items 1-12 on the table had mean responses higher than the criterion mean and were accepted. Also, average mean of 2.94 is greater than the criterion mean which implies a positive attitude on the part of students.

Research Question 2: What is the difference between the attitudes response means of male and female students towards Mobile Learning Approach (MLA) in mathematics?

Table 2: Summary of male and female students' attitude means

Gender	N	Mean	SD	Diff in mean	df	t-cal	t-0.05	Remark
Male	70	2.93	1.01					
Female	60	2.89	1.03	0.04	252	0.31	1.96	NS

Table 2 points that, the response mean for male students was 2.93 with a standard deviation of 1.01. Also, the response mean of 2.89 with a standard deviation of 1.03 was recorded for the female students. As a result, the mean responses varied by 0.04.

H01: There is no significant difference between the attitude response mean of male and female students towards Mobile Learning Approach (MLA) in mathematics.

Table 2 shows that at the 0.05 significance level, the results indicate that the difference in mean attitude scores between male and female students toward the Mobile Learning Approach (MLA) in mathematics is not statistically significant ($t^* = 0.31$, critical value = 1.96). Therefore, the null hypothesis of no difference is retained.

Discussion

The study revealed that the Mobile Learning Approach (MLA) positively improved students' attitudes towards mathematics. This was evident in the fact that all items relating to attitudes on the questionnaire were accepted, as they had response means greater than the criterion mean. Also, the student's average response mean stood above the criterion mean, indicating a positive attitude towards mathematics. Also, further statistical analysis showed that there was no significant difference between the attitude response mean of male and female students towards mathematics due to the Mobile Learning Approach (MLA). This result is linked to the promising influence of the mobile learning approach (MLA) on students' interest, granting interactive learning, building confidence, granting motivation to learning, encouraging hands-on problem solving, and granting accessibility to learning materials. The approach allowed students to learn from anywhere at any time, enhanced self-paced learning, and more. The result is in

agreement with Fabian et al. (2016), which revealed that mobile learning significantly enhanced students' attitudes towards mathematics, fostering increased enthusiasm and engagement compared to traditional methods. The study also agrees with the research, which indicated that adaptive technology positively influences gender attitudes towards mathematics, resulting in their various beneficial outcomes. The result is also consistent with Barkatsas et al. (2009), which found that high achievement in mathematics was associated with high levels of mathematics confidence, strongly positive levels of affective engagement and behavioral engagement, high confidence in using technology, and a strongly positive attitude to learning mathematics with technology.

Conclusion

The study investigated the influence of the Mobile Learning Approach (MLA) on students' attitudes towards mathematics in secondary schools. The result revealed that the approach improved students' attitudes towards mathematics. Students exhibited greater interest, enjoyment, and self-confidence while learning mathematics using the mobile learning approach. The approach reduced anxiety and made the learning process more flexible. The positive students' attitudes were witnessed across male and female students, as there existed no significant gender difference in their attitude responses. Therefore, it's concluded that the mobile learning approach (MLA) is an effective approach to teaching in secondary schools to improve students' attitudes towards mathematics.

Recommendation

Following recommendations are made considering the outcome of the study.

1. Mathematics teachers in secondary schools should apply mobile learning in classroom to enhance students' attitudes.
2. Government, school managers, and non-governmental organizations should organize workshops, conferences, and symposiums to educate teachers on the use of the mobile learning approach (MLA) in teaching mathematics at secondary school levels.
3. Curriculum planners should include the application of technology-enhanced learning approaches in teacher training programs to prepare them for full adoption while in the field.
4. The government should provide technological facilities to secondary schools to enable teachers to access them for teaching and other purposes.

References

- Akaazua, T.J., Bolaji, D.C., Kajuru, K., Mu, M., Musa, M. & Bala, K. (2017). Effect of concrete manipulative approach on attitude, retention and performance in geometry among junior secondary school students in Benue State, Nigeria. *IOSR Journal of Research & Method in Education (IOSR-JRME)* 7(6), 80-175.
- Akintola, D.A. & Marafa, M. (2020). Challenges associated with science and mathematics teachers' utilization of information and communication technology in Nigerian senior schools. *Al-Hikmah Journal of Educational Management and Counselling*, 2 (1), 59-67.
- Ashton, A. S. (2018). How human resources management best practice influence employee satisfaction and job retention in the Thai hotel industry. *Journal of Human Resources in Hospitality and Tourism*, 17(2), 175–199. <https://doi.org/10.1080/15332845.2017.1340759>.
- Baah-Duodu, S., Borbye, S., Someah-Addae, E., Ennin, F. C., & Osei-Buabeng, V. (2021). Developing Female Pre-Service Teachers' Mathematics Self-Efficacy by Integrating History of Mathematics into Teaching During Lesson Study. *Social Education Research*, 3(1), 91–102. <https://doi.org/10.37256/ser.3120221011>
- Barkatsas, A., Kasimatis, K., & Gialamas, V. (2009). Learning secondary mathematics with technology: Exploring the complex interrelationship between students' attitudes, engagement, gender and achievement. *Computers in Education*, 52(3), 562–570. <https://doi.org/10.1016/J.COMPEDU.2008.11.001>
- Bayram, s. (2004). *The effect of instruction with concrete models on eighth grade students' geometry achievement and attitudes toward geometry*. Unpublished M.Ed. Thesis submitted to university of Middle East Technical University.
- Dogo, P., Tyoor, I. T., Joseph, M., Sulai, E. I., Huseyn, G., & Samaila, Y. D. (2021). Assessment of availability, teachers' proficiency and challenges of ICT integration in teaching secondary school mathematics and science in Bauchi State, Nigeria. *Kashere Journal of Education*, 2(2). 34-41.
- Eragbai, J.I.(2018.) Teachers and students' attitude towards the use of ICT in the teaching and learning of mathematics in secondary schools in Ibadan, Oyo State, Nigeria
- Ejoh, D. U. (2020). "Influence of mathematics teachers' technology use on secondary students' motivation, attitude, and achievement in Nigeria" (2020). *Walden Dissertations and Doctoral Studies*. 9724. <https://scholarworks.waldenu.edu/dissertations/9724>
- Fabian, K., Topping, K., & Barron, I. (2016). Mobile technology and mathematics: effects on students' attitudes, engagement, and achievement. *Journal of Computers in Education* 3(1), 77–104. <https://doi.org/10.1007/S40692-015-0048-8>
- John, M & Sincuba, M. (2017). An exploration of learners' attitudes towards mobile learning technology-based instruction module and its use in mathematics education. *International Electronic Journal of Mathematics Education* 12(3), 845-858.
- Kahveci, M., & Imamoglu, Y. (2007). Interactive learning in mathematics education: Review of recent literature. *The Journal of Computers in Mathematics and Science Teaching* 26(2), 137-153.
- Kubiatko, M. (2010). Czech university students' attitudes towards ICT used in science education. *Journal of Technology and Information Education* 2(3), 20-25.
- Kundu, A & Ghose, A. (2016). Students' attitude towards mathematics in higher secondary schools

- of southern districts of West Bengal. *Education India Journal: A Quarterly Refereed Journal of Dialogues on Education* 5(3), 160-180
- Mendezabal, M, J.N &Tindowen, D.J.C. (2018). Improving students' attitude, conceptual understanding and procedural skills in differential calculus through micro-soft mathematics. *Journal of Technology and Science Education* 8(4),385-395.
- Mohammed, A. S., Jatto, O. F., & Shuaibu, S. (2025). The role of digital technology in enhancing mathematics education in senior secondary schools in Lere Local Government Area of Kaduna State. *African Journal of Humanities and Contemporary Education Research*, 18(1), 250-259.
- Oparah, J.S., Nwoke, B.I., Nwoga, A.N.& Ugwu, D.U. (2017). Pre-service teachers' attitude towards application of information and communication technology (ict) as a pedagogical tool in teacher education. *British Journal of Education* 5(11)50-57
- Pellerito, F. L. (2011). *The effects of technology enriched mathematics instruction on at-risk secondary school students*. Unpublished Ph.D. thesis University of Kansas
- Samuel, N. (2021). Nigerian Secondary Students' Accessibility, Utilization, Competence and Attitude towards the Use of Tablet PC for Pedagogic Experience. *International Journal of Learning and Instruction (IJLI)* 31(1), 27-39.
- Ursini, S., & Sánchez, G. (2008). Gender, technology and attitude towards mathematics: a comparative longitudinal study with Mexican students. *Zdm*, 40(4), 559–577. <https://doi.org/10.1007/S11858-008-0120-1>
- Yeribatuah, P., & Arthur, Y. D. (2023). Learners' attitude towards mathematics, technology on their mathematics interest: The mediating role of learners' mathematics perception. *Jurnal Pendidikan Matematika*, 17(3), 361-378.
- Zan, R., & Di Martino, P. (2007). *Attitude toward Mathematics: Overcoming the positive/negative dichotomy*. In B. Sriraman, Ed., *The Montana Mathematics Enthusiast* (Monograph 3, 157-168).
- Zogheib, B., Rabaa'i, A. A., El Saheli, A., & Zogheib, S. (2015). University students' acceptance of technology in math classes: does gender matter? *Journal of Emerging Trends in Engineering and Applied Sciences*, 6(4), 273–287. https://journals.co.za/content/sl_jeteas/6/4/EJC178646

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