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Assessment of Senior Secondary School Students' Preparedness and Challenges for Mathematics E-Examination in Ebonyi State

[1] Onele Theophilus Ikechukwu, [2] Egbe Irene Ogochukwu, [3] Anugwo Margret Ndidiamaka, [4] Okpube Nnaemeka Michael

[1, 2, 3, 4] Ebonyi State University, Abakaliki, Nigeria

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Corresponding Author: **Onele Theophilus Ikechukwu**

Abstract

The study assessed Senior Secondary School Students' Preparedness and Challenges for Mathematics E-examination Ebonyi State. Three (3) research questions and two (2) null hypotheses guided the study. The population of the study was the entire SS III Students (2025 set) from all the two hundred and thirty-three (233) public secondary schools in Ebonyi state, comprising twelve thousand one hundred and sixty-three (12,163) students. A total of three hundred and fifty-two (352) students, comprising one hundred and eighty-one (181) males and one hundred and seventy-one (171) females were used as sample for this study. The instruments for data collection were the Ebonyi State unified Mock Examination (EB-UME) on mathematics. The EB-UME and a questionnaire on the challenges facing students' preparedness for mathematics e-examination. The internal consistency of the questionnaire was ensured using Cronbach Alpha estimate and it yielded a reliability coefficient of 0.83. The data collected were analyzed using mean, and standard deviation for the research questions and t-test for the hypotheses at an alpha level of 0.05. The findings of the study showed that there was no significant difference in the mean preparedness of male and female students for mathematics E-examination. Whereas significant difference existed between the mean preparedness of urban and rural students. Equally, some of the challenges constraining students in public secondary schools in Ebonyi State from preparing well for e-examination include, inadequate number of computers, lack or no power supply, among others. It was recommended among others that local, state and federal government should encourage and sponsor in-service training workshops and seminars for teachers so as to assist them update their knowledge, skills, attitude and new ideas on newly developed software on E-examination.

Keywords: Students, Mathematics, E-Examination, Preparedness

Introduction

Secondary education in Nigeria is the form of education pupils receive after primary education and before the tertiary education. The duration is six years given in two stages of three years each of junior and senior secondary schools. The National Policy on Education (FRN, 2024) indicated that the junior secondary school is both pre-vocational and academic while senior secondary school is comprehensive with a core curriculum designed to broaden students' knowledge and outlook. Taking a critical look at the broad goals of secondary education, the curriculum is expected to provide trained manpower in applied science, technology and commerce at sub professional grades and inspire the student with a desire for self-improvement of excellence. Ajelabi and Agbatogun (2022) are of the view that considering the broad goals of secondary education, one would realize that there is need for self-development among the students knowing full well that the students' enrolments are high with the implementation of the Universal Basic Education (UBE) scheme. Ajelabi and Agbatogun project that the programme is likely to enroll about fourteen million students in Nigeria secondary schools from year 2020 out of the estimated one hundred and forty million citizens declared by the Federal Government of Nigeria, based on the 2006 National Census Exercise.

Despite the astronomical growth in enrolment, the secondary school level is also faced with other challenges such as shortage of professionally qualified teachers, high students to teachers' ratio, shortage of space and facilities and inadequate instructional materials, poor conduct of school examination among others. As postulated by Ajelabi and Agbatogun (2022), the Nigerian secondary school system is facing problems with credible assessment or examination process standing out as a

fundamental constraint towards attaining sustainable secondary education outcome. In view, Reju and Adesina (2022) [42] assert that assessment is central to teaching and learning. Stressing that what is assessed defines what is taught and how it is learnt. The process of assessing in turn shapes institutional practices and affects a learner's views of the value of engaging in learning. Getting assessment right is essential to the wellbeing of the learners and institutions, and instrumental to the achievement of the national strategies or widening participation and e-learning. Consequently, it has become obvious that the Nigeria government should look for alternative means apart from the face-to-face teaching and paper and pen examination to ensure that the large number of students are taught effectively and proper examination conducted with or without the shortage of the trained teachers. Reju and Adesina (2022) [42] emphasized that there is the need for innovation and reforms. The reforms should make the instruction and examination in Nigeria secondary schools much more interesting and relevant to meet not only the needs of the smaller society but also the outside world as well. This involves the application and integration of technology in the education of our secondary school students.

Abubakar and Adebayo (2023) [1] argued that the predominant mode of students' assessment in Nigeria is the traditional method. In this method students are assessed using paper and pen in cognitive abilities. This method of assessment has imposed serious limitation to effectiveness of the method. They assert that E-examination mode of examination can be used to assess cognitive abilities. Furthermore. Ayo, Akinyemi, Adebiji and Ekong (2023) [13], opines that the advent of web application into the computing technology has brought about a significant revolution in our social life including the traditional system of education. Many institutions are beginning to re-assess their traditional method and have considered providing pedagogical materials through the internet. The authors further expressed that web-based also known as electronic assessment (e-assessment) testing systems, offer greater flexibility than the traditional approach because test could be offered at different times, at different locations, and more especially, questions could be shuffled while maintaining the same structure and same content. It equally helps to checkmate incidences of examination malpractice (Abubakar & Adebayo, 2023) [1].

In recent times, the quest for e-assessment has increased and will continue to increase in popularity; towards attaining reliable and sustainable examination or testing process. Its popularity can be felt in all aspects of our educational system. Okonkwo (2023) [37] defined E-examination as electronic examination approach to assessment. It explains the conditions under which students' abilities will be tested. It restricts the time and place where assessment tasks will be performed. Moreso, Joshua, Joshua and Ikiroma (2024) [31] explained E-examination as electronic examination system which involves the conduct of examination through the web or the intranet. It reduces the large proportion of workload on examination; from training, grading and reviewing. Yussuff, Akanmu, Enikumehin and Salman (2023) added that the education system has moved from pen and paper assessment to the e-platform. The use of E-examination is aimed at resolving many questions and limitations inherent in the traditional paper and pen form of examination. The procedure equally helps to cater for leakages and malpractices, demand for gratification by teachers in the form of assistance during examination and bribe-taking by supervisors and invigilators of examinations. Olawale and Shafi-Mahammad (2023) [38] outlined some of the challenges of the traditional pen and paper assessments to include heavy work load as a result of marking/grading of students' scripts, recording, organizing the statistical analysis and presentation of the results, poor security, poor feedback, wasting of paper resources among others. These challenges make the assessment cumbersome but with e-assessment, it becomes easier to take examinations. Equally, whether students are well-prepared to sit for examination through e-assessment modes is a course of worry.

In evidence-based researches by Ukpebor and Emwanta (2024) [45], Abubakar and Adebayo (2023) [1], and Okonkwo (2022), on tertiary students' preparedness for E-examination, it was reported that that participants preferred E-examination mode to pen and paper mode and are therefore tolerant of the examination process. However, studies by Dermo and Eyre (2021) [17], and George (2020) on computer-mediated examinations, students' perceptions, students' attitude and performance, found out that students believe the traditional paper and pencil test (PPT) enhance their performance while computer-based test had a negative effect, and other varied result. This inconsistency coupled with paucity of research studies on secondary school students' preparedness for e-examinations, calls for further research to ascertain senior secondary school students' level of preparedness for Mathematics E-examination in Ebonyi State.

Notwithstanding the gains inherent in e-examination, there challenges constraining its effective implementation and they include; inadequate number of computers, unreliable internet connections, poor power supply, lack of backup systems (e.g., generators), insufficient trained teachers for e-examination or ICT support staff, and lack or no closed-circuit television (CCVT) surveillance. Inadequate number of computers contributes to unequal access to examination opportunities, especially for students in rural or underserved regions. Reports on Nigeria's transition to CBT examinations show that some states have only a few accredited CBT centers despite having tens of thousands of candidates (Lawal, *et al*., 2025) [33]. In some areas, one CBT center may serve thousands of candidates, forcing students to travel long distances or wait for extended periods before writing their examinations (Ohiorenoya & Imonike, 2024). This uneven distribution of facilities creates disparities between urban and rural students and undermines the objective of ensuring fair and inclusive assessment especially in mathematics.

Mathematics according to Adolphus (2023) [9] is concerned with the study of relative sizes, volume, weights and capacities of objects, materials and human activities. It is one of the skills everybody needs to survive in life. Mathematics is the basis of all sciences and technology and for all human progress. Mathematics is the mother of all sciences that deals with the logic of shape, quantity, measurement and arrangement (Bashir, Abubakar & Garba, 2022) [15]. It is all round us and in everything we do. Its knowledge is used and applied in virtually everything in our society. Ugwuanyi (2022) [44] described mathematics as a science that deals with the meaning of numbers and their relationships to space, measurements and quantities. Gupta

and Pasrija (2023) [24] described mathematics knowledge as an indispensable tool in every society because it has application in all other human endeavours including basic science, technology, social sciences and in the arts.

Knowledge of mathematics, thus, promotes the habit of accuracy, logical, systematic and orderly arrangements of fact in the individual learner. Mathematics equally helps to develop proper moral attitude in individuals as there is no place for biased feelings, no place for dishonesty and it trains people to observe riches respect procedure and value time (Kravitz, 2021). As Anugwo (2019) [12] stipulates that mathematics enables students to acquire and broaden their knowledge, skills, and outlook in many fields because of its applicability to many areas of life. However, for students to possess the conceptual understanding in different ways, they should know how and when these different mathematical representations can be used for different purposes. Such presentation would enable the students experience, discover, discuss and reconstruct their views about the nature of mathematics.

In spite of the indispensability and essentiality of mathematical knowledge to all works of life**,** mathematics education in Nigeria over the years has been grappling with numerous man-made problems despite all the efforts by the government through huge investments, different policies and programmes (Egbulefu, Amaele & Osaat, 2022). Nigerians especially parents are now forced and compelled to accept poor performance in the subject as normal. On the pages of The Sun and Vanguard Newspapers, and on the television and radio stations, reports about this ugly trend of students' abysmal performance in mathematics are been rolled out. No year passes, that parents do not hear about poor and below average achievement of their children and wards in this all-important subject (i.e., mathematics). In fact, many students now live with the misconception and wrong belief that mathematics cannot be passed by oneself or through one's personal efforts, which is an erroneous impression.

Furthermore, it is particularly disappointing and disheartening to find that mathematics has remained one of the least subjects in terms of students' performance in Nigerian school system despite its role in our everyday life and its importance in society (Ahmed, 2022) [10]. Many students fear it and also have the obnoxious notion that Mathematics learning is an unattainable task, and that it is exclusively reserved for the gifted ones (Ajai & Imoko, 2023) [11]. More so, the WAEC Chief Examiners' report in 2023, 2024 and 2025 respectively, on students' performance showed that students' overall performance in the subject has not yet significantly improved. The report further showed that the percentage of students that passed the subject at credit level over the years still fell between 30 and 32 percent.

Many reasons are adduced in literature for students' poor performance in mathematics. According to Timayi, Bolaji and Kajuru (2022) [43], among the reasons are; poor teaching methods, incompetent teachers, environmental influence, non-availability of instructional materials, mathematics anxiety among the students as well as poor preparation by the students. Consequently, students struggle to understand mathematics with many seeing it as an abstract subject. This method has hindered students' achievements in mathematics at both internal and external examinations (Egbulefu, Amaele, & Osaat, 2023 [18]; Bashir *et al*, 2022). It therefore, follows that there is urgent need for mathematics teachers to employ innovative and learner centered instructional approaches driven by technological integration, to enhance students' understanding and set them in motion for E-examination. The researchers are of the view that effective teaching and learning of mathematics is still attainable with the integration of technology into the teaching and learning process as well as modes of testing and examination. The researchers are advocating the use of e-learning in mathematics teaching, learning and assessment, since the popular talk and chalk method prevalently used in most public secondary schools have failed. The researchers asserts that with this approach, mathematics can be more learner friendly and students irrespective of their gender and location, would be well-equipped to face examinations especially through electronic means.

Gender is defined by Uzoamaka and Ugboaja (2022) [46] as the various socially and culturally constructs roles, qualities and responsible behaviour, power and other factors ascribed to men and women by different societies. Studies on gender influence on students' perception of e-assessment (E-examination) have been done by researchers including; Fagbola, Adigu and OkeAdegbija, George, Abayomi, Bola and Olaniyi (2023), Bandele, Oluwatayo and Omodare (2023) [14], and Bebetos and Antonio (2022) [16], with results revealing that both male and female students have positive attitude and regard to e-assessment with more positive perception by female students. However, study by Joshua; Joshua and Ikiroma (2023) reported that students preferred taking Paper and Pen Test (PPT) to Computer-Based Testing (CBT). The inconsistencies in research of students' preference for PPT and CBT coupled with paucity of research on students' preparedness for E-examinations at the secondary school level, demand for further research in this regard.

According to Hornby (2022) [25], the word preparedness is the state of being ready or prepared for something. In the context of this study, the researcher views preparedness as the ability and willingness of senior secondary school students to embrace E-examination. It is obvious that in any innovation there are apprehensions and public outcry among the citizenry including various stakeholders in the education sector with the introduction of E-examination in our secondary school. Consequently, Ayo *et al*. (2023) [13] affirmed that getting assessment of students right implies generating assessment results which are reliable, valid, useable, credible and interpretable. Osuji (2021) stressed that E- examination can be used in reducing or eliminating most of the problems of the traditional assessment, which have resulted to the general falling standards of education particularly among secondary school students in Nigeria. This implies that E-examination is a way of getting assessment right. But are the students' prepared to embrace this sustainable mode of examination? In seeking answer to this question, this study empirically investigated senior secondary school students' preparedness and challenges they face in mathematics E-examination in public secondary schools in Ebonyi State, Nigeria.

Objectives

The study examined:

1. How male and female students' preparedness vary when exposed to mock mathematics e-examination in public secondary schools in Ebonyi State.
2. How urban and rural students' preparedness vary when exposed to mock mathematics e-examination in public secondary schools in Ebonyi State.
3. The challenges faced by students of public secondary schools in Ebonyi State in preparing for mathematics E-examination.

Methodology

Descriptive survey design was adopted for this study. The researchers chose the research design to answer the research and question objectively, rapidly and economically as possible by explaining the true state of e-examination practices in Ebonyi State with particular emphasis on students' preparedness and challenges of e-examination in the state. This study was carried out in Ebonyi State comprising three (3) Education zones namely: Abakaliki Education Zone, Onueke Education Zone, and Afikpo Education zone.

The population of this study was 12,163 SSIII students (2024 set) from all the two hundred and thirty-three (233) public secondary schools in Ebonyi State. A total of three hundred and fifty-two (352) students were used as sample for this study. Purposive sampling technique was used to select twelve (12) schools with functional computer laboratories and internet facilities that supports electronic teaching, learning and assessment. In each of the schools selected, the whole SS III classes were used. This comprises of one hundred and ninety-eight (198) males and one hundred and fifty-four (154) females; and 81 urban and 271 rural students. Ebonyi State Unified Mock-Examination (EB-UME) and a structured questionnaire on the challenges faced by students of public secondary schools in Ebonyi State in preparing for mathematics E-examination with reliability coefficient of 0.83 was used for data collection. Research questions were answered using mean and standard deviation while the research hypotheses were tested using t-test at an alpha level of 0.05.

Results

Table 1: Mean and Standard Deviation of Achievement stores of Male and Female Students Prepared for Mathematics E-examination

Group	Mean	SD	N
Male	41.37	4.08	181
Female	40.25	4.16	171

Source: Researcher's field work, 2026.

The result on the table 1 showed that male students prepared for mathematics E-examination had mean achievement score of 41.37 and standard deviation score of 4.08 while the female students had mean achievement score of 40.25 and standard deviation score of 4.16. The implication is that male students; are slightly more prepared for Mathematics E-examination compared to their female counterparts.

Table 2: Mean and Standard Deviation of Achievement stores of Urban and Rural Students Prepared for Mathematics E-examination

Group	Mean	SD	N
Urban	43.72	3.58	81
Rural	31.63	5.46	271

Source: Researcher's field work, 2026.

Result as presented on table 2 showed that the urban students had mean achievement score of 43.72 and standard deviation score of 3.58 while the rural students had mean score of 31.63 and standard deviation score of 5.46. This implies that the students in the urban schools are more prepared for mathematics E-examination compared to those in the rural schools.

Table 3: Mean and Standard Deviation on the Challenges Faced by Students in Preparing for Mathematics E-examination

S. No	Items	N	Mean	SD	Decision
1	Inadequate number of computers	352	3.70	0.46	Agreed
2	Unreliable internet connections	352	3.43	0.49	Agreed
3	Poor power supply	352	3.64	0.48	Agreed
4	Lack of backup systems including generators	352	3.74	0.44	Agreed
5	Lack of trained teachers for the E-examination/support staff	352	3.46	0.49	Agreed
6	Lack of/non-availability of CCTV surveillance	352	3.26	0.47	Agreed

Source: Researcher's field work, 2026.

Summary of result in table 3 showed that the students agreed on all the as the challenges facing them in preparing for E-examinations in public secondary schools in Ebonyi State with inadequate computers (mean = 3.70) and lack of backup systems (mean = 3.74), ranking highest.

Table 4: Summary table of t-test between two means

Gender	N	X	SD	$t_{cal.}$	t_{crit}	decision
Males	181	41.37	4.08	1.37	1.96	NS
Females	171	40.825	4.16			

The result in table 4 indicates that the calculated t-value of 1.37 is less than the critical t-value of 1.96 at 0.05 level of significant. The null hypothesis is hereby upheld. This implies there is no significant difference in the mean level of preparedness of male and female senior secondary school students' in Ebonyi State when exposed to mathematics E-examinations.

Table 5: Summary table of t-test between two means

Location	N	X	SD	$t_{cal.}$	$t_{crit.}$	decision
Urban	81	43.72	3.58	2.17	1.96	S
Rural	171	31.63	5.46			

The result in table 5 shows that the calculated t-value of 2.17 is more than the critical t-value of 1.96 at 0.05 level of significant. The null hypothesis is hereby rejected. This means that there is a significant difference in the mean level of preparedness for mathematics E-examination students of urban and rural areas.

Table 7: Mean and standard deviation of male and female students on the challenges they in preparing for mathematics e-examination

Items	Location	N	Mean	SD	t.cal.	Df	P.value	Decision
1	Urban	81	3.68	0.47	2.573	350	0.567	Significant
	Rural	271	3.71	0.46				
2	Urban	81	3.44	0.50	2.320	350	0.749	Significant
	Rural	271	3.42	0.49				
3	Urban	81	3.64	0.48	2.119	350	0.905	Significant
	Rural	271	3.63	0.48				
4	Urban	81	3.72	0.45	2.526	350	0.599	Significant
	Rural	271	3.75	0.44				
5	Urban	81	3.48	0.50	2.436	350	0.663	Significant
	Rural	271	3.45	0.49				
6	Urban	81	3.25	0.51	2.375	350	0.708	Significant
	Rural	271	3.27	0.46				

Source: Researcher's Field Work, 2026.

Summary of result on table 7 showed that across the six items, the P.values are greater than alpha level of 0.05, and therefore, the null hypothesis is rejected. This implies that there was significant difference in the mean ratings of urban and rural students on the factors they face in preparing for E-examinations in public secondary schools in Ebonyi State.

Discussions

The result of the analysis indicates that male secondary school students have slightly high preparation for mathematics E-examination compared to their female counterparts. Although, there was no significant difference in their level of preparedness of the male and female students of public secondary schools in Ebonyi State. This result is in line with the works of Kadir (2023) whose findings indicated that students had encouraged experienced with E-examination but the preferred pen and paper mode of examination. They gave their reason on the quality of E-examination. However, most research works of Adegbija, Fakomogbon and Daramola (2023) [4] and Ayo *et al* (2024), Bandele et at (2023) [14], Okonkwo (2023) [37], Osuji (2023) and Osang of high preferred for E-examination to the pen and paper examination. They believed that examination has lesser administrative tasks in administering and marking E-examination and it encourages timely release of nation results, they said that E-examination was introduced to address series of anomalies being encountered in the manual human test. E-examination would remove all human errors recorded in manual examination-like hiccups in compilation of answer scripts and the movement of examination papers from one part of the state to another as well as encouraging increase in the level of computer literacy among secondary school students. Ndunagu (2023) [35], findings released that electronic examination is the way forward for our education institution in Nigeria. Ndunagu indicated that electronic examination is a product of information and communication technology that was developed to solve problems and limitation confronting the process and procedure of conducting paper examinations. Such problems and limitation are as follows: high cost of conducting the examinations, examination leakages, missing result, lack of flexibility of examinations, long period of retrieval of results and so much more problems that give the examiners and students night mare. The problems have almost brought the conduct and credibility of print examination to the lowest ebb.

Furthermore, the result of the analysis expressed a high level of preparedness for urban students compared to their rural counterparts for mathematics E-examination. Equally, there was significant difference in the level of preparedness of urban and rural students for mathematics e-examination. This could be attributed to the differences in access to modern amenities such as internet connectivity, availability of computers and relative higher power supply in the urban areas. This result is in conformity with the findings of Oshionebo and Ashang (2023) [39] in their study discovered that Federal Government of Nigeria recognized the prominent role of ICT in modern world and has integrated ICT into secondary education. Moreso, the findings of this study are in line with the National policy on Education (2023) which promoted information and communication technology capability at all level of education. This result is consistent with the findings of Adeyinka, *et al* (2024) that there is now increasing awareness regarding the potential of ICTS in learning. Many private and public secondary schools in the country are infusing ICT into their teaching activities. He said that the race has become rather dramatic because the students seem to be leading the teachers in E-capabilities. The computers and internet facilities in the home of the influence students complemented by the cybercafé proliferation in the entire country have provided hundreds of thousands of Nigerian secondary school students an unprecedented opportunity to join millions of their colleagues around the globe to surf and navigate. This study has shown generally that ICT now have far reaching implications in teaching and learning. The result is in agreement to Owolabi (2024) [41] findings that showed that students and teachers have average level of ICT skills but deferred with the result of this study in revealing that in the extent of usage in instructions and assessment is low. Furthermore, Iheberem revealed that inadequate provision of ICT equipment has among others affected the level of technological and institutional factors for secondary school students.

Equally, the result of the study under this theme revealed that the students agreed that inadequate number of computers, poor internet connectivity and power supply, lack of competent trained teachers on e-examination as well as support staff, among others are the challenges faced in public secondary schools for effective preparation for e-examination. This is evident as no significant difference was recorded in their ratings of the challenges. This finding aligns with that of Olawale and Shafi-Muhammad (2023) [38] as well as Abubakar and Adebayo (2023) [1] who reported that lack of computers, poor internet connection, and lack of competent trained manpower to implement e=examination are fundamental challenges constraining public secondary schools from embracing e-examinations.

Conclusion

The researchers in line with the findings of the study, concluded that male students had slightly higher mean preparedness compared to their female counterparts. Equally, urban and science students had higher mean preparedness compared to rural and non-science students respectively. Lack of computers in good number, poor internet connectivity and poor power supply are among the cardinal challenges facing poor implementation of e-examination in public secondary schools in Ebonyi state.

Recommendations

Based on the findings of the study, the researcher made the following recommendations.

1. In order to motivate, stimulate and sustain students' interest in mathematics with the sole aim of enhancing their achievement in mathematics, teachers and students of mathematics should employ E-examination mode of teaching.
2. Local, State and Federal Governments should encourage and sponsor in-service trainings, workshops and seminars so as to assist them update their knowledge, skills, attitude and new ideas on newly developed software on E-examination.
3. The technical issues such as computer functionalities, power outages and internet accesses need to be continually addressed to ensure that they do not mitigate the successful implementation of E-examination.

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