AWARENESS AND READINESS OF UNIVERSITY STUDENTS TOWARDS EMERGING TECHNOLOGIES FOR OPTIMUM LEARNING OUTCOMES IN UNIVERSITIES IN ANAMBRA STATE

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Abstract

The research is anchored on assessing the level of awareness and readiness of university students of Federal and State Universities in Anambra state. Specifically, the study provided empirical evidence on the current state of technological knowledge and preparedness of university students in Anambra state universities towards embracing emerging technologies for the purposes of improving learning in 21st century education. A descriptive survey research design was adopted for this study. The study were guided by three research questions and three null hypotheses. The target population consisted of regular undergraduate students from universities in Anambra state at the tune of 30,000 students. The sample size comprised four hundred students' across two public universities; Nnamdi Azikiwe university, Awka (NAU) and Chukwuemeka Odumegwu Ojukwu university, Igbariam (COOU). Multi stage sampling technique was used to draw target audience. A 30 item researchers' constructed and validated questionnaire was used for data collection at 5-point likert scale. The reliability of the instrument was established

using Cronbach's alpha, and the reliability index was found to be within the acceptable limit of 0.81 indicating a high level of internal consistency. An online survey using Google Forms and physical forms were used to collect the data. Mean and standard deviation were used to analyze the research questions while the null hypothesis was tested using ANOVA at 0.05 level of significance. The findings revealed that the level of awareness was weighted at 3.04, therefore showing that awareness is moderately high. On the other hand, readiness was weighted 2.44, which indicated slightly ready. Finding also revealed the extent of usage was 2.93, this revealed small extent usage of emerging technologies for learning purposes. Results of the hypotheses showed that there were no significant difference between male and female university students in their level of awareness, readiness and usage in universities in Anambra State respectively. The study recommended amongst others, a periodic sensitization programme where university students will be educated on the relevance of these emerging technologies for their academic and professional development.
Keywords: Awareness, Education, Emerging technologies, Readiness

Introduction

In 21st century academic and professional world, explosion of technological advancement has redefine the whole spheres of human endeavors and activities, with the educational sector at the frontline of this trend. Education of the moment is striving to bridge the gap between theoretical knowledge and practical application of knowledge by proffering concrete solutions to human complex needs and problems. The knowledge that stems from this education builds upon each other and attracts creative minds alike which bring forth greater opportunity for innovations, growth, development, technology explosion and global interconnectivity (Obineche, Obineche & Muojekwu,2025). Technological explosion fosters promising improvement on emerging technologies worldwide. Jaja and Emerole (2024) opines emerging technologies as new or developing technologies that are highly innovative with the potentials to significantly change or disrupt existing systems, and change the way societies work and live. According to Quora.com (2023) these are new and or developing technologies with

tremendous capabilities and potentials to provide innovative solutions to the most compelling socio-economic and scientific challenges.

In the last few decades, national authorities and multinational organizations have emphasized the importance of increasing the use of information and communication technologies (ICT) and other emerging technologies in the school system (Roztocki, Soja & Weistroffer, 2019; UNESCO ICT Competency Framework for Teachers, 2018). This is because of the fact and the realization that emerging technologies are making dynamic changes globally. Emerging technologies are influencing all aspects of life. The influences are felt more and more in the educational system.

In this regard, authors sees emerging technologies as a novel digital learning and problem solving tools, evolving to proffer practical solution and promotes holistic inclusion to knowledge, with boundless transformative possibilities to all facet of human endeavor. The educational experience and knowledge that stems from emerging technologies provides students with 21st century practical skills, directly applicable in real world careers. Emerging technologies plays an innovative and transformative role of revolutionizing educational landscape with unlimited opportunities and further altering the status quo of conventional pedagogy to promoting inclusivity in education.

Education is increasingly taking a new dimension for better. Its future are being shaped and reshaped by current and emerging technologies that are drastically changing the way in which teaching and learning are experienced. Such changes are as a result of development in the field of educational technology to utilize personalized learning, immersive learning, automated grading, intelligent tutoring systems, skills training, assistive technology, language learning, collaborative learning, scalable infrastructure, adaptive learning, interactive learning ,and the use of digital platforms basically among others (Nsofor *et al*.,2015; Rane *et al*., 2023), with the integration of artificial

intelligence(AI), robotics, virtual reality(VR),blockchain technology, gamification/game-based learning, augmented reality(AR), internet of Things (IoT), amongst others into the curriculum implementation (Rane *et al*., 2023).These emerging technologies have a wide range of benefits from improving students engagement, retention, active learning across disciplines to optimizing their learning outcomes which is the core target of education.

Educational sector has in recent time witnessed the influx of some of these emerging technologies in instructional process. Some of these emerging technologies gained global recommendation and commendation during Covid 19 pandemic especially in developed countries with developing countries trying to brace up with the applications of these cutting-edge technologies. Thus, different universities and faculty lecturers were encouraged to acquire technological competences, assuming a fundamental role in the transition from traditional learning environments to technology-driven learning environments (Peiris, 2024; Peiris et al., 2024). These cutting-edge approaches to learning encourages problem-solving, critical thinking, creativity, tracking student engagement, personal and social development, mastery of content and the ability to adapt to new technologies and processes that bring about accessibility and inclusivity.

Global inclusivity that comes with the adoption of emerging technologies in educational sector can only be gainfully realized especially in developing countries such as Nigeria, is by exposing the students with intrinsic potential benefits of these emerging technologies for their wholesome development, both academically and career wise. Students' awareness to the relevance of these emerging technologies will foster their readiness to embrace the profound transformation driven by rapid advancements in technology. This technological revolution in education is not merely about digitizing existing practices but about fundamentally reimagining how knowledge is acquired,

shared, and applied (Collins & Halverson, 2018). The rapid advancements in technology and evolving job demands are fundamentally reshaping the educational curriculum. Emerging technologies have come a long way to bring their effect in every sector of society including education where we see the dawn of a new era.

Similarly, the promising potentials of emerging technologies to 21st-century education system cannot be overstated (Giesenbauer & Muller-Christ, 2020). These emerging technologies such as; artificial intelligence tailors content and learning experience to individual student personal needs, speeds up assessment, feedback and automate administrative tasks, and provide 24/7 intelligent tutoring support (Holmes *et al*., 2019). Virtual Reality (VR) through special wearable headset, stimulate real-world scenarios without leaving the classroom, create immersive learning environments and also useful in training for vocational skills (Merchant *et al*., 2014). Blockchain technology, enhances trust and verification of academic credentials and also give students access to global educational resources (Grech & Camilleri, 2017).

More so, gamification and game-based learning incorporates gamified learning activities in other to enhance student engagement, participation, motivation and enjoyment during learning (Wang & Tahir, 2020). Augmented Reality (AR) brings abstract concepts to life with interactive 3D visuals (Merchant *et al*., 2014) For instance, AR can enrich learning experiences at home, providing students access to interactive 3-D content whenever needed (Burley and Stubbs,2023). Learning Management System (LMS) with analytics is emerging as a powerful tool for understanding and optimizing learning processes, with platforms like Canvas, Moodle and Blackboard are used to early identification of at-risk students and allows for timely interventions to support student success (Ferguson, 2012).

Furthermore, 3D printing technology is revolutionizing hands-on learning experiences across various disciplines, such as engineering, architecture, and medical,

students can now design and create physical models, enhancing their understanding of complex concepts as well as enhances creativity and problem-solving (Ford & Minshall, 2019). The Internet of Things (IoT) is enabling the creation of smart classrooms that can monitor and adjust environmental conditions for optimal learning experiences and outcome (Hsu & Lin, 2018). Massive Open Online Courses (MOOCs), democratizing access to education on a global scale amongst other profound benefits of these emerging technologies.

As these ground breaking technologies continue to evolve and integrate, it continues to address long-standing challenges in education, bridging gaps in access and quality, ensures that learners are not just consumers of information but active participants in their educational journey, equipped with the skills necessary to navigate the complexities of the modern workforce (Chaker & Damak, 2024; Swargiary,2024).

Also, the successful adoption of these emerging technologies for optimum learning outcomes in universities depends largely on the awareness and readiness of students, who are key stakeholders in the education system (Akpomi, Nwile & Kayii, 2022; Zhai *et al*., 2021). On that note, Emelogu *et al*. (2022) views awareness as a demand to recognizing or acknowledging the existence of these emerging technologies by students and lecturers. In this context, authors sees awareness as conscious understanding and well informed knowledge by students on the complexities and endless potential benefits of these novel and emerging technologies that have profound transformation to academic and professional landscapes.

Obviously, these emerging technologies can only be impactful if students are aware of its usefulness in their disciplines and future endeavors. Corroborating the above, research finding of Jaja & Emerole (2024) showed that emerging technologies such as; Al, Robotics, IoT, machine learning and block chain technology revealed low level of

awareness, this may be as a result of lack in knowledge on the usefulness of these emerging technologies. Contrary, research finding of Dergunova *et al*.(2022) revealed that the emerging technology such as, artificial intelligence showed good level of students' awareness within the scope of the research area. The results indicate that, in a relatively large number of situations, the students expressed knowledge about emerging technology. Ventura & Lopez (2024) research finding revealed that the students are slightly aware of the AI-powered learning tools and frequently use these technologies in accomplishing their schoolwork. The level of awareness is dependent on the type of emerging technologies the students used. Nwadi, Attah & Eze (2023) findings revealed that vocational and technical education(VTE) students had an awareness and utilization rate of 84.8% for the e-learning website, 75.6% for Google Classroom, and 60.6% for smart boards and video conferencing. Showing 24.4% of the students were still unaware of the Moodle Learning Management System and the Canvas e-learning platform at the University of Nigeria Nsukka. Thus, these research reports seems to be inconsistent.

Basically, in Nigeria, there are 274 universities comprising private, state, and federal-owned institutions (National Universities Commission, 2024). Considering the realities of the emerging technologies, the extent to which these universities integrate students to the potential benefits of these emerging technologies determines their readiness to leverage on these technologies for optimal learning outcomes, raises important questions. Oladele (2024) affirms that while technology driven-education (TDE) is widely accepted as a beneficial development, its readiness remains a pertinent issue for meaningful engagement. Emerging technologies readiness denotes the mental, physical, and material preparedness of universities involved in TDE, which is essential for a successful e-learning experience and implementation (Oladele,2024). Thus, in this context, authors sees readiness as wholesome preparedness and willingness of students

to embrace, adapt and effectively leverage on these novel and emerging technologies in their academic, personal and future careers growth.

More so, lecturers at the Nigeria universities were uncertain about students' readiness in terms of their preparedness, willingness, understanding of emerging technologies and having sufficient IT/web skills required to support the new trend (Nwagwu, 2020). Research study conducted at a privately-owned university in North-Central Nigeria suggest that, generally, students are positive and open-minded about the potential of AI to enhance their learning experiences and outcomes, alongside the necessity for sufficient training to effectively employ AI tools (Suleiman, 2024). This finding departs from Nwagwu (2020), which revealed uncertainty regarding students' readiness for technology-driven education in terms of understanding e-learning and possessing sufficient IT/web skills required to drive e-learning. Studies by Alakash & Razak, 2020; Aldemita *et al*., (2024) shown high level of students readiness for utilization of emerging technologies.

Furthermore, gender is another variable increasingly regarded as significant in assessing awareness and readiness for technology-enhanced education within the higher education space, considering that findings have been inconclusive. Alimi *et al*. (2021) research study revealed no significant difference between male and female university students' awareness of the use of artificial intelligence for learning. This study concluded that students' ability to explore digital resources such as AI is dependent on their awareness and access to digital technologies. A study by Oladele *et al*. (2021) revealed significant differences related to the male gender, while Ayanwale *et al*. (2024) found significant differences associated with the female gender which leaves room for further investigation, in other to close the gender gap, with well-informed knowledge as a key

driver to awareness and readiness on emerging technologies which glaringly optimized their learning outcomes. This is the core target of educational goal.

From the foregoing one will deduce that exposing university students toward profound potential benefits of these cutting-edge technologies by the university community will foster awareness and readiness, owning that students develop interest and learn faster when realizes the usefulness and relevance of the content to their academic and professional endeavors. Also, this will motivate them to embrace and leverage on these cutting-edge technologies for the purposes of increasing learning outcomes, which is the core target of teaching and learning processes 'to optimized learning outcomes'' Hence the study.

The purpose of this study was to assess the level of awareness and readiness of university students towards emerging technologies for optimum learning outcomes in universities in Anambra State. Specifically, the study sought to ascertain the:

1. Level of awareness of university students towards emerging technologies in universities in Anambra State .
2. Level of readiness of university students towards emerging technologies in universities in Anambra State.
3. Extent university students use emerging technologies for improved learning outcomes in universities in Anambra State.

The following research questions guided the study:

1. What is the level of awareness of university students towards emerging technologies in universities in Anambra State?
2. What is the level of readiness of university students towards emerging technologies in universities in Anambra State?

3. To what extent do university students use emerging technologies to improve learning outcomes in universities in Anambra State?

Hypotheses was tested at 0.05 alpha level

1. There is no significant difference in the level of awareness of university students towards emerging technologies for optimum learning outcomes based on gender in universities in Anambra State.
2. There is no significant difference in the level of readiness of university students towards emerging technologies for optimum learning outcomes based on gender in universities in Anambra State.
3. There is no significant difference in the extent of usage of emerging technologies by university students for optimum learning outcomes based on gender in universities in Anambra State.

Method

The study adopted a descriptive survey research design. Survey research according to Leedy and Ormod (2019) aims at obtaining information about one or two groups of people about their behaviors, opinions either directly or systematically using their answers. The design allows for the collection and analysis of data from a sample representing a larger population. This design was considered suitable because it made use of students' opinions about their awareness and readiness towards emerging technologies. The population of this study comprises 16,523 NAU undergraduates and 13,477 COOU undergraduates, respectively amounting to the tune of 30,000(Record Academic Planning Office, 2025) with sample size of 400 undergraduate students drawn from the two universities, using multistage sampling techniques. It already involves two public universities in Anambra State, next stage was four faculties were randomly selected from each public universities. Also, in next stage two departments were randomly selected

from each faculty, after which a purposive(judgmental) sampling was employed to select students across different levels in the selected departments, for adequate management. In that vein, Nworgu (2015) opined that purposive sampling gives the researcher the opportunity to carefully and consciously choose the elements to be included in the sample in other to suit researchers' needs. A researcher's structured questionnaire titled "Awareness and Readiness of Emerging Technologies Questionnaire (ARETQ)" were printed and circulated among undergraduates students through the help of faculty/course representatives and trained research assistants, using Google Forms and physical form to reach target sample. The 30 questionnaires items were divided into four sections; Section A: Demographic information; Section B: Items measuring level of awareness towards emerging technologies; Section C: Items measuring level of readiness towards emerging technologies; Section D: Items measuring the extent of use of emerging technologies for improve learning outcomes. The items were structured on a five-point Likert rating scale of: Awareness scale consist, 1=not aware,2=slightly aware,3=moderately aware,4=very aware, 5=extremely aware; Readiness scale consists,1=not ready,2=slightly ready 3=moderately ready, 4=very ready, 5=extremely ready; Usage scale consist,1=very small extent,2=small extent,3=moderate extent,4=great extent and 5=very great extent. The instrument was validated by experts in Educational Foundations, Nnamdi Azikiwe University, Awka. Their suggestions were incorporated into the final version of the instrument. To determine reliability, a pilot study was conducted with 30 students and a Cronbach Alpha coefficient of 0.81 was obtained, indicating a high level of internal consistency. Data collected from the questionnaires were analyzed using both descriptive and inferential statistics; mean and standard derivation were used to answer the research questions while ANOVA was used to test the null hypotheses at 0.05 level of significance. With mean score check rate to be 3.00 as 3point based on 5-likert scale.

Result

Research Question One: What is the level of awareness of university student towards emerging technologies in universities in Anambra State?

Table 1: Level of Awareness of Emerging Technologies

		Undergraduates	Awareness
N	Valid	400	400
	Missing	0	0
Mean		1.44	30.3675
Std. Deviation		0.497	3.13481

The analysis from table 1 shows the mean awareness of 400 university student towards emerging technologies in universities in Anambra State as 30.3675 as a multiple of 10 items in the questionnaire. Therefore, the individual means is 3.03675 which is higher than 3point based on the rating of the 5-likert scale. The analysis indicates that the mean awareness of university students of the aforementioned universities is moderately aware. Thus, the standard deviation is 3.13481 which show a high degree of dispersion from the mean.

Research Question Two: What is the level of readiness of university student towards emerging technologies in universities in Anambra State?

Table 2: Level of Readiness to Emerging Technologies

		Undergraduates	Readiness
N	Valid	400	400
	Missing	0	0
Mean		1.44	24.3725
Std. Deviation		0.497	4.02856

The analysis from table 2 shows the mean readiness of 400 university student towards emerging technologies in universities in Anambra State as 24.3725 as a multiple of 10 items in the questionnaire. Therefore, the individual means is 2.43725 which is 2point based on the rating of 5-likert scale. The analysis indicates that the mean readiness

of university students of the aforementioned universities is slightly ready. Thus, the standard deviation is 4.02856 which show a high degree of dispersion from the mean.

Research Question 3: To what extent do university students toward use emerging technologies to improve learning outcomes in universities in Anambra State?

Table 3: Level of usage of Emerging Technologies

		Undergraduates	Usage
N	Valid	400	396
	Missing	0	4
Mean		1.44	29.3586
Std. Deviation		0.497	3.28906

The analysis from table 3 shows the mean usage of 400 university student towards emerging technologies in universities in Anambra State as 29.3586 as a multiple of 10 items in the questionnaire. Therefore, the individual means is 2.93586 2point based on the rating of the 5-likert scale. The analysis indicates that the mean usage of university student of the aforementioned universities recorded small extent usage. Thus, the standard deviation is 3.28906 which show a high degree of dispersion from the mean.

Hypothesis One: There is no significant difference in the level of awareness of male and female university student towards emerging technologies for improved learning outcomes in the universities in Anambra State.

Table 4: Test for gender awareness

	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Between Groups	1.886	13	0.145	0.58	0.87
Within Groups	96.551	386	0.25		
Total	98.438	399			

The analysis from table 5 reveal no significant difference in the level of awareness of male and female university student towards emerging technologies, given that P- value 0.87 is greater than the 0.05 level of significance. Therefore, the null hypothesis is not

rejected, thus there is no significance difference in the level of awareness of male and female university students towards emerging technologies for improving learning outcomes based on gender in universities in Anambra State.

Hypothesis Two: There is no significant difference in the level of readiness of male and female university student towards emerging technologies for improved learning outcomes in universities in Anambra State.

Table 5: Test for gender readiness

	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Between Groups	2.446	9	0.272	1.104	0.359
Within Groups	95.991	390	0.246		
Total	98.438	399			

The analysis from table 5 reveal no significant difference in the level of readiness of university student towards emerging technologies, given that P- value 0.359 is greater than the 0.05 level of significance. Therefore, the null hypothesis is not rejected, thus there is no significance difference in the level of readiness of male and female university student towards emerging technologies for improving learning outcomes in universities in Anambra State.

Hypothesis Three: There is no significant difference in the extent of usage of male and female university student towards emerging technologies for optimum learning outcomes in universities in Anambra State.

Table 6: Test for gender usage

	Sum of Squares	Df	Mean Square	F-Ratio	P-Value
Between Groups	4.1	17	0.241	0.974	0.487
Within Groups	93.564	378	0.248		
Total	97.664	395			

The analysis from table 6 reveal no significant difference in the extent of usage of emerging technologies by university student, given that P- value 0.487 is greater than the 0.05 level of significance. Therefore, the null hypothesis is not rejected, thus there is no significance difference in the extent of usage of male and female university student towards emerging technologies for improving learning outcomes in universities in Anambra State.

Discussion of Findings:

The finding on the level of awareness of university students toward emerging technologies in universities in Anambra State, revealed moderately awareness to the knowledge and understanding of profound potential benefits of these emerging technologies. The moderate awareness recorded could be that, it is still an evolving technologies that required technological skills and expositions to gain adequate insight, relevance and usefulness of the emerging technologies to their career and professional endeavors. However, the finding of this study is in consonance with the research finding of Dergunova *et al*.(2022) which revealed that the emerging technology such as, artificial intelligence showed good level of students' awareness within the scope of the research area. The results indicate that, in a relatively large number of situations, the students expressed knowledge about emerging technology. Moreso, Ventura & Lopez (2024) research finding revealed that the students are slightly aware of the AI-powered learning tools and frequently use these technologies in accomplishing their schoolwork. The level of awareness is dependent on the type of emerging technologies the students used. Also, research finding of Jaja & Emerole (2024) showed that emerging technologies such as; Al, Robotics, IoT, machine learning and block chain technology revealed low level of awareness. The finding was in discordant with the present study. The low-level

awareness recorded in Jaja & Emerole might be as a result of aforesaid assertion made by the present researchers.

Finding on the level of readiness of university students toward emerging technologies in universities in Anambra state revealed slightly ready to preparedness of embracing and leveraging on emerging technologies for improving their learning outcomes. The slight readiness recorded could be that the students are not willing to embrace the complexities that comes with digital learning and evolving technologies. Research study conducted at a privately-owned university in North-Central Nigeria suggest that, generally, students are positive and open-minded about the potential of AI to enhance their learning experiences and outcomes, alongside the necessity for sufficient training to effectively employ AI tools (Suleiman, 2024).This reveals that university are although ready but lack adequate preparedness to navigate the challenges of novel technologies and also need technological-know how to manage the complexities.

Finding on the extent of usage of university students toward emerging technologies in universities in Anambra State for improving learning outcomes revealed small extent usage. This small extent usage recorded could be that university students are wrong prioritizing their needs by using technological knowledge gain to explore entertainment platforms instead of academic purposes. It might also be that they lack required technological guidance and skills to embrace the emerging technologies. Studies by Alakash & Razak, 2020; Aldemita *et al*., (2024) shown high level of students utilization of emerging technologies. This study is in disagreement with the present study that recorded small extent usage.

No significant differences between male and female university students in regards to awareness, readiness and usage of emerging technologies in universities in Anambra State for improving learning outcomes. Agreeing with the present study was Alimi *et al*.

(2021) which revealed no significant difference between male and female university students' awareness of the use of artificial intelligence for learning. Both studies concluded that students' ability to explore digital resources such as AI is dependent on their awareness and access to digital technologies. A study by Oladele *et al*. (2021) revealed significant differences related to the male gender. This was in disagreement with the present study.

Conclusion:

The study has revealed the current state of technological knowledge and preparedness of university students in Anambra State universities towards embracing and leveraging on emerging technologies for purposes of improving learning outcomes in 21st century education. The findings of the study obviously revealed that potential benefits of emerging technologies have not be given the right publicity that it deserves in university communities. And can only be impactful if university students are aware of its relevance and usefulness in their chosen careers as well as in their professional endeavors. This will bring about increase in learning outcomes which is the core target of education, 'optimizing learning outcomes''

Recommendations:

The following recommendations were made;

1. Staff development should be considered in various universities as they are key stakeholders in the education system. Their wealth of knowledge will facilitate students' awareness, readiness and usage of emerging technologies which will reflect in their learning outcomes.
2. Federal and State owned universities should strive to provide an enabling learning environment of making power supply stable and subsidizing internet facilities for university students to support the demand of 21st education.

3. A periodic sensitization programme where university students will be educated on the relevance of these emerging technologies for their academic and professional development.
4. Students should be exposed to the benefits as well as the complexities of the emerging technologies, for this will help them approach technology more confidently and correctly without abuse.
5. A constant follow up awareness campaign should be established on how students should embrace and leverage on emerging technologies to brace up with expectations of 21st century learning.

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