

EMERGING TECHNOLOGIES AS CATALYSTS FOR ADVANCING ELECTRICAL AND ELECTRONIC TECHNOLOGY EDUCATION IN EKITI STATE UNIVERSITIES.

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Abstract

This study examined the emerging technologies as catalysts for advancing Electrical and Electronic Technology Education. Three research questions were raised to guide the study. A descriptive survey research design was adopted for the study. The research was carried out in Ekiti State owned universities, Ekiti State. The population of the study comprised 28 lecturers, technical staff and students of electrical and electronics technology education in the Ekiti State-owned universities, Ekiti State. Questionnaire was used to collect data from the respondents. Research questions were answered using mean and standard deviation. Data were analyzed with SPSS version 27. Findings revealed among others that some of the emerging technologies such as Artificial Intelligence, Virtual /Remote laboratory, Internet of Things, Simulation Software, Mobile Learning, Cloud Computing were utilized while, Virtual Reality, Augmented Reality, 3D Printing, Gamification and Robotics &Automation were not utilized. The study concluded that emerging technology have the potential to revolutionize Electrical and Electronic Technology Education and their effectiveness depends on proper and fully utilization of them. Based on the findings of the study, it was recommended among others that, Ekiti State universities should fully integrate emerging technologies and enforce its utilizations.

Key words: Emerging Technologies, Electrical and electronic technology education.

Introduction

Emerging technologies are transforming educational systems globally, particularly in technical and vocational disciplines. The global education system is undergoing a profound transformation driven by the rapid emergence of new technologies, which continue to reshape how knowledge is produced, transmitted, and consumed in university settings, especially within engineering and applied science disciplines (Schwab, 2016). This transformation reflects broader changes associated with the Fourth Industrial Revolution, where technological

advancements are redefining skills development and knowledge systems. The increasing adoption of digital tools, artificial intelligence, and smart learning environments has significantly influenced curriculum design and instructional delivery in higher education (Selwyn, 2017). These developments are reshaping teaching practices and redefining pedagogy toward more flexible, learner-centered approaches. The integration of emerging technologies into engineering and technology education remains uneven and constrained by systemic challenges within Nigeria. These challenges include

inadequate funding, weak policy implementation, insufficient infrastructure, and limited digital competencies among educators. Such constraints hinder the effective adoption of Fourth Industrial Revolution Technologies in higher education and underscore the need for strategic reforms tailored to the local context (National Academies of Sciences, Engineering, and Medicine, 2017).

Addressing these issues requires targeted investment in digital infrastructure, capacity building for educators, and the development of context-specific policies that support innovation in teaching and learning. The emerging technologies such as Artificial Intelligence, Virtual/Remote Laboratory, Augmented Reality, Internet of Things, Simulation Software, 3D Printing, Gamification, Mobile Learning, Cloud Computing, and Robotics and Automation can be integrated into teaching of electrical and electronic technology for advancement.

Electrical and Electronic Technology (EET) education occupies a pivotal position at the intersection of theory and practice. The discipline focuses on the study and application of electricity, electronics, and electromagnetism, and it plays a critical role in advancing industries such as transportation, healthcare, construction, and robotics. In recent years, EET education has increasingly been influenced by emerging technologies such as artificial intelligence, the Internet of Things (IoT), virtual and augmented reality, and simulation tools (Bo Xing & Marwala, 2017). As industries continue to integrate automation, smart systems, and intelligent networks into their operations, universities are under growing pressure to align their curricula and pedagogical approaches with these technological

realities. These technologies support interactive and experiential learning environments that promote collaboration and real-time problem-solving. However, despite their potential, many universities particularly state-owned institutions still rely heavily on traditional teaching methods that limit innovation and practical exposure, especially in Ekiti State Universities.

Ekiti State, often known as the “Fountain of Knowledge,” presents a unique case within this national landscape. The state has demonstrated relatively high literacy levels and a strong commitment to educational development. Despite these advantages, challenges persist in terms of technological infrastructure and readiness for advanced digital integration, particularly in areas such as artificial intelligence and smart learning systems. Bridging this gap requires sustained investment and strategic policy direction.

The State Universities in Ekiti State, including Ekiti State University and Bamidele Olumilua University of Education, Science and Technology, face the dual responsibility of maintaining academic standards while modernizing their engineering and technology programmes. Although efforts have been made to improve infrastructure, research capacity, and digital learning systems, the integration of emerging technologies into Electrical and Electronic Technology education remains limited and under-researched. This highlights the need for focused scholarly inquiry into how these technologies can be effectively adopted to enhance teaching, learning, and skill acquisition.

Despite the growing body of literature, significant gaps remain. Many international studies focus on technologically advanced environments,

while studies in developing contexts often emphasize challenges without adequately examining the impact of emerging technologies on learning outcomes. More importantly, there is limited research specifically addressing the integration of these technologies within Electrical and Electronic Technology education in state-owned universities in Southwest Nigeria. This study, therefore, seeks to bridge this gap by investigating how emerging technologies can serve as catalysts for improving EET education in Ekiti State universities, with implications for policy formulation, curriculum development, and institutional strategy.

Statement of the Problem

It is expected for all engineering and technology education programmes especially electrical and electronic technology education should be integrated with emerging technologies such as: Artificial Intelligence (AI), Virtual Reality (VR), Augmented Reality (AR), Internet of Things (IoT), e-library, Simulation Software, Gamification, Mobile Learning among others. The integration and utilization of the above-mentioned emerging technologies is critical and important because of the nature and important place of electrical/electronic technology education in the world.

Despite the increasing availability of emerging technologies, their integration into Electrical and Electronic Technology Education remains inadequate. Many universities still emphasize theoretical instruction with limited practical engagement, resulting in graduates who lack industry-relevant skills. There seems to be a disconnect between educational outcomes and labour market demands, leading to unemployment and underemployment among graduates. Additionally,

insufficient pedagogical frameworks and weak strategic planning hinder effective technology adoption. This study addresses the need for a comprehensive approach that integrates emerging technologies, instructional innovations, and strategic directions to enhance educational outcomes in Ekiti State Universities.

Purpose of the Study

The study purposely examined emerging technologies as catalysts for advancing electrical and electronic technology education in Ekiti State Universities. Specifically, the study

1. assessed the emerging technology utilized by Electrical and Electronic Technology education in Ekiti-State Universities
2. examined the extent of emerging technology utilization by Electrical and Electronic Technology education in Ekiti State Universities.
3. determined the impact of emerging technology utilization on Electrical and Electronic Technology education in Ekiti State Universities.

Research Questions

The following research questions are raised to guide this study.

1. What are the emerging technology utilized by Electrical and Electronic Technology education in Ekiti State Universities?
2. To what extent of emerging technology utilized by Electrical and Electronic Technology education in Ekiti State Universities?
3. What is the impact of emerging technology utilization on Electrical and Electronic Technology education in Ekiti State Universities?

Methodology

This study adopted a descriptive survey research design to examine emerging technologies as catalysts for advancing Electrical and Electronic Technology education in Ekiti State Universities. The descriptive survey design is appropriate for this study because it enables the researcher to collect data from respondents and describe existing conditions, and experiences relating to the emerging technologies.

The population of the study is 28 which consist 5 Lecturers, 18(300 and 400level) students, and 5 technologists in Electrical and Electronic Technology of the department of Vocational and Technical Education in the Ekiti State Universities. These universities are: Ekiti

State University, Ado Ekiti and Bamidele Olumilua University of Education, Science and Technology, Ikere Ekiti. Since the population was of a manageable size, there was no sampling technique. Structured questionnaire was used as a sole instrument used to collect data. It was developed on a 4point Likert type rating scale of Strongly Disagree (SD) = 1, Disagree (D) = 2, Agree (A) = 3, strongly Agree (SA) = 4. Twenty-eight (28) copies of the questionnaire were administered to the respondents; however, the retrieval rate was 100%.

The data collected was analyzed using both descriptive and inferential statistics. Frequency counts, percentages were used to answer the research questions, regression analysis and thematic analysis were used to test the hypotheses at 0.05 level of significance.

Result and Discussion

Table 1: Responses of the respondents on the assessment of the emerging technologies utilized by Electrical and Electronic technology education in Ekiti State universities.

S/N	ITEM	$\bar{X}$	S. D	R
1	Artificial Intelligence (AI) tools	2.82	1.12	U
2	Virtual Reality (VR)	2.23	1.10	NU
3	Augmented Reality (AR)	2.31	1.17	NU
4	Virtual/Remote Laboratories	2.68	1.22	U
5	Internet of Things (IoT)	2.89	1.07	NU
6	Simulation Software	2.81	1.05	U
7	3D Printing	2.00	.98	U
8	Gamification	2.04	.99	NU
9	Mobile Learning	2.82	1.06	U
10	Cloud Computing	2.86	1.08	U
11	Robotics and Automation	2.07	1.05	NU

Key $\bar{X}$ = mean, SD= Standard deviation, R= Remark, Utilized (U), Not Utilized(NU)

Analysis table1, shows that items 1,4, 5, 6 ,9 and 10 with the mean ranges from 2.68-2.89 indicated utilized. Meaning the respondents agreed that the items were utilized by electrical and electronic technology education in Ekiti

State Universities. The table also, revealed that items 2, 3, 7, 8 and 11 with the mean ranges between 2.00-2.31 indicated not utilized. Meaning that the respondents disagreed with the items to be utilized by electrical and electronic

technology education in Ekiti- State Universities. The table shows that the standard deviation range between 0.98-1.22 which is a positive and less than the

normal deviate of 1.96, thereby indicated that respondents were not too far from the mean and from one another in their responses.

Table 2: Responses of the respondents on the extent of emerging technology utilized by electrical and electronic technology education in Ekiti State Universities.

S/N	ITEM	$\bar{X}$	S. D	R
1	Artificial Intelligence (AI) tools	2.82	1.12	FU
2	Virtual Reality (VR)	2.23	1.10	UU
3	Augmented Reality (AR)	2.31	1.17	UU
4	Virtual/Remote Laboratories	2.68	1.22	AU
5	Internet of Things (IoT)	2.89	1.07	FU
6	Simulation Software	2.81	1.05	FU
7	3D Printing	2.00	.98	NU
8	Gamification	2.04	.99	NU
9	Mobile Learning	2.82	1.06	FU
10	Cloud Computing	2.86	1.08	FU
11	Robotics and Automation	2.07	1.05	NU

Keys: $\bar{X}$ = Mean, SD= Standard Deviation, R= Remark, Fully Utilized (FU), Adequately Utilized (AU), Under Utilized (UU) and Not Utilized (NU)

Analysis table 1 shows that items 1, 5, 6, 9, and 10 with the mean ranges from 2.81 - 2.89 indicated fully utilized and item 4 is adequately utilized with range of 2.68. Meaning the respondents agreed that the items were utilized by electrical and electronic technology education in Ekiti State Universities. The table also, revealed that items 2 and 3 indicated underutilized with range between 2.23-2.31. Meaning the respondents disagreed with the items to be utilized Items 7, 8 and 11 with the

mean ranges between 2.00 - 2.31 indicated not utilized. Meaning that the respondents disagreed with the items to be utilized by electrical and electronics technology education in Ekiti State Universities. The table shows that the standard deviation ranges between 0.98 – 1.22 which is a positive and less than the normal deviate of 1.96, thereby indicated that respondents were not too far from the mean and from one another in their responses.

Table 3: the responses of the respondents on the impact of emerging technology utilization on Electrical and Electronic Technology education in Ekiti State Universities.

S/N	N	$\bar{X}$	S. D	R
1	The use of simulation software improves students' understanding of complex EET concepts	2.82	1.12	A
2	Virtual laboratories provide a safe and effective alternative to physical laboratory experiments in EET	2.25	1.11	D
3	Augmented Reality (AR) tools enhance students' visualisation and comprehension of electronic circuits and systems	2.14	1.08	D
4	The integration of AI-based tutoring systems helps to personalise learning for EET students	3.21	.79	A
5	IoT-based projects improve students' practical skills and problem-solving abilities in EET	3.00	1.05	A
6	The use of gamification and game-based learning tools increases student engagement and motivation in EET courses	1.86	.97	D
7	Mobile learning technologies make EET learning resources more accessible outside the classroom	3.00	.94	A
8	The use of emerging technologies improves overall student academic performance in EET programmes	3.04	1.03	A
9	Emerging technologies make it easier for students to understand power systems and renewable energy concepts	3.00	.98	A
10	The flipped classroom model (supported by technology) enhances active participation of students in EET	3.07	1.05	A

Keys: $\bar{X}$ = Mean, SD= Standard Deviation, R= Remark, A= Agree, D=Disagree

Table 3 shows that items 1, 4, 5, 7, 8, 9, and 10 with the mean range between 2.83 – 3.21 indicated agreed. Meaning the respondents agreed that those emerging technology utilization have positive impacts on Electrical and Electronic Technology education in Ekiti State Universities. The table again, revealed that items 2, 3, and 6 with the mean ranges between 1.86 - 2.25 indicated disagreed. Meaning the respondent agreed that those emerging technology utilization have no positive impacts on electrical and electronic technology education in Ekiti State Universities. The table shows that the standard deviation ranges between 0.79 – 1.12 which is a positive and less than the normal deviate of 1.96, thereby indicated that respondents were not too far from the mean and from one another in their response

Discussion of Findings

The finding revealed on research question one that seek to assess the emergent technologies utilized in electrical and electronic technology education in Ekiti State Universities. It was revealed that: Artificial Intelligence (AI) tools, Virtual/Remote Laboratories, Internet of Things (IoT), Mobile Learning are utilized. This study is in agreement with the study of Abubakar (2024) who found out that lecturers are aware and uses mobile learning. It was revealed also, that some of the emergent technologies were not utilized by electrical and electronic technology education in Ekiti State universities. Such technologies are: Virtual Reality (VR), Augmented Reality (AR), Gamification among others. This study disagreed with the study of Asoodar et al, (2025) who revealed that Virtual Reality (VR),

Augmented Reality (AR) are utilized in universities. These technologies are revolving therefore; there is need for every fields of the study to embrace its application and full integration.

Based on the finding of research question two. It was revealed that the extent at which some of the emerging technology has been utilized, it was revealed that some of the emerging technology were fully utilized such as Artificial Intelligence, Internet of Things, Simulation Software, Mobile Learning and Cloud Computing were fully utilized. The emerging technology such as Virtual Reality, Augmented Reality were under utilized while emerging technology such as 3D Printing, Gamification and Robotic and Automation were not utilized.

Based on the finding of research question three. It was revealed that the used emergent technologies have positive impact on electrical and electronic technology education in Ekiti State Universities. The emergent technologies and its impact are: The use of simulation software improves students' understanding of complex EET conepts, the integration of AI-based tutoring systems helps to personalise learning for EET students, IoT-based projects improve students' practical skills and problem-solving abilities in EET. The significant relationship between technology use and educational outcomes aligns with constructivist and experiential learning theories of González-Pérez & Ramírez-Montoya, (2022) which emphasize active engagement.

Conclusion

Emerging technologies have the potential to revolutionize Electrical and Electronic Technology Education. However, their effectiveness depends on proper and fully utilization of them. It was

revealed that some of the emerging technologies were utilized by electrical and electronic technology education. While, some of these emerging technologies are not utilized by them. In line with this, it was revealed that those emerging technologies utilized by Electrical and Electronic Technology education in Ekiti State Universities have positive impact on them.

Recommendations

From the findings of the study, it therefore recommends that:

1. The emerging technologies should be made available in Ekiti- State Universities for utilization by Government and the school Administration by providing internet in the schools.
2. Ekiti State Universities should fully integrate emerging technologies and enforce its utilizations by investing in digital laboratories and smart learning infrastructure, by Workshop and seminars should be organized by the university managements for fully awareness and integration of the emerging technologies and enforce its utilizations by Electrical and Electronic Technology education.

References

- Abubakar, U. (2024). Mobile pedagogy in higher education: a comprehensive analysis of mobile learning practices for classroom management in Usmanu Danfodiyo University, Sokoto State, Nigeria. *Eduscape: Journal of Education Insight*, 2(2), 99-110.
- Asoodar, M., Janesarvatan, F., Yu, H., & de Jong, N. (2024). Theoretical foundations and implications of augmented reality, virtual reality,

- and mixed reality for immersive learning in health professions education. *Advances in Simulation*, 9(1), 36.
- González-Pérez, L. I., & Ramírez-Montoya, M. S. (2022). Education 4.0 and 21st-century skills. *Sustainability*, 14(3), 1493.
- National Academies of Sciences, Engineering, and Medicine. (2017). *The fourth industrial revolution: Proceedings of a workshop—in brief*. Washington, DC: National Academies Press.
- Schwab, K. (2016). *The fourth industrial revolution*. Geneva: World Economic Forum.
- Selwyn, N. (2017). *Education and technology: Key issues and debates* (2nd ed.). London: Bloomsbury Academic.
- Swargiary, K. (2024). *Emerging technologies in education*. Research Gate Preprint.
- Xing, B., & Marwala, T. (2017). *Implications of the Fourth Industrial Age on higher education*. arXiv preprint.