Integrating Emerging Technologies in the Actualization of Sustainable Development Goals (SDGs) in Public Secondary Schools in Enugu State

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ABSTRACT

The study focused on integrating emerging technologies in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State. The researchers adopted descriptive research design for the study. The study was guided by two research questions and two null hypotheses. It was conducted in the 295 public secondary schools in Enugu State. The population for the study comprised 295 principals (201 males and 94 females). There was no sampling because the population was manageable. The instrument for data collection was researcher developed questionnaire titled "Integrating Emerging Technologies in the actualization of SDGs Questionnaire (IETASDGsQ)". The instrument contained 13 items based on the two research questions. Research experts in Faculty of Education, Enugu State University of Science and Technology validated the instrument. The reliability of the instrument was determined by the use of Cronbach Alpha method which yielded .80 for cluster 1 and .76 for cluster 2 with an overall reliability index of .79 which indicated that the instrument is reliable. Mean and standard deviation were used to answer the research questions and t-test statistic to test the hypotheses. The findings of the study showed that emerging technologies are integrated in the areas of record management and instructional delivery in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State to a low extent. Based on the findings, the study recommended that government should provide the emerging technologies needed in order for quality education to take place.

Keywords: Emerging Technologies, Sustainable Development Goals (SDGs)

INTRODUCTION

Education has significantly contributed to the enhancement of knowledge development, fostering an environment conducive to innovation, and cultivating the human capital necessary for a potential future knowledge-based economy. According to Okai (2020), education is widely recognized as a potent instrument for driving societal transformation. Education plays a vital role in societal progress, leaving no room to doubt that it serves as the driving force behind growth and advancement in all human endeavors. Oparaji and Ugwu (2019), characterize education as an essential tool for achieving sustainable development and as a means to propel knowledge forward. In Nigeria, secondary education holds a pivotal role in preparing individuals for higher education. As described by Ogohi (2020), secondary education is a facet of learning that nurtures learners' cognitive, emotional, and practical attributes, shaping them into better citizens and readying them for tertiary education. Okechukwu and Ukeh (2022), asserted that the central focus in achieving educational objectives is now on the incorporation of technology. The integration of emerging technologies into teaching and learning has revolutionized the traditional classroom, as suggested (Mormah and Bassey, 2021). According to Okigbo and Ukeh (2020),

emerging technology has really brought in a total innovation into teaching and learning in the academic activities. Onyekaba (2021), asserted that for entities like secondary education, emerging technologies stand as the lifeblood, driving its operations.

Emerging technologies play a significant role in shaping the educational process. According to Bozalek (2015), these technologies are defined as those with the potential to greatly impact teaching, learning, and creative inquiry for learners, or those technologies that are currently gaining prominence. They encompass various fields such as educational technology, information technology, nanotechnology, biotechnology, robotics, and artificial intelligence. Bukukbaykal (2015) conducted research that revealed how technological advancements have opened up new possibilities in education. The integration of emerging technologies involves utilizing technology to carry out academic tasks, including delivering instruction and managing records.

Record keeping involves the organized method of recording, storing, documenting, and retrieving information for organizational purposes. Within the context of educational institutions, school records encompass documents, books, digital storage, and other materials containing information about the daily activities of the school. Egwuyenga (2016) emphasized that record management is the backbone of an organization. Chinyemba and Ngulube, cited in Egoeze, Misra, Maskeliūnas, and Damaševičius (2018), emphasized that effective records management is crucial for universities to efficiently fulfill their roles, protect themselves from legal issues, preserve institutional memory, and promote accountability and good governance.

Traditionally, schools maintained records using physical files, filing cabinets, and desk-based systems for teaching, learning, and administrative purposes. Atsu (2014) pointed out that the utilization of technology for record keeping assists school administrators in managing tasks related to curriculum, instruction, school-community relations, and operational aspects. Juma, Raihan, and Clement (2016), discovered that information and communication technologies (ICTs) enhance efficiency in managing student records by streamlining information organization, enabling swift and accurate data analysis, improving coordination, and facilitating prompt and effective decision-making. Effective record management has the potential to elevate instructional delivery in public secondary schools.

Instructional delivery refers to the dynamic interplay involving students, educators, content, and the necessary knowledge for effective learning and collaboration within a diverse society and a rapidly evolving world (Canales, 2020). Edeh (2019), stated that the incorporation of new technologies into the teaching and learning process is no longer optional but essential for educators due to the significant impact of technology on education. This impact is particularly relevant in the context of changing learning environments, the demand for adaptable teaching methods, and the drive to enhance creativity and innovation in education. In educational settings, emerging technologies encompass hardware, software, and networking solutions that aid in professional development for staff (Wordu and Kwata, 2020). This investment is justified by the positive influence it has on school performance, effectiveness, and efficiency (Carnoy, 2014). Kiplagat (2011), noted that educational institutions are adopting computer technology to complement traditional classroom methods and administrative practices.

Consequently, both students and school administrators or managers require computer literacy to excel within the school environment. Owulu, Ntamu, and Monity (2016), emphasized that effectively harnessing information and communication technology (ICT) resources for instructional purposes empowers teachers to address individual learning differences and encourages student engagement, participation, and comprehension. This engagement aids students in developing a solid foundation for their thoughts and emotions, contributing to improved academic achievements in schools. With the rise of emerging technologies, Kasinathan (2022), highlighted the imperative nature of societal transformation to achieve Sustainable Development Goals. This need became even more pronounced with the onset of the pandemic. The integration of emerging technologies is widely acknowledged as central to realizing sustainable development objectives.

The Sustainable Development Goals (SDGs), established on September 25, 2015, represent a universal set of objectives, targets, and indicators aimed at eradicating all forms of poverty by 2030 and harmonizing the three aspects of sustainable development: economic, social, and environmental (UN Assembly, 2015). Comprising seventeen global goals, the SDGs serve as a comprehensive plan to create a more sustainable and improved future for everyone. Each of these 17 goals is set to be accomplished by 2030, across every nation worldwide. The underlying vision of the SDGs encompasses a world without poverty, hunger, illness, or deprivation, where life flourishes, fear and violence are absent, universal literacy is achieved, and equitable and universal access to quality education, healthcare, and social safeguards ensures the well-being of individuals in physical, mental, and social realms. Furthermore, the SDGs aim for universal respect for human rights and dignity, upholding principles of justice, equality, and non-discrimination, as well as celebrating diversity in race, ethnicity, and culture. The aspiration is to provide equal opportunities that unlock human potential and contribute to shared prosperity (United Nations, 2021). To fulfill these ambitions, the SDGs necessitate the incorporation of technological advancements and emerging technologies. Meanwhile, in the context of secondary education, the key driving force behind realizing the SDGs' objectives is the school principal.

Principals serve as the leaders of secondary schools, responsible for overseeing all school activities. According to Chidobi (2012), the term "principal" refers to the head of a secondary school, and this individual holds a significant role within the institution. Nwogu and Ebunu (2019) emphasize that principals serve as managers of secondary education, carrying out various administrative tasks regardless of their gender.

Gender plays a crucial role in this study, referring to socially constructed roles, behaviours, and expectations associated with males and females. The World Health Organization (WHO) (2016) defined gender as encompassing the characteristics, responsibilities, and roles attributed to women, men, boys, and girls within societal norms.

The researchers' concerns in this study stem from the growing student population in public secondary schools, which negatively impacts record management and instructional delivery. It's evident that educational institutions are experiencing a significant increase in student numbers across all levels. This situation leads to challenges such as an overwhelming amount of files and documents that cannot be efficiently managed using traditional

methods. Issues arise due to limited space, inadequate file storage solutions, and difficulties in organizing and retrieving necessary files and documents. To address these challenges and work towards achieving Sustainable Development Goals (SDGs), there's a need to incorporate emerging technologies into public secondary schools in Enugu State.

Statement of the Problem

The incorporation of emerging technologies in achieving Sustainable Development Goals (SDGs) within public secondary schools has shown uneven progress. The significant surge in student enrollment within Enugu state's public secondary schools has complicated administrative procedures. Challenges arise from managing the large student population and maintaining extensive record-keeping, both of which have hindered the advancement of SDGs in these schools. This research addresses the issue of insufficient integration of emerging technologies in public secondary schools, despite government initiatives. Regrettably, many conventional methods still persist in managing administrative tasks within these schools. Hence, this study explores the degree to which emerging technologies are integrated in achieving SDGs, focusing on record management and instructional approaches, within Enugu State's public secondary schools in Nigeria.

Purpose of the Study

The purpose of the study was to ascertain the extent of integrating emerging technologies in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu state. Specifically, the study sought to:

1. determine the extent of integration of emerging technologies for record management in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State;

2. examine the extent of integration of emerging technologies for instructional delivery in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State.

Research Questions

The following research questions guided the study:

1. To what extent are emerging technologies integrated for record management in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State?

2. To what extent are emerging technologies integrated for instructional delivery in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State?

Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance:

Ho_1: There is no significant difference between the mean ratings of male and female principals on the extent to which emerging technologies are integrated for record management in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State.

Ho_2: There is no significant difference between the mean ratings of male and female principals on the extent to which emerging technologies are integrated for instructional delivery in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State.

Research Method

The researchers employed a descriptive survey research design, which involves

gathering and systematically describing characteristic features or facts about a given population. The study focused on 295 principals (201 males and 94 females) from public secondary schools in Enugu State. Since the population was manageable, the researchers didn't need to use sampling. This approach is consistent with the idea that a small or manageable population can be studied as a whole, as suggested by Uzoagulu (2013). For data collection, the researchers used a structured questionnaire titled "Integrating Emerging Technologies in the Actualization of SDGs Questionnaire (IETASDGsQ)" with 13 items based on the research questions. Three research experts, two from the Department of Educational Management and one from the Department of Mathematics and Computer Education at Enugu State University of Science and Technology (ESUT), validated the instrument. The instrument's reliability was confirmed using the Cronbach Alpha method, resulting in a reliability index of 0.79, indicating its reliability. Among the 295 administered questionnaires, 281 (193 males and 88 females) were retrieved, yielding a return rate of 95.25%. To address the research questions, the researchers analyzed the data using mean and standard deviation, while the hypotheses were tested using a t-test statistic at a significance level of 0.05.

Data Analysis and Results Presentation
Research Question 1: To what extent are emerging technologies integrated for record management in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State?

Table 1: Mean ratings of male and female principals on the extent to which emerging technologies are integrated for record management in the actualization of SDGs in public secondary schools

S/N	ITEMS	Male Principals 193		Female Principals 88		Overall 281		
	Emerging technologies are integrated for record management when:	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	Dec
1	word processing is integrated for storing information on students' results.	1.54	.82	1.53	.83	1.54	.83	LE
2	details of my class list are kept in ICT devices.	2.48	.83	2.47	.81	2.48	.82	LE
3	teaching content is kept in computers.	1.50	.83	1.51	.82	1.51	.82	LE
4	spread sheet is meant for preparing time table.	2.41	.83	2.38	.80	2.40	.82	LE
5	spread sheet helps to save students' attendance register.	2.08	.80	2.00	.80	2.04	.80	LE

		$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	
6	database package helps to store and retrieve records on students' academic performance.	2.27	.83	2.21	.82	2.24	.83	LE
	Cluster Mean/SD	**2.05**	**.82**	**2.02**	**.81**	**2.04**	**.82**	**LE**

The data analysis presented in Table 1 illustrates the average ratings assigned by male and female principals regarding the incorporation of emerging technologies for record management in achieving Sustainable Development Goals (SDGs) within Enugu State's public secondary schools. For male principals, the mean ratings ranged from 1.54 to 2.48, while for female principals, the range was 1.51 to 2.38. The cluster means for male and female principals were 2.05 and 2.02, respectively, with corresponding standard deviations of 0.82 and 0.81. Nonetheless, when considering their overall ratings, they spanned from 1.51 to 2.40, yielding a cluster mean of 2.04 and a standard deviation of 0.82 for both male and female principals. The study's findings indicate that the integration of emerging technologies for record management in pursuit of Sustainable Development Goals (SDGs) within Enugu State's public secondary schools is relatively limited.

Research Question 2: To what extent are emerging technologies integrated for instructional delivery in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State?

Table 2: Mean ratings of on the extent to which emerging technologies are integrated for instructional delivery in the actualization of SDGs in public secondary schools

	ITEMS	Male Principals 193		Female Principals 88		Overall 281		
S/N	Emerging technologies are integrated for instructional delivery when:	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	Dec
7	teachers integrate on-line test multimedia to assess the students' level of performance.	2.47	.83	2.43	.85	2.45	.84	LE
8	teachers use multimedia application to prepare instructional materials.	2.34	.85	2.36	.83	2.35	.84	LE
9	compact disks are used by students to record lecturers and replay them back for more and better understanding .	2.37	.86	2.33	.80	2.35	.83	LE
10	teachers use word processing application for preparing lesson notes.	2.48	.85	2.48	.84	2.48	.85	LE

11	teachers use Computer Assisted Instruction (CAI) to deliver their lesson to students.	2.37	.89	2.35	.86	2.36	.88	LE
12	instructors use Computer Aided Teaching (CAT) to make teaching easier and faster	2.24	.85	2.23	.84	2.24	.85	LE
13	teachers use computer assisted instruction (CAI) for students self directory learning.	2.48	.83	2.47	.81	2.48	.82	LE
	Cluster Mean/SD	**2.39**	**.85**	**2.38**	**.83**	**2.39**	**.84**	**LE**

The data analysis on Table 2 above shows the mean ratings of male and female principals on the extent to which emerging technologies are integrated for instructional delivery in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State. The male principals' means ranged from 2.24 to 2.48, while the female principals' means ranged from 2.23 to 2.48 respectively. The values of the cluster means for male and female principals are 2.39 and 2.38 with standard deviations of .85 and .83 respectively. However, their overall means ranged from 2.24 to 2.48 with cluster mean of 2.39 and standard deviation of .84 respectively. The finding of the study shows that emerging technologies are integrated for instructional delivery in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State to a low extent.

Hypotheses

Ho$_1$: There is no significant difference between the mean ratings of male and female principals on the extent to which emerging technologies are integrated in record management in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State.

Table 3: t-test on the mean ratings of male and female principals on the extent to which emerging technologies are integrated in record management in the actualization of Sustainable Development Goals (SDGs) in public secondary schools

Group	N	x̄	SD	df	p-value	Decision
Male Principals	193	2.05	.82	279	.105	H0$_1$ not rejected
Female Principals	88	2.02	.81			

Data on Table 3 for male and female principals on the extent to which emerging technologies are integrated for record management in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu state show that at 279 degree of freedom, the p-value was .105. The outcome of the p-value

is greater than 0.05 level of significance set for this study. This signifies that the null hypothesis was not rejected, therefore, there was no significant difference between the mean scores of male and female principals on the extent to which emerging technologies are integrated for record management in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu state.

Ho₂: There is no significant difference between the mean ratings of male and female principals on the extent to which emerging technologies are integrated in instructional delivery in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State.

Table 4: t-test on the mean ratings of male and female principals on the extent to which emerging technologies are integrated in instructional delivery in the actualization of Sustainable Development Goals (SDGs) in public secondary schools

Group	N	$\overline{\text{x}}$	SD	df	p-value	Decision
Male Principals	193	2.39	.85	279	.069	H0₂ not rejected
Female Principals	88	2.38	.83			

Data on Table 4 for male and female principals on the extent to which emerging technologies are integrated for instructional delivery in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu state show that at 279 degree of freedom, the p-value was .069. The outcome of the p-value is greater than 0.05 level of significance set for this study. This signifies that the null hypothesis was not rejected, therefore, there was no significant difference between the mean scores of male and female principals on the extent to which emerging technologies are integrated for instructional delivery in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu state.

Discussion of Findings
The finding of the study shows that emerging technologies are integrated for record management in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State to a low extent. The finding of the study is in agreement with Atsu (2104), who opined that emerging technologies have not been integrated for record keeping. Atsu (2014) noted that the use of technologies for record keeping assisted the school administrator to meet the tasks of school management in the areas of curriculum and instruction, school community relationship and school business operations. Further finding showed that there was no significant difference between the mean scores of male and female principals on the extent to which emerging technologies are integrated for record management in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu state.

The finding of the study shows that emerging technologies are minimally integrated for instructional delivery in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State to a low extent. Further finding showed that there was no significant difference between the mean scores of male and female principals on the extent to which

emerging technologies are integrated for instructional delivery in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu state.

Conclusion

Integration of emerging technologies has great influence on the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State. Emerging technologies produce effective, efficient and excellent services in secondary education management of staff/students' records as well as instructional delivery. Unfortunately, secondary schools in Enugu state are yet to take full benefits of emerging technologies. However, the study showed that emerging technologies are integrated for record management and instructional delivery in the actualization of Sustainable Development Goals (SDGs) in public secondary schools in Enugu State to a low extent.

Recommendations

Based on the findings, the following recommendations were proffered:
1. Enugu state government should provide the emerging technologies needed in order for effective record management to be actualized.
2. There should be a continuous training of teachers to update their knowledge on learning technologies in order to deliver instruction effectively.

REFERENCES

Atsu, A.A. (2014). Provision, utilization and information and communication technology (ICT) resources and secondary school administrators' effectiveness in Cross River State, Nigeria. *Unpublished Ph.D. Dissertation, Faculty of Education, University of Calabar, Calabar-Nigeria.*

Büyükbaykal, C.I. (2015). Communication technologies and education in the information age. *Procedia-Social and Behavioural Sciences, 174*, 636-640.

Carnoy, M. (2014). Distance Education in China: A Discussion of the History, Challenges and Implications for China in the, 2014.

Chidobi, R.U. (2012). *Administration of secondary Education (Principalship)*. Enugu. Godswill prints Enterprise.

Edeh, M.O. (2019). Integration of emerging technologies in teaching and learning process in Nigeria: the challenges. *Central Asian Journal of Mathematical Theory and Computer Sciences, 1*(1), 35-39.

Egoeze, F., Misra, S., Maskeliūnas, R. & Damaševičius, R. (2018). Impact of ICT on universities administrative services and management of students' records: ICT in university administration. *International Journal of Human Capital and Information Technology Professionals (IJHCITP) 9*(2); 1-16.

Juma, D., Raihan, F.A. & Clement, D. (2016). Users' studies and information needs. *Journal of Documentation, 62*(6), 671-179.

Kasinathan, P. (2022). Realization of Sustainable Development Goals with disruptive technologies by integrating industry 5.0, Society 5.0, Smart Cities and Villages. *Sustainability, 14*, 15258; 1-31.

Mormah, F.O. & Bassey, A.B. (2021). Teacher education in Nigeria and the emerging technologies in the 21st century classroom. *African Educational Research Journal*, *9*(3), 641-647.

Nworgu, B.G. (2018). *Educational research, basic issues and methodology*. University Trust Publishers Nsukka, Nigeria.

Nwogu, U.J. & Ebunu, A.A. (2019). Principals' technical and conceptual management skills for effective administration of public secondary schools in Delta State, Nigeria. *Educational Research International*, 8(3), 63-72.

Ogohi, C.D. (2020). Effects of communication strategies on the performance of public organisations in Nigeria. *The International Journal of Science & Technoledge*, 6(8); 51-58.

Okai (2020). Impact of training on academic staff productivity in public universities in Rivers State. *International Journal on Integrated Education*, 3(12), 513-518.

Okechukwu, O. & Ukeh, B.O. (2022). Awareness of cloud computing services in Tertiary Institutions in Enugu State. *International Technology Research Journal*, 8(1), 27-34.

Okigbo, F.S. & Ukeh, B.O. (2020). Information and communication technology competencies needed and possessed by academic staff of the colleges of education in Enugu State. *Sapientia Global Journal of Arts, Humanities and Development Studies (SGOJAHDS)*, 3(3), 197-207.

Onyekaba, M.N. (2021). Assessment of utilization of Information and Communications Technology (ICT) facilities in Colleges of Education in North-West Geo-Political Zone, Nigeria. *African Journal of Science, Technology & Mathematics Education (AJSTME)*; 6(1), 145-156.

Oparaji, I.C. & Ugwu, I. (2019). Self-regulated learning as correlates of academic achievement of students of economics in secondary schools in Imo State. *South Eastern Journal of Research and Sustainable Development (SEJRSD)*, 2(2), 101-114.

Owulu, E.E., Ntamu, G.U. & Monity, F.M. (2016). ICT utilization and student's academic performance in Christian Religious Studies in Calabar Municipality, Nigeria. *The International Journal of Social Sciences and Humanities Invention*, 3(11), 2925-2932.

UN United Nations (UN, 2015). *Transforming our world: The 2030 Agenda for sustainable Development*. UN, New York.

United Nations (2021). Transforming our world: the 2030 Agenda for Sustainable Development. *Retrieved from https://sustainabledevelopment.un.org*.

Uzoagulu, A.E. (2011). *Practical guide to writing research projects reports in tertiary institutions*. Enugu: Cheston Ltd.

World Health Organization (2016). *Gender and health*.

Wordu, H. & Kwata, B.E. (2020). Acquisition and utilization of information and communication technology in the administration of secondary schools in Rivers State, Nigeria. *International Journal of Advanced Education and Research*, 5(1), 13-18.