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Artificial intelligence tools for effective teaching and learning in colleges of education in south east Nigeria

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ABSTRACT

The emergence of artificial intelligence (AI) brings new possibilities as well as new challenges to the teaching-learning process. The paper focused on artificial intelligence for effective teaching and learning in colleges of education in south east Nigeria. Colleges of education are heavily dependent on human and manual work, leading to an increase in operational costs and errors, as well as slow processing in the field. This has resulted in a significant burden on Colleges of education and must spend a large budget on hiring and retaining educators and processing data. Additionally, institutions put a considerable amount of effort into the admission, learning, and success of all their students, leading to wasted information and efforts on repetitive tasks that can be minimized. The paper concludes that, internationally, there is a growing recognition of the need to integrate AI into education to foster innovation and address the evolving demands of the workforce. Recommendations were also made which include: Professional development and training programs should be provided for educators to build their capacity for effectively integrating AI tools and resources into their area of specialization and also allocate resources for AI integration, including training educators, providing updated technology and teaching aids, and fostering partnerships to ensure access to necessary tools.

1. Introduction

In the last few decades, technology has occupied a commanding position in almost every aspect of human life. Humans cannot imagine a single day without technological interference. The emergence of artificial intelligence (AI) brings new possibilities as well as new challenges to the teaching-learning process. The use of Artificial Intelligence (AI) in education has the potential to revolutionize the way we teach and learn, making education more personalized, engaging and effective. AI can be used to develop personalized learning systems that adapt to the needs and abilities of individual learners. These systems can use data such as learner performance and behavior to create customized learning experiences that improve engagement and learning outcomes. AI can also be used to develop intelligent tutoring systems that provide feedback and guidance to learners. Internationally, there is a growing recognition of the need to integrate AI into education to foster innovation and address the evolving demands of the workforce (Olatunde-Aiyedun, 2024). However, countries around the world are experimenting with AI-driven educational technologies, emphasizing the cultivation of critical thinking, problem-solving, and adaptability—skills essential for thriving in the Fourth Industrial Revolution.

Moreover, Copeland (2024) defined artificial intelligence (AI) as the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning,

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generalize, or learn from past experience. Bassey and Owushi (2023) defined artificial intelligence (AI) as “the development of computer systems that can perform tasks that typically require human intelligence.” Additionally, Laskowski (2024) mentioned that artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert systems, natural language processing, speech recognition, and machine vision. In a number of areas, AI can perform tasks much better than humans. Kanade (2022) described artificial intelligence (AI) as the intelligence of a machine or computer that enables it to imitate or mimic human capabilities. AI uses multiple technologies that equip machines to sense, comprehend, plan, act, and learn with human-like levels of intelligence. Fundamentally, AI systems perceive environments, recognize objects, contribute to decision-making, solve complex problems, learn from past experiences, and imitate patterns. In the same vein, Glover (2024) stated that artificial intelligence (AI) is a wide-ranging branch of computer science that aims to build machines capable of performing tasks that typically require human intelligence. While AI is an interdisciplinary science with multiple approaches, advancements in machine learning and deep learning, in particular, are creating a paradigm shift in virtually every industry. Artificial intelligence allows machines to match, or even improve upon, the capabilities of the human mind.

Colleges of education are heavily dependent on human and manual work, leading to an increase in operational costs and errors, as well as slow processing in the field. This has resulted in a significant burden on Colleges of education and must spend a large budget on hiring and retaining educators and processing data. Additionally, institutions put a considerable amount of effort into the admission, learning, and success of all their students, leading to wasted information and efforts on repetitive tasks that can be minimized. However, adoption of artificial intelligence can bring a cheaper and more responsive approach to the higher education industry, reducing both financial and physical losses (Olatunde-Aiyedun, & Hamma, 2023). Despite the great potentials of AI-enabled learning supports, the pervasive use of technology in education does not guarantee teachers’ ability to deploy technology in classrooms, nor does it ensure the quality of teaching since teachers are not yet fully prepared to implement AI based education (Lydia, Vidhyavathi and Malathi, 2023). Moreover, scholars have claimed that the successful implementation of new instructional technologies is closely related to the attitudes of the teachers who lead the lesson.

Despite decades of professional development about educational technology integration, a great number of teachers still view the implementation of technology in the classroom negatively and are not inclined to use it. Instead, they continue using the same materials and teaching methodologies, rejecting the application of anything that might bring negative outcomes (Tallvid, 2016). Moreover, anxiety brought about by using new technologies can act as a burden and hinder teachers’ efforts to introduce technology on-site (Hébert,. Roorda,, Koomen, Spilt & Oort (2021). In view of this, teachers need to learn not only how to use technology but also how to successfully integrate it into their curricula. Also, in order to be open to integrating advanced technology into their lessons, teachers need to understand the importance of educational technology and the affordances that it can bring to instruction. Furthermore, when it comes to AI, a great number of teachers and school officials have not yet experienced AI-based learning support and might simply recognize it as slightly more advanced educational technology. Consequently, before the successful application of an AI support system into education and an evaluation of its effectiveness, teachers should first utilize it themselves so that they can fully understand how it can scaffold STEM learning in particular in scientific writing.

Consequently, educators can help their students navigate the rise of AI by teaching them how to ask good questions that machines can answer. As AI becomes more advanced, it will become increasingly important for individuals to know how to communicate effectively with these technologies. By developing critical thinking skills and learning to ask questions requiring higher-order thinking, students can learn to leverage AI’s power to enhance their learning and

problem-solving abilities. This will prepare them for the future job market and help them better understand the capabilities and limitations of AI and ultimately appreciate what makes humans unique. Another challenge related to using AI in education is its potential to widen the digital divide. According to **Liao, Huang, Sun, & Li (2021)**, not all students have equal access to technology or the internet, which can create disparities in their ability to benefit from AI-powered tools and resources. This digital divide can exacerbate existing inequalities in educational opportunities and outcomes. Therefore, educators must ensure that AI tools are accessible to all students and take steps to close the digital divide, such as providing access to technology and internet resources in underserved communities. In addition to ensuring equal access to AI powered tools, it is also essential for educators to learn how to incorporate AI into their teaching practices effectively. As AI becomes more prevalent in education, teachers must stay up to-date with the latest developments in AI and how to use it to enhance their teaching.

The best place to start is the category that brought AI to the mainstream. AI chatbots allow you to chat with an AI large language model, letting you ask questions and get answers in a conversational style. The best chatbots use advanced reasoning and logic, write code, and make mathematical calculations. Google AI Studio is the fast path for developers, students, and researchers who want to try Gemini models and start building with the Gemini Developer API. We also offer free tools for common AI use cases, including translation, image and video analysis, speech-to-text, and more. Google Cloud offers free usage of many AI products up to monthly limits, including Translation, Speech-to-Text, Natural Language, and Video Intelligence. There is no charge to use these products up to their specified free usage limit. The free usage limit does not expire, but is subject to change. ChatGPT is the current industry leader, and the first chatbot that set the scene on fire. Now powered by GPT-4o, 4o-mini and the o1 reasoning model, it's surprisingly flexible and very easy to use. Learn how to use ChatGPT, understand how it works, and discover how to use it to write marketing copy, do market research, or write sales emails. When you connect ChatGPT to Zapier, you can automate ChatGPT, so you can access the power of the AI chatbot from within any of your favorite apps. DALL·E, DALL·E 2, and DALL·E 3 are text-to-image models developed by Open AI using deep learning methodologies to generate digital images from natural language descriptions known as "prompts" (Gupta & Verma, 2021).

However, the use of AI in education is not without its risks. Consequently, one of the main concerns is the potential for students to use AI tools to cheat during examinations or otherwise bypass the learning process. In response to this risk, some educators have called for rethinking traditional assessments and shifting towards more creative and open-ended tasks that machines cannot quickly solve (Gupta & Verma, 2021). Furthermore, the rise of AI in education has highlighted the importance of developing "human" skills in students, such as critical thinking, creativity and problem-solving which machines cannot easily replicate (Gee, 2018). Therefore, while AI can enhance teaching and learning, educators must be mindful of its potential risks and take steps to mitigate them while prioritizing developing essential human skills in their students.

One approach is to design tasks that require creativity, critical thinking, and problem solving skills that machines cannot replicate. Similarly, open-ended tasks, such as essay writing or research projects, can be used to assess students' understanding and ability to synthesize information in their own words. By designing tasks that machines cannot quickly solve, educators can ensure that students are actively engaged in the learning process and are developing skills that will be essential for success in the future. In order to guarantee that the advantages of AI are fairly distributed and successfully achieved, Colleges of Education in the South East must address concerns about teacher preparedness, ethical considerations and equity as it considers integrating AI into its pedagogical methods.

Problem

The emergence of artificial intelligence (AI) brings new possibilities as well as new challenges to the teaching-learning process. The use of Artificial Intelligence (AI) in education has the potential to revolutionize the way we teach and learn, making education more personalized, engaging and effective. AI can be used to develop personalized learning systems that adapt to the needs and abilities of individual learners. Internationally, there is a growing recognition of the need to integrate AI into education to foster innovation and address the evolving demands of the workforce. However, Colleges of education are heavily dependent on human and manual work, leading to an increase in operational costs and errors, as well as slow processing in the field. This has resulted in a significant burden on Colleges of education who must spend a large budget on hiring and retaining educators and processing data, admissions into the institution, learning and success of all their students, leading to wasted information and efforts on repetitive tasks that can be minimized. It is against this background that the study investigated artificial intelligence for effective teaching and learning in colleges of education in south east Nigeria.

Research Questions

1. What is the extent of awareness on the available artificial intelligence tools for effective teaching and learning in colleges of education in south east Nigeria?
2. What is the extent of utilization of artificial intelligence tools for effective teaching and learning in colleges of education in south east Nigeria?

Hypothesis

1. There is no significant difference between the male and male and female teaching staff on the extent of awareness on the availability of artificial intelligence tools for effective teaching and learning in colleges of education in south east Nigeria.
2. There is no significant difference between the male and male and female teaching staff on the extent of utilization of artificial intelligence tools for effective teaching and learning in colleges of education in south east Nigeria.

Method

The study adopted a descriptive survey design. The population for the study comprised all the 3420 teaching staff in public colleges of education in South east Nigeria. The sample size for the study is 684 which is made up of the male and female teaching staff in 7 public colleges of education in South east Nigeria. A proportionate random sampling technique was used in the selection of 312 male and 372 female teaching staff in 7 public colleges of education in South east Nigeria that was used for the study which is 20% of the total population. The instruments consist of 16 items used to elicit information relevant to the problem investigated. The data for the study was gathered with a questionnaire titled "Artificial Intelligence for Effective Teaching and Learning (AIETL)". The instrument was validated and their reliability co-efficient established at 0.76. A criterion mean of 2.50 was also established to analyze the questionnaire, thus, responses with mean of 2.50 and above were accepted while those below 2.50 were not accepted. The t-test statistics was used to test the hypotheses at 0.05 level of significance.

Results

1. Research Question 1: What is the extent of awareness on the available artificial intelligence tools for effective teaching and learning in colleges of education in south east Nigeria?

Table 1: Extent of awareness on the available artificial intelligence tools for effective teaching and learning in colleges of education

			Male		Female			
			Teaching Staff		Teaching Staff		mean	
S/N	items	N= 684	x	SD	x	SD	xixi	Remark
Extent teachers are aware of the following AI tools:								
1.	Chat GPT4		2.11	0.84	2.14	0.81	2.13	Disagree
2.	Google Bard		3.10	0.77	3.18	0.79	3.14	Agreed
3.	Chatsonic		2.00	0.67	2.15	0.68	2.08	Disagree
4.	Mid journey		2.14	0.78	2.22	0.75	2.18	Disagree
5.	Dale-E3		2.10	0.66	2.17	0.74	2.14	Disagree
6.	Paradox		3.12	0.84	2.84	0.81	2.98	Agreed
7.	Synthesia		2.19	0.77	2.15	0.72	2.17	Disagree
8.	Tab9		3.14	0.84	3.06	0.72	3.10	Agreed
Aggregate Mean			2.48	0.81	2.49	0.79	2.49	Disagreed

The mean scores on table 1 ranges from 3.14 to 2.08. The mean scores from item 1 to 8 are lower than the criterion mean score of 2.50 except for item 2, 6 and 8. Therefore, item 1 to 8 except for item 2, 6 and 8 are the extent of awareness on the available artificial intelligence tools for effective teaching and learning in colleges of education in south east Nigeria.

Research Question 2: What is the extent of utilization of artificial intelligence tools for effective teaching and learning in colleges of education in south east Nigeria?

Table 2: Extent of utilization of artificial intelligence tools for effective teaching and learning in colleges of education learning in colleges of education

in colleges of education learning in colleges of education								
			Male		Female			
			Teaching Staff		Teaching Staff		mean	
S/N	items	N= 684	x	SD	x	SD	xixi	Remark
Extent teachers utilize the following AI tools:								
9.	Chat GPT4		2.12	0.84	2.24	0.81	2.18	Disagree
10.	Google Bard		3.16	0.77	3.20	0.79	3.18	Agree
11.	Chatsonic		2.10	0.67	2.17	0.68	2.10	Disagree
12.	Mid journey		2.19	0.78	2.02	0.75	2.11	Disagree
13.	Dale-E3		2.16	0.66	2.12	0.74	2.15	Disagree
14.	Paradox		2.53	0.84	2.72	0.81	2.63	Agree
15.	synthesia		2.15	0.77	2.09	0.72	2.12	Disagree
16.	Tab9		2.77	0.84	2.62	0.72	2.70	Agreed
Aggregate Mean			2.40	0.81	2.40	0.78	2.40	Agreed

The mean scores on table 2 ranges from 3.18 to 2.10. The mean scores from item 9 to 16 are lower than the criterion mean score of 2.50 except for item 10, 14 and 16. Therefore, item 9 to 16 except for item 10, 14 and 16 are the extent of utilization of artificial intelligence tools for effective teaching and learning in colleges of education in south east Nigeria.

Table 3. Mean(x), standard deviation (SD) and t-test analysis of male and female teaching staff on extent of awareness on the available artificial intelligence tools for effective teaching and learning in colleges of education

Variable	N	Mean	SD	t-cal	t-crit.	Df	Level of sig.	Decision
Male Teaching Staff	312	2.83	0.75	0.74	1.96	682	0.05	Accepted
Female Teaching Staff	372	2.80	0.73					

The result of the analysis on table 3 using t- test shows that there is no significance difference between the mean rating of male and female teaching staff on the extent of awareness on the available artificial intelligence tools for effective teaching and learning in colleges of education in south east Nigeria. This was so because the calculated t-test of 0.74 was less than the critical value of 1.96 at 0.05 level of significance and degree of freedom 682.

Table 4. Mean(x), standard deviation (SD) and t-test analysis of male and female teaching staff on Extent of utilization of artificial intelligence tools for effective teaching and learning in colleges of education learning in colleges of education

Variable	N	Mean	SD	t-cal	t-crit.	Df	Level of sig.	Decision
Male Teaching Staff	312	2.81	0.85	0.87	1.96	682	0.05	Accepted
Female Teaching Staff	372	2.78	0.88					

The result of the analysis on table 4 using t- test shows that there is no significance difference between the mean rating of male and female teaching staff on the Extent of utilization of artificial intelligence tools for effective teaching and learning in colleges of education learning in colleges of education colleges of education in south east Nigeria. This was so because the calculated t-test of 0.87 was less than the critical value of 1.96 at 0.05 level of significance and degree of freedom 682.

Summary of Findings

1. Google Bard, Paradox and Tab9 are the extent of awareness on the available artificial intelligence tools for effective teaching and learning in colleges of education in south east Nigeria.
2. Google Bard, Paradox and Tab9 are highly utilized artificial intelligence tools for effective teaching and learning in colleges of education in south east Nigeria.

Discussion of Findings

The study revealed that Google Bard Paradox and Tab9 are the extent of awareness on the available artificial intelligence tools for effective teaching and learning in colleges of education in south east Nigeria.

The study also revealed that, Google Bard, Paradox and Tab9 are highly utilized artificial intelligence tools for effective teaching and learning in colleges of education in south east Nigeria.

Conclusion

Internationally, there is a growing recognition of the need to integrate AI into education to foster innovation and address the evolving demands of the workforce. Colleges of education are heavily dependent on human and manual work, leading to an increase in operational costs

and errors, as well as slow processing in the field. This has resulted in a significant burden on Colleges of education and must spend a large budget on hiring and retaining educators and processing data. Additionally, institutions put a considerable amount of effort into the admission, learning, and success of all their students, leading to wasted information and efforts on repetitive tasks that can be minimized. However, adoption of artificial intelligence can bring a cheaper and more responsive approach to the higher education industry, reducing both financial and physical losses.

Recommendations

1. Professional development and training programs should be provided for educators to build their capacity for effectively integrating AI tools and resources into their area of specialization.
2. They should be development of a comprehensive AI integration strategy aligned with the goals and priorities in College of Education, encompassing infrastructure development, capacity building, and stakeholder engagement.
3. Government should integrate project-based learning into AI-infused curricula, aligning course content with students' experiences and aspirations.
4. Government should provide allocate resources for AI integration, including training educators, providing updated technology and teaching aids, and fostering partnerships to ensure access to necessary tools.

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