

## **ChatGPT a Veritable Tool in Lesson Planning for Sustainable Education in the 21<sup>ST</sup> Century and Beyond: Pre-service Teachers' Preparedness in the Usage of Digital Tool in Science**

By

**Ogun, A.O.<sup>1</sup> Otujo, C.O.<sup>2</sup> & Odufeko, G.T.<sup>3</sup>**

<sup>1</sup>[anggyogun2004a@yahoo.co.uk](mailto:anggyogun2004a@yahoo.co.uk)

<sup>2</sup>[cotujo65@gmail.com](mailto:cotujo65@gmail.com)

<sup>3</sup>[blessingolavinka2015@gmail.com](mailto:blessingolavinka2015@gmail.com)

**Biology Dept., Sikiru Adetona College of Education, Science and Technology, Omu-Ijebu, Ogun State, Nigeria**

### **Abstract**

ChatGPT was released to the public in November 2020, and research studies have expressed excitement or concern about its introduction into academia and education. While there are many questions to be asked, the current study examined pre-service teachers' usage of ChatGPT and AI tools in lesson planning during teaching practice. The probable usage of ChatGPT and AI tools in teaching were discussed as revealed by the study. Purposive sampling techniques were used to obtain three hundred and twenty-five (325), out of which only two hundred and twenty-five (225) pre-service teachers across Colleges of Education, South-West Nigeria responded to the online questionnaires. The results of this research show that many of the pre-service teachers are quite aware of various ChatGPT and AI tools available, but majority are still in awe of using it for educational purposes, quite a number of them said there is no course devoted in their courses that is meant solely for learning the use of ChatGPT and other AI tools for teaching and learning, while many of them are using it for self-interest and self-learning, but not for lesson planning. In conclusion, the applications of ChatGPT for educational settings as come to stay hence effort must be put to good use to see that pre-service teachers are not left behind because they are the future of quality teaching in science. Finally, ChatGPT and its derivatives would create a new paradigm in education as a whole.

**Keywords: ChatGPT, Artificial intelligence tools, Pre-service teachers, Science**

### **Introduction**

In November 2020, OpenAI released Chat Generative Pre-Trained Transformer, or ChatGPT. It is based on OpenAI's GPT-3 a large language model artificial intelligence (AI) application. Following its release to the public, ChatGPT quickly received recognition for its thorough responses and articulate answers in various subject areas (Quinn et al., 2020; Vincent, 2022a) and which has significantly impacted various domains of human endeavours. The foundation of modern AI was laid by philosophers who tried to explain human thinking as the mechanical manipulation of symbols, leading to the development of the programmable digital computer in the 1940s. Based on mathematical reasoning, this machine prompted the idea among scientists of building an electronic brain (Kaplan & Haenlein, 2019). AI research was

first established in 1956 at Dartmouth College in the United States, where attendees of a workshop would become the leading AI researchers in the decades that followed. They believed that a machine as intelligent as a human would exist within a generation and were granted appropriate funding in order to make that happen. The introduction of ChatGPT has been a major disruption to the education community, their main concern was that it will erode intellectual mental ability of learners. On the other hand, generative AI has been found to ease teachers' workload, furthermore it has been found to be a powerful tool in teaching and learning (Ulrich &Dohrmann, 2023). In this article we seek to examine pre-service teachers' usage of ChatGPT and generative AI tools during teaching practice simply because they are the future of quality science education in our schools.

Artificial intelligence refers to intelligent devices and software that can reason, absorb, gather knowledge, interact, control, and distinguish between objects. However, they soon realized that creating such a machine was much more complicated than they first thought, and funding from both the United States and United Kingdom governments was withdrawn in 1974 due to criticism levelled at the venture (Newquist, 1994). After a period commonly known as the "AI winter," an initiative by the Japanese government in the early 1980s sparked renewed interest in AI, and along with it came funding, although this eventually waned by later that same decade. Twenty years later, the 21st century saw continual new developments in artificial intelligence technology, and AI experienced a high investment and interest as machine learning was applied to various academic and industrial problems, mainly using new techniques, powerful computers, and massive datasets (Newquist, 1994).

Artificial intelligence (AI) soon became the rave of the moment in various industries, and education sector was not an exception. With AI founding its way into teaching and learning, personalized learning experiences by students became possible and teachers were provided with powerful tools to track student progress and were able to adapt their teaching methods. AI has also been found to providing immediate feedback, and offering guidance. These technologies have shown to have directly or indirectly affect educational environments and shape educational settings. AI-based learning platforms, have gained popularity due to their ability to engage students in a conversational manner, similar to that of a human tutor.

The use of AI has also been praised for its potential to improve learning outcomes by providing students with more efficient and effective ways to learn. However, with the rise of AI in learning, there are also concerns about the potential negative impact it could have on students. Some experts argued that AI-based learning platforms could hinder critical thinking

skills and reduce human interaction, which is an essential aspect of learning. Although, some researchers have highlighted the benefits of artificial intelligence in learning, for example, Chatbots like ChatGPT can engage students, answer their questions, and keep them busy and motivated. Additionally, AI can collect and analyze data on student performance, enabling educators to make informed decisions about teaching methods and curriculum improvements. The potential benefits of AI in learning are significant, with the ability to revolutionize teaching and learning processes. Despite challenges, such as bias and limitations in individualized learning, the potential benefits make AI a promising tool for educators to consider. AI in learning has the potential to enhance the educational experience, improve learning outcomes, and support student success.

An education system that aims to offer a quality education for all its citizens should be able to rely on teachers who are well prepared, competent and committed (Oparah, Ihechukwu & Ndidi 2020). This result is consistent with Sukdee (2021), who stated that students should have transformational leadership consisting of idealized influence, inspiration motivation, intellectual stimulation, and individualized consideration to prepare for economic changes in society and technology, hence teachers are the most important contributors to the success of a country's education system. With the changing dynamics of the world and the advancement of digital technology, which affect learning in the 21st century as well as the development of new technologies that integrate sciences and cross-cultural aspects, the pre-service teachers of today are in a better position to make technology part of their teaching because of their training. These new teachers do not have to unlearn teaching habits which have been established over a long time. They could start off with innovative teaching techniques that support the use of technology. This is why it is essential to focus at that point where new teachers begin their teaching to establish whether they get off to a good start that could set them on the path to revolutionary teaching. Preparing pre-service teachers for AI-powered education is challenging (Pedró et al., 2019). Therefore, there is a substantial demand for research on accepting AI in teacher education and understanding what factors govern its use; yet, the necessary research is scarce.

Over the past few years, many empirical studies have been conducted with pre-service teachers to better understand the factors that shape their perspectives on technology in different settings. The current crop of pre-service teachers has come to be commonly known as digital natives, describing the generation that has grown up with technology (Vodanovich, Sundaram & Myers, 2010). Digital natives are often characterized by a high-level enthusiasm

in using technology (Junco, 2014). This gives a legitimate expectation that they are more likely to use technology in their teaching, with the aims of creating a modern curriculum that responds to national development strategies and learning in the digital world, representing the characteristics of the Education Curriculum/Education Science requirement (Ministry of Education, 2019). Several studies have emphasized the importance of teaching practice in the professional training of teachers especially, in the various teacher training colleges in the respective of colleges of education and universities (Amuda, 2017; Makamure & Jita, 2019; Mkhasibe & Mncube, 2020; Mokoena, 2017; Msangya et al., 2016; Sirmaci, 2010). However, it has been determined that pre-service teachers did not have an idea about technology and technological developments in the Industrial Age 4.0 (Bolat & Baş, 2018).

In literature, several concepts have been used to refer to activities, where student teachers and/or pre-service teachers are placed in schools to gain teaching experience. Among the concepts used include practice teaching, field studies, infield experiences, school-based experiences, and internship (Mokoena, 2017). Marais and Meier (2004) assert that teaching practice represents the range of experiences to which student teachers are exposed to when they work in classrooms and school. This range of experiences go a long way to determine how successful a pre-service teacher will be when he finally becomes a teacher. In the words of Nuangchalem (2009), the researcher opines that teaching practice provides real school situation for preservice teachers to be successful and it also provides basis for further guidance. This is because teaching practice gives rooms for feedback after evaluation of pre-service teachers during and after teaching practice. It also allows the teachers/supervisors to identify pre-service teachers' areas of strength to consolidate on those areas and it also provides avenue to revisit and improved on identified areas of weakness(es) and challenge(s) that the prospective teacher might come across during the teaching practice exercise. Today, almost all teacher training programs around the world have a technology training component (Yüksel & Kavanoz, 2011). However, several studies have found that the majority of these pre-service teachers use various technology resources extensively outside the classroom for their personal use and very minimally in the classroom for teaching. Hence the study seeks to examine to ChatGPT and AI tools usage by pre-service teachers in lesson planning during teaching practice.

### **Objective of the study**

1. To examine possible areas that pre-service teachers are using ChatGPT in lesson planning during teaching practice.
2. To examine the acceptance rate of ChatGPT and AI tools between male and female pre-service teachers
3. To examine the concerns and challenges of using ChatGPT and AI tools by the pre-service teachers

### **Purpose of the study**

The study examined the usage of ChatGPT tools in lesson planning by pre-service teachers during teaching practice.

### **Research Questions**

1. What are the possible areas that pre-service teachers are using ChatGPT?
2. Do acceptance rate of ChatGPT and AI tools between male and female pre-service teachers differs?
3. What are the concerns and challenges of using ChatGPT and AI tools by the pre-service teachers?

### **Research Methodology**

This study adopted the descriptive survey design. Through online questionnaire study was administered to participating pre-service teachers who were all enrolled in teacher education programme and were on mandatory 6-months teaching practice exercise. Data were collected anonymously and out of 325 potential respondents, a complete data set of 225 (69.2% of the responses) participants was received. Participants in this study were pre-service teachers from different teacher education programs from colleges of education in Ogun State, South-West Nigeria. Among the participants, 71.90% were female students, and the mean age of all students was 21.31 years ( $SD=3.89$ ). The data analysis was done using t-test and mean score.

## Discussion of Findings

### 1. What are the possible areas that pre-service teachers are using ChatGPT?

**Table 1: Possible area of used of ChatGPT and other AI tools**

S/N	Items	Mean	SD	Decision
1.	Creating content	3.14	.782	Agree
2.	Creating quizzes	3.09	.786	Agree
3.	Gamma AI	3.10	.774	Agree
4.	Essay	3.20	.786	Agree
5.	Generate ideas	3.09	.787	Agree
6.	Lesson planning	3.09	.787	Agree
7.	Assessment	3.10	.786	Agree
8.	Grammar check	3.10	.786	Agree
9.	Research assistant	3.02	.838	Agree
10.	Simplify topics	3.15	.793	Agree
11.	Discussion questions	3.07	.808	Agree
12.	Prompt generator	3.02	.808	Agree
13.	Cloze tests	3.05	.808	Agree
14.	Assignment	3.27	.786	Agree
15.	X-factor instruction	3.10	.774	Agree
16.	Slideshow	3.00	.838	Agree
17.	Others	3.30	.799	Agree

The table 1 above indicates all of the seventeen (17) items possible areas preservice teachers are using ChatGPT and other AI tools during teaching practice. As seen in the above table “others” was rated the highest at 3.30 and then followed by assignment at 3.27 which are indicative of personal purposes the pre-service teachers are using ChatGPT and AI tools. Other areas where pre-service teachers use AI tools are creating content (3.14), essay writing (3.20), simplifying topics (3.15) and less frequently for lesson planning (3.09) and gamma (3.10) which are basically for educational purposes.

## 2. Do acceptance rate of ChatGPT between male and female pre-service teachers differs?

**Table 2: T-test of male and female pre-service teachers' acceptance rating use of ChatGPT and AI tools by gender**

Item		Male (N-117)		Female (N-108)		df	T-test	P-value
Gender	N	Mean	SD	Mean	SD			
Male	117	3.50	1.037	3.24	1.231	223	1.814	0.71
Female	108							

In above table 2, the independent samples t-test score shows no significant gender differences { $t(223) = 1.814$ ;  $p = .071$ } among pre-service teachers' acceptance of usage of ChatGPT and AI tools. However, based on the descriptive statistic male pre-service teachers are more likely to accept the use of ChatGPT and AI tools relatively higher ( $M=3.50$ ,  $SD=1.037$ ) than the female ( $M=3.24$ ,  $SD=1.231$ ). However, in general terms there is a high level of acceptance of the use of AI tools among pre-service teachers which is consistent with previous research of (Granic & Marangunie 2019, Scherer & Teo 2019). The study equally observed that female pre-service teachers are more likely to experience anxiety about usage of ChatGPT and AI-based tools than male pre-service teachers, leading to differences in their perceived ease of use and usefulness.

## 3. What are the concerns and challenges of using ChatGPT and AI tools by the pre-service teachers?

**Table 3: Preservice teachers' concerns and challenges of using ChatGPT and AI tools**

S/N	Responses	Yes	No
1.	ChatGPT and AI tools do not give accurate response to prompts	21%	79%
2.	It is considered as a threat to core skill development	65%	35%
3.	The use of ChatGPT should be prohibited in schools	10%	90%
4.	The use of ChatGPT should be regulated in schools	95%	5%
5.	ChatGPT is prone to false and misleading information	1%	99%
6.	ChatGPT and AI tools have negative influence on teachers efficiency	2%	98%

7.	Educators should integrate the tools into education system	100%	NIL
8.	ChatGPT and AI posse challenges to traditional education and teaching	25%	75%
9.	There is ChatGPT and AI as a course in teacher education programme	0%	100%

---

From table 3 above, it was found that one of the main challenges and concerns in the usage of ChatGPT and AI tools is that it might serve as a threat to core skill development (65%), and it should be regulated in schools (95%) but not outright prohibition on its usage because of its usefulness in transforming schools and classrooms, and making teachers' job easier (Wogu et.al 2019).

### **Summary of findings**

The study found out that pre-service teachers used ChatGPT more, for other reasons than for lesson planning. Again, it was found out that there is a high level of acceptance of ChatGPT and AI tools among pre-service teachers, however, female pre-service teachers are more likely to experience anxiety about usage of ChatGPT and AI-based tools than male pre-service teachers. In addition, it was found out that ChatGPT and AI tools might serve as a threat to skill development, hence should be regulated in schools.

### **Conclusion and Recommendations**

Pre-service teachers expressed concerns about integrating ChatGPT into science learning, especially when limited evidence about accuracy, reliability, and security has been provided. Furthermore, the potential perceived usefulness of AI technology is greater than the possible perceived ease of use for pre-service teacher AI, acceptance. As the use of AI in education continues to increase, it is crucial that pre-service teachers, who will be at the forefront of education in the future, acquire knowledge of this technology without fear and anxiety.

Digital pedagogy offers unprecedented opportunities to enhance educational quality, and that in 21<sup>st</sup> century digital tools were no longer a choice, but a necessity for growth and stability, this was said by the Minister of Education, Prof. Tahir Mamman at a meeting held with the National Executive Council of Colleges of Education in Abuja on May 15th 2024.

Therefore, for a teacher to be relevant in 21<sup>st</sup> century classroom irrespective of culture, beliefs and affiliates the knowledge of digital technology in education is no longer a choice but a must have. Finally, educational institutions should train educators to help them maximize and



utilize the potentials of ChatGPT in teaching. Finally, it is essential to carefully consider students' needs and preferences when developing AI based educational tools to ensure they are perceived as valuable.

## References

- Amuda, A. (2017). The Conducts of Teaching practice exercise in colleges of education and universities in Nigeria: A call for revitalization. *International Journal of Tropical Educational Issues*, 1(2), 344-354.
- Bolat, Y., & Baş, M. (2018). The perception of the educational philosophy in the Industrial Age 4.0 and the educational philosophy productivity of teacher candidates. *World Journal of Education*, 8(3), 149-161. <https://doi.org/10.5430/wje.v8n3p149>
- Granić, A., & Marangunić, N. (2019). Technology acceptance model in educational context: A systematic literature review. *British Journal of Educational Technology*, 50(5), 2572–2593. <https://doi.org/10.1111/bjet.12864>
- Junco, R. (2014). iSpy: Seeing what students really do online. *Learning, Media and Technology*, 39(1), 75-89. <http://dx.doi.org/10.1080/17439884.2013.771782>
- Kaplan, A., & Haenlein, M. (2019). Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence. *Business* <https://doi.org/10.1016/j.bushor.2018.08.004>
- Makamure, C., & Jita, L. C. (2019). Teaching practice and pre-service mathematics teachers' teaching knowledge in Zimbabwe: A mixed methods study. *Issues in Educational Research*, 29(3), 858-880.
- Marais, P., & Meier, C. (2004). Hear our voices: Student teacher's experience during practical teaching. *Africa Education Review*, 1(2), 220-223 <https://doi.org/10.1080/18146620408566281>
- Ministry of Education. (2019). Undergraduate education qualifications (Four-year course).
- Mkhasibe, R. G., & Mncube, D. W. (2020). Evaluation of pre-service teachers' classroom management skills during teaching practice in rural communities. *South African Journal of Higher Education*, 34(6), 150- 165. <https://doi.org/10.20853/34-6-4079>
- Mokoena, S. (2017). Student teachers' experiences of teaching practice at open and distance learning institution in South Africa. *Turkish Online Journal of Distance Education*, 18(2), 122-133. <https://doi.org/10.17718/tojde.306564>
- Msangya, B. W., Mkoma, S. L., & Yihuan, W. (2016). Teaching practice experience for Undergraduate student teachers: A case study of the Department of Education at Sokoine University of Agriculture, Tanzania. *Journal of Education and Practice*, 7(14), 113-118.
- Newquist, H. P. (1994). *The Brain Makers: Genius, Ego, And Greed in the Quest for Machines That Think*. Macmillan

- Nuangchaler, P. (2009). Implementing professional experiences to prepare preservice science teachers. *The Social Sciences*, 4(4), 388-391. <https://doi.org/10.2139/ssrn.1346186> on 2023 May 12].
- Oparah I, Ihechukwu C & Ndidi E (2020). The perception of readiness for teaching profession: A case of Pre-service trainees. *Journal of Language, Culture and Educ.* 3, 32–42.
- Quinn, J., McEachen, J., Fullan, M., Gardner, M., & Drummy, M. (2020). Dive into deep learning: tools for engagement. Corwin.
- Scherer, R., & Teo, T. (2019). Unpacking teachers' intentions to integrate technology: A meta- analysis. *Educational Research Review*, 27, 90–109. <https://doi.org/10.1016/j.edurev.2019.03.001>
- Sukdee, T. (2021). The development of indicators for transformational leadership of undergraduate students at Thailand National Sports University. *World Journal of Education*, 11(1), 94-106. <https://doi.org/10.5430/wje.v11n1p94>
- Vodanovich, S., Sundaram, D. & Myers, M. (2010). Research commentary: Digital natives and ubiquitous information systems. *Information Systems Research*, 21(4), 711-723. <http://dx.doi.org/10.1287/isre.1100.0324>
- Vincent, J. (2022a, December 5). AI-generated answers temporarily banned on coding Q&A site Stack Overflow. *The Verge*. <https://www.theverge.com/2022/12/5/23493932/chatgpt-ai-generated-answerstemporarily-banned-stack-overflow-llms-dangers>
- Wogu I.A, Mistra P.A, Assibon E.F, Olu-Owolabi R, Maskelinas, and Damasevicius, R (2019). Artificial Intelligence, Smart classroom and online education in the 21<sup>st</sup> Century; Implications for human development, *J. Cases Information Technology*, 21 (3), pp 66- 79
- Yüksel, B & Kavanoz, V (2011). Artificial Intelligence and Real Teaching. In C. Keitel & K. Ruthven (Eds.), *Learning from Computers: Mathematics Education and Technology* Pp. 131– 158, Springer. [https://doi.org/10.1007/978-3-642-78542-9\\_6](https://doi.org/10.1007/978-3-642-78542-9_6)