

# IMPACT OF TECHNOLOGY AND ARTIFICIAL INTELLIGENCE AMONG PRIMARY SCHOOL PUPILS IN LAGOS STATE

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## Abstract

*The study examined the impact of technology and artificial intelligence among primary school pupils in Lagos State. Technology is the mother of civilisations. It has impacted different aspects of life. Complex and critical processes can be carried out with ease and greater efficiency with the help of technology. A descriptive survey research design was adopted for the study. The targeted population for this consisted of pupils and teachers in Ojo and Amuwo-Odofin local government education authorities in Lagos State, and the sample involved 220 participants. A multistage sampling procedure was employed for the study. A self-designed instrument was used for the study titled, Technology and Artificial Intelligence for Pupil and Teachers Questionnaires (TAIPTQ). The reliability of the instrument was tested using Cronbach's alpha, with a reliability coefficient of 0.81. Inferential statistics of the Pearson Product-Moment Correlation coefficient was used to test the null hypotheses formulated at a 0.05 level of significance. The findings show that there was a significant positive relationship between technology and AI integration and learning outcomes among primary school pupils in Lagos State. Also, there was a significant positive relationship between technology and AI usage and pupils' well-being in Lagos State. The study recommended that AI-powered platforms can provide personalised learning experiences, improving pupils' understanding and engagement. Lastly, AI can help pupils develop essential soft skills like communication, critical thinking, teamwork, and adaptability.*

**Keywords:** Technology, Pupils, Artificial Intelligence, Educational System and Application of Artificial Intelligence

## Introduction

Lagos State, Nigeria, is not an exception to the growing global interest in integrating technology and artificial intelligence into basic education. Artificial intelligence has considerable potential to change educational methods and results, enabling young pupils to achieve greater academic performance, higher engagement, and personalised learning experiences (Roy & Swargiary, 2024).

However, a detailed understanding of the unique advantages and limitations of Lagos State's educational system is essential for the effective use of artificial intelligence in this context.

Society has undergone a profound transition from a conventionally driven framework to a contemporary knowledge-based paradigm, in which creativity and innovation serve as the primary catalysts. Artificial Intelligence (AI) has become a major topic of discussion in today's culture, because of the rapid advancements in technology. Krstić *et al.* (2022) assert that artificial intelligence is universally and publicly acknowledged as the technology of the future. Jain and Jain (2019) assert that the AI technological revolution has occurred in many regions globally in recent decades. The main goal is to replicate human intelligence in computers, which would then improve their ability to learn.

Defining artificial intelligence in a single, universally accepted form is difficult because it has many different uses. According to Tuomi (2018), there are many different ways to define artificial intelligence, such as machines that can think, comprehend language, solve issues, diagnose illnesses, operate automobiles, play chess, and paint like Van Gogh. According to Nilsson in Tuomi (2018), artificial intelligence is the ability of a computer system to perform tasks that intelligent individuals typically perform. Nevertheless, this definition is tautological, as it requires defining intelligence, thereby limiting its applicability. Consequently, artificial intelligence is increasingly perceived as a scientific field dedicated to the development of machines capable of effective operation within their environments.

Moreover, Hussain *et al.* (2022) posit that artificial intelligence conjures the image of a potent computer, distinguished by sophisticated processing capabilities. These capabilities encompass adaptive behaviors, integrating sensors and other attributes that emulate human cognition and abilities, thus improving its capacity for interaction with individuals.

According to these criteria, advances in computers, computer technologies, machinery, and information communication technologies give rise to artificial intelligence, which allows computers to do tasks that are very similar to those of humans. Artificial intelligence is certainly a key technology that's changing education worldwide. Education is the foundation for progress in every country.

According to Agih (2015), it establishes the foundation for literacy, skill development, technological progress, and the use of natural resources for growth. Universities serve as pivotal institutions in tertiary education, significantly contributing to national development. Their role involves shaping human capital, conducting research, and promoting innovation across diverse industries. Iviemu (2021) asserts that tertiary institutions are responsible for producing high-quality graduates who will emerge as influential leaders and proficient professionals in their fields. Artificial intelligence has recently addressed challenges in education, especially within universities, stemming from the limitations of conventional teaching methods and the complexities of the educational system.

E-learning has made vast amounts of data available, enabling AI to devise intelligent solutions to intricate educational challenges. Research indicates that artificial intelligence (AI) is of paramount importance in higher education, especially within universities, as it offers students adaptable learning options through advanced technological applications.

AI-driven educational tools, such as ChatGPT, Scikit Learn, TensorFlow, PyTorch, CNTK, Caffe, Apache MXNet, Keras, OpenNN, AutoML, H2O, OpenAI, Grammarly, and QuillBot, are augmenting the effectiveness and efficiency of pedagogical practices and the learning process.

According to reports, artificial intelligence tools have a big impact on university students' academic performance. Nwosu and Okoli (2019) define academic success as the systematic and deliberate assessment of learning outcomes. This encompasses assessing students' academic progress via their grades, test scores, attendance, class engagement, study practices, and other vital metrics of academic achievement. AI systems in education help university students become more organised, enhance their study habits, offer personalised guidance, and build their critical thinking skills.

Huang (2021) emphasises the advantages of employing artificial intelligence tools in teaching. AI's application in education has demonstrated a beneficial impact on personal development (Lai *et al.*, 2023). By analysing data, finding trends, and predicting results, artificial intelligence helps educators personalize their teaching to each student's needs (Bit *et al.* 2024).

Adaptive learning systems can adjust the difficulty of instructional content based on a student's performance, thereby enhancing engagement and utility of the learning experience (Kannamma *et al.* 2022). Artificial intelligence can automate grading and provide rapid feedback, thereby facilitating student learning and allowing educators to dedicate more time to individualised assistance (Kamalov & Gurrib, 2023). Notwithstanding these advantages, concerns persist regarding data privacy, algorithmic bias, and the potential for excessive dependence on technology, which may hinder the cultivation of essential social and emotional competencies (Kannamma *et al.* n.d.).

The growing adoption of artificial intelligence in educational settings demands a comprehensive assessment of its effects, especially for younger students, to fully harness its potential while also protecting their

holistic growth and welfare. According to Farhan *et al.* (2024), AI is able to identify elements that are relevant to classes. Teachers can use AI to improve students' daily conduct, grades, and even emotions (Ma *et. al.*, 2024). It is important to take into account how AI can enhance students' academic achievement as well as how it impacts other facets of their lives (Hwang, 2022).

To see and understand the world, AI systems use a range of input modalities, such as text, images, audio, and video (Luz, 2020). This includes methods that allow machines to understand and process sensory data, such as computer vision, natural language processing, and speech recognition. Furthermore, studies have shown that AI systems assess information, reach conclusions, and form opinions using logical and probabilistic reasoning. They can use statistical models, algorithms, or preset rules to tackle complicated problems and generate appropriate solutions or actions. AI systems can also learn from data and progressively become better at what they do. They can automatically pick up new knowledge, spot trends, and change their behavior by using techniques like machine learning, deep learning, and reinforcement learning (Abed & Anupam, 2023). This adaptability enables AI systems to thrive in dynamic settings, boosting both precision and productivity.

By leveraging smart course design, AI may assist educators in crafting curricula that resonate with students' individual requirements and preferences. By analyzing student data, artificial intelligence (AI) systems can offer suggestions regarding preferred learning styles, optimal topic sequencing, and any gaps in the course material. With this knowledge, lecturers can create more engaging and practical learning exercises. Academics assert that AI systems operate autonomously, completing tasks without constant human supervision (Sipior, 2020). By automating repetitive or complex procedures, they can reduce manual labour and increase output. Pattern recognition, data processing, and decision-making are key aspects, with physical actions in robotics. AI systems frequently interact with people through interfaces designed for teamwork and communication, such as advanced humanoid robots, chatbots, and virtual assistants.

The objective is to facilitate fluid and instinctive communication between humans and machines, permitting AI systems to comprehend and react to human inquiries, demands, or directives (Abed & Anupam, 2023). Artificial intelligence includes a wide range of methods, techniques, and uses, such as machine learning, natural language processing, computer vision, and robotics.

The operational definition of AI delineates the essential elements and functionalities that differentiate AI systems from conventional computer programs, enabling them to exhibit intelligent behaviour and perform tasks that typically require human intelligence.

Although not new, the value of 21st-century skills has increased (Schmoker, 2011). Teachers are increasingly recognising that essential concepts and methodologies are crucial for 21st-century learning. Currently, this term is frequently addressed in various forums and discussions and is a prevalent subject in seminars and workshops. The twenty-first century, often known as the Common Era, commenced on January 1, 2001, and will conclude on December 31, 2099. This date is the present year in the Anno Domini calendar. What distinguishes twenty-first-century education from that of the past, necessitating our investment of time, energy, and finances to study, examine, and understand it for our advantage? Schools throughout the twentieth century were considerably different from those of now.

Groups do very little work; most pupils work alone. Educators assess pupils through a summative evaluation system that incorporates specific formative elements, typically represented as a percentage or numerical value. The instructor served as the sole source of information in the teacher-centred classroom. The majority of the learning was confined to a few procedures. The primary objective of the teaching approaches is to facilitate student learning; they do not consider individual differences that are often insignificant, lack relevance, or fail to provide contextual understanding. The majority of cognitive abilities were designed to be unstructured and low-level. During this phase, children received instructions on using technology and were coached through their activities.

Regulations dictated students' self-management, severely limiting their influence over the structure. Academic progress was achieved through single-level education; acceleration was emphasised for gifted and talented pupils; reading, writing, and auditory learning methods predominated; and feedback was limited.

In 2015, the Partnership for 21st Century Learning (P21) produced the Framework for 21st Century Learning to provide a unified educational vision. This paradigm integrates topic knowledge, specialised skills, expertise,

and literacies, delineating the knowledge, abilities, and competences students must attain to succeed in both professional and personal spheres (Ige *et al.* 2024). All students must acquire essential academic knowledge and understanding to apply 21st-century skills. Effective communicators and critical thinkers need to build a foundation of fundamental academic knowledge. Within the framework of teaching foundational knowledge, students must acquire critical thinking, problem-solving, communication, and teamwork, all of which are crucial qualities for success in the modern world.

The Asian Development Bank (2016) states that leaders, educators, and pupils collaborate to establish 21st-century learning. Students are somewhat influenced by the modern, media-rich, instantaneous, dynamic, and captivating electronic and digital environment that allows for instant gratification through communication (Nakrani, 2013). "Millennials," "Neo-Millennials," "Digital Natives," "Digital Children," and "21st Century Learners" are terms that describe contemporary students. They are motivated and involved, acquiring information through digital technology, driven by consistent exposure to various digital media. They are adept at utilising digital media. Students formulate, refine, and evaluate methods alongside materials. Furthermore, they can employ a broader range of cognitive and learning modalities while adhering to moral and ethical standards in their educational pursuits. Feedback is acquired from diverse sources, including peers, educators, and self-assessment.

The research by Salido (2023), entitled "Impact of AI-Powered Learning Tools on Pupil Understanding and Teachers' Performance," examined how the integration of artificial intelligence into education is catalysing a significant transformation in current teaching methodologies and educational practices. This research aims to assess the impact of artificial intelligence-based educational tools, including intelligent tutoring systems and virtual learning environments, on students' academic performance and understanding. The findings indicate that artificial intelligence has the capacity to instigate a significant transformation in education by enabling the personalisation and adaptation of students' learning experiences, thereby enhancing both academic performance and overall comprehension.

However, the ethical implications and infrastructure constraints must be recognised. This illustrates the importance of the judicious integration of artificial intelligence. This research reveals the significant impact that artificial intelligence may have on schooling. This essay will explore the careful attention needed when incorporating artificial intelligence into education, focusing on teaching methods, ethical issues, and the necessary infrastructure. It accomplishes its goal by upholding the core principles that underpin education while encouraging fair and improved educational opportunities.

Sandhya and Varghese (2023) assert that the education sector is merely one of numerous businesses affected by technological advancements. The pedagogical methods and strategies employed by educational institutions worldwide illustrate the integration of technology into education. Blended learning has attracted considerable attention due to its multifaceted nature, which combines conventional face-to-face teaching with online and digital resources. The integration of technology requires processing extensive student data, which can raise ethical dilemmas and concerns due to its sensitive and private nature. This chapter primarily addresses the various aspects of technology integration within the educational system and its beneficial implications for enhancing student learning and engagement, serving as a framework for future research on developing an educational Model that improves teaching and learning environments.

Wang *et al.* (2023) say that instructors are at the forefront of incorporating artificial intelligence (AI) into the classroom. It is expected that they would attain a comprehensive understanding of AI and become proficient lecturers and users. The efficacy of AI-enhanced education depends on its readiness for implementation. This study investigated the interconnections among the four elements of AI readiness: cognition, ability, vision, and ethics, in the context of AI utilisation in education, along with the implications for educators' jobs. Data from 3164 primary school teachers were collected, and cluster analysis, together with partial least squares structural equation modelling, was employed for analysis. This study identified a positive association between ethical considerations and cognition, capability, and foresight in the educational use of AI. The four dimensions of AI readiness showed a positive correlation with AI-enhanced innovation, which, in turn, was positively associated with instructors' job satisfaction.

Nonetheless, perceived AI hazards were negatively correlated with AI preparedness. This study categorised the



teachers into three groups based on their levels of AI preparedness. Instructors with higher AI preparedness also perceived fewer AI-related risks, demonstrated significant AI-driven innovation, and reported greater job satisfaction. Nevertheless, there were no significant differences among teachers of varying socioeconomic origins and genders regarding their readiness for AI and its impact on their profession. This study has substantial implications for developing strategies and policies that facilitate the effective integration of AI into education, while also providing empirical evidence of the importance of AI preparedness in teachers' roles. Although this study shares commonalities with other research, the earlier studies did not examine the effects of technology and artificial intelligence on elementary school pupils.

These technologies can help students monitor their academic progress, develop more efficient study plans, receive personalised instruction, and improve their problem-solving skills. Utilising these tools enables students to identify their educational needs, cultivate self-directed study habits, and enhance their critical and logical reasoning skills. This underscores the substantial influence that artificial intelligence tools may have on student academic performance and elucidates the rationale for their growing use by institutions globally, including those in Nigeria. This study examines the impact of technology and artificial intelligence on primary school pupils in Lagos State.

### **Purpose of the Study**

The purpose of this study is to examine the impact of artificial intelligence (AI) tools on the academic performance of pupils in Primary School in Lagos State. Specifically, the study seeks to:

1. Investigate the impact of Artificial Intelligence (AI) tools on the learning abilities of pupils in Primary School in Lagos State.
2. Examine the impact of artificial intelligence (AI) tools on the problem-solving skills of pupils in Primary School in Lagos State.
3. determine the impact of artificial intelligence (AI) tools on the critical thinking abilities of pupils in Primary School in Lagos State.

### **Hypotheses**

**H01:** There is no significant relationship between technology and AI integration and learning outcomes among primary school pupils in Lagos State

**H02:** There is no significant relationship between technology and AI usage and pupil well being in Lagos State

### **Methodology**

This study adopted a descriptive survey research design. The target population for this consisted of the pupils and teachers in Ojo and Amuwo Odofin local government education authorities in Lagos State, and the sample consisted of 220 participants; 180 pupils and 40 teachers respectively (though 210 fully participated in the study) selected from 20 preschool centres (private and public centres) through a multistage sampling technique. The two local government education authorities were involved in the study, and 10 preschool centres (5 private and 5 public) were selected from the LGEAs using a disproportionate stratified random sampling technique. A random sampling technique was adopted to select four teachers from each of the centres already selected (though this was inconsistent, as some centres had more than four, while others had fewer than four). At the end of the selection, 84% of the teachers from private centres and 16% from public centres participated in the study. One research instrument was used for the study titled "Technology and Artificial Intelligence for Pupil and Teachers Questionnaires" (TAIPTQ). The instrument's reliability was tested using Cronbach's alpha, with a coefficient of 0.81. Inferential statistics using the Pearson Product-Moment Correlation coefficient were used to test the null hypotheses at the 0.05 level of significance.

## Results

### Hypothesis 1

**H01:** There is no significant relationship between technology and AI integration and learning outcomes among primary school pupils in Lagos State

**Table 1: Summary of Pearson Product Moment Correlation Showing Relationship between technology and AI integration and learning outcomes among primary school pupils**

Variables	N	Mean	St.D	r	Sig.	Remarks
Technology and IA integration	21235.991	12.001	.561	.000	significant	
primary school learning outcome	212	19.571	6.880			

Table 1 affirms that there is a significant positive relationship between technology and AI integration and learning outcomes among primary school pupils in Lagos State ( $r = 0.56$ ;  $p < 0.05$ ). Therefore, the hypothesis 1 is rejected. The positive relationship implies technology integration of AI positively affect pupils learning outcomes. **Hypothesis 2**

**H<sub>0</sub>2:** There is no significant relationship between technology and AI usage and pupil wellbeing in Lagos State.

**Table 1: Summary of Pearson Product Moment Correlation Showing Relationship between technology and AI usage and pupil well being**

Variables	N	Mean	St.D	r	Sig.	Remark	s
Technology and IA usage	212	29.463	10.234	.5135	.000	significant	
pupils well being	212	14.158	5.183				

Table 2 depicts that there is a significant positive relationship between technology and AI usage and pupils wellbeing in Lagos State ( $r = 0.51$ ;  $p < 0.05$ ). Therefore, the hypothesis 2 is rejected. The positive relationship implies that technology and AI usage go together in the primary school pupils wellbeing.

### Discussion of Findings

Hypothesis 1 asserts that a significant positive relationship exists between technology and AI integration and learning outcomes among primary school pupils in Lagos State ( $r = 0.56$ ;  $p < 0.05$ ). The positive relationship implies that integrating AI technology improves pupils' learning outcomes, suggesting that AI-enhanced classrooms do have a significant effect on teachers' productivity. This result was supported by Wang *et al.* (2023), who assert that when it comes to integrating artificial intelligence (AI) into the classroom, teachers are leading the way. They are anticipated to acquire a sufficient comprehension of AI and become knowledgeable educators and users. The results from hypothesis 2 show a significant positive relationship between technology and AI usage and pupils' wellbeing in Lagos State ( $r = 0.51$ ;  $p < 0.05$ ). The positive relationship implies that

technology and AI use go hand in hand with the primary school pupil's well-being. The findings support the findings of Abed and Anupam (2023). The goal is to enable seamless, natural interaction between humans and machines, enabling AI systems to understand and respond to human queries, requests, and commands.

## Conclusion

The integration of technology and artificial intelligence (AI) in primary education has significantly transformed the learning environment for young pupils. These advancements have enhanced engagement, personalised learning experiences, and improved access to educational resources. AI-powered tools support differentiated instruction, allowing pupils to learn at their own pace and according to their individual needs. However, the impact is not without challenges. Overreliance on technology can affect social development, reduce physical activity, and create disparities in access among students from different socioeconomic backgrounds. Moreover, concerns about data privacy and the ethical use of AI in education must be addressed. In conclusion, while technology and AI offer tremendous opportunities to enrich primary education, their implementation must be carefully managed. A balanced approach that combines traditional teaching methods with innovative digital tools, guided by educators and supported by policy, will ensure that these technologies truly benefit the holistic development of young learners.

## Recommendations

1. School management is to ensure equal access to technology and internet connectivity for all pupils, particularly in underserved areas.
2. The government should offer comprehensive training and professional development opportunities for educators to build their capacity in using AI tools.
3. Educator to encourage pupils to develop critical thinking, problem-solving, and creativity skills through AI-powered tools and projects.
4. Education should regularly assess the impact of AI tools on pupils' learning outcomes and adjust implementation strategies as needed.

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