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# A COMPARATIVE STUDY OF THE ADVANTAGES AND DISADVANTAGES OF AI-ENHANCED LEARNING IN THE 21ST CENTURY: THE IMPLICATIONS TO SECONDARY SCHOOL STUDENTS IN IMO STATE

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## ABSTRACT

*This study compared the advantages and disadvantages of AI-enhanced learning in the 21st century, assessing the implications to secondary school students in Imo State. Comparative survey design was adopted to carry out this research in Imo State. The targeted population comprised all ICT teacher in Imo State. Simple random sampling technique was used to select 140 ICT teachers which formed the sample size used for this research. The instrument used for data collection was a structured questionnaire titled "Advantage and Disadvantage of AI Enhanced Learning Questionnaire (ADAIELQ)". Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The reliability coefficient obtained was 0.84, and was high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical technique such as descriptive statistics to answer the research question. The result of the data analysis revealed that "Personalized Learning" among others was the highest advantage of AI enhanced learning, it also revealed that "Lack of Human Interaction" among others was rated as the highest disadvantage of AI enhanced learning. Furthermore, the result of the data analysis, revealed that "AI-Driven Personalized Learning and adaptation of content to individual needs, analysis of student progress and provision of targeted feedback" was the highest effect of AI enhanced learning on students' academic performance. The study concluded that the rapid advancement of artificial intelligence (AI) has significantly impacted education globally. One of the recommendations made was that to bridge the digital divide, it is crucial to invest in improving technological infrastructure, especially in rural areas of Imo State.*

KEYWORDS: Artificial Intelligence, Enhanced Learning, 21st Century, Secondary School and Imo State

## INTRODUCTION

The rapid advancement of Artificial Intelligence (AI) technologies has brought about transformative changes in various fields, and education is no exception. In the 21st century, AI-enhanced learning tools have become essential in reshaping the educational experience for students worldwide (Fitria, 2021). These technologies, ranging from intelligent tutoring systems to personalised learning platforms, promise to revolutionise how knowledge is delivered, making learning more adaptive, interactive, and efficient. In Imo State, Nigeria, the integration of AI into secondary school education is gaining traction, offering both opportunities and challenges in the classroom.

One of the key advantages of AI-enhanced learning is its ability to provide personalised education. AI systems can adapt to individual student needs, adjusting the pace, content, and difficulty level of lessons according to their learning style and ability (Ayeni, Hamad, Chisom, Osawaru, and Adewusi, 2024). This personalised approach ensures that students receive targeted support, potentially improving learning outcomes. In Imo State, where large class sizes and resource constraints can limit personalised attention, AI presents a valuable solution.

However, the implementation of AI in secondary schools also presents challenges. While AI can cater to individual learning preferences, it may also widen the digital divide, particularly in regions where access to technology is limited. Students in rural or economically disadvantaged areas of Imo State may face barriers such as inadequate infrastructure, low internet connectivity, and the lack of technological devices. These disparities could exacerbate existing educational inequalities, undermining the potential benefits of AI-enhanced learning.

Another significant benefit of AI in education is its potential to enhance the efficiency of teaching and administrative tasks. AI-powered systems can assist educators in managing class activities, grading assignments, and tracking student progress, reducing the administrative burden and allowing teachers to focus more on direct instruction. However, there is concern that reliance on AI for administrative functions could result in the dehumanisation of education, as teachers may become less engaged with the personal development of their students (Abdallah, 2023).

Moreover, the ethical implications of AI in education cannot be overlooked. While AI promises improved learning outcomes, there are concerns about data privacy, surveillance, and the potential for biased algorithms. In a secondary school setting, where students are still developing critical thinking and social skills, the overuse of AI-driven tools may stifle creativity and independent thought. Teachers must strike a balance between incorporating AI and maintaining a human-centred approach to education that fosters holistic development (Tiwari, 2024).

## STATEMENT OF THE PROBLEM

The integration of Artificial Intelligence (AI) into educational systems has emerged as a transformative force in 21st-century learning. In secondary schools within Imo State, the adoption of AI-enhanced learning tools is gradually increasing. While these technologies offer promising advantages such as personalized instruction and improved learner engagement, their implications remain inadequately explored. There is growing concern regarding potential drawbacks, including over-reliance on technology, diminished critical thinking skills, and ethical concerns such as data privacy. Furthermore, disparities in access to AI tools may exacerbate existing educational inequalities among students. Despite the global discourse on AI in education, empirical research contextualized to the secondary school environment in Imo State is limited. Educators, policymakers, and stakeholders lack sufficient data to evaluate the overall effectiveness and potential risks of AI-enhanced learning. This gap poses challenges for informed decision-making and strategic implementation in the region's educational sector. A comparative study is therefore necessary to assess both the benefits and limitations of AI applications in secondary education. Such an investigation will provide critical insights into the broader implications for students' academic outcomes and socio-emotional development.

## OBJECTIVES OF THE STUDY

The following objectives will guide this study:

1. To examine the advantages of AI enhanced learning

2. To find out the disadvantages of AI enhanced learning

3. To find out the effect of AI enhanced learning on students' academic performance

## RESEARCH QUESTIONS

The following questions will be answered in this research

1. What are the advantages of AI enhanced learning?
2. What are the disadvantages of AI enhanced learning?
3. What is the effect of AI enhanced learning on students' academic performance?

## LITERATURE REVIEW

## CONCEPT OF LEARNING

Learning is the process of acquiring new knowledge, skills, or behaviors. It can be a challenging but rewarding process that helps people grow and understand the world around them. According to Behlol, (2024) learning is a permanent change in behavior as a result of experience, and the behavior includes both of the external and internal actions of the individual which are observed and remain unobserved by the outside world. It also includes the different ways in which people understand or experience or conceptualize the world around them.

Learning is a personal act of individual to make full use of his potential. It is a process of self-actualization to its maximum level. Learning is a process of continuous change in human performance or performance potential. It must come about as a result of the learner's experience and interaction with the world around him. Learning is a way of being. It is an ongoing set of attitudes/temperaments and actions by the individual and groups which they employ to keep abreast of the surprising, novel/new, ambiguous, obtrusive and recurring events. Learning is about a change: the change brought about by developing a new skill, understanding a scientific law, changing an attitude.

Learning is a process that is often not under our control and is wrapped up with the environments we inhabit and the relationships we make. It involves encountering signals from the senses; attending to them; looking for connections and meanings; and framing them so that we may act. Sequeira, (2020). Learning is about a change: the change brought about by developing a new skill, understanding a scientific law, changing an attitude. The change is not merely incidental or natural in the way that our appearance changes as we get older.

## CONCEPT OF ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is the science of building machines that can learn, reason, and act in ways that mimic human intelligence. AI uses algorithms, data, and computing power to enable machines to perform tasks that usually require human intelligence. According to Bassey and Owushi (2023), artificial intelligence (AI) refers to the development of computer systems that can perform tasks that typically require human intelligence. The term "artificial intelligence" encompasses a broad spectrum of cutting-edge analytics, applications, and logic-based techniques that mimic human behaviour, judgement, and cognitive functions, including learning and problem-solving (Akpan and Lion, 2024).

Artificial intelligence (AI) is a technology that enables machines to simulate human abilities like learning, problem-solving, and decision-making. Artificial intelligence (AI) is technology that enables computers and machines to simulate human learning, comprehension,

problem-solving, decision-making, creativity, and autonomy. Ufot (2024) stated that artificial intelligence (AI) describes computer programs that are able to carry out sophisticated operations that were previously limited to human performance, such as problem-solving, thinking, and decision-making.

## CONCEPT OF AI ENHANCED LEARNING

AI-enhanced learning uses computer systems to customize learning experiences for students. AI can help students learn at their own pace, and teachers can focus on more meaningful interactions with students. Chen (2023) suggested that AI could help teachers stay up-to-date with the latest advancements in their field. For example, a biology teacher would have AI update them on the latest breakthroughs in cancer research, or leverage AI to update their curriculum.

According to Kamalov, Calonge & Gurrib, (2023). AI facilitates personalized learning by adapting educational content to meet individual student needs. Intelligent Tutoring Systems (ITS) employ AI algorithms to provide customized instruction and feedback, enhancing student engagement and understanding. These systems analyze student performance data to tailor lessons, thereby promoting a more individualized learning experience.

Furthermore, Holmes, Bialik & Fadel, (2024). Mentioned that, AI tools have been shown to improve both personal and collaborative learning environments in higher education. They enhance personalized learning and assessments, communication and engagement, and scaffolding performance and motivation. Additionally, AI promotes a collaborative learning environment by providing peer-learning opportunities, enhanced learner-content interaction, and cooperative learning support.

Artificial intelligence is already reshaping the educational landscape for students and teachers by revolutionizing learning experiences and enhancing instruction methodologies. Over the next few years, I expect that AI will cement itself as a cornerstone in educational evolution, seamlessly integrating with traditional teaching methods to foster a more dynamic, inclusive and effective learning environment.

## TYPES OF AI ENHANCED LEARNING

AI-enhanced learning incorporates various methods and tools that leverage artificial intelligence to improve the learning experience. Here are some of the key types:

**Personalised Learning:** AI can adapt educational content to enhance the needs of each learner, adjusting the pace, difficulty, and style of teaching based on performance. For instance, platforms like Duolingo adjust language lessons based on how well the learner is doing. Jian (2023) AI-powered chatbots and virtual assistants have further facilitated personalised learning. These tools can act as personal tutors, offering instant feedback, answering queries, and even suggesting supplementary resources based on the student's learning trajectory. Moreover, these students were more consistent in their performance, suggesting that AI tools provided them a steadier learning curve.

**Intelligent Tutoring Systems (ITS):** These AI systems provide one-on-one tutoring and feedback to learners, simulating human tutors. They can identify areas where students struggle and offer tailored exercises. Intelligent Tutoring Systems (ITS) represent a transformative shift from traditional teaching methods by providing personalised, adaptive learning experiences tailored to individual student needs. Intensify Tutoring System leverages advanced AI techniques, including machine learning, natural language processing, and adaptive algorithms,

to simulate one-on-one tutoring and offer real-time feedback and support, which uses AI to personalise math instruction (Marouf et al., 2024).

**Adaptive Learning Systems:** AI-based adaptive learning systems refer to those educational technologies that use artificial intelligence to personalise learning experiences considering the needs of individual students. The systems collect and analyse information related to student performance, learning preferences, and progress to create personalised learning pathways. Gyonyoru, (2024). These platforms use AI algorithms to analyse students' learning behaviours and performance to deliver customised learning experiences. For instance, Knewton helps adjust learning materials based on how a student interacts with them.

**AI-Powered Assessment and Feedback:** AI can assist in grading and providing instant feedback. It can also analyse patterns in responses to suggest areas for improvement. AI-Powered Assessment and Feedback (ASA) is a key component of AI-enhanced learning, which refers to the use of artificial intelligence (AI) to improve educational experiences. AI enhances learning in various ways, not just by assessing students but also by offering personalised and adaptive learning paths, automating administrative tasks, and supporting real-time learning analytics.

## CHARACTERISTICS OF AI ENHANCED LEARNING

AI-enhanced learning is revolutionizing education by leveraging artificial intelligence to create more personalized, efficient, and engaging learning environments. The key characteristics of AI-enhanced learning are those elements that make it distinct from traditional learning approaches. These characteristics not only improve learning outcomes but also foster a more interactive and adaptable educational experience.

**Personalisation:** AI systems assess the individual learning styles, strengths, and weaknesses of students, adapting the content, pacing, and difficulty to each learner's needs. This personalised approach helps ensure that each student gets the right level of challenge and support. Pawar (2023) mentioned that AI provides real-time feedback that is customised for each student, pointing out specific areas where improvement is needed and offering resources that address their unique learning gaps. AI can generate and adjust learning materials like quizzes, assignments, and lessons to suit individual student preferences and progress.

**Scalability:** AI can manage and assess large numbers of students simultaneously, making it possible to scale personalised learning for large classrooms or online courses. This scalability helps meet the needs of diverse learners, even in large educational settings. AI enables automated grading of tests, assignments, and essays, saving educators time while maintaining consistency in assessments (Moro-Visconti et al., 2023).

**Real-Time Data and Analytics**: AI-enhanced learning platforms provide instant feedback to students as they progress through tasks and assessments, allowing them to learn from mistakes and correct them in real-time. A recent study carried out by Marr (2024) found that AI collects data on student performance and engagement, providing insights into learning patterns, strengths, and weaknesses. These insights help educators track progress, make informed decisions, and personalise learning experiences further. AI can predict student outcomes based on past performance, offering early warnings about potential struggles and suggesting interventions before issues become significant.

**Adaptive learning through AI:** AI constantly adapts to the learner's behaviour, adjusting content based on their understanding. For example, if a student struggles with a specific concept, the AI might revisit the topic with simpler explanations or additional practice exercises. As students master topics. Joshi (2022) states that AI increases the difficulty level to provide continuous challenges, keeping learners engaged without overwhelming them.

**Automation:** AI can generate educational content such as quizzes, practice exercises, and study material based on the curriculum. This allows instructors to focus on higher-level teaching tasks while AI handles routine content creation. AI can streamline administrative processes, like scheduling, tracking progress, and managing assignments, freeing up time for educators to focus on teaching (Voreco 2024).

**Accessibility:** AI-enhanced learning tools can cater to students with diverse needs, including those with disabilities. For instance, AI can provide text-to-speech for students with visual impairments or adjust the pace for students with learning disabilities. AI can support learners in multiple languages, translating content and providing instruction in a way that makes education more accessible to non-native speakers (Marouf et al., 2024).

**Continuous Improvement:** Over time, AI systems learn from interactions and performance data, improving their ability to personalise learning experiences. As AI collects more data, its recommendations, assessments, and learning paths get more refined and accurate. AI-based systems continuously evolve based on student feedback, usage patterns, and advances in educational theories, ensuring they stay relevant and effective.

## ADVANTAGES OF AI ENHANCED LEARNING

Artificial Intelligence (AI) is transforming nearly every sector, and education is no exception. With its increasing influence, AI-enhanced learning is emerging as a revolutionary force in shaping the future of education. AI provides innovative solutions that address many challenges in traditional learning systems, offering personalized, adaptive, and efficient learning experiences for students and teachers alike

**Personalized Learning:** AI can tailor the learning experience to the individual needs of each student. By analyzing data on students' learning styles, preferences, and progress, AI systems can adjust content delivery, difficulty levels, and even teaching methods to better suit each learner. This personalization helps to ensure that students are not left behind or bored, as they can engage with material that matches their pace and ability level. Studies have shown that personalized learning powered by AI can improve retention and comprehension, enabling students to master subjects more efficiently (Shute & Ventura, 2013).

**Enhanced Learning Efficiency:** AI-powered tools can streamline learning processes, offering students access to educational resources 24/7. For example, AI-driven chatbots or virtual tutors can provide instant support, answer questions, and assist students outside of traditional classroom hours. This continuous learning model helps reinforce lessons and enables students to work at their own pace. Additionally, AI can automate administrative tasks for educators, allowing them to spend more time focusing on teaching, mentoring, and providing feedback to students (Baker & Siemens, 2014).

**Scalability of Education:** AI has the potential to democratize education by making quality learning accessible to a larger number of students, regardless of location or socioeconomic status. In regions where traditional educational resources are scarce or inadequate, AI-driven platforms can provide affordable and scalable solutions, offering educational content that can reach students anywhere with an internet connection. This scalability is particularly important in addressing educational disparities and ensuring that more learners can benefit from high-quality educational experiences (Popenici & Kerr, 2017).

**Data-Driven Insights and Continuous Improvement:** AI-powered systems can collect and analyze vast amounts of data related to student performance, learning behaviors, and engagement levels. Educators can use these insights to identify struggling students early on, track their progress, and adjust teaching strategies accordingly. This data-driven approach

enables more informed decision-making in the classroom and helps teachers provide targeted interventions. AI also helps identify trends and patterns in learning that could guide future curriculum improvements (Siemens, 2013).

**Interactive and Immersive Learning Experiences:** AI can create engaging and immersive learning environments, particularly in fields such as science, technology, engineering, and mathematics (STEM). Through the use of AI technologies like virtual reality (VR), augmented reality (AR), and simulations, students can experience complex concepts in a more hands-on and interactive manner. For example, medical students can practice surgeries in virtual environments, or history students can "visit" ancient civilizations through immersive simulations. These types of interactive learning experiences help improve understanding and retention of difficult concepts (Freina & Ott, 2015).

**Support for Special Needs Learners:** AI can provide valuable support for students with special needs by adapting learning experiences to their specific requirements. For instance, AI-powered tools can assist students with dyslexia, visual impairments, or autism by offering tailored resources such as speech recognition, language translation, or customizable learning interfaces. These technologies ensure that students with disabilities receive a more inclusive education, allowing them to participate more effectively in the learning process (Almalki & Aziz, 2021).

**Improved Teacher Support and Professional Development:** AI can also support teachers by providing tools for continuous professional development. AI-based systems can offer real-time feedback on teaching methods, suggest new resources, and even recommend personalized development plans for educators. Furthermore, AI can automate administrative tasks such as grading, lesson planning, and scheduling, allowing teachers to focus on instruction and student engagement. This increased efficiency helps reduce teacher burnout and provides more opportunities for educators to innovate in the classroom (VanLehn, 2011).

**Global Collaboration and Learning Communities:** AI enables students and educators to connect globally, transcending geographical boundaries and fostering international collaboration. Through AI-powered platforms, students can collaborate with peers from different cultures and backgrounds, enhancing their global awareness and communication skills. These collaborative opportunities enrich the learning experience and encourage the sharing of diverse perspectives and ideas, preparing students for an interconnected world (Cobo, 2015).

## DISADVANTAGES OF AI ENHANCED LEARNING

AI-enhanced learning refers to the integration of artificial intelligence tools and systems in educational processes, aiming to personalize, streamline, and improve the learning experience. However, despite its advantages, AI-enhanced learning brings with it a range of challenges and disadvantages that must be considered.

**Lack of Human Interaction:** One of the most significant disadvantages of AI-enhanced learning is the reduction in human interaction. Traditional learning environments rely heavily on face-to-face interactions between students and teachers, which can help develop critical social skills, emotional intelligence, and provide personalized guidance. AI systems, no matter how sophisticated, cannot replicate the empathy, encouragement, and nuanced understanding that human teachers provide. The absence of such interactions may lead to feelings of isolation, especially for younger students or those who rely on emotional support from educators to succeed.

**Bias in AI Algorithms:** AI systems learn from data, and if this data is biased, the AI can perpetuate and even amplify these biases. In the context of learning, this can affect the fairness and inclusivity of educational opportunities. For instance, AI-powered platforms might favor certain learning styles, demographic groups, or backgrounds, while marginalizing others. Research has shown that AI algorithms can reinforce racial, gender, and socio-economic biases, leading to unequal learning experiences and outcomes for different groups of students (O'Neil, 2016).

**Data Privacy Concerns:** AI-powered learning platforms collect vast amounts of data about students, including their academic performance, behavior patterns, and even personal preferences. This data collection raises serious privacy concerns, particularly for minors. There is a risk that this data could be misused or fall into the wrong hands, leading to security breaches or identity theft. Moreover, students and parents may not always be fully aware of the extent to which their personal information is being used or shared, raising ethical issues around consent and transparency (Zeng et al., 2021).

**Dependency on Technology:** AI-enhanced learning can lead to an over-reliance on technology. This can become problematic when students face technical issues such as hardware malfunctions, poor internet connectivity, or limited access to necessary devices. In areas with limited resources or during emergencies (such as the COVID-19 pandemic), students from disadvantaged backgrounds may struggle to access AI-powered learning tools, widening the educational gap between socioeconomic groups. Furthermore, students may become overly dependent on AI systems for learning, neglecting the development of critical thinking and problem-solving skills that do not rely on technology.

**Job Displacement and Teacher Roles:** AI in education may contribute to the displacement of educators or changes in their roles. While AI can support teachers by automating administrative tasks or providing personalized learning experiences, it may also lead to reduced job opportunities, especially in environments where AI can replace basic teaching functions. This shift can diminish the role of human educators, potentially reducing the personal and professional satisfaction that many teachers find in direct interactions with students (Brynjolfsson & McAfee, 2014). The fear of job loss could also discourage teachers from adopting AI-enhanced tools.

**Limited Creativity and Innovation:** While AI can facilitate the learning process by offering personalized experiences, it often does so within predefined parameters. This means that AI systems are typically designed to follow specific algorithms and patterns, which can limit students' opportunities for creative thinking and innovation. Education, especially in fields like the arts and humanities, thrives on creativity, exploration, and the development of new ideas, and AI's tendency to optimize for efficiency might stifle these aspects of learning (Schwab, 2016).

**Unequal Access to AI Resources:** Access to AI-enhanced learning tools is not universal. Students from wealthier families or schools with larger budgets may have access to the best AI-powered tools, while others may not. This inequality further deepens the digital divide, creating disparities in learning experiences across different regions and socioeconomic statuses. The availability of AI-enhanced learning resources depends heavily on infrastructure, such as high-speed internet and modern devices, which are not accessible to everyone, especially in rural or underserved areas.

## EFFECTS OF AI ENHANCED LEARNING ON STUDENT'S ACADEMIC PERFORMANCE

*AI-Driven Personalized Learning and adaptation of content to individual needs, analysis of student progress and provision of targeted feedback*: AI-driven personalized learning improves students' academic performance by adapting content to individual needs. AI systems analyze student progress and provide targeted feedback, ensuring mastery of concepts before moving to advanced topics. This personalized approach leads to higher grades and better retention. AI-powered tools also reduce frustration by breaking complex subjects into manageable steps. The study found that AI-driven language learning significantly boosted students' proficiency and exam performance. Personalized learning systems foster better engagement, translating to improved academic outcomes.

*AI-Enhanced Learning and Cognitive Development*: AI-driven learning environments significantly enhance students' cognitive abilities, leading to better academic performance. Jaksa and Margerum-Leys (2024) found that AI technologies support students in developing problem-solving skills, analytical thinking, and information processing. AI-based platforms provide real-time feedback, allowing students to correct mistakes instantly. Additionally, AI enhances metacognition by encouraging students to reflect on their learning strategies. The study highlighted that students exposed to AI-supported cognitive training demonstrated improved test scores. AI also assists in reducing cognitive overload by presenting information in digestible formats.

*AI in STEM Education contribute to better conceptual understanding and academic Success*: AI has had a profound impact on student performance in science, technology, engineering, and mathematics (STEM) subjects. Research by Wang et al. (2023) found that AI-based tutoring systems help students grasp complex STEM concepts faster. AI simulations and virtual labs provide hands-on learning experiences, leading to better conceptual understanding. AI-powered problem-solving tools enhance students' analytical abilities, resulting in higher test scores in mathematics and physics. The study also noted that AI-assisted coding platforms improve programming skills, making students more proficient in computational thinking. These improvements contribute to overall academic success in STEM disciplines.

*AI-Driven Feedback and Student learning Improvement*: One of the most significant advantages of AI-enhanced learning is its ability to provide immediate and personalized feedback. AI-driven assessments allow students to understand their mistakes instantly and improve upon them. Traditional feedback methods often delay student learning, whereas AI systems provide corrections in real time. This rapid feedback loop enables students to learn more efficiently and achieve higher academic performance. The study found that students who received AI-generated feedback demonstrated greater progress in writing, mathematics, and critical reasoning tests. This suggests that AI plays a crucial role in academic improvement.

## METHODOLOGY

In carrying out the study, a comparative study design was adopted. The study was carried out in Imo State. The targeted population for the study comprised all ICT teachers in Secondary school in Akwa Ibom State. A simple random sampling technique was used to select 140 ICT teachers in Secondary Schools in Imo State and this formed the sample size used to carry out this study. The instrument used for data collection was a structured questionnaire titled "Advantage and Disadvantage of AI Enhanced Learning Questionnaire (ADAIELQ)". Face and content validation of the instrument was carried out by an expert in test, measurement, and evaluation in order to ensure that the instrument has the accuracy, appropriateness, and completeness for the study under consideration. The reliability coefficient

obtained was 0.84 and this was high enough to justify the use of the instrument. The researcher subjected the data generated for this study to appropriate statistical technique such percentage analysis to answer research questions.

Research Question 1

The research question sought to find out the advantages of AI enhanced learning. To answer the research percentage analysis was performed on the data, (see table 1).

Table 1: Percentage analysis of the advantages of AI enhanced learning

| ADVANTAGES | FREQUENCY | PERCENTAGE |
|---|---|---|
| Personalized Learning | 37 | 26.43** |
| Enhanced Learning Efficiency | 28 | 20 |
| Scalability of Education | 19 | 13.57 |
| Data-Driven Insights and Continuous Improvement | 16 | 11.43* |
| Interactive and Immersive Learning Experiences | 14 | 10 |
| Support for Special Needs Learners | 12 | 8.57 |
| Improved Teacher Support and Professional Development | 8 | 5.71 |
| Global Collaboration and Learning Communities | 6 | 4.29 |
| TOTAL | 140 | 100% |

** The highest percentage frequency
* The least percentage frequency
SOURCE: Field survey

The above table 1 presents the percentage analysis of the advantages of AI enhanced learning. From the result of the data analysis, it was observed that the advantage tagged "Personalized Learning" 37(26.43%) was rated as the highest advantages of AI enhanced learning, while "Global Collaboration and Learning Communities" 6(4.29%) was rated the least. The result therefore is in agreement with the research findings of Shute & Ventura, (2013), who noted that personalized learning powered by AI can improve retention and comprehension, enabling students to master subjects more efficiently. AI can tailor the learning experience to the individual needs of each student. By analyzing data on students' learning styles, preferences, and progress, AI systems can adjust content delivery, difficulty levels, and even teaching methods to better suit each learner.

Research Question 2

The research question sought to find out the disadvantages of AI enhanced learning. To answer the research percentage analysis was performed on the data, (see table 2).

Table 2: Percentage analysis of the disadvantages of AI enhanced learning

| DISADVANTAGES | FREQUENCY | PERCENTAGE |
|---|---|---|
| Lack of Human Interaction | 36 | 25.71** |
| Bias in AI Algorithms | 31 | 22.14 |
| Data Privacy Concerns | 27 | 19.29 |
| Dependency on Technology | 24 | 17.14* |

| | | |
|---|---|---|
| Job Displacement and Teacher Roles | 22 | 15.71 |
| Limited Creativity and Innovation | 17 | 12.14 |
| Unequal Access to AI Resources | 16 | 11.43 |
| TOTAL | 140 | 100% |

** The highest percentage frequency
* The least percentage frequency
SOURCE: Field survey

The above table 2 presents the percentage analysis of the disadvantages of AI enhanced learning. From the result of the data analysis, it was observed that the disadvantage tagged "Lack of Human Interaction" 36(25.71%) was rated as the highest disadvantages of AI enhanced learning, while "Unequal Access to AI Resources" 16(11.43%) was rated the least. The result therefore is in agreement with the research findings of Brynjolfsson & McAfee (2014) who mentioned that the shift to artificial intelligence can diminish the role of human educators, potentially reducing the personal and professional satisfaction that many teachers find in direct interactions with students.

Research Question 3

The research question sought to find out the effects of AI enhanced learning on students' academic performance. To answer the research percentage analysis was performed on the data, (see table 3).

Table 3: Percentage analysis of the effects of AI enhanced learning on students' academic performance

| EFFECTS | FREQUENCY | PERCENTAGE |
|---|---|---|
| AI-Driven Personalized Learning and adaptation of content to individual needs, analysis of student progress and provision of targeted feedback | 46 | 32.86** |
| AI-Enhanced Learning and Cognitive Development | 40 | 28.57 |
| AI in STEM Education contribute to better conceptual understanding and academic Success | 31 | 22.14* |
| AI-Driven Feedback and Student learning Improvement | 23 | 16.43 |
| TOTAL | 140 | 100% |

** The highest percentage frequency
* The least percentage frequency
SOURCE: Field survey

The above table 3 presents the percentage analysis of the effects of AI enhanced learning on students' academic performance. From the result of the data analysis, it was observed that the effect tagged "AI-Driven Personalized Learning and adaptation of content to individual needs, analysis of student progress and provision of targeted feedback" 46(32.86%) was rated as the highest effects of AI enhanced learning on students' academic performance, while "AI-Driven Feedback and Student learning Improvement" 23(16.43%) was rated the least. The result

therefore is in agreement with the research findings of Xu (2024) who mentioned that AI-powered personalized learning systems allow students to study at their own pace, increasing engagement and interest in subjects. AI-driven personalized learning improves students' academic performance by adapting content to individual needs. AI systems analyze student progress and provide targeted feedback, ensuring mastery of concepts before moving to advanced topics.

## CONCLUSION

The result of the data analysis concluded that "Personalized Learning" among others is the highest advantage of AI enhanced learning, it also revealed that "Lack of Human Interaction" among others is the highest disadvantage of AI enhanced learning. Furthermore, revealed that "AI-Driven Personalized Learning and adaptation of content to individual needs, analysis of student progress and provision of targeted feedback" is the highest effect of AI enhanced learning on students' academic performance. The rapid advancement of Artificial Intelligence (AI) has significantly impacted education globally. AI-enhanced learning tools, including intelligent tutoring systems and personalized learning platforms, promise to make education more adaptive, interactive, and efficient. In Imo State, Nigeria, the integration of AI into secondary schools offers opportunities to address challenges like large class sizes and limited resources, providing tailored support for students. However, there are concerns about widening the digital divide, especially in rural areas with limited access to technology. Additionally, reliance on AI in administrative tasks could reduce teacher-student interaction. Striking a balance between AI use and personal engagement is key to maximizing its benefits.

## RECOMMENDATIONS

1. To bridge the digital divide, it is crucial to invest in improving technological infrastructure, especially in rural areas of Imo State. Ensuring that students have access to devices and reliable internet connectivity will enable equitable access to AI-enhanced learning tools, enhancing the learning experience for all students.
2. Teachers should be provided with training on how to effectively integrate AI tools into their teaching practices. Professional development programs that emphasize AI literacy will empower educators to balance technology with personal engagement, ensuring AI complements rather than replaces human interaction in the classroom.
3. Schools should adopt a balanced approach to AI-enhanced learning by ensuring that AI tools are used to complement, not replace, traditional teaching methods. Teachers should maintain a human-centered approach, fostering critical thinking, creativity, and social skills, while AI handles personalized learning and administrative tasks.

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