Original Article

HARNESSING ARTIFICIAL INTELLIGENCE IN DISTANCE EDUCATION

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Abstract: This research study explores the potential benefits and challenges of integrating Artificial Intelligence (AI) distance education in Sokoto state tertiary institutions. The rapid advancement of AI technologies presents an opportunity to revolutionize the delivery of education, particularly in the context of distance learning. This research aims to investigate the impact of AI on personalize learning experiences, administrative efficiency and students support services in the context of Sokoto state tertiary institutions. The study employed a mixed-method approach, incorporating both quantitative and qualitative data collection methods. Survey and interviews were conducted with students, educators and administrators to gather insight into their perceptions and the experiences with AI-enabled distance education. Additionally, data analysis will be conducted to assess the effectiveness of AI tools in improving learning outcomes, automating administrative tasks and enhancing and support. The finding of this research will contribute to the existing body of knowledge on the integration of AI in distance education, with a specific focus on the unique needs and challenges faced by Sokoto state tertiary institutions. The research outcome will provide valuable insight for educational policy makers, administrators and educators seeking to leverage AI technologies to enhance the quality and accessibility of distance education in Sokoto state.

Keywords: Artificial intelligence, distance education, administrative efficiency and students support services

Introduction

Artificial intelligence is the simulation of human intelligence processes by machine, especially computer systems, it's also defined as a wide-ranging branch of automated decision making without human involvement. It covers different areas from conditional logic to neural networks. Machine Learning (ML), a subset of AI, means decisions or predictions made by data-driven technology. Machine learning methods powered by AI include deep neural networks (DNN), also known as deep learning (DL). Machine learning, artificial intelligence, and deep learning are widespread and integrated across data-driven industries that create AI-based products and services.

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The growing interaction between humans and AI has resulted in the development of human centred machine learning (HCML) (Kaluarachchi, Reis, and Nanayakkara, 2021).

Distance education also known as online education, has significantly benefitted from advancements of artificial intelligence (AI) technology. AI has numerous application in distance education, bringing about benefit that enhance the overall learning experience for both students and educators. Here are some keywords in which AI is significant in distance education;

1. Personalized learning; AI-. powered learning platforms can adopt content and the pacing to match individual students need. By analyzing student data and the behavior, AI can provide personalized recommendations, identify areas of weakness, and tailor lesson plans to optimize learning outcomes.
2. Automation of administrative tasks; AI can automate routine administrative tasks, such as grading assignments, providing feedback, and scheduling assessment. This frees up educators to focus on developing more engaging and interactive course content.
3. Real-time feedback; AI-powered tools can provide instantaneous feedback to student on their assignments, quizzes, and presentations. This immediate feedback helps students identifies areas for improvement and adjust their approach accordingly.
4. Predictive analytics; AI algorisms can analyze data trends to predicts students' performance and risk factors for dropping out. Educators can use this information to intervene early, providing additional support and resources to at-risk students.
5. Improved accessibility; AI technology can ensure that online courses are assessable to students with disabilities by providing text to speech capabilities, transcripts, and translations. This enhances the inclusivity of distance education program.
6. Enhance student's engagement; AI can use tools like chatbots and virtual tutors to engage with students in real-time, answering questions and providing support. Interactive simulations powered by AI can also foster active learning and critical thinking skills.

Overall, AI has enabled greater flexibility, customization, efficiency, and the user engagement in distance education. By harnessing the power of AI technology, distance education institutions can better meet the diverse learning needs of students and improve the overall quality of online learning experiences

In the context of Sokoto State tertiary institutions, the integration of artificial intelligence (AI) holds particular significance for several reasons, reflecting the overall trend in Nigeria and global education landscape. Here are some specific reasons why AI integration is needed in Sokoto state tertiary institutions.

1. Enhancing access to quality education; By incorporating AI technology in online learning platforms, Sokoto state tertiary institutions can improve access to quality education for students in remote or underserved areas. AI powered distance education program can reach a larger number of students, providing opportunities for those who may not have access to traditional resources.
2. Personalized learning experiences; AI can facilitate personalized learning experiences by analyzing individual student data and the preferences. By incorporating AI algorism into course recommendations, study plans, and the feedback mechanisms, Sokoto state tertiary institutions can create tailored educational experiences that cater each students' unique needs and learning styles.
3. Addressing teaching and administrative challenges; integrating AI into teaching and administrative processes can help Sokoto state tertiary institutions streamline tasks such as grading, assessment scheduling, and the student

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support services. This can improve operational efficiency and educators to focus on fostering students' development and academic mentoring.

4. Students performance and retention; AI can play a crucial role in predicting students' performance and identifying at-risk students who may be prone to drop out. By leveraging AI analytics, tertiary institutions in Sokoto state can implement targeted interventions and the support systems to improve student retention rates and enhance overall academic success.

5. Promoting innovations and the competitiveness; AI integration can position Sokoto state tertiary institutions as leaders in innovative and technology-driving education practices. By adopting AI powered tools and solutions, these institutions can enhance their reputations, attract top-tier faculty and the students, and emerged as competitive players in the global education market.

Overall, the integration of AI technology in Sokoto State tertiary institutions can contribute to transforming the educational landscape, promoting inclusivity, efficiency, and effectiveness in delivering higher education services. By harnessing the power of AI, these institutions can adapt to the demands of modern education and equip students with the skills and knowledge needed to thrive in a rapidly changing, technology-driving world.

The need for integration of Artificial Intelligence (AI) in Distance Education (DE) in Sokoto State is an important issue for several reasons. Firstly, the vast majority of the population lives below poverty level. They are unable to attend urban based institutions and thus remain deprived of higher education despite their superior merit. Secondly, those who joined workforce without completing their studies or education due to family commitments are unable to combine their work with studies and very few of them who have strong desire for higher studies could not do so because of the limited offer in the traditional institution of higher learning. Thirdly, the tradition of childhood, early marriage and religious belief in the state deprives the majority of female population from higher education. Besides, there are some other usual factors like physical disabilities, remoteness of localities, exorbitant tuition fees in most privately owned institutions and so on. These are some of the major challenges responsible for why millions of Nigerians are deprived of higher education despite their keen interest and eligibilities. Adoption of AI in DE provides avenues for higher education for such a vast educationally disadvantaged population. Nigeria is generously endowed with human resources that need to be well equipped with literacy and skills to contribute to its economic development, which is badly needed for this country. Thus, it is crystal clear that the way forward is to embrace AI using both hands and supported by all necessary financial and infrastructural commitments.

Despite the glaring relevance of AI in education, Sokoto State teachers are still reluctant, ineffective, and unproductive in using AI facilities to improve students' interest, motivation and achievement especially in distance education. Colleges of Education trainers in developing countries like Nigeria and Sokoto in particular, have still a long way to go before they will be able to take advantage of the opportunity provided by 21st-century technology and it was not surprising when Adomi (2010) reported that 75 percent of teachers in Nigerian secondary schools have little or no experience and expertise regarding ICT in education. These poor ICT skills may also promote their adherence to ineffective teaching methods in delivery of distance education.

Literature Review

Artificial intelligent as rightly put by Castrounis (2016) it is the ability to perceive information, and retain its knowledge to be applied towards adaptive behaviors within an environment or context. Another wider and also precise is how Miner (2017) viewed Artificial intelligence as "Any technique which enables computers to mimic

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human behavior". It aims primarily to make computer performance more comprehensive and cultivate intelligent patterns of thinking linking humans to computers to make them smarter (Han, 2019).

With the development of information technology, more and more people have entered mobile learning, and are gradually accustomed to using fragmented time for distance learning to obtain knowledge sources from diverse spaces. The learning platform that is intelligent, personalized and mobile is more and more popular with the public. With the rapid development of artificial intelligence, big data, cloud computing and other technologies, it is possible to obtain useful data from the vast Internet, identify and classify these data at a high speed, and build a personalized environment, improve administrative efficiency of distance education system and provide accurate support services that are accurately customized for learners (Xiaogang, 2018). As one of the most advanced information technologies globally, Artificial intelligence technology has made many advances in some key areas of distance education such as personalize learning experiences, administrative efficiency and students support services.

Personalized learning

Personalized learning is a wide range of educational programs in which the method and pace of learning depend on learners' needs, special interests, and preferences. Artificial intelligence adapts the learning process to the individual learning rate of every student and offers tasks of increased complexity. Personalized learning is a systematic learning design that adapts learning to the personal strengths, preferences, needs and goals of an individual learner. It leads to a comprehensive learning experience by ensuring a wide choice of new disciplines and skills development (Walkington & Bernacki, 2020). Personalized learning assigns a specific role to teachers that is, to give the student the opportunity to manage the learning process, to be responsible for setting and implementing educational goals that correspond to his personal interests and needs (Aberbach *et al*., 2021). Personalized learning systems and approaches motivate students to learn and improve academic performance (Zlatarov et al., 2021).

Personalized learning emphasizes the importance of personal growth and the learning environment. A personalized learning environment includes a variety of services, learning tools and applications tailored to the individual students' needs. They use technologies such as Web 2.0 or Web 3.0 to develop cheaper training, enhance user experience, and create personalized student profiles. Adaptive systems can be customized to individual learners' needs, focusing more on specific topics, repeating learning materials that have not been mastered properly (KlašnjaMilićević & Ivanović, 2021).

Administrative Efficiency

AI may be adopted in administrative duties in tertiary institutions. Academicians spend a lot of time and effort on grading the examination, accessing homework, and making available valuable suggestions and guidance to their students. In accordance with this automated grading system may be applied with the help of Artificial Intelligence (AI), academicians have no need to spend a long time in evaluation and assessment which may be saved and utilized for some other important tasks. Recently numerous software companies are coming up with their Learning Management System (LMS) to provide better ways of grading written answers and essays.

Integration of AI into distance education system can improve administrative efficiency through provision of massive teaching resources, and carry out unified management, giving priority to providing high-quality resources to students, thus ensuring the quality of distance education. The distance education system based on artificial intelligence technology will also capture and analyze each learner's state data and environment data, offer

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different learning resources in accordance with their learning preferences, learning habits, learning progress, learning time and learning level, and actively propose appropriate learning plans and learning suggestions to learners. It not only has the high-speed intelligent identification function, but also has the ability of precise positioning and personalized service (Xiaogang, 2018). With AI in distance education, efficiency should be expected in learning content management systems, learning management systems, classroom management system, virtual learning environments, course management system, user management system, supporting system, intelligent tutoring system, and Massive Open Online Course (MOOC).

Students support services

The use of artificial intelligence offers students of different age groups, academic levels and socioeconomic backgrounds opportunities to enhance learning experiences and improve academic achievements. Artificial intelligence technologies play a pivotal role in the development of personalized learning pathways. AI allows the use of different teaching methods effective for each student, taking into account the strengths, weaknesses, talents and academic problems of each learner. Advanced analytics and machine learning present a potential for developing social and emotional learning skills. New technologies help teachers to develop personalized learning pathways and analyze both qualitative and quantitative data. Artificial intelligence, data, analytics and machine learning help educators to deliver educational programs to students via an immersive virtual environment. This approach helps to ensure the quality of distance learning and effective teaching (Duggan, 2020).

Students' support which is also an important dynamic unit can witness AI integration in tertiary institutions. Schools utilize machine learning in student guidance. Some applications help students automatically schedule their course load. Others recommend courses, majors, and career paths as is traditionally done by guidance counsellors or career services providers. The tools make recommendations based on how students with similar data profiles performed in the past.

Another area for AI use in student support is just-in-time financial aid. Higher institutions can use data about students to give those microloans or advances at the last minute if they need the money to, for example, get to the end of the semester and not drop out. Finally, one of the most prominent ways that predictive analytics is being used in student support is for early warning systems, analyzing a wide array of data academic, nonacademic, operational to identify students who are at risk of failing or dropping out or having mental health issues. This particular use shows some of the real advantages of artificial intelligence where big data can give educators more holistic insight into students' status. Traditionally, an institution might use a couple of blunt factors for example, GPA or attendance to assess whether a student is at risk. AI software systems can use much more granular patterns of information and student behavior for real-time, up-to-the-minute assessment of student risk. Some even incorporate information such as when a student stop going to the cafeteria for lunch. They can include data on whether students visit the library or a gym and when they use school services. Yet while these systems may help streamline success, they also raise important concerns about student privacy and autonomy.

Methodology

This section used both qualitative and quantitative method.

a) The qualitative approach reviewed current researches on AI integration in distance education.

b) The quantitative survey approach assessed perceptions, and effectiveness of artificial intelligence (AI) technology integration in the context of distance learning in Sokoto state tertiary institutions. The survey method was chosen because it can provide a comprehensive picture of students' perceptions and experiences regarding

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the use of AI technology in the context of online learning. A total of 10 teachers and 20 students were randomly selected as respondents, with sample selection using the purposive sampling method. This process ensures maximum representation of teachers and students who have significant experience with the integration of AI technology in learning. Sample selection through purposive sampling ensures that respondents have relevant insights and in-depth experience with AI technology in distance learning. Data was collected through questionnaires and interview focused on perceptions, effectiveness of AI tools in improving learning outcomes, automating administrative tasks and enhancing students' level of interactivity during learning. Next, descriptive statistical analysis will analyze patterns and relationships between variables to explore the effectiveness of AI technology, perception and its impact on students learning experiences.

Result and Discussion

This section presents the analysis of data, presentation and discussion of findings.

Results

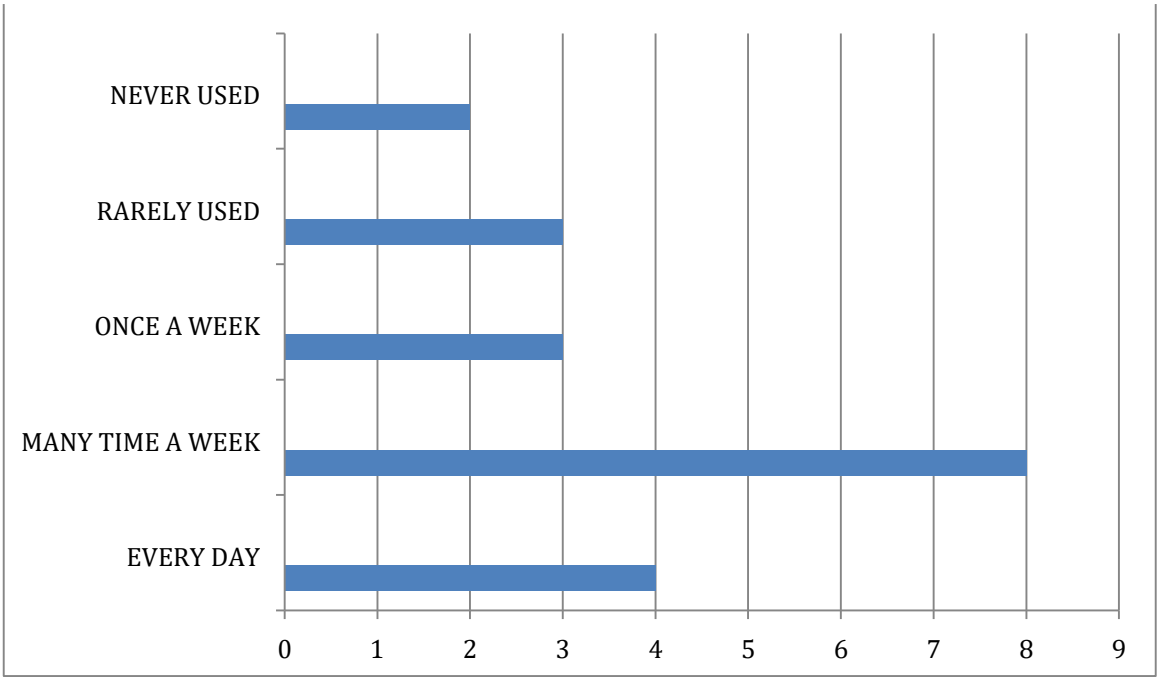

Figure 1: Frequently use of AI technology among students in distance learning

From figure 1 above use of AI among 20 students; everyday use 4 (20%), many time a week 8 (40%), once a week 3 (15%), rarely used 3 (15%) while never used 2 (10%). This indicated that the majority of students (60%) actively use AI technology. The majority of them (40%) use AI technology many times a week, indicating a fairly high adoption rate. Meanwhile, a few students (10%) never use AI technology. These results showed that integration of AI technology in distance learning has become an integral part of the students learning experience, which can provide a foundation for tertiary education institutions to continue to develop and improve the use of AI technology in the learning environment.

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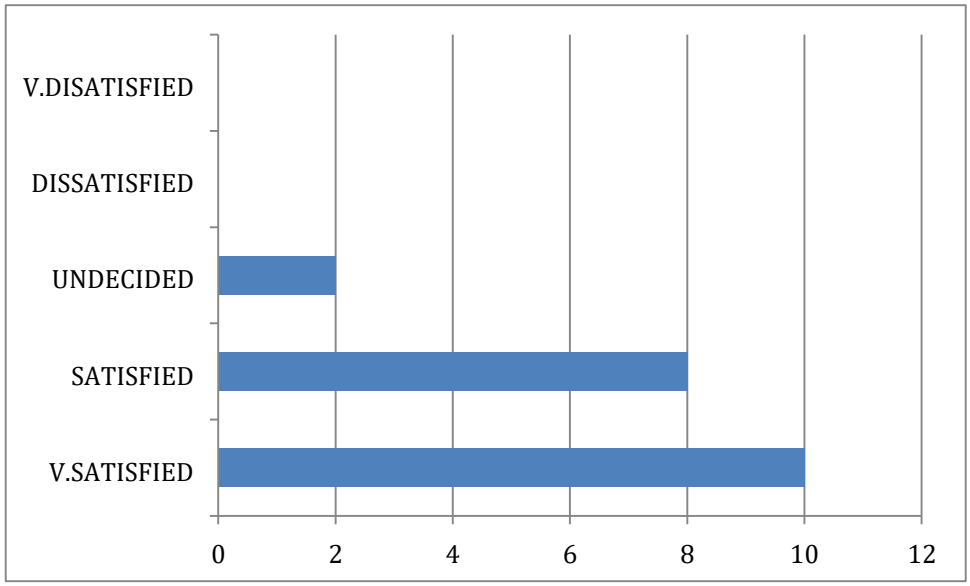

Figure 2: students' level of perception on the use of AI technology in learning.

Out of the 20 students who participated in the survey, the level of perceptions on the use of AI technology in distance learning is as follows: Very satisfied: 10 students (50%), Satisfied: 8 students (40 %), Undecided: 2 students (10%), Dissatisfied: 0 students (0%), Very Dissatisfied: 0 students (0%). Thus, the survey results showed that majority of students (90%) have a very good perception about the use of AI technology in distance learning. Means while only 10% of the students did not decided. No one expressed dissatisfaction or very dissatisfaction. These results indicated that adoption of AI technology in distance learning received a positive response from the majority of students.

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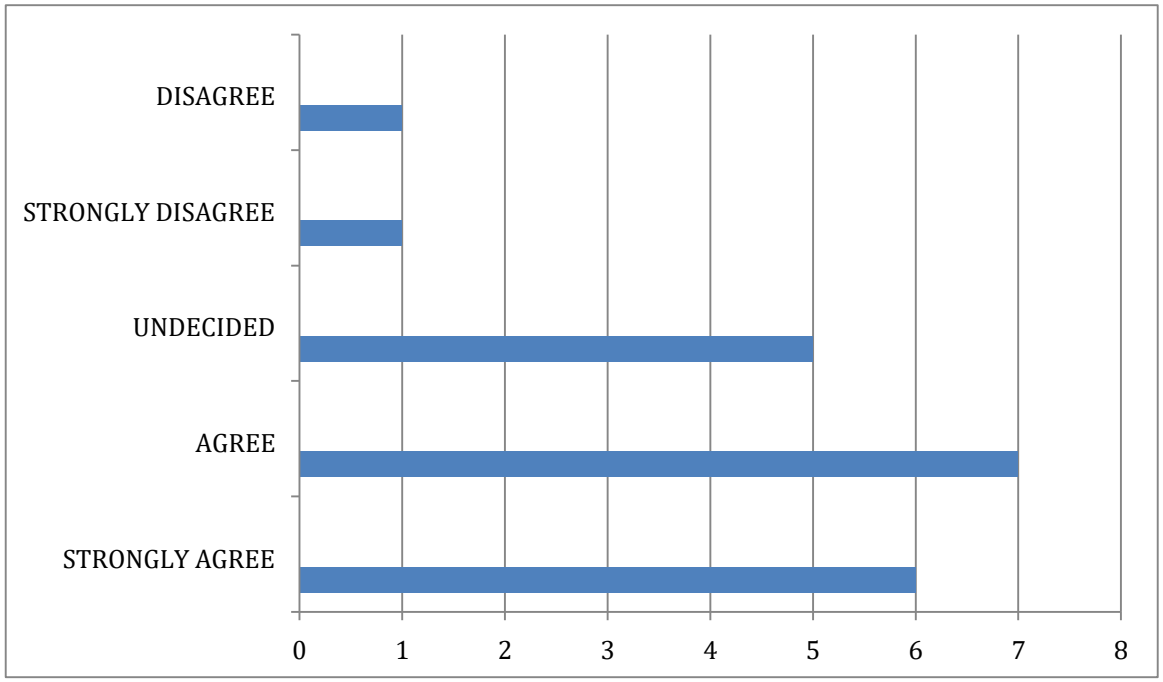

Figure 3: Efficiency of Integration of AI technology in improving the quality of distance learning

Results from figure 3 were Strongly Agree: 6 students (30%), Agree: 7 students (35%), Undecided: 5 students (25%), Disagree: 1 student (5%), Strongly Disagree: 1 student (5%) The survey results showed that majority of students (65%) have agreed that AI technology integration effectively improved the quality of distance learning, while 25% of them did not decide. And only few students 10% showed disagreement with this statement, indicating that the integration of AI technology positively improve quality of distance learning according to the majority of the respondents.

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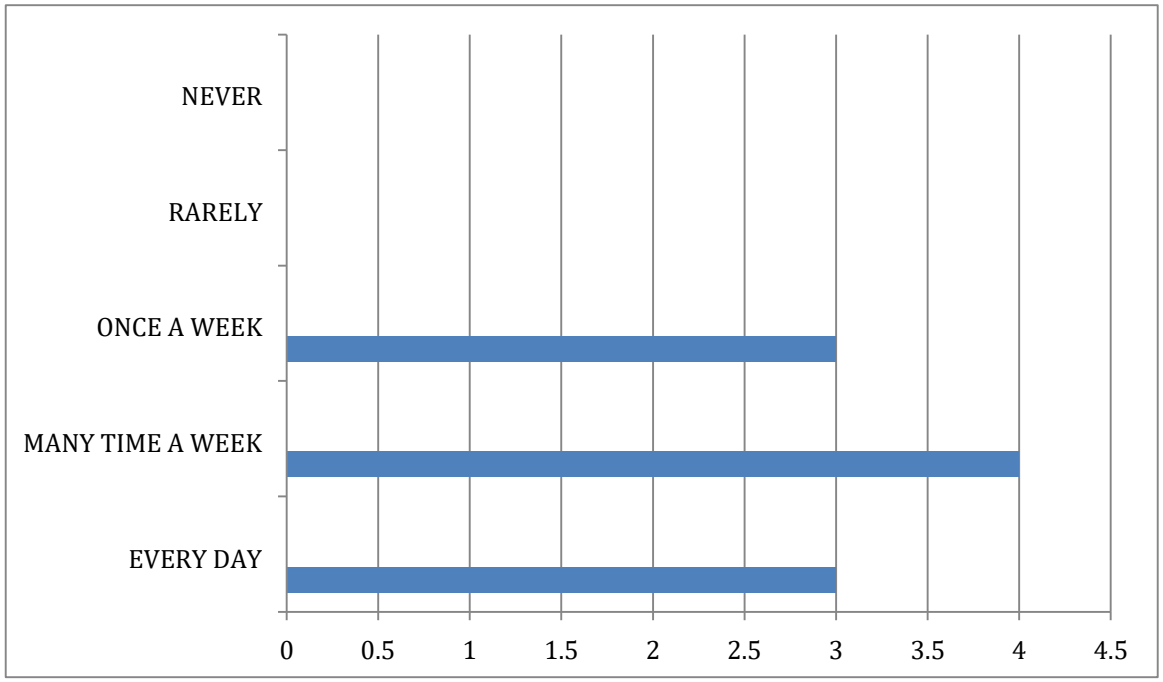

Figure 4: Use of AI technology in Improving Administrative Efficiency among distance education Teachers.

From figure 4 above use of AI in improving Administrative Efficiency among distance education Teachers; everyday use 3 (30%), many time a week 4 (40%), once a week 3 (30%), rarely used 0 (0%), and never used 0 (0%). This indicated that the majority of teachers (70%) actively use AI technology. The majority of them (40%) use AI technology many times a week, indicating a fairly high adoption rate. Meanwhile, all the staff use AI technology in improving administrative efficiency. These results showed that integration of AI technology in distance learning has become an integral part of the administrative affairs of tertiary institutions which can provide a foundation for the development and improvement teaching and learning environment.

Discussion of Results

Findings from the survey show that both students and Teachers generally actively use AI technology in distance learning, with the majority of them doing so several times a week. The level of perception with the use of AI technology also tends to be high, with the majority of students feeling very satisfied or satisfied. Students also see that the integration of AI technology has made a positive contribution to improving the quality of their distance learning. This reflects high interest in the application of AI technology to create more immersive and interactive learning experiences. Nonetheless, the survey also revealed a positive picture of adoption AI technologies in the context of distance learning in tertiary institution, while also highlighting some aspects that can be improved for maximum benefits of this integration.

Conclusion

Based on the results of a survey of 20 students and 10 teachers regarding the use of AI technology in distance learning, it can be concluded that the majority of students and teachers actively use AI technology, especially several times a week. The level of perception with the use of AI technology is also high, with the majority of students having very good perception. This positive view is also reflected in the perception that the integration of AI technology has made a positive contribution to improving the quality of distance learning in the aspect of personalized learning, administrative efficiency and students' support services. However, the survey results also

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highlight that all respondents experienced challenges in the use of AI technology, emphasizing the need to address these issues to maximize the benefits of integrating AI technology in distance learning. Thus, the overall survey shows that AI technology has become an integral part of students' distance learning experience in tertiary institutions, but certain challenges need to be overcome so that the implementation of this technology can run more effectively and efficiently in the future.

Areas for Future Study

There are several areas for future research integrating artificial intelligence (AI) in distance education in Sokoto State Tertiary institutions. Some potential research areas include:

1. Pedagogical implications of AI in distance education: Investigating how AI technologies can enhance the delivery of educational content and improve learning outcomes in a distance education setting.
2. Designing AI-powered personalized learning experiences: Exploring how AI can be used to create personalized learning experiences for distance education students.
3. Assessing the effectiveness of AI in students support services: investigating the role of AI in providing personalized students support services such as AI powered virtual advisors or mentors.

These research areas can contribute to the advancement of AI in distance education at Sokoto State Tertiary institutions, leading to improve quality, accessibility and effectiveness of online learning experiences

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