ARTIFICIAL INTELLIGENCE USAGE AND TEACHER'S PERFORMANCE IN PUBLIC SENIOR SECONDARY SCHOOLS IN RIVERS STATE, NIGERIA

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Abstract

This study examined artificial intelligence usage and teacher's performance in public senior secondary schools in Rivers State. The study was guided by two objectives with corresponding research questions and hypotheses. The descriptive survey research design that is correlational in nature was adopted for the study. The population of the study comprised of 6,153 academic staff (320 principals and 5833 teachers) in three hundred and twenty public senior secondary schools in Rivers State. The sample size of the study was 376 respondents obtained using Taro Yamane formula of minimum sample, with stratified sampling as the technique. The instrument for the study was a two set questionnaire titled: Artificial Intelligence Usage Questionnaire (AIUQ) and Teacher's Performance Questionnaire (TPQ). The questionnaire were validated and reliability coefficients of 'r' = 0.84 and 0.81 respectively were obtained using the Cronbach alpha statistical method. Pearson Product Moment Correlation (PPMC) was used to answer the two research questions, while same correlation statistics was used to test the corresponding hypotheses at 0.05 significance level. The findings of the study revealed that there was a positive and significant relationship between artificial intelligence usage in assessment/grading of students, virtual teaching and teacher's performance in public senior secondary schools in Rivers State. Based on the findings, it was recommended among others that government through training should encourage teachers to utilise AI-powered assessment and automated grading systems to navigate and adjust the level of difficulty and workload they face in assessing/grading of students in order to improve individual teacher performance. Also, teachers should not see AI-powered adaptive systems and chatbots as a silver bullet, but rather as vital tools that can enhance their performance to deliver instruction through virtual means in order for them and the students to compete favourably with their counterparts globally.

Keywords: *Artificial Intelligence, Teacher Performance*

Introduction

Education plays an important role in supporting the quality of human resources especially as capital for the development and progress of a nation. Because one form of investment in human resources lies in the level of education received. Success in education can create quality and feasible human beings in society and this is made possible through the educator who is known as the teacher. The teacher is one of the school members who play an important role in achieving educational goals. He or she is directly involved in the implementation of the teaching and learning process in the classroom. In other words, how the teacher carryout the teaching and learning process shows his level of performance. Good teacher performance is needed in order to create interesting teaching and learning activities to stimulate students in developing their thinking and increase the

spirit of learning when at school. Adequate teacher performance is expected to increase students' knowledge. One measure of the quality of student knowledge that is directly influenced by teacher performance.

Consequently, teacher performance is the behaviour or work shown by a teacher to achieve the goals that have been set. If the performance is good, the teacher can create a quality teaching and learning process so that student learning outcomes increase. It is all efforts made by a teacher in order to promote a sustainable instructional activities, so that the educational goals and objectives that have been set can be achieved (Pido, Mahmud & Sudirman, 2023). Teacher performance refers to the effectiveness and quality of a teacher's instructional practices, classroom management, and overall contribution to students learning and achievement. It encompasses various aspects, including; instructional skills, classroom management, assessment and feedback, content knowledge, communication skills, students engagement and many more (Adeyemi, 2021).

Duffield in Ray-offor (2017), described a performing teacher as one who is liable to improve students' reading and writing skills, work with students with special needs, and employs active learning activities.

The task of a performing teacher is to create a good classroom atmosphere that promotes effective students learning and stimulate their creativity. In view of this great role, efforts can be made by the teacher by adopting any positive means to support the process of delivery quality teaching and learning experience. Such effort can be the adoption of technology like Artificial Intelligence (AI). Artificial Intelligence (AI) refers to the simulation of intelligent processes in human beings by technology of the computer systems. These systems are designed to perform tasks that normally require human intelligence (Joiner, 2018) such as understanding natural language, solving complex problems, learning, and even recognizing visual and auditory patterns (Chintalapati, et al., 2021; Nazarpour, et al., 2021), it continues to evolve rapidly, offering both promising opportunities and significant challenges in various fields, including education.

Artificial Intelligence (AI) was established as an academic discipline in the 1950s wherein it was described as a systemic ability to interpret, learn, and achieve specific tasks from data. It was classified as "analytical, human-inspired intelligence" because of the features it contains, together with the exhibited outputs that involve cognitive, emotional, and social display. In recent developments and advancements, several platforms have popularized mainstream usage of AI as part of daily processes such as incorporation of AI in tools that are used in several industries. This has implicated the inclusion of AI systems in day-to-day usage, indicating the improved outcomes of using AI as a powerful tool to increase efficiency and performance. Zhang & Lu (2021) described AI as a knowledge project that absorbs various information, analyzes these data, and studies the methods of expressing the outcomes. It compiles multi-disciplinary information, processes it according to categories, and displays based on commands. It was noted as a revolutionary technology that results in efficient labour improvements, cost reduction, and optimization of human resources toward job opportunities creation. Nabila et al. (2021) explained that this "man-made brain power" has induced advances that have been subjects in academic, public, and business arrangements, promoting proficiency and efficiency in the development of processes and mechanisms. It has tapped into several societal spheres such as marketing, healthcare, human rights and education (Perifanis & Kitsios, 2023). With the development of artificial intelligence technology, modern education have started combining more technologies, such as speech semantic recognition, image recognition, Augmented Reality/Virtual Reality, machine learning, brain neuroscience, quantum computing, blockchain and so on. These technologies are collectively referred to as intelligent technologies and are consistently and rapidly integrated with the education industry. The intelligent upgrade of the education industry is in full swing. At present, more and more artificial intelligence education products have been applied to school education to ensure effective administration of the school system (Yan, 2021).

The typical scenarios of artificial intelligence education applications include intelligent tutor-assisted personalized teaching and learning, intelligent assistants such as educational robots, children's partners at home, intelligent assessment, mining and intelligent analysis of educational data, learning analysis and learning, digital portraits, and etcetera. Nevertheless, Liu, et al (2020) literature studies show that artificial intelligence technology usage in school can help to improve teacher's performance. To the scholar, a teacher can actually

use AI in the assessment/grading of students as well as virtual teaching. On the point of view that AI can be used in the assessment/grading of students, Bell, et al (2022) note that teachers are spending more time on direct teaching and engagement and less time on preparation, assessment, and administrative chores. Concurrently, it has been discovered that technology like AI may assist instructors in assessing and grading 20–30% of their student. By incorporating AI educational technology, Bryant, et al (2020) assert that instructors will not only be able to be more productive and spend less time on grading, but they will also be able to interact with their students on a deeper level, having additional time and energy to foster a better and more powerful connection, thereby improving their performance (Bryant, et al. 2020).

Furthermore, Booth (2023) opined artificial intelligence could be used for the setting, marking and grading of exams and assessed coursework, as well as the delivery and invigilation of remote assessments. Reiss (2021) notes that secondary schools are like any other organization and there is no doubt that AI will play an increasing role in what might be termed the administrative aspects of the system. Some of these have something to do with the classroom teacher for example, the grading of students after teaching and learning activities. Other aspects do involve the teacher – for example, improved design and marking of terminal assessments, more valid provision of information about students to their parents/guardians (reports) and so on. The importance of these for the lives of teachers should not be underestimated. Many teachers today in many schools where artificial intelligence is adopted would be delighted to see that it reduce what they often characterize as bureaucracy and workload that wears them down (Towers, 2021; Skinner et al., 2019).

In addition, artificial intelligence brings benefits and opportunities to education by facilitating virtual teaching, providing instant feedback and improving efficiency in the teaching and learning process for better teacher performance. Virtual teaching has been described by Turoff (2021) as a web-based environment that allows an individual to participate in live training events without traveling to any other place. It allows students to sit in the comfort of their environment and listen to lectures. Students can participate in the lab exercises, ask questions and effectively interact with the teacher as if the action is taking place in a conventional classroom but it is done with the convenience of artificial intelligence. Artificial intelligence provides such advantages and new ways of communicating, interacting, and assessing information for both teachers and students. Writing on the definition of AI virtual teaching, Mangal and Mangal (2019) opines that AI saves students and teachers the hassle, expense, and travel time to a conventional class, thereby giving teachers opportunity to deliver instruction and assignment to students outside the four walls of the classroom.

Also, artificial intelligence application in virtual teaching can encourage collaboration and teamwork among students, because it allows students connect with other students and instructors. Artificial intelligence provides new ways of communicating, interacting, and assessing information for both teachers and students. More so, it creates tutorials and interactive virtual assistants, systems that can answer students' questions, provide additional explanations, and guide students in real time through the learning process. Thus, through tutorials and virtual assistance students can benefit from additional support and learn at an individualized pace receiving real-time guidance to support the learning process thereby giving the teacher less work. Combining AI with virtual reality, teachers create immersive learning experiences. AI algorithms analyze student interactions within virtual environments, adapting scenarios and challenges based on real-time responses, enhancing experiential learning (Mahendra 2023).

In view of the above discussion, Madiha (2021) emphasize that AI system usage in educational management has increased rapidly due to its effectiveness in improving teacher's performance; the main purpose and usage of AI is to improve teacher's performance in terms of s assessment/grading of students and virtual teaching. Consequently, the overall literature review highlighted the positive impact of artificial intelligence on teacher's performance for effective school management and administration. Thus, technology includes all scientific techniques and processes for improving work and to be an effective user of technology, it is important for the school teachers to understand how technological advances could affect the effectiveness of school management (Munro, 2018). In other words, teachers are the driving force to ensure effective utilization of AI in school. However, teachers need to have the necessary skills or competencies to perform this task. Hence, this study was

carried out to examine the relationship between artificial intelligence usage and teacher's performance in public senior secondary schools in Rivers State.

Statement of the Problem

Artificial intelligence systems provide benefits for teachers by offering more flexibility about place, time and pace. Its platforms often offer more ways for interactions and motivation than traditional teaching and learning settings. However, it has been observed by the authors of this paper that teachers of secondary schools have been teaching and carrying out classroom duties such assessment and grading of students using the traditional way, resulting in poor performance of teachers especially in the area of getting job task done effectively and efficiently. It is alleged that workload experienced by teachers when it has to do with teaching and assessment/grading of students is that teachers have failed to recognize and use technologies such AI to enhance their performance. And there is need to improve the awareness of how AI can improve teacher's performance in the way they assess/grade, as well as teach the students in order to compete with other high ranking secondary schools in the world. Hence, this was what necessitated this study.

Aim and Objectives of the Study

The aim of this study was to examine the relationship between artificial intelligence usage and teacher's performance in public senior secondary schools in Rivers State. Specifically, the study sought to:

1. examine the relationship between artificial intelligence usage in assessment/grading of students and teacher's performance in public senior secondary schools in Rivers State.

2. determine the relationship between artificial intelligence usage in virtual teaching and teacher's performance in public senior secondary schools in Rivers State.

Research Questions

The following research questions guided the study:

1. What is the relationship between artificial intelligence usage in assessment/grading of students and teacher's performance in public senior secondary schools in Rivers State?

2. What is the relationship between artificial intelligence usage in virtual teaching and teacher's performance in public senior secondary schools in Rivers State?

Research Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

1. There is no significant relationship between artificial intelligence usage in assessment/grading of students and teacher's performance in public senior secondary schools in Rivers State?

2. There is no significant relationship between artificial intelligence usage in virtual teaching and teacher's performance in public senior secondary schools in Rivers State?

Methodology

This study adopted a correlational survey design to ascertain the relationship between the independent variable (artificial intelligence usage) and the dependent variable (teacher's performance). The population of this study was 6,153 academic staff (320 principals and 5833 teachers) in three hundred and twenty public senior secondary schools in Rivers State. (Source: Rivers State Senior Secondary School Board, 2024). A sample size

of 376 respondents was obtained using Taro Yamane minimum sample formula. A stratified sampling technique was used to select the respondents in six local government areas spread across the three Senatorial District in Rivers State (Rivers South-East, Rivers West and Rivers East). This ensured that all members of the population are given equal opportunity of being selected. Questionnaire was the instrument used to generate data, and it was titled: Artificial Intelligence Usage Questionnaire (AIUQ) and Teacher's Performance Questionnaire (TPQ). The instrument were two, with two sections (A and B). Section A elicited demographic information from the respondents, while section B elicited information on AIUQ and TPQ. Cronbach Alpha reliability statistics was used to test the reliability of the instruments. The reliability coefficients of Artificial Intelligence Usage Questionnaire and Teacher's Performance Questionnaire are 0.84 and 0.81. For the data that were analyzed, Pearson Product Moment Correlation (PPMC) formula was used to answer the research questions, while same correlation statistics was used to test the corresponding hypotheses at 0.05 significance level. Research questions were answered based on the value and direction of the correlation coefficient. Correlation coefficients between 0.90 – 1.00 were considered to be a Very High (VH), 0.70 – 0.80 are High (H) while correlation coefficients between 0.50 – 0.60 were Moderate (M) and between 0.30 – 0.40 were Low (L) while below 0.20 (< 0.20) were Very Low (VL). Data obtained were run using Statistical Packages of the Social Sciences (SPSS) version 23.00. Out of 376 copies of the questionnaire that was administered, 358 copies were retrieved and found suitable for data analysis, resulting in 95% retrieval rate.

Results and Findings

Research Question 1: What is the relationship between artificial intelligence usage in assessment/grading of students and teacher's performance in public senior secondary schools in Rivers State?

Table 1: Pearson Product Moment Correlation (PPMC) Showing the Relationship between Artificial Intelligence Usage in Assessment/Grading of Students and Teacher's Performance in Public Senior Secondary Schools in Rivers State

Variables	n	df	R	Decision
AI Usage in Assessment/Grading of Students	358	356	0.672	Strong Relationship
Teacher's Performance	358			

Decision Rule: 0.00 – 0.19 = Very Weak, 0.20 – 0.39 = Weak, 0.40 – 0.59 = Moderate, 0.60 – 0.79 = Strong, 0.80 – 1.00 Very Strong

To answer the research question 1, results from Table 1 produced a correlation coefficient, 'r' of 0.672; which by percentage is 67%. This value shows there is a strong and positive relationship between artificial intelligence usage in assessment/grading of students and teacher's performance in public senior secondary schools in Rivers State. In other words, artificial intelligence usage in assessment/grading of students relates with teacher's performance.

Research Question 2: What is the relationship between artificial intelligence usage in virtual teaching and teacher's performance in public senior secondary schools in Rivers State?

Table 2: Pearson Product Moment Correlation (PPMC) Showing the Relationship between Artificial Intelligence Usage in Virtual Teaching and Teacher's Performance in Public Senior Secondary Schools in Rivers State

Variables	n	df	R	Decision
AI Usage in Virtual Teaching	358	356	0.611	Strong Relationship
Teacher's Performance	358			

Decision Rule: 0.00 – 0.19 = Very Weak, 0.20 – 0.39 = Weak, 0.40 – 0.59 = Moderate, 0.60 – 0.79 = Strong, 0.80 – 1.00 Very Strong

To answer the research question 2, results from Table 2 produced a correlation coefficient, 'r' of 0.611; which by percentage is 61%. This value shows there is a strong and positive relationship between artificial intelligence usage in virtual teaching and teacher's performance in public senior secondary schools in Rivers State. In other words, artificial intelligence usage in virtual teaching relates with teacher's performance.

Test of Hypotheses

Hypothesis 1: There is no significant relationship between artificial intelligence usage in assessment/grading of students and teacher's performance in public senior secondary schools in Rivers State.

Table 3: Test of Hypothesis on the Relationship between Artificial Intelligence Usage in Assessment/Grading of Students and Teacher's Performance in Public Senior Secondary Schools in Rivers State

Variables	n	df	r	p-value	Level of Significance	Decision
AI Usage in Assessment/Grading of Students	358	356	0.672	0.000	0.05	Reject Ho_1
Teacher's Performance	358					

For hypothesis 1 tested, it is revealed also from Table 3 that the correlation for hypothesis one shows a significant correlation at r = .672 where p-value = 0.000 (P<0.05). Since the p-value 0.000 is less than the alpha level 0.05, we therefore reject the null hypothesis, thus, there is a significant relationship between artificial intelligence usage in assessment/grading of students and teacher's performance in public senior secondary schools in Rivers State

Hypothesis 2: There is no significant relationship between artificial intelligence usage in virtual teaching and teacher's performance in public senior secondary schools in Rivers State.

Table 4: Test of Hypothesis on the Relationship between Artificial Intelligence Usage in Virtual Teaching and Teacher's Performance in Public Senior Secondary Schools in Rivers State

Variables	n	df	r	p-value	Level of Significance	Decision
AI Usage in Virtual Teaching	358	356	0.611	0.000	0.05	Reject Ho_2
Teacher's Performance	358					

For hypothesis 2 tested, it is revealed also from Table 4 that the correlation for hypothesis two shows a significant correlation at r = .611 where p-value = 0.000 (P<0.05). Since the p-value 0.000 is less than the alpha level 0.05, we therefore reject the null hypothesis, thus, there is a significant relationship between artificial intelligence usage in virtual teaching and teacher's performance in public senior secondary schools in Rivers State.

Discussion of Findings

The first finding of the study revealed that there is a strong and positive relationship between artificial intelligence usage in assessment/grading of students and teacher's performance in public senior secondary schools in Rivers State. Also, the corresponding hypothesis tested establishes a significant relationship between artificial intelligence usage in assessment/grading of students and teacher's performance in public senior secondary schools in Rivers State. These findings corroborate Oztok and Zingaro (2019), Bryant (2020), Reiss (2021) and Bell, et al (2022) whose empirical studies showed that there is a positive and significant relationship between artificial intelligence application in grading of students and teacher's performance. To the scholars, artificial intelligence can be used to improve the efficiency of grading and assessment of students in order to facilitate teacher work activities. Oztok and Zingaro (2019) buttressed that AI-powered systems can automate routine tasks, such as grading, scheduling, and record-keeping, freeing up teachers' time to focus on more impactful work, such as lesson planning and student engagement. Bryant, et al (2020) asserted that by incorporating AI educational technology in assessing and grading of students, teachers will not only be able to be more productive and spend less time on grading, but they will also be able to interact with their students on a deeper level, having additional time and energy to foster a better and more powerful connection, thereby improving their performance.

The second finding showed that there is a strong and positive relationship between artificial intelligence usage in virtual teaching and teacher's performance in public senior secondary schools in Rivers State. Similarly, the corresponding hypothesis tested establishes a significant relationship between artificial intelligence usage in virtual teaching and teacher's performance in public senior secondary schools in Rivers State. These finding are in consonance with Mangal and Mangal (2019), Turoff (2021), Anekwe (2021) and Tira (2021) whose scholarly works reported that there is a positive and significant relationship between the use of AI in virtual teaching and teacher's performance. To Mangal and Mangal (2019), using AI for virtual teaching saves teachers as well as the students the hassle, expense, and travel time to a conventional class, thereby giving teachers opportunity to deliver instruction and assignment to students outside the four walls of the classroom. Mahendra (2023) concurred that artificial intelligence application in virtual teaching can encourage collaboration between a teacher and his students, making teaching and learning experience less tasking for the teacher, which result in better performance. Thus, through virtual assistance teachers get to deliver instruction to student without struggling on how to reach the students in the classrooms with materials on the concept or topics to be taught. Materials are made available for students by the teacher through the help of AI, which empowers the teacher to create immersive learning experiences.

Conclusion

Based on the findings of this study, it was deduced that there is a positive and significant relationship between artificial intelligence usage in assessment/grading of students, virtual teaching and teacher's performance in public senior secondary schools in Rivers State.

Recommendations

Based on the findings and conclusion of this study, the following are hereby recommended:

1. Government through training should encourage teachers to utilise AI-powered assessment and automated grading systems to navigate and adjust the level of difficulty and workload they face in assessing/grading of students performance in order to improve individual teacher performance.

2. Teachers should not see AI-powered adaptive systems and chatbots as a silver bullet, but rather as vital tools that can enhance their performance to deliver instruction through virtual means in order for them and the students to compete favourably with their counterparts globally.

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