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The Role of Artificial Intelligence in Enhancing Administrative and Learning Efficiency in Higher Education: Insights from Abia State University, Uturu

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Abstract: *In the absence of artificial intelligence, educational institutions would find it challenging to accommodate each student's unique learning preferences and style, effectively manage administrative responsibilities, and harness the full potential of data analytics for improving educational outcomes. In this direction, this study examined the role of artificial intelligence in the education system at Abia State University, Uturu (ABSU). The specific objectives of the study were to: determine the nature of the relationship between robotics and automated grading systems; examine the nature of the relationship between chatbots and research assistance; and ascertain the nature of the relationship between automation and virtual teaching assistants. The study adopted a survey research design involving academic and non-academic staff of Abia State University, Uturu (ABSU). A sample of 337 was drawn from a population of 2,150 of academic and non-academic staff, using the Yamane (1967) formula. Data were collected through a structured questionnaire which was based on a five-point Likert scale. Spearman rank correlation was used in testing the hypotheses. The results of the analysis revealed that: Robotics has a positive and significant relationship with automated grading systems; chatbots have a positive and significant relationship with research assistance; and automation has a positive and significant relationship with virtual teaching assistants. The study concluded that artificial intelligence presents a promising opportunity to revolutionize the education system by enabling personalized learning, and overall educational outcomes and student success. Based on the findings, the study recommended that the management of institutions should adopt artificial intelligence to enhance learning outcomes and efficiency.*

Keywords: Chatbot, automated grading systems, robotics, virtual teaching assistant, automation, research assistance.

1 INTRODUCTION

In formal historical records, artificial intelligence first appeared in 1956. According to Minsky (2000), the problem of artificial intelligence modeling within a generation can be solved" in his book "Stormed Search for Artificial Intelligence. During this time, the first artificial intelligence applications were released. These applications rely on chess games and logic theorems. The notion that intelligent computers may be built stemmed from the programs generated during this time, which were differentiated from the geometric shapes employed in the intelligence tests. Artificial intelligence (AI) has become an essential component of the virtual world and plays a significant role in education (Zouhaier, 2023). Artificial intelligence (AI) is a broad and diverse field of technologies. It approaches that aim to give computer systems the ability to perform tasks that

are typically associated with human cognitive functions, such as learning, problem-solving, and decision-making (Yu, 2022, Varshaa et al., 2020 Kuwaiti et al., 2023). The goal of artificial intelligence (AI) systems is to read outside input, learn from it, and then use that knowledge to adapt and change to accomplish particular goals (Kumar et al., 2019, Yu, 2022).

The potential benefits of utilizing AI in education include enhancing pedagogical innovation, streamlining administrative duties, and personalizing the learning experience. Massive volumes of data have been generated by the quick spread of digital devices and online platforms, creating previously unheard-of prospects for AI-driven insights and educational interventions. AI and education are coming together to create a disruptive force that could completely change how people educate and learn. With its capacity to analyze enormous volumes of data, adjust to different learning styles, and provide personalized experiences, artificial intelligence (AI) heralds a new era of opportunities and challenges in the constantly changing field of education. AI also holds the promise of completely changing the way that people teach and learn. Artificial intelligence has had a significant impact on education, as evidenced by increased effectiveness and efficiency, global learning, virtual instruction, research support, customized and personalized learning, smarter content, and automated grading systems in education administration, among other benefits (Amado-Salvatierra, 2024). As artificial intelligence advances, new applications in education start to appear. Artificial intelligence has found greater use in the field of education, extending beyond the traditional notion of AI as a supercomputer to encompass embedded computer systems.

2 STATEMENT OF THE PROBLEM

The importance of artificial intelligence (AI) in the University lies in its potential to advance research, enhance education, improve administrative processes, optimize resource allocation, and ultimately contribute to the advancement of knowledge. Failure of the management of the institution to consider the integration of artificial intelligence (AI) in educational institutions poses significant challenges and missed opportunities for enhancing learning outcomes and administrative efficiency. Without leveraging AI-driven solutions, educational institutions may struggle to address the diverse learning needs of students, optimize resource allocation, and adapt to the rapidly evolving educational landscape. Consequently, educational institutions risk falling behind in preparing students for the demands of the 21st-century workforce and society at large. In other words, the failure to consider AI in educational institutions represents a critical oversight with far-reaching implications for educational equity, effectiveness, and relevance in an increasingly digital age.

3 LITERATURE REVIEW

Artificial intelligence (AI) uses machines to imitate human intelligence, allowing for the understanding of language, learning, reasoning, and problem-solving. Artificial Intelligence has a big impact on education, bringing technologies to improve instruction and learning. It offers personalized learning by using algorithms to analyze student data, identifying strengths and weaknesses, and tailoring instruction to individual needs. To maximize results and assist students in realizing their full potential, adaptive learning platforms modify content in response to student performance. Artificial intelligence (AI) technologies include chatbots, robotics, automation, research assistants, virtual classrooms, and automated grading systems. In the study of Jeffery

(2003), the finding revealed that robotics has a positive and significant relationship with education. The study by David (2016) revealed that robotics has a positive effect on students at all levels of their education. Belen and Vidal (2016) in their study revealed that robotics positively strengthens the learning skills of future engineers and scientists.

Automated grading systems quickly and accurately assess assignments, providing instant feedback and reducing educators' workloads (Johnson, 2023). Intelligent tutoring systems (ITS) offer personalized tutoring, delivering customized lessons and real-time feedback to help students master concepts at their own pace. AI-powered tools also transform assessment and evaluation by analyzing various data points to provide comprehensive insights into student performance, identifying struggling areas, and suggesting interventions.

Virtual teaching assistants, driven by AI, answer questions, provide resources, and offer emotional support, creating an interactive learning environment (Smith and Garcia, 2022). AI research assistance tools help gather information, analyze data, and generate insights, speeding up the research process (Kim, 2024). Ion *et al* (2012) in their study revealed that virtualization is positively associated with automation tools which can be used to address issues and in learning.

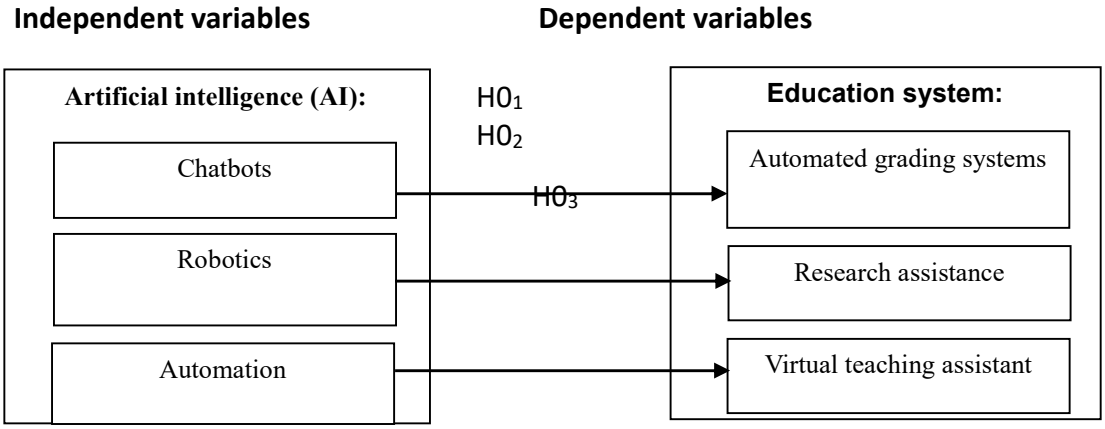
To guarantee appropriate AI use in education, ethical issues including data privacy, algorithmic bias, and potential disparities must be addressed.

Chatbots, virtual teaching automation, and behavior-adaptive intelligent systems are just a few ways AI improves web-based and online education (Ketak *et al*., 2024; Pierrès *et al*., 2024; Abdellatif *et al.,* 2024; Miao *et al.,* 2024). AI is included in teaching and learning, as mentioned by Chassignol *et al*. (2018) (Pierrès *et al.,* 2024). Eleonora and Gebriele's (2020) study found a positive correlation between the capacity for automatic user interaction (chatbot) and the digital research assistant. Future developments in AI might bring more immersive and customized experiences, as well as the use of augmented and virtual reality for practical learning (Kim, 2024). AI could also support lifelong learning, creating customized pathways for skill acquisition and career advancement (Rodriguez, 2023).

AI has several uses in education, including important applications in customized learning. AI is used by Carnegie Learning and other platforms to create adaptive learning pathways that improve student comprehension and engagement (Johnson, 2023). As demonstrated by Watson Tutor, intelligent tutoring systems provide quick feedback and tailored help, imitating one-on-one tutoring sessions (Smith and Garcia, 2022). By automating scheduling, attendance monitoring, and grading, AI also transforms administrative duties and frees teachers to concentrate more on instruction (Brown, 2023). Personalized learning, which can enhance academic achievement by attending to individual learning demands, is one of the advantages of AI in education (Williams, 2023). By providing students with disabilities with other formats and tools, such as real-time translation for non-native languages and speech-to-text for visually impaired students, artificial intelligence (AI) improves accessibility (Lee, 2022). With the use of AI's data analysis capabilities, educational outcomes, and retention rates can be improved through early intervention techniques, the identification of at-risk pupils, and predictive analytics (Chen et al., 2023). Pongsakorn's (2022) study demonstrated the dual effects of artificial intelligence technology on the education sector.

4 CONCEPTUAL FRAMEWORK

The framework guides the study:



Source: Researchers' Conceptualization (2024).

5 THEORETICAL FRAMEWORK

The learning theory of AI is the underpinning theory that supported this work. The learning theory was propounded by Alan (1950). This theory focuses on understanding how artificial intelligence systems acquire knowledge, improve their performance, and make decisions. This theory encompasses various principles, methodologies, and algorithms that guide the learning process in AI. The learning theory of AI includes supervised learning, unsupervised learning, reinforcement learning, transfer learning, and deep learning. In the context of the education system, the learning theory of AI applies principles and methodologies from artificial intelligence to enhance the teaching and learning experience. The application of learning theory in AI to the education system may lead to more adaptive, personalized, and data-driven learning environments that cater to the diverse needs of students, fostering engagement, motivation, and academic achievement.

6 AIMS OF THE STUDY

The specific objectives of this study were to: determine the nature of the relationship between robotics and automated grading systems, examine the nature of the relationship between chatbots and research assistance, and ascertain the nature of the relationship between automation and virtual teaching assistant. Based on these objectives, the following hypotheses guided the study;

Ho_1. Robotics has no positive and significant relationship with automated grading systems.
Ho_2. Chatbots has no positive and significant relationship with research assistance.
Ho_3. Automation has no positive and significant relationship with virtual teaching assistant.

7 METHODOLOGY

This study utilized a survey design, which, according to Okpara et al. (2021), allows the researcher to assess and study the views and opinions of a large number of individuals on a specific topic. The research was conducted at Abia State University (ABSU), a top institution in West Africa known for its ICT educational system and research-friendly environment. The study population comprised 2,150 academic and non-academic staff at ABSU. Using the Taro Yamane (1964) formula, a sample size of 337 respondents was determined. Data were collected using a questionnaire, with 312 out of 337 questionnaires (93%) correctly filled out and usable. A 5-point Likert scale was used to gather responses, ranging from 5 (Strongly agree) to 1 (Strongly disagree). The study's variables, independent (Robotics, Chatbots, Automation) and dependent variables (automated grading systems, research assistance, virtual teaching assistant), were measured using five constructs. Data analysis was performed using SPSS version 23, employing correlation coefficient analysis to evaluate the level of relationship between the variables.

7.1 DATA ANALYSIS

Data collected in the field were analyzed, tested and interpreted accordingly.

Data Analysis One:

Table 1: Responses on robotics

S/N	STATEMENT	SA	A	U	D	SD
a.	Robotics technology can significantly improve students' problem-solving skills.	102 32.7%	157 50.3%	24 7.7%	12 3.8%	17 5.4%
b.	Robotics can help students develop critical thinking abilities necessary for future careers.	151 48.4%	109 34.9%	3 1.0%	34 10.9%	15 4.8%
c.	Exposure to robotics fosters creativity and innovation among students.	134 42.9%	135 43.3%	13 4.2%	30 9.6%	-
d.	Robotics can provide students with practical, hands-on experience applicable to real-world challenges.	143 45.8%	124 39.7%	17 5.4%	16 5.1%	12 3.8%
e.	Robotics in education enhances collaboration and teamwork among students.	165 53%	129 41.3%	5 1.6%	8 2.6%	5 1.6%

Source: Field Survey, 2024

As shown in table 1, the study indicated that 102(32.7%) of the respondents strongly agree that robotics technology significantly improve students' problem-solving skills, 157(50.3%) agreed, 24(7.7%) were undecided, 12(3.8%) disagreed while 17(5.4%) strongly disagreed. The study also indicated that 151(48.4%) of the respondents strongly agree that robotics can help students develop critical thinking abilities necessary for future careers, 109(34.9%) agreed, 3(1.0%) were undecided, 34(10.9%) disagreed while 15(4.8%) strongly disagreed. The study also indicated that 134(42.9%) of the respondents strongly agree that exposure to robotics fosters creativity and innovation among students, 135(43.3%) agreed, 13(4.2%) were undecided, and 30(9.6%) disagreed while none of the respondents strongly disagreed. The study also indicated that 143(45.8%) of the respondents strongly agree that robotics can provide students with practical, hands-on experience applicable to real-world challenges, 124(39.7%) agreed, while 17(5.4%) were undecided, 16(5.1%) agreed and 12(3.8%) strongly disagreed. Finally, the study

also indicated that 165(53%) of the respondents strongly agree that robotics in education enhances collaboration and teamwork among students, 129(41.3%) agreed, 5(1.6%) were undecided, 1(2.6%) disagreed while 5(1.6%) strongly disagreed.

Table 2: Responses on Automated Grading Systems

S/N	STATEMENT	SA	A	U	D	SD
a.	Automated grading systems provide more timely feedback to students, which improves their learning experience.	145 46.5%	114 36.5%	28 9.0%	15 4.8%	10 3.2%
b.	The use of automated grading systems reduces the workload on teachers, allowing them to focus more on individual student needs.	159 50.9%	108 34.6%	23 7.4%	13 4.2%	9 2.9%
c.	Automated grading systems contribute to a fairer assessment process by eliminating human bias.	160 51.3%	95 30.4%	30 9.6%	12 3.8%	15 4.8%
d.	Automated grading systems can accurately assess complex assignments and provide detailed feedback.	98 31.4%	169 54.2%	17 5.4%	6 1.9%	22 7.1%
e.	Students are more motivated to improve their performance when using automated grading systems.	148 47.4%	140 44.9%	8 2.6%	4 1.3%	12 3.8%

Source: Field Survey, 2024

As shown in Table 2, the study indicated that 145(46.5%) of the respondents strongly agree that automated grading systems provide more timely feedback to students, which improves their learning experience, 114(36.5%) agreed, 28(9.0%) were undecided, 15(4.8%) disagreed while 10(3.2%) strongly disagreed. The study also indicated that 159(50.9%) of the respondents strongly agree that the use of automated grading systems reduces the workload on teachers, allowing them to focus more on individual student needs, 108(34.6%) agreed, 23(7.4%) were undecided, 13(4.2%) disagreed while 9(2.9%) strongly disagreed. The study also indicated that 160(51.3%) of the respondents strongly agreed that automated grading systems contribute to a fairer assessment process by eliminating human bias, 95(30.4%) agreed, 30(9.6%) were undecided, and 12(3.8%) disagreed while 15(4.8%) strongly disagreed. The study also indicated that 98(31.4%) of the respondents strongly agree that automated grading systems can accurately assess complex assignments and provide detailed feedback, 169(54.2%) agreed, while 17(5.4%) were undecided, 6(1.9%) agreed and 22(7.1%) strongly disagreed. Finally, the study also indicated that 148(47.4%) of the respondents strongly agree that students are more motivated to improve their performance when using automated grading systems., 140(44.9%) agreed, 8(2.6%) were undecided, 4(1.3%) disagreed while 12(3.8%) strongly disagreed.

Test of hypothesis One:

$H0_1$: Robotics has no positive and significant relationship with automated grading systems.

Table 1 and table 2 were used to test the correlation between robotics and automated grading system.

Correlations

			Robotics	Automated grading system
Spearman's rho	Robotics	Correlation Coefficient	1.000	.980**
		Sig. (2-tailed)	.	.000
		N	312	312
	Automated	Correlation Coefficient	.980**	1.000
		Sig. (2-tailed)	.000	.
		N	312	312

**. Correlation is significant at the 0.01 level (2-tailed).

Interpretation:

The table above shows that a coefficient of 0.980 at p= 0.000 (p = 0.000, p < 0.05). The p-value (0.000) is less than the significant level of 0.05, thus the null hypothesis is rejected and alternate hypothesis is accepted. The result of Spearman Rank Correlation test revealed that robotics has a positive and significant relationship with automated grading systems.

Data Analysis Two:

Table 3: Responses on chatbots

S/N	STATEMENT	SA	A	U	D	SD
a.	Chatbots help students improve their understanding of complex concepts by offering additional resources and practice opportunities.	107 34.2%	151 48.4%	24 7.7%	12 3.8%	18 5.8%
b.	Chatbots contribute positively to student retention rates by providing ongoing support and reminders.	162 51.9%	116 37.2%	3 0.9%	21 6.7%	10 3.2%
c.	Chatbots encourage self-directed learning by guiding students to relevant learning materials and resources.	153 49.0%	119 38.1%	9 2.9%	18 5.8%	13 4.2%
d.	Chatbots enhance student engagement through interactive and personalized learning experiences.	125 40.1%	158 50.6%	9 2.9%	13 4.2%	7 2.2%
e.	Chatbots effectively support learning by providing timely responses and explanations.	246 78.8%	55 17.6%	1 0.3%	3 0.9%	6 1.9%

Source: Field Survey, 2024

As shown in table 3, the study indicates that 107(34.2%) of the respondents strongly agree that chatbots help students improve their understanding of complex concepts by offering additional resources and practice opportunities, 151(48.4%) agreed, 24(7.7%) were undecided,

12(3.8%) disagreed while 18(5.8%) strongly disagreed. The study also indicated that 162(51.9%) of the respondents strongly agree that chatbots contribute positively to student retention rates by providing ongoing support and reminders, 116(37.2%) agreed, 3(0.9%) were undecided, 21(6.7%) disagreed while 10(3.2%) strongly disagreed. The study also indicated that 153(51.3%) of the respondents strongly agree that chatbots encourage self-directed learning by guiding students to relevant learning materials and resources, 119(38.1%) agreed, 9(2.9%) were undecided, and 18(5.8%) disagreed while, 13(4.2%) strongly disagreed. The study also indicated that 125(40.1%) of the respondents strongly agree that chatbots enhance student engagement through interactive and personalized learning experiences, 158(50.6%) agreed, while 9(2.9%) were undecided, 13(4.2%) agreed and 7(2.2%) strongly disagreed. Finally, the study also indicated that 246(78.8%) of the respondents strongly agree that chatbots effectively support learning by providing timely responses and explanations, 55(17.6%) agreed, 1(0.3%) were undecided, 3(0.9%) disagreed while 6(1.9%) strongly disagreed.

Table 4: Responses on Research Assistance

S/N	STATEMENT	SA	A	U	D	SD
a.	High turnover rates leads to decline in the knowledge and expertise within the workforce, affecting service quality.	135 43.3%	143 45.8%	14 4.5%	13 4.2%	7 2.2%
b.	Frequency turnover hampers team cohesion and collaboration resulting in diminished service effectiveness.	103 33.0%	140 44.9%	14 4.5%	32 10.3 %	23 7.4%
c.	A stable workforce contributes to a better understanding of customer needs and preferences, enhancing service quality.	126 40.4%	118 37.8%	41 13.1%	18 5.8%	9 2.9%
d.	Employee turnover undermines organizational trust and loyalty, affecting the quality of customer interactions.	161 51.6%	136 43.6%	-	7 2.2%	8 2.6%
e.	The loss of experienced employees due to turnover negatively impacts service innovation and problems-solving abilities.	198 63.5%	99 31.7%	4 1.3%	6 1.9%	5 1.6%

Source: Field Survey, 2024

As shown in table 4, the study indicated that 135(43.3%) of the respondents strongly agree that high turnover rates lead to decline in the knowledge and expertise within the workforce, affecting service quality, 143(45.8%) agreed, 14(4.5%) were undecided, 13(4.2%) disagreed while 7(2.2%) strongly disagreed. The study also indicated that 103(33.0%) of the respondents strongly agree that frequency turnover hampers team cohesion and collaboration resulting in diminished service effectiveness, 140(44.9%) agreed, 14(4.5%) were undecided, 32(10.3%) disagreed while 23(7.4%) strongly disagreed. The study also indicated that 126(40.4%) of the respondents strongly agree that stable workforce contributes to a better understanding of customer needs and preferences, enhancing service quality, 118(37.8%) agreed, 41(13.1%) were undecided, and 18(5.8%) disagreed while, 9(2.9%) strongly disagreed. The study also indicated that 161(51.6%) of the respondents strongly agree that employee turnover undermines organizational trust and loyalty, affecting the quality of customer interactions, 136(43.6%) agreed, while none of the

respondents were undecided, 7(2.2%) agreed and 8(2.6%) strongly disagreed. Finally, the study also indicated that 198(63.5%) of the respondents strongly agree that loss of experienced employees due to turnover negatively impacts service innovation and problems-solving abilities, 99(31.7%) agreed, 4(1.3%) were undecided, 6(1.9%) disagreed while 5(1.6%) strongly disagreed.

Test of hypothesis Two:

$H0_2$: Chatbots has no positive and significant relationship with research assistance.

HA_2: Chatbots has a positive and significant relationship with research assistance.

Table 3 and table 4 were used to test the correlation between chatbots and research assistance.

Correlations

			Chatbots	Research Assistance
Spearman's rho	Chatbots	Correlation Coefficient	1.000	.929**
		Sig. (2-tailed)	.	.000
		N	312	312
	Research Assistance	Correlation Coefficient	.929**	1.000
		Sig. (2-tailed)	.000	.
		N	312	312

**. Correlation is significant at the 0.01 level (2-tailed).

Interpretation:

The table above shows that a coefficient of 0.929 at p= 0.000 (p = 0.000, p < 0.05). The p-value (0.000) is less than the significant level of 0.05, thus the null hypothesis is rejected and alternate hypothesis is accepted. The result of Spearman Rank Correlation test revealed that chatbots has a positive and significant relationship with research assistance.

Data Analysis Three:

Table 5: Responses on automation

S/N	STATEMENT	SA	A	U	D	SD
a.	Automation in education promotes a more innovative and technologically advanced learning environment.	156 50%	114 36.5%	20 6.4%	14 4.5%	8 2.6%
b.	Automated systems in education can personalize learning experiences for students.	185 59.3%	86 27.6%	27 8.7%	7 2.2%	7 2.2%
c.	Automated grading systems provide fair and accurate assessments of student work.	120 38.5%	139 44.6%	26 8.3%	16 5.1%	11 3.5%
d.	Automation in education helps educators focus more on individual student needs.	119 38.1%	160 51.3%	8 2.6%	20 6.4%	5 1.6%
e.	Automated data analytics in education helps identify and address learning gaps effectively.	186 59.6%	108 34.6%	4 1.3%	7 2.2%	7 2.2%

Source: Field Survey, 2024.

As shown in table 5, the study indicates that 156(50.0%) of the respondents strongly agree that automation in education promotes a more innovative and technologically advanced learning environment, 114(36.5%) agreed, 20(6.4%) were undecided, 14(4.5%) disagreed while 8(2.6%) strongly disagreed. The study also indicated that 185(59.3%) of the respondents strongly agree that automated systems in education can personalize learning experiences for students, 86(27.6%) agreed, 27(8.7%) were undecided, 7(2.2%) disagreed while 7(2.2%) strongly disagreed. The study also indicated that 120(38.5%) of the respondents strongly agree that automated grading systems provide fair and accurate assessments of student work, 139(44.6%) agreed, 26(8.3%) were undecided, and 16(5.1%) disagreed while, 11(3.5%) strongly disagreed. The study also indicated that 119(38.1%) of the respondents strongly agree that automation in education helps educators focus more on individual student needs, 160(51.3%) agreed, while 8(2.6%) were undecided, 20(6.4%) agreed and 5(1.6%) strongly disagreed. Finally, the study also indicated that 186(59.6%) of the respondents strongly agree that automated data analytics in education helps identify and address learning gaps effectively, 108(34.6%) agreed, 4(1.3%) were undecided, 7(2.2%) disagreed while 7(2.2%) strongly disagreed.

Table 6: Responses on virtual teaching assistant

S/N	STATEMENT	SA	A	U	D	SD
a.	Virtual teaching assistants enhance the accessibility of educational resources and materials.	143 45.8%	147 47.1%	4 1.3%	11 3.5%	7 2.2%
b.	Virtual teaching assistants effectively complement the role of traditional educators in the education system.	192 61.5%	106 34.0%	5 1.6%	4 1.2%	5 1.6%
c.	Virtual teaching assistants contribute effectively to student learning outcomes.	128 41.0%	161 51.6%	6 1.9%	8 2.6%	9 2.9%
d.	Virtual teaching assistants help in addressing queries and providing timely feedback.	116 37.2%	172 55.1%	11 3.5%	9 2.9%	4 1.3%
e.	The presence of virtual teaching assistants improves the overall quality of online education.	186 60.0%	110 35.3%	4 1.3%	5 1.6%	7 2.2%

Source: Field Survey, 2024

As shown in table 6, the study indicates that 143(45.8%) of the respondents strongly agree that virtual teaching assistants enhance the accessibility of educational resources and materials, 147(47.1%) agreed, 4(1.3%) were undecided, 11(3.5%) disagreed while 7(2.2%) strongly disagreed. The study also indicated that 192(61.5%) of the respondents strongly agree that virtual teaching assistants effectively complement the role of traditional educators in the education system, 106(34.0%) agreed, 5(1.6%) were undecided, 4(1.2%) disagreed while 5(1.6%) strongly disagreed. The study also indicated that 128(41.0%) of the respondents strongly agree that virtual teaching assistants contribute effectively to student learning outcomes, 161(51.6%) agreed, 6(1.9%) were undecided, and 8(2.6%) disagreed while, 9(2.9%) strongly disagreed. The study also indicated that 116(37.2%) of the respondents strongly agree that virtual teaching assistants help in addressing queries and providing timely feedback, 172(55.1%) agreed, while 11(3.5%) were undecided, 9(2.9%) agreed and 4(1.3%) strongly disagreed. Finally, the study also indicated that

186(60.0%) of the respondents strongly agree that the presence of virtual teaching assistants improves the overall quality of online education, 110(35.3%) agreed, 4(1.3%) were undecided, 5(1.6%) disagreed while 7(2.2%) strongly disagreed.

Test of hypothesis Three:

$H0_3$: Automation has no positive and significant relationship with virtual teaching assistance.

HA_3: Automation has a positive and significant relationship with virtual teaching assistance.

Table 5 and table 6 were used to test the correlation between automation and virtual teaching assistance.

Correlations

			Automation	Virtual Teaching Assistance
Spearman's rho	Automation	Correlation Coefficient	1.000	.975**
		Sig. (2-tailed)	.	.000
		N	312	312
	Virtual Teaching Assistance	Correlation Coefficient	.975**	1.000
		Sig. (2-tailed)	.000	.
		N	312	312

**. Correlation is significant at the 0.01 level (2-tailed).

Interpretation:

The table above shows that a coefficient of 0.929 at p= 0.000 (p = 0.000, p < 0.05). The p-value (0.000) is less than the significant level of 0.05, thus the null hypothesis is rejected and alternate hypothesis is accepted. The result of Spearman Rank Correlation test revealed that automation has a positive and significant relationship with virtual teaching assistant.

8 DISCUSSION

The result of hypothesis one showed that robotics has a positive and significant relationship with automated grading systems. This implies that combining robotics with automated grading systems can significantly streamline the grading process, enhance teaching methods, and prepare students for a rapidly evolving digital world. This result is in agreement with the findings of Jeffery (2003), David and Illah (2016), and Vidal (2016) which revealed that robotics has a positive and significant relationship with the automated grading system in the education sector.

The result of hypothesis two showed that chatbots have a positive and significant relationship with research assistance. This implies that chatbot enhances the efficiency, effectiveness, and user experience of conducting research tasks. This finding corroborates the works of Eleonora and Gebriele (2020) which indicates that there is a positive relationship between digital research assistants and the ability to automatically interact with the user (chatbot).

The result of hypothesis three showed that automation has a positive and significant relationship with virtual teaching assistants. This indicates a shift towards leveraging technology to make virtual teaching more effective, accessible, and tailored to the needs of both educators and learners. This result is in line with the finding of Kim (2024) which revealed that AI research assistance tools help gather information, analyze data, and generate insights, speeding up the research process. The finding corroborates with the works of Ion et al (2012) which indicate that virtualization is positively associated with automation tools that can be used to address issues and in learning.

9 RECOMMENDATIONS

Artificial intelligence, through chatbots, robotics, automated grading systems, virtual teaching assistants, automation, and research assistance, offers substantial benefits to the education system which can enhance student support, streamline administrative tasks, and provide personalized learning experience. In other words, artificial intelligence holds great potential to transform education, but careful implementation and monitoring are essential to ensure its effectiveness and ethical use.

10 DEFINITION OF TERMS

An automated grading system refers to software that helps replace or supplement individuals in evaluating assignments or other educational appraisal tasks. A computerized grading system constitutes an assessment to automate substantial aspects of the grading or marking experience; supporting markers or instructors throughout each stage in the process constitutes a critical aim for automated grading systems constituted within summative assessment delivery (Dann, 2020). Thus, an automated grading system automates the grading process, making it more efficient. Automation refers to any electrical, mechanical, electronic, or computer device or process allowing a particular course of action to be achieved with less human exertion, which could be standard production tasks, problem-solving, and office functions (Koedinger *et al.,* 2018). Thus, automation does not just entail automated grading systems but also several other fields. A chatbot is an automated system that allows users to communicate directly without human intervention. A research assistance system facilitates the retrieval of research-related information and thus uses automation to streamline the activity for the user. Robotics involves automating manual tasks using physical devices, including drones, robotic arms, and other devices. Virtual teaching assistance involves the use of technology to help virtual instructors in their role as a virtual teaching assistant.

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