Rivers State University Faculty of Education Conference Journal
Journal homepage: www.rsufecj.org ISSN: 1116-3496

Brain-Friend: An Intelligent Tutoring System for Enhancing Learning of Postgraduate Business Education Programme in Rivers State Universities

ANIREH, Uchenna Nicholas
Department of Business Education, Faculty of Education, Rivers State University, Port-Harcourt, Nigeria.
anireh.uchenna@ust.edu.ng

Abstract

This study examines the use of BrainFriend Intelligent Tutoring System for Enhancing Learning of Postgraduate Business Education Programme at Rivers State University (RSU) and Ignatius Ajuru University of Education (IAUE). Four specific objectives were to assess the extent Brain-Friend Intelligent Tutoring System enhances personalized learning, instructional effectiveness, research competency development and examine challenges that affect Brain-Friend adaptation in Rivers State Universities. Four research questions guided the study, while four hypotheses were formulated and tested on the observed results. A descriptive research design was adopted, targeting a population of 146 Postgraduate Business Education Students enrolled in the 2024/2025 Master's and Doctor of Philosophy programmes at Rivers State University and Ignatius Ajuru University of Education. The entire population was studied. Data were collected using a self-designed questionnaire, validated by three experts, two from Business Education Department and one Psychometrician. The instrument's reliability was confirmed through Cronbach's Alpha, which yielded a coefficient of 0.83. The research questions were analyzed using mean and standard deviation, while the hypotheses were tested using t-test inferential statistics at 0.05 significance level. Findings revealed high level use of Brain-Friend for enhancing personalized learning, improving instructional effectiveness and research competency development among Postgraduate Business Education Programme in Rivers State Universities. However, infrastructural and technical challenges were discovered as a bane towards effective utilization of technology. The study concludes that BrainFriend-ITS have the potential to enhance learning delivery and recommends for its proper integration in the Business Education Programme in Rivers State Universities. There is also a need to provide adequate funding for infrastructural development, training and retraining programmes for capacity building and skill enhancement for overall effectiveness of BrainFriend-ITS utilization in Business Education.

Keywords: AI-Based learning platform, BrainFriend, Intelligent feedback, Intelligent tutoring systems, Personalized learning.

Introduction

The rapid advancement of Artificial Intelligence (AI) technologies has significantly transformed educational practices across the globe. Higher education institutions are increasingly adopting intelligent educational technologies to improve instructional delivery, learner engagement, academic performance, and personalized learning experiences (Zawacki-Richter, et al., 2019). Among these emerging technologies, Intelligent Tutoring System

Platforms (ITSPs) have gained considerable attention because of their ability to simulate human tutoring, provide adaptive feedback, monitor learner progress, and support individualized learning pathways (Holmes et al., 2022). BrainFriend Intelligent Tutoring System (ITS) is an Artificial Intelligence-driven educational platform designed to support personalized learning, instructional effectiveness, research competency development, and academic performance through adaptive content delivery, intelligent feedback mechanisms, learning analytics, and automated instructional support. BrainFriend as AI-based teaching and learning educational system incorporates the following features; personalized learning, intelligent feedback, adaptive learning pathway, learning analytics and AI tutoring support. The platform provides interactive, adaptive, and personalized learning experiences (Akyuz, 2020; Morgan, et al., 2020).

The concept of Intelligent Tutoring Systems (ITS) emerged from developments in artificial intelligence, cognitive science, and educational technology. An ITS is a computer-based instructional system designed to provide personalized guidance, feedback, and learning support similar to that offered by a human tutor. Unlike traditional e-learning platforms that primarily deliver content, intelligent tutoring systems utilize learner analytics, machine learning algorithms, and adaptive instructional strategies to tailor learning experiences to individual learners' needs and performance levels (Woolf, 2021). Recent advances in generative artificial intelligence and learning analytics have further enhanced the capabilities of intelligent tutoring systems, enabling them to support real-time feedback, adaptive assessment, collaborative learning, and competency-based instruction.

Business Education programs aim to equip students with managerial, entrepreneurial, and analytical skills. Traditional classroom methods often fall short in addressing dynamic global business challenges (UNESCO, 2023). AI-powered platforms address these gaps by offering interactive course content, real-time feedback, collaborative tools, and exposure to global business practices, enabling learners to develop competencies aligned with 21st-century workplace demands.

Globally, universities are integrating AI-powered tutoring systems to address challenges associated with large class sizes, limited instructional support, diverse learner needs, and increasing demands for flexible learning. Reports from the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2023) indicate that AI-supported learning environments are increasingly being adopted to promote inclusive, personalized, and lifelong learning opportunities. Similarly, the Organisation for Economic Co-operation and

Development (OECD, 2023) emphasizes that intelligent educational technologies are becoming essential tools for developing critical thinking, problem-solving skills, and digital competencies required in contemporary workplaces.

Within postgraduate education, intelligent tutoring systems offer unique advantages. Postgraduate learners often require advanced academic support, research guidance, self-directed learning opportunities, and timely feedback to achieve higher-order learning outcomes. Business Education postgraduate programmes, in particular, require students to acquire entrepreneurial competencies, research capabilities, digital literacy skills, innovative thinking abilities, and professional decision-making competencies. Consequently, intelligent tutoring platforms such as BrainFriend may provide a strategic mechanism for enhancing teaching effectiveness and learning outcomes among postgraduate students.

BrainFriend , as an Intelligent Tutoring System Platform (ITSP), represents a technology-driven learning environment that combines adaptive learning, artificial intelligence, learner analytics, personalized feedback mechanisms, and collaborative digital tools to support academic activities. The platform has the potential to improve instructional delivery through intelligent content recommendations, automated feedback systems, individualized learning pathways, and continuous assessment mechanisms. These capabilities align with contemporary educational paradigms that emphasize learner-centred instruction, competency-based learning, and digital transformation in higher education.

The theoretical foundation of this study is anchored on Constructivist Learning Theory and Technology Acceptance Model (TAM). Constructivist Learning Theory posits that learners actively construct knowledge through interaction with learning environments, experiences, and instructional resources (Piaget, 1972; Vygotsky, 1978). Intelligent tutoring systems support this process by providing interactive, adaptive, and personalized learning experiences. The Technology Acceptance Model developed by Davis (1989) further explains that users' acceptance and utilization of technological innovations are influenced by perceived usefulness and perceived ease of use. Therefore, postgraduate students' perceptions of BrainFriend 's effectiveness may significantly influence its adoption and educational outcomes.

Despite the growing global adoption of AI-powered educational technologies, Rivers State Universities face challenges in adopting AI platforms, including limited infrastructure, insufficient digital literacy, and high system costs (Romero & Ventura, 2013; Igbokwe, 2023). Additionally, student engagement depends on motivation, prior knowledge, and learning

preferences (Zheng, Wang, Guo, & Chen, 2023). Evidence suggests that many Nigerian universities are still at the early stages of integrating intelligent tutoring systems into teaching and learning processes. Existing studies have focused primarily on Learning Management Systems (LMS), virtual learning environments, and general AI applications in education, with limited empirical attention devoted to intelligent tutoring platforms specifically designed for postgraduate learning contexts. This gap is particularly evident within Business Education programmes in Rivers State universities, where technology-enhanced learning remains underexplored.

Furthermore, contemporary challenges such as increasing postgraduate enrolment, limited academic supervision, inadequate personalized support, and the need for flexible learning environments necessitate innovative educational interventions. BrainFriend's intelligent tutoring capabilities may provide a viable solution for addressing these challenges while improving teaching effectiveness, learner engagement, academic achievement, and research productivity among postgraduate Business Education students. Consequently, there is a need to empirically investigate the effectiveness of BrainFriend as an Intelligent Tutoring System Platform for enhancing teaching and learning in postgraduate Business Education programmes in Rivers State universities.

Statement of the Problem

The contemporary higher education environment is increasingly characterized by the adoption of digital technologies aimed at improving teaching effectiveness, learner engagement, academic achievement, and research productivity. However, despite advancements in educational technology, many postgraduate Business Education programmes Rivers State Universities continue to rely heavily on conventional instructional approaches that may not adequately address individual learning needs, provide timely feedback, or support the development of advanced research competencies.

Postgraduate students are expected to demonstrate high levels of independent learning, critical thinking, research capability, and academic excellence. Yet, many students experience challenges such as limited access to personalized academic support, delayed feedback from lecturers, inadequate engagement in learning activities, and difficulties in developing research competencies necessary for successful postgraduate studies. Research competency development remains a critical requirement for university students in producing quality scholarly outputs and contributing to knowledge creation.

Although Intelligent Tutoring Systems have demonstrated significant potential in enhancing personalized learning, instructional effectiveness, and student achievement through adaptive learning technologies, there is limited empirical evidence regarding the usefulness of BrainFriend Intelligent Tutoring System Platform in postgraduate Business Education programmes in Rivers State universities. Consequently, the problem of this study is the lack of empirical evidence on whether BrainFriend can effectively enhance personalized learning, instructional effectiveness, research competency development, and academic performance among postgraduate Business Education students in Rivers State universities.

Purpose of the Study

The purpose of this study is to investigate the effectiveness of BrainFriend as Intelligent Tutoring System in enhancing teaching and learning among postgraduate Business Education students in Rivers State Universities with the following specific objectives, to:

1. Examin the extent BrainFriend Intelligent Tutoring System enhances personalized learning among postgraduate Business Education students in Rivers State Universities.
2. Examine the extent Brain-Friend Intelligent Tutoring System improves instructional effectiveness among Postgraduate Business Education students in Rivers State Universities.
3. Assess the extent BrainFriend Intelligent Tutoring System Platform enhances research competency development among postgraduate Business Education students in Rivers State Universities.
4. Assess the challenges that affect the adoption of BrainFriend Intelligent Tutoring System among Postgraduate Business Education Students in Rivers State Universities.

Research Questions

The following research questions guided this study:

1. To what extent does BrainFriend Intelligent Tutoring System Platform enhance personalized learning among postgraduate Business Education students in Rivers State Universities?
2. To what extent does BrainFriend Intelligent Tutoring System improve instructional effectiveness among Postgraduate Business Education students in Rivers State Universities?
3. To what extent does BrainFriend Intelligent Tutoring System enhance research competency development among Postgraduate Business Education students in Rivers State Universities?
4. What are the challenges affect the adoption of BrainFriend Intelligent Tutoring System among Postgraduate Business Education students in Rivers State Universities?

Hypotheses

The following null hypothesis were formulated and tested at 0.05 level of significance:

1. There is no significant difference in the mean ratings of Postgraduate Business Education students on the extent BrainFriend Intelligent Tutoring System Platform enhances personalized learning among Postgraduate Business Education Students in Rivers State Universities.
2. There is no significant difference in the mean ratings of Postgraduate Business Education students on the extent BrainFriend Intelligent Tutoring System improves instructional effectiveness among Postgraduate Business Education students in Rivers State Universities.
3. There is no significant difference in the mean ratings of Postgraduate Business Education Students on the extent BrainFriend Intelligent Tutoring System enhances research competency development among Postgraduate Business Education Students in Rivers State Universities.
4. There is no significant difference in the mean ratings of Postgraduate Business Education Students on challenges affecting the adoption of BrainFriend Intelligent Tutoring System among Postgraduate Business Education students in Rivers State Universities.

Methodology

The study adopted a descriptive survey design, suitable for collecting data on perceptions and experiences regarding AI-based learning platforms. The population of the study consisted of 146 Postgraduate Business Educations Students of 2024/2025 academic session. Census sampling technique was used, which ensured using the entire population. A structured instrument titled: “Brain-field: An Intelligent Tutoring System for Enhancing Learning of Postgraduate Business Education Questionnaire (BITSELPBEQ). The questionnaire was structured on four-pointed rated Very High Extent-VHE (4); High Extent –HE (3); Moderate Extent – ME (2) and Low Extent LE (1). The reliability of the instrument was done through a pilot study of 20 respondents from Federal University Otuoke, (Bayelsa State) and reliability index of 0.83 was established. One hundred and thirty-six were returned (representing approximately 90% retrieval rate). Mean and standard deviations was used to analyze the research questions with a criterion mean of 2.50; while t-test statistic was employed to test the hypotheses formulated at 0.05 levels of significance. The decision rule was to reject the null hypotheses if the t-calculated is greater than the t-critical and vice versa.

Results

Research Question 1: To what extent does BrainFriend Intelligent Tutoring System enhances personalized learning among postgraduate Business Education Students in Rivers State Universities?

Table 1: Mean and Standard Deviation on the extent BrainFriend Intelligent Tutoring System enhances personalized learning

S/N	Item	RSU (n = 60)			IAUE (n = 72)		
		$\bar{x}$	SD	Rmks	$\bar{x}$	SD	Rmks
1.	BrainFriend provides personalized learning recommendations based on my learning needs.	3.5	0.39	VHE	3.8	0.75	VHE
2.	BrainFriend enables me to learn at my own pace and convenience.	3.2	0.49	HE	3.5	0.45	VHE
3.	BrainFriend helps identify my learning weaknesses and provides corrective guidance.	3.1	0.52	HE	3.4	0.37	HE
4.	BrainFriend improves my understanding of Business Education concepts and course content.	3.3	0.53	HE	3.6	0.49	VHE
5.	The use of BrainFriend contributes significantly to improved academic performance	3.4	0.37	HE	3.4	0.49	HE
	Grand Mean	**3.30**	**0.46**		**3.54**	**0.51**	

Source: Researchers Field, Survey, 2025

The results in Table 1 shows the mean and standard deviation on the extent BrainFriend-ITSP enhances personalized learning in Rivers State University (RSU) and Ignatius Ajuru University of Education (IAUE) with grand mean range of 3.30±0.46 and 3.54±0.51. The highest mean occurred in item 1 which stated that BrainFriend provides personalized learning recommendations based on my learning needs with means of 3.5±0.39 and 3.8±0.75 for RSU and IAUE respectively. The lowest mean occurred in item 3 with mean value range of 3.1±0.52 and 3.40±0.37.

To provide answer to the research question 1, the research found that BrainFriend-ITSP enhances personalized learning among Business Education Postgraduate Students. With an average aggregate mean of 3.42 which falls within the boundaries of high extent criterion mean range.

Research Question 2: To what extent does BrainFriend Intelligent Tutoring System improves instructional effectiveness among postgraduate Business Education students in Rivers State Universities?

Table 2: Mean and Standard Deviation on the extent BrainFriend Intelligent Tutoring System improve instructional effectiveness

S/N	Item	RSU (n = 60)			IAUE (n = 72)		
		$\bar{x}$	SD	Rmks	$\bar{x}$	SD	Rmks
6.	BrainFriend facilitates effective delivery of instructional content.	3.5	0.40	VHE	3.2	0.40	HE
7.	BrainFriend enhances interaction and engagement with students during learning activities.	3.7	0.42	VHE	3.5	0.45	VHE
8.	BrainFriend provides immediate feedback that improves learning outcomes.	3.4	0.45	HE	3.1	0.49	HE
9.	BrainFriend supports the use of diverse instructional strategies for effective learning.	3.4	0.49	HE	3.3	0.51	HE
10.	BrainFriend improves classroom and online learning experiences among postgraduate students.	3.5	0.45	VHE	3.4	0.45	HE
	Grand Mean	**3.5**	**0.44**		**3.3**	**0.46**	

Source: Researchers' Field Survey, 2025

The results in Table 2 revealed the mean and standard deviation on the extent BrainFriend-ITSP enhances instructional effectiveness in Rivers State University (RSU) and Ignatius Ajuru University of Education (IAUE), with grand mean ranges of 3.3±0.46 and 3.5±0.44. The highest mean occurred in item 7 which stated that BrainFriend enhances interaction and engagement with students during learning activities with means of 3.7±0.42 and 3.5±0.45 for RSU and IAUE respectively. The lowest mean occurred in item 8 with mean value range of 3.1±0.52 and 3.40±0.37.

In providing answer to Research Question 2, the research found that BrainFriend-ITSP improves instructional effectiveness among Business Education Postgraduate Students. With an average aggregate mean is 3.40, which falls within the high extent criterion mean range.

Research Question 3: To what extent does BrainFriend Intelligent Tutoring System enhances research competency development among Postgraduate Business Education students in Rivers State Universities?

Table 3: Mean and Standard Deviation on the extent BrainFriend Intelligent Tutoring System enhance research competency development

S/N	Item	RSU (n = 60)			IAUE (n = 72)		
		$\bar{x}$	SD	Rmks	$\bar{x}$	SD	Rmks
11.	BrainFriend assists students in identifying relevant research topics and problems.	3.5	0.45	VHE	3.5	0.45	VHE
12.	BrainFriend enhances students' ability to conduct literature reviews and source scholarly materials.	3.4	0.37	HE	3.4	0.37	HE
13.	BrainFriend improves students' competence in data analysis and interpretation of research findings.	3.3	0.53	HE	3.0	0.50	HE
14.	BrainFriend supports the development of academic writing and referencing skills.	3.4	0.49	HE	3.4	0.49	HE
15.	BrainFriend enhances overall research productivity and competence among postgraduate Business Education students.	3.6	0.57	VHE	3.6	0.49	VHE
	Grand Mean	**3.44**	**0.48**		**3.38**	**0.46**	

Source: Researchers' Field Survey, 2025

The result in Table 3 represents the mean and standard deviation on the extent BrainFriend-ITSP enhances research competency development in Rivers State University (RSU) and Ignatius Ajuru University of Education (IAUE) with grand mean range of 3.44±0.48 and 3.38±0.46. The highest mean occurred in item 15 that states BrainFriend enhances overall research productivity and competence among postgraduate Business Education students with means of 3.6±0.57 and 3.6±0.49 for RSU and IAUE respectively. The lowest mean occurred in item 12 with mean value range of 3.4±0.37 respectively.

To provide answer to the research question 3, the research discovered that BrainFriend-ITSP enhances research competency development among Business Education Postgraduate Students. With an average aggregate mean of 3.41 which falls within the threshold of high extent criterion mean range.

Table 3, presents mean range and standard deviation of 3.4 – 3.6 ± 0.48 and 3.4 – 3.6 ± 0.46 for Lecturers and Students respectively, indicating high extent (HE) to very high extent utilization of Brain-friend platform for enhancing interactive learning and assessment in Business Education Postgraduate Programme in Rivers State Universities.

Research Question 4: What are the challenges affect the adoption of BrainFriend Intelligent Tutoring System among Postgraduate Business Education students in Rivers State Universities?

Table 4: Mean and Standard Deviation on the challenges affecting the adoption of BrainFriend Intelligent Tutoring System

S/N	Item	RSU (n = 60)			IAUE (n = 72)		
		$\bar{x}$	SD	Rmks	$\bar{x}$	SD	Rmks
16.	Inadequate technological infrastructure affects the effective adoption of BrainFriend in universities.	3.5	0.45	VHE	3.6	0.49	VHE
17.	Poor internet connectivity limits the utilization of BrainFriend for teaching and learning activities.	3.4	0.37	HE	3.5	0.39	VHE
18.	Lack of adequate training and technical support affects users' ability to effectively use BrainFriend.	3.8	0.75	VHE	3.7	0.42	VHE
19.	Resistance to the use of emerging educational technologies hinders the adoption of BrainFriend among lecturers and students.	3.6	0.49	VHE	3.4	0.49	HE
20.	Financial constraints associated with the implementation and maintenance of BrainFriend affect its adoption in universities.	3.4	0.49	HE	3.2	0.49	HE
	Grand Mean	**3.54**	**0.51**		**3.48**	**0.46**	

Source: Researchers Field, Survey, 2025

The result in Table 4 showed the mean and standard deviation on the challenges that affects the adoption of BrainFriend-ITSP in Rivers State University (RSU) and Ignatius Ajuru University of Education (IAUE) with grand mean range of 3.54±0.51 and 3.48±0.46. The highest mean occurred in item 18 which stated that lack of adequate training and technical support affects students ability to use BrainFriend-ITSP to a very high extent with means of 3.8±0.75 and 3.7±0.42 for RSU and IAUE respectively. The lowest mean occurred in item 20 with mean value range of 3.4±0.49 and 3.2±0.4.9 respectively.

To provide answer to the research question 4, the research found that challenges such as inadequate infrastructure, internet connectivity, inadequate training, digital literacy and financial constraints affect the adoption of BrainFriend-ITSP among Postgraduate Business Education Students in Rivers State Universities. With an average aggregate mean of 3.51, which falls within the boundaries of very high extent criterion mean range.

Hypotheses

Hypothesis 1: There is no significant difference in the mean ratings of Postgraduate Business Education students on the extent BrainFriend Intelligent Tutoring System Platform enhances personalized learning among Postgraduate Business Education Students in Rivers State Universities.

Table 5: t-Test on the extent BrainFriend Intelligent Tutoring System enhances personalized learning

Institution	N	$\bar{x}$	SD	Df	tcal	tcrt	α level	Decision
RSU	60	3.30	0.46					
				130	1.690	1.96	0.05	Accept
IAUE	72	3.54	0.51					

Source: Researchers Field, Survey, 2025

A t-test was conducted to examine differences between the two groups. Results (Table 5) show that RSU had a mean of 3.56 (SD = 0.44) while IAUE had a mean of 3.25 (SD = 0.46). The calculated t-value (tcal = 1.690) is less than the critical t-value (tcrt = 2.132) at α = 0.05 and df = 174. Since tcal < tcrt, the null hypothesis is accepted, implying that there is no significant difference between the respondents on the extent BrainFriend Intelligent Tutoring System Platform enhance personalized learning and academic performance in Business Education Postgraduate Programme, Rivers State Universities.

Hypothesis 2: There is no significant difference in the mean ratings of Postgraduate Business Education students on the extent BrainFriend Intelligent Tutoring System improves instructional effectiveness among Postgraduate Business Education students in Rivers State Universities

Table 6: t-Test on the extent BrainFriend Intelligent Tutoring System improves instructional effectiveness

Institution	N	$\bar{x}$	SD	Df	tcal	tcrt	α level	Decision
RSU	60	3.50	0.44					
				130	1.470	1.96	0.05	Accept
IAUE	72	3.30	0.46					

Source: Researchers Field, Survey, 2025

The t-test results in Table 6 indicate that RSU recorded a mean of 3.50 (SD = 0.44) while IAUE recorded a mean of 3.30 (SD = 0.46). The calculated t-value (tcal = 1.470) is less than the critical value (tcrt = 1.96) at α = 0.05 and df = 130. Since tcal < tcrt, the null hypothesis is accepted. This means that there is no significant difference (statistically) between the respondents on the extent BrainFriend Intelligent Tutoring System Platform improve instructional effectiveness in the teaching and learning process Business Education Postgraduate Programme in Rivers State Universities.

Hypothesis 3: There is no significant difference in the mean ratings of Postgraduate Business Education Students on the extent BrainFriend Intelligent Tutoring System enhances research

competency development among Postgraduate Business Education Students in Rivers State Universities

Table 7: t-Test on the extent BrainFriend Intelligent Tutoring System enhances research competency development

Institution	N	$\bar{x}$	SD	Df	Tcal	tcrt	α level	Decision
RSU	60	3.44	0.48					
				130	1.31	1.96	0.05	Accept
IAUE	72	3.38	0.46					

Source: Researchers Field, Survey, 2025

The independent samples t-test results in Table 7 show that RSU recorded a mean score of 3.44 (SD = 0.48) while IAUE recorded 3.38 (SD = 0.46). The calculated t-value (tcal = 1.31) is less than the critical value (tcrt = 1.96) at $\alpha = 0.05$ and df = 130. Since tcal < tcrt, the null hypothesis is accepted, indicating no significant difference between respondents on the extent Brain-friend Intelligent Tutoring System enhances research competency development in Business Education Postgraduate Programme in Rivers State Universities.

Hypothesis 4: There is no significant difference in the mean ratings of Postgraduate Business Education Students on challenges affecting the adoption of BrainFriend Intelligent Tutoring System among Postgraduate Business Education students in Rivers State Universities.

Table 8: t-Test on the challenges affecting the adoption of BrainFriend Intelligent Tutoring System

Institution	N	$\bar{x}$	SD	Df	Tcal	tcrt	α level	Decision
RSU	60	3.54	0.51					
				130	1.688	1.96	0.05	Accept
IAUE	72	3.48	0.46					

Source: Researchers Field, Survey, 2025

The t-test results in Table 8 show that RSU had a mean of 3.54 (SD = 0.51) and IAUE had a mean of 3.48 (SD = 0.46). The calculated t-value (tcal = 1.688) is less than the critical t-value (tcrt = 1.96) at $\alpha = 0.05$ and df = 130. Since tcal < tcrt, the null hypothesis is accepted indicating no significant difference between respondents on the extent challenges and infrastructural requirements affecting BrainFriend Intelligent Tutoring System implementation in Business Education Postgraduate Programme in Rivers State Universities.

Findings

The findings of the study revealed the following:

1. BrainFriend ITSP enhances personalized learning and academic performance to a High Extent (grand mean = 3.42). This suggests respondents perceive BrainFriend as improving learning flexibility, individualized support, and improved academic achievement.
2. BrainFriend improves instructional effectiveness to a High Extent (grand mean = 3.40), indicating enhanced engagement, feedback mechanisms, instructional strategies, and learning outcomes.
3. BrainFriend enhances research competency development to a High Extent (grand mean = 3.41), through problem identification, literature review, data analysis, and academic writing skills.
4. Challenges to adoption exist to a Very High Extent (grand mean = 3.51), including infrastructure, internet connectivity, resistance to change, digital literacy, and financial constraints.

Discussion

Findings from RQ1 showed that BrainFriend enhances interactive learning, assessment, and independent study habits among Business Education students. High mean responses from lecturers and students indicate that BrainFriend's multimedia resources, assessment tools, and interactive exercises are effective educational supports. This aligns with the findings of Eze, Okafor & and Nwosu (2022), who noted that BrainFriend significantly enhances students' understanding through interactive modules and digital assessments. Stamatelatos & Brooks (2020) and Leal-Rodríguez & Albort-Morant (2019) equally reported that digital learning tools (BrainFriend self-paced learning processes) promote and improve performance in business-related subjects.

The findings align with previous studies reporting that Intelligent Tutoring Systems significantly improve learner motivation, engagement, and academic performance through personalized learning experiences (Adayilo et al., 2026). AI-supported instructional strategies have also been shown to enhance classroom effectiveness and student outcomes. The study therefore suggests that BrainFriend can serve as a transformative educational technology for postgraduate Business Education programmes in Rivers State universities.

Artificial Intelligence (AI)-based Tutoring Systems provides have been found to provide personalized learning feedback and to enhance academic performance even at the secondary education level (Adayilo et al., 2026). This study provides empirical evidence also on the

pedagogical viability of AI tutoring such as BrainFriend in under-resourced contexts, contributing to self-regulated and socio-technical learning theories. It also recommends enhanced systemic teacher education, ethical leadership, and structural support to foster equitable adoption of AI in education. Brainfriend's role as a complementary instructional resource is capable of enriching Business Education pedagogy. This further demonstrates that even localized educational technologies can be as impactful as global tools when integrated effectively into teaching practices and should not neglected.

Findings from RQ4 supports widespread believe that inadequate internet connectivity, insufficient institutional support, limited digital infrastructure, high cost of AI tools, and lack of technical skills are major barriers to BrainFriend ITS implementation. These findings are consistent with Adewale & Bello (2022) who identified limited technical competencies and poor institutional readiness as primary obstacles to AI integration in higher education. The prominent challenge of technical skill deficiency reported in this study is supported by the work of Ng et al., (2023) and Celik (2023), who concluded that AI literacy and digital competency significantly influence educators' ability to adopt intelligent learning technologies.

Integration of artificial intelligence (AI) into personalized learning has been identified as a major factor in reshaping educational practices through adaptive, learner-centred experiences (Deckker, Sumanasekara, & Fakhrou, 2025). In a studied outcome of a narrative review, structured to synthesise recent empirical and conceptual research (2022–2025), assesses both the transformative potential and the challenges of AI-powered personalised learning; revealed that AI intelligent tutoring system can enhance student performance, motivation, and engagement through the provision of real-time feedback, tailored content delivery, and intelligent tutoring systems. Additionally, AI supports teacher efficiency by automating routine tasks and providing data-driven insights. The study also identified challenges and pitfalls that are pressing concern in the smooth implementation of smart tutoring systems for learning such as BrainFriend, Coursera, Google Classroom etc.

The researcher discovers existence of structural readiness gap that must be addressed in order for BrainFriend ITS to meet up with challenges and infrastructural needs of Business Education. This suggests a strong need for investment in digital infrastructure, broadband expansion, continuous capacity building, and institutional policies that support AI-driven teaching practices. Without addressing these foundational requirements, adoption of AI-based ITS may remain superficial or unsustainable.

The researcher observed that while Business Education programmes in Rivers State strives to integrate technology into teaching and learning, digital readiness gaps persist among students in the Department. This situation is in alignment with the results of prior empirical studies, which strengthen the reliability of this study which highlights the urgent need for capacity building, infrastructural investments, and policy-level support. This has to be complemented with technology-driven pedagogy that requires not only access to digital tools but also stable networks, technical skills, and supportive institutional frameworks for effective utilization.

Conclusion

Based on the findings of the study, it was concluded that BrainFriend Intelligent Tutoring System Platform (BITSP) is an effective educational technology for enhancing teaching and learning among postgraduate Business Education students in universities in Rivers State. The platform enhances personalized learning, improves academic performance, increases instructional effectiveness, and strengthens research competency development among students. However, challenges such as inadequate technological infrastructure, limited digital skills, poor internet connectivity, and funding constraints may hinder its optimal adoption and utilization. These findings support previous studies which established that Intelligent Tutoring Systems positively influence learning outcomes, academic achievement, and personalized instruction.

Recommendations

1. Rivers State Universities should integrate BrainFriend- ITS into postgraduate Business Education programmes to enhance teaching and learning effectiveness.
2. University management should provide adequate ICT infrastructure and reliable internet facilities to support effective utilization of BrainFriend-ITS.
3. Regular training and capacity-building programmes should be organized for lecturers and students on the effective use of BrainFriend-ITS.
4. BrainFriend Intelligent Tutoring System should be properly incorporated into instructional delivery system, assessment, and research supervision activities to maximize learning outcomes.
5. Institutions should establish technical support units to assist users and ensure sustainable adoption of BrainFriend-ITS.

References

Adayilo, D.M., Oyefolahan, I.O., Ndunagu, J.N., Otuya, C., Malcalm, E. & Twabu, K. (2026): AI-Powered Tutoring Systems for Personalized Learning Feedback in Developing Secondary Education Contexts. *Journal of Future Artificial Intelligence and Technologies*, 2(4), 549 – 564.

Adewale, T., & Bello, K. (2022). Digital divide and adoption of AI-based learning tools in Nigerian tertiary education. *International Journal of Educational Technology*, 9(3), 120 – 134.

Akyuz, Y. (2020). *Effects of Intelligent Tutoring Systems (ITS) on Personalized Learning (PL). Creative Education*, 11(6), 953–978. https://doi.org/10.4236 /ce.2020.116069.

Celik, I. (2023). Exploring the determinants of artificial intelligence (AI) literacy: Digital divide, computational thinking, cognitive absorption. *Telematics and Informatics*, 83, Article 102026. https://doi.org/10.1016/j.tele.2023.102026

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340.

Deckker, D., Sumanasekara, S., & Fakhrou, A. (2025). AI-Powered Personalised Learning: Promise and Pitfalls. *World Journal of Advanced Research and Reviews,* 26(03), 2081-2095.

Eze, U., Okafor, P. & Nwosu, C. (2022). Impact of BrainFriend on students' performance in Business Education: A case study of Rivers State University. *African Journal of Educational Technology*, 11(2), 105 – 120.

Holmes, W., Bialik, M., & Fadel, C. (2022). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.

Igbokwe, C. (2023). Artificial intelligence integration in Nigerian education: Prospects and challenges. *African Journal of Educational Technology, 5*(2), 45–58.

Leal-Rodríguez, A. L., & Albort-Morant, G. (2019). Promoting innovative experiential learning practices to improve academic performance. *Journal of Innovation & Knowledge*, 4(2), 97–103. https://doi.org/10.1016/j.jik. 2017.12.001

Morgan, B., Hogan, M., Hampton, A. J., & Lippert, A. (2020). *The Need for Personalized Learning and the Potential of Intelligent Tutoring Systems.* In *Handbook of Learning from Multiple Representations and Perspectives. Retrieved from* https://Users/ P/*Downloads/Chapter28 Morganpre-print.pdf*

Organisation for Economic Co-operation and Development. (2023). *OECD digital education outlook 2023: Towards an effective digital education ecosystem*. OECD Publishing.

Piaget, J. (1972). *The psychology of the child*. Basic Books.

Romero, C. & Ventura, S. (2013). *Data mining in education*. Wiley Interdisciplinary Reviews; *Data Mining and Knowledge Discovery*, 3(1), 12 – 27.

Stamatelatos, A., & Brooks, R. (2020). Simulated business effectiveness: learning and performance outcomes. *Education and Training*, 62(9), 1015–1036. https://doi.org /10. 1108/ET-04-2019-0084.

UNESCO (2023). Global education monitoring report: technology in education: a tool on whose terms? Retrieved from https://unesdoc.unesco.org/ark:/48223/ pf000038-5723.

UNESCO. (2023). *Guidance for generative AI in education and research*. UNESCO.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Woolf, B. P. (2021). *Building intelligent interactive tutors: Student-centered strategies for revolutionizing e-learning* (2nd ed.). Morgan Kaufmann.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education, 16*(39), 1–27.