

AI INTEGRATION FACTORS AND STUDENTS' ECONOMIC PROBLEM-SOLVING SELF-EFFICACY IN THE UNIVERSITY SYSTEM

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Abstract

Artificial Intelligence (AI) is increasingly being integrated into university teaching and learning, yet little is known about how this integration relates to students' capacity to solve economic problems. Guided by a systems thinking perspective, this study examined the joint and relative influence of four AI integration factors, namely students' perceived usefulness of AI, perceived ease of use of AI, institutional access to Information and Communication Technology (ICT), and lecturers' AI integration, on the economic problem-solving self-efficacy of undergraduate Economics students in two purposively selected universities in Oyo State, Nigeria. Five validated questionnaires which are Perceived Usefulness of AI ($r=0.72$), Perceived Ease of Use of AI ($r=0.84$), Institutional Access to ICT ($r=0.82$), Lecturers' Integration of AI ($r=0.86$), and Students' Economic Problem-solving Self-Efficacy Scale ($r=0.72$) were administered to 300 students of economics and analyzed using multiple regression. The four factors had a significant joint influence on students' economic problem-solving self-efficacy ($F(4, 295) = 17.66, p < 0.05$; Adjusted $R^2 = 0.18$). Perceived ease of use ($\beta = 0.297, p < 0.05$) and perceived usefulness ($\beta = 0.134, p < 0.05$) each had a significant relative influence on students' economic problem-solving self-efficacy, whereas institutional access to ICT ($\beta = 0.061, p > 0.05$) and lecturers' AI integration ($\beta = 0.051, p > 0.05$) did not. The results implied that technological availability and institutional support alone may not translate into enhanced problem-solving self-efficacy. The study recommended a systems-based AI integration approach to train digitally competent and economically resilient undergraduates for national development.

Keywords: AI integration in education, economic problem-solving self-efficacy, perceived usefulness, systems thinking, Nigerian universities

Introduction

Teaching and learning are being transformed by the rapid adoption of Artificial Intelligence (AI) in all sectors, including the education sector, through personalized instruction, intelligent tutoring, automatic feedback, and adaptive learning model and environments that caters to individual student needs. In the broader context, AI is a technology that continues to gain traction as a valuable tool to enhance learning outcomes, foster critical thinking and problem-solving abilities globally. Recent research demonstrates that AI-enriched learning environments can enhance cognitive functions like problem-solving, analytical reasoning, and critical thinking (Ikram et al., 2026; Chiu, et al., 2026). But the gains from AI are not guaranteed, as their successful implementation requires institutional preparedness, teacher capability, access to technology, and ethical oversight (Zuo, 2025; Fakuade, 2025).

A key impact of the application of AI in higher education is students' acquisition of economic problem-solving self-efficacy. It is defined as students' self-awareness in solving economic issues, understanding economic data, assessing options, and making informed decisions. This construct is particularly important as economics is a practical subject, which requires students to relate theory to real-life situations like inflation, scarcity, budgeting, consumer behaviour, unemployment, and economic policies (Adepoju et al., 2026). Economic problem-solving self-efficacy is positively related to students' persistence in difficult problems, active participation in learning activities, and everyday problem-solving. Thus, self-efficacy is also a result of learning and is a basis for responsible involvement in economic life.

Nigeria's Higher Education (HE) system is currently facing an accelerated digital context that is experiencing the integration of emerging technologies in various aspects of teaching, learning, research, and administration (Kayode-Olawoyin et al., 2024). Some studies show that the implementation of AI in higher education in Nigeria can revolutionize the field through personalized learning, teaching methods, and academic support (Adeduntan, et al., 2026; Jiang, 2024). However, there are still challenges in the adoption due to limited infrastructure, digital literacy, funding, and the fear of change (Ayoola, et al., 2025). Despite the potential benefits of integrating AI into higher education in Nigeria, the adoption of

AI in institutions is hindered by several base-line factors, including limited infrastructure, low digital literacy, inadequate funding, and resistance to change (Junaïd, 2021; Gbadamosi, 2025). Likewise, research on the use of AI in Nigerian universities reveals that despite the immense potential, universities are still encountering issues like inadequate internet connectivity, lack of power supply, shortage of trained staff, and a lack of a comprehensive policy on AI usage (Gbadamosi, 2025; Junaïd et al., 2026). The realities imply an uneven level of integration of AI in Nigeria, and it is largely dependent on institutional conditions.

Nigeria is also confronted with a larger socio-economic environment which reinforces the importance of economic problem-solving self-efficacy of students (Rasaki, 2021). Keeping up with today's rapidly changing digital world, with its need for practical decision-making skills, while facing unemployment, inflation, and financial insecurity is a challenge for many youths. In this context, the role of economic education goes beyond just conveying economic theories, and it is necessary for students to be able to read and understand the economic realities and make good personal and social choices. Additionally, from local evidence, the application of AI tools in educational delivery can enhance financial literacy and decision-making skills of Nigerian students. For instance, an AI-powered financial literacy chatbot proved to be an effective tool in enhancing students' financial management capabilities by demonstrating how AI can contribute to local context-relevant financial literacy education (Jiang, 2024; Adeduntan, et al., 2026). By providing real-life scenarios and personalize interactive engagement on financial management. This helps to support the idea that AI can also help to build students trust in solutions to economic issues.

Furthermore, literature has also confirmed the link between the use of AI and self-efficacy. Research has demonstrated that perceived usefulness and perceived ease of use are significant factors influencing students' engagement with AI tools and their ability to effectively utilize them (Chiu et al., 2026; Zhang et al., 2026). The ease of access and effectiveness of AI tools in supporting students' learning can motivate students to be immersed in academic tasks that builds their self-confidence in solving complex problems. Ayoola, et al., (2025) and Chiu, et al., (2026) in the meta-analysis of some studies reported that AI has beneficial medium-to-large effects on learners' self-efficacy and higher-order thinking, particularly when it comes

to problem solving. This suggests that AI is more than a tool for technical tasks, but also a mental support system that can assist students in developing confidence in their ability to handle real-life and academic difficulties.

The systems thinking perspective provided the theoretical basis for understanding AI integration in Economics education as an interaction of interconnected technological, institutional, and pedagogical factors. In this context, students' economic problem-solving self-efficacy was viewed as an outcome associated with the perceived usefulness and ease of use of AI, institutional access to ICT, and lecturers' level of AI integration. The perspective emphasises that these factors should not be considered in isolation, as their combined influence may shape students' confidence in identifying, analysing, and solving economic problems. Thus, the perspective guided the examination of both the joint and relative contributions of the four predictor variables to students' economic problem-solving self-efficacy. Students with a positive perception of the usefulness and manageability of AI for problem-solving tasks tend to have high self-efficacy when using AI in classroom learning, particularly when the ICT infrastructure are reliable and when the lecturer engages in using AI in teaching (Ayoola, et al., 2025; Zhang et al., 2026). On the other hand, inadequate infrastructure and inadequate instructional support can undermine the educational benefits of AI and students' confidence.

In the higher education sector, AI is being increasingly introduced in the classroom, thereby aiding in teaching, learning experiences, and academic achievement. Yet, despite the increasing prevalence of such integration, the extent to which it contributes to students' economic problem-solving self-efficacy is poorly understood, particularly in developing countries like Nigeria. Most studies on the topic discuss the adoption of AI, digital literacy, or academic performance as a whole, and very few studies are specifically concentrated on economic problem-solving self-efficacy. However, this is an important result in economics teaching because students will be expected to be able to use concepts like scarcity, inflation, budgeting, and allocation of resources in the real world (Adepoju et al., 2026). Without students' confidence in solving these problems, the educational benefits of using AI in the learning process of economics may be constrained. This study, therefore examined the extent to which the AI

integration factors (the availability of ICTs in institutions, the lecturers integration of AI, perceived usefulness of the use of AI, and the perceived ease of using AI) predict the economic problem-solving self-efficacy of students in the University system.

Method

This study used the correlational research design method to analyze the economic problem-solving self-efficacy of students under an AI integration system from a system thinking perspective. The design was appropriate because the variables were not manipulated, and relationships and predictive contributions were explored. Purposive sampling was used to select the two government-owned universities that have Economics as a course of study in Oyo State, Nigeria. A total of 300 students were proportionally used for the study. Five self-developed instruments, each made up of 10 items with two sections (Section A is for demographic data and Section B to measure the variable), were employed in this study. The instruments were face and content validated by experts in the related fields, and they were trial tested for internal consistency. The instruments were the Perceived Usefulness of AI Scale ($r = 0.72$), Perceived Ease of Use of AI Scale ($r = 0.84$), and Students' Economic Problem-Solving Self-Efficacy Scale ($r = 0.72$) measured on a four-point Likert scale ranging from 'Strongly Agree' to 'Strongly Disagree'. The Institutional Access to ICT Scale ($r = 0.82$), and Lecturers' Level of AI Integration Scale ($r = 0.86$) were measured a four-point Likert scale ranging from 'Very High' to 'Very Low'.

Four research assistants were trained to help facilitate the administration of the research instruments. The researcher and trained assistants went to the selected universities and administered the questionnaires to the 300 after the seeking the approval for the study. The questionnaires were administered to the respondents in their respective campuses, during agreed upon periods, by the research assistants, with the help of the concerned lecturers. To prevent loss and non-response, the research assistants collected the completed questionnaires as soon as they were completed. The trained assistants assured respondents of the confidentiality of the information and explained that participation in the study was voluntary. Of the 300 distributed questionnaires, 295 were completed and were found suitable for analysis, representing a 98.3% usable response rate. All the

completed questionnaires were coded and analysed using multiple regression analysis at 0.05 level of significance. The overall significance of the regression model was tested with the F statistic and the importance of the predictors was tested by standardised beta coefficients.

Results

Research Question 1: What is the level of students' economic problem-solving self-efficacy?

Table 1: Economics Problem-Solving Self-Efficacy

SN	Items	SA	A	D	SD	Mean	St.D
1	I can explain my problem-solving process better with AI support.	90 (30%)	135 (45%)	53 (17.7%)	22 (7.3%)	2.98	.879
2	AI tools help me identify errors in my Economics problem-solving steps.	89 (29.7%)	135 (45%)	49 (16.3%)	27 (9%)	2.95	.906
3	I am confident in applying AI tools to evaluate case studies in Economics.	86 (28.7%)	135 (45%)	58 (19.3%)	21 (7%)	2.95	.872
4	I can use AI tools to compare different solutions to economic problems.	87 (29%)	135 (45%)	56 (18.7%)	22 (7.3%)	2.96	.878
5	AI tools make me more independent in solving Economics problems.	87 (29%)	143 (47.7%)	45 (15%)	25 (8.3%)	2.97	.880
6	I can rely on AI tools to simplify calculations in Economics.	80 (26.7%)	147 (49%)	58 (19.3%)	15 (5%)	2.97	.813
7	AI tools help me develop strategies for solving complex questions.	87 (29%)	145 (48.3%)	54 (18%)	14 (4.7%)	3.02	.812
8	I am capable of using AI tools to interpret graphs and economic models.	103 (34.3%)	123 (41%)	56 (18.7%)	18 (6.0%)	3.04	.878
9	I can integrate AI tools effectively in group problem-solving activities.	99 (33%)	138 (46%)	51 (17%)	12 (4%)	3.08	.810
10	I believe AI tools enhance my long-term problem-solving skills in Economics.	100 (33.3%)	142 (47.3%)	44 (14.7%)	14 (4.7%)	3.09	.812
Weighted mean = 3.00		threshold = 2.50					

Table 1 shows that the level of students' Economics problem-solving self-efficacy is high ($WA = 3.00$). The table reveals that students can explain their problem-solving process better when supported by AI tools ($\bar{x} = 2.98$). AI tools also help them identify errors in their problem-solving steps ($\bar{x} = 2.95$). Students can rely on AI tools to simplify calculations ($\bar{x} = 2.97$), while AI also helps them develop strategies for solving complex Economics questions ($\bar{x} = 3.02$). The findings indicate that students are capable of using AI tools to interpret graphs and economic models ($\bar{x} = 3.04$). They can integrate AI effectively in group problem-solving activities ($\bar{x} = 3.08$), and they believe that AI tools enhance their long-term problem-solving skills in Economics ($\bar{x} = 3.09$), which is the highest-rated item in the category.

Research question 2: What is the level of lecturers integration of AI to Economics lesson?

Table 2: Lecturers' AI Integration in Economics Lessons

SN	Items	SA	A	D	SD	Mean	St.d
1	My lecturers design assignments that encourage the use of AI tools.	76 (25.2%)	116 (38.7%)	76 (25.3%)	32 (10.7%)	2.79	.944
2	My lecturers integrate AI-related activities into Economics tutorials.	70 (23.3%)	124 (41.3%)	75 (25%)	31 (10.3%)	2.78	.922
3	My lecturers create awareness about the benefits of AI in learning.	70 (23.3%)	125 (41.7%)	79 (26.3%)	26 (8.7%)	2.80	.903
4	My lecturers show me practical ways of using AI tools.	77 (25.7%)	114 (38%)	83 (27.7%)	26 (8.7%)	2.81	.919
5	My lecturers are open to students using AI tools in their work.	80 (26.7%)	125 (41.7%)	75 (25%)	20 (6.7%)	2.88	.879

6	My lecturers demonstrate AI applications during Economics lessons.	68 (22.7%)	130 (43.3%)	76 (25.3%)	26 (8.7%)	2.80	.888
7	I feel encouraged by my lecturers to explore AI beyond the classroom.	64 (21.3%)	122 (40.7%)	78 (26%)	36 (12%)	2.72	.941
8	My lecturers provide training sessions or workshops on AI tools.	77 (25.7%)	105 (35%)	92 (30.7%)	26 (8.7%)	2.78	.929
9	My lecturers evaluate assignments with consideration of AI integration.	64 (21.3%)	119 (39.7%)	86 (28.7%)	31 (10.3%)	2.72	.915
10	My lecturers recommend AI tools that are relevant to Economics learning	70 (23.3%)	115 (38.3%)	93 (31%)	22 (7.3%)	2.78	.888
Weighted mean = 2.79						threshold = 2.50	

Table 2: shows that the extent of lecturer AI integration in Economics is moderate (WA = 2.79). The table reveals that lecturers design assignments that encourage the use of AI tools to a moderate extent ($\bar{x} = 2.79$). They also integrate AI-related activities into Economics tutorials ($\bar{x} = 2.78$). Lecturers create awareness about the benefits of AI in learning ($\bar{x} = 2.80$), and they show students practical ways of using AI tools ($\bar{x} = 2.81$). The results further indicate that lecturers are open to students using AI tools in their academic work ($\bar{x} = 2.88$), which is the highest-rated item in the category. They also demonstrate AI applications during lessons ($\bar{x} = 2.80$). In addition, students feel moderately encouraged by lecturers to explore AI tools beyond the classroom ($\bar{x} = 2.72$). Lecturers also provide occasional training sessions or workshops on AI tools ($\bar{x} = 2.78$), and they evaluate

assignments with consideration for AI integration ($\bar{x} = 2.72$). Furthermore, lecturers recommend relevant AI tools that support Economics learning ($\bar{x} = 2.78$).

Researchquestion 3: What is the combined influence of student's perceived usefulness, perceived ease of use, institutional access to ICT, and lecturers' AI integration on students' economic problem-solving self-efficacy?

Table 3: Summary of Multiple Regression of Combined Influence of Students Perceived Usefulness, Perceived Ease of Use, Institutional Access to ICT, and Lecturers' AI Integration on Students Economic Problem-Solving Self-Efficacy

R= 0.440; R Square = 0.193, Adj. R Square = 0.182, Std. Error of the Estimate= 5.17860

ANOVA^a

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1894.664	4	473.666	17.662	.000 ^b
	Residual	7911.282	295	26.818		
	Total	9805.947	299			

Table 3 shows that students perceived usefulness, perceived ease of use, institutional access to ICT, and lecturers' AI integration has significant joint influence on students' economic problem-solving self-efficacy ($F(4, 295) = 17.662$; $p < 0.05$). This implies that the four variables when pulled together has a significant influence on student economic problem-solving self-efficacy. The results indicate an Adj. R Square of 0.335, which implies that 33.5% variance in on students' economic problem-solving self-efficacy was due to the joint influence of the independent variables while the remaining variance of 65.5% could be due to other factors not included in this model

Researchquestion 4: What is the relative influence of students' perceived usefulness, perceived ease of use, institutional access to ICT, and lecturer AI integration on students' economic problem-solving self-efficacy?

Table 4: Summary of Multiple Regression of Relative Influence of Students Perceived Usefulness, Perceived Ease of Use, Institutional Access to ICT, and Lecturers' AI Integration on Students Economic Problem-Solving Self-Efficacy

Coefficients ^a					
Model		Unstand	ardizedStand		Sig.
		Coefficients	Coefficients	t	
1	(Constant)	10.960		4.655	.000
	Perceived usefulness	.153	.134	2.074	.039
	Perceived ease	.378	.297	4.290	.000
	Access to ICT	.058	.061	.995	.321
	Lecturer AI integration	.052	.051	.826	.410

Table 4 shows that students perceived usefulness (Beta = 0.134; $p < 0.05$) perceived ease of use (Beta = 0.297; $p < 0.05$) had significant relative influence on students' economic problem-solving self-efficacy while institutional access to ICT (Beta = 0.061; $p > 0.05$) and lecturers' AI integration (Beta = 0.051 $p > 0.05$) has no significant relative influence. With the highest beta weight of 0.297, perceived ease of use was the variable that could predict students' economic problem-solving self-efficacy.

Discussion

The study revealed that the self-efficacy of students in problem-solving Economics is high. It means that students are confident that they can learn and solve the problems that are related to Economics, and this is possible when they are being taught by instructional tools enhanced by AI. The high value of self-efficacy indicates that students do not just believe they can be involved in complex analytical activities, but they also feel that they can be able to use economic reasoning practically in studies as well as in practice. The finding is well correlated with the extensive amount of research evidence that shows that AI-enhanced learning settings help students become more confident and competent when carrying out problem-solving exercises, with the key role being played by such AI features as step-by-step demonstrations and worked examples (Jiang, 2024; Fakuade, 2025). On the same note, Olasunkanmi, et al., (2024) and Oyewole, et al., (2025) reported that AI-specific learning suggestions enhanced the perceived

ability of students to address problems of domain relevance by providing more specific and pertinent practice through which confidence in their solution grew over time.

The study also revealed that the degree of lecturers' AI integration in Economics is moderate. This implies that there are lecturers who strongly promote and implement the application of AI in teaching Economics, but the adoption rate is not at its best, which means that there is a chance to enhance the process of helping students develop AI-based learning techniques. This observation aligns with the findings of other researchers on the importance of lecturer adoption of AI in determining the attitudes of students to economics and their engagement. In another study, (Kehinde-Awoyele, et al., 2024; Olasunkanmi, et al., 2024) reported that students who were subjected to AI-based teaching strategies with the help of a lecturer had a higher level of motivation and a more positive attitude towards learning than the students who participated in traditional teaching.

The finding of the study also, shows that, the combination of the perceived usefulness, perceived ease of use, institutional accessibility to ICT, and lecturer support of AI integration have a strong effect on self-efficacy of students in solving Economics problems. The overall interaction of the predictors is consistent with the ample evidence body of research globally and on the African continent that AI-mediated learning outcomes are contingent on several factors that interrelate. Ogundipe et al., (2026) , and Zhou et al., (2023) revealed that AI tools help students feel more confident about their ability to solve analytical and quantitative problems. In all these studies, perceived usefulness of AI like providing worked examples, hints and step-by-step instructions enhanced student competence and confidence in solving a problem. The result is also in line with other studies by Olasunkanmi, et al., 2024; Oyewole, et al., 2025, that found that intuitive and easy-to-use AI tools led to less cognitive strain and made students more confident about their ability to carry out complex reasoning tasks.

In addition, the importance that ICT access holds in the joint model supports the results of Junaid, 2021; Paredes-Aguirre. et al., 2026 who found that successful AI-assisted teaching requires a stable ICT infrastructure. The usefulness and ease of use become not translated into real self-efficacy achievement without access to devices, internet, or AI

systems. Also, the lecturer's integration of AI is one of the key aspects of the joint influence model. The result is consistent with that by Olasunkanmi, et al., (2024); Kehinde-Awoyele et al. (2024) and Oyewole, et al., (2025) who reported lecturer guidance, feedback, demonstration of AI tools, and structured scaffolding to have a significant influence on problem-solving self-efficacy in students. With the involvement of lecturers in the active use of AI in teaching, the students obtain clarity, direction, and confidence, particularly in addressing complicated Economics tasks.

The finding in table 4 indicated that learners perceived usefulness and perceived ease of use of AI tools had a strong impact on their self-efficacy in solving economic problems, and the availability of ICT to institutions and AI implementation by lecturers did not have a strong impact. Of all the predictors, perceived ease of use increased the effect the most, as it was the strongest determinant of student confidence with pleasing AI-based tools to solve economic problems. The importance of perceived usefulness is consistent with the fact that the Technology Acceptance Model (TAM) suggested by Davis (1989) has suggested that people can better use digital tools when they think that the latter will positively influence their performance.

Moreover, the best predictive value was on perceived ease of use, which means that perceived ease of use is a significant influence on students in terms of confidence in solving economic problems by using AI tools. This result supports a hypothesis of TAM that the ease of use improves the attitude of the users, usage behaviour and self-efficacy. In learning with the use of AI, simplification of interaction removes cognitive load, and thus the students are able to concentrate more on problem-solving activities than learning how to operate complicated systems (Oyewole, et al., 2025; Olaniyi et al., 2026; Kayode-Olawoyin et al., 2024).

Conversely, institutional access to ICT had no pronounced influence on self-efficacy in solving problems. And yet, despite the fact that technology integration is inseparable with the ICT infrastructure, its presence does not necessarily lead to competence or confidence. This aligns with the results of Zhao et al. (2025), who stated that access is not enough without the actual engagement and meaningful use of digital tools by students. The fact that the study was not statistically significant indicates the perception and

experience of the students in relation to the tools they are using is a more important determinant of self-efficacy instead of the institutional support itself. In a similar manner, no significant lecturers' AI integration also affected the self-efficacy of students to solve economic problems. This finding can point to the fact that students can be more dependent on their own interaction with AI tools and not on the external advice and assistance of the lecturers. It was previously shown in the work of Olasunkanmi, et al., (2024) and Ayoola, et al., (2025); that the adoption of technology and the resulting confidence is influenced more often by the individual-level factors (perceived value and ease of use) than by instructor-related variables, particularly in a self-directed or technology-rich learning context. The result implies that despite the integration of AI by lecturers, the internal conviction in the usefulness and usability of AI tools among the students is more decisive in forming their self-efficacy.

Conclusion

The study concludes that AI integration in Economics education has immense potential to boost the economic problem-solving self-efficacy of learners, which mainly depends on their perceptions from the usefulness and ease of using AI. The four factors of AI integration collectively and significantly contributed to the students' economic problem-solving self-efficacy, but only perceived usefulness and perceived ease of use had significant individual contributions. However, when these factors were analyzed separately, the availability of ICT and the lecturers integration of AI did not significantly predict students' self-efficacy. The moderate level of lecturers' integration of AI is also an indicator of the need for further support in pedagogical aspects for integration of AI in education. Through a systems lens, the findings suggest that for successful use of AI in Economics education, the technology is not enough; the technology must be perceived as useful and accessible by students and foster positive perceptions of its role as a learning tool. Institutions and lecturers should therefore enhance pedagogical practices using AI, ensuring students are properly supported to critically, responsibly and purposefully analyse and solve economic issues with the aid of AI.

Recommendations

The following recommendations are made, based on the findings of the study:

1. Economics lecturers must more strategically utilize AI tools in their coursework and incorporate learning activities that allow students to leverage AI to solve economic problems, consider options, and present solutions in real-life situations.
2. The institutions must increase the availability of ICT facilities and access to internet. While in this study, the availability of ICTs in institutions did not have an independent impact, adequate technological infrastructure is also seen as an enabling factor for meaningful AI integration.
3. Students should be taught the positive educational implications of and suitable uses for AI. While introducing the use of AI in various ways, it is crucial to include a focus on its potential to assist with critical thinking, economic analysis, problem solving, and independent learning rather than relying on AI-generated answers.
4. The use of AI literacy and AI-supported economic problem-solving should be integrated into the curriculum in Economics education. It should focus on the critical evaluation, ethical application, creativity, and practical application of AI tools in real economic challenges.

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