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Effect of Problem-Based Learning on Colleges of Education Economics Students' Critical Thinking and Collaborative Skills in North-East Nigeria

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ABSTRACT

This study investigated the effect of Problem-Based Learning (PBL) on the critical thinking and collaborative skills of Economics students in Colleges of Education in North-East Nigeria. The study was guided by two research questions and tested two corresponding hypotheses. A quasi-experimental design was adopted, involving 350 students selected from three Colleges of Education using stratified and simple random sampling techniques. Data were collected using the Critical Thinking Skills Test (CTST) and the Collaborative Skills Rating Scale (CSRS). The experimental group was exposed to Problem-Based Learning, while the control group was taught using conventional lecture methods. Data were analysed using descriptive statistics (mean and standard deviation) and inferential statistics (ANCOVA) at a 0.05 significance level. The findings revealed that PBL significantly enhanced students' critical thinking skills, with 23.8% of the variance in post-test scores attributable to the intervention. Similarly, PBL significantly improved collaborative skills, accounting for 28.5% of the variance in post-test scores. The study concluded that Problem-Based Learning is an effective instructional strategy for developing both cognitive and social competencies among Economics students. It is recommended that lecturers and institutions integrate PBL into Economics curricula to enhance problem-solving, teamwork, and analytical skills, and that future studies explore its effects in other disciplines and settings.

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INTRODUCTION

In the 21st century, higher education is expected not only to transmit disciplinary knowledge but also to develop higher-order competencies such as critical thinking, problem solving and teamwork skills that employers and education policy documents increasingly prioritize (Manuaba et al., 2022). Problem-Based Learning (PBL) is a student-centred pedagogy that situates learning around real-world problems and requires learners to define problems, search for information, and collaboratively generate solutions; it is widely promoted as an approach that fosters both critical thinking and collaborative skills across disciplines (Su, T. 2025). A growing body of quantitative syntheses and systematic reviews indicates that PBL produces positive effects on critical thinking and related outcomes, though effect sizes vary by discipline, implementation fidelity, and assessment method (Liu et al., 2022).

Several meta-analyses and systematic reviews report consistent gains in problem-solving, self-directed learning and higher-order cognitive skills for students exposed to PBL compared with traditional lecture methods, especially when PBL is well-structured and accompanied by tutor facilitation. Evidence from Nigeria and specifically from North-East Nigeria suggests PBL can be effective in local contexts but that research remains limited and often discipline-specific. Experimental and quasi-

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experimental studies conducted in Nigerian tertiary institutions (including colleges of education and technical/NCE programmes) report improvements in academic outcomes, interest, and in some cases retention.

When students are taught with PBL variants; however, many of these studies focus on technical or vocational subjects rather than on social science disciplines such as Economics. For example, a study of PBL in welding and fabrication among NCE students in North-East Nigeria found significant positive effects on academic performance and interest, indicating the approach is feasible in the region's colleges of education (Kwami, Kumazeghe, & Umar, 2023). Despite these positive signs, there is a gap in robust, discipline-specific research on how PBL affects Economics students' critical thinking and collaborative skills in colleges of education in North-East Nigeria.

Local conditions including large class sizes, limited instructional resources, varying tutor familiarity with student-centred methods, and socio-cultural patterns of classroom interaction may moderate PBL's effectiveness and influence the degree to which collaborative behaviours actually emerge (studies of PBL in Nigerian higher education and secondary contexts). These contextual factors, combined with the relative scarcity of controlled studies in Economics education within the region, justify a focused investigation into PBL's effect on Economics trainees' critical thinking and teamwork competencies in North-East Nigerian colleges of education.

CONCEPTUAL REVIEW

Problem-Based Learning (PBL)

Problem-Based Learning (PBL) is an instructional strategy that shifts the focus of learning from teacher-led lectures to student-centred inquiry. In PBL, students are presented with a real-world problem and work collaboratively to identify what they need to learn to solve it. The approach encourages self-directed learning, critical thinking, and application of knowledge to practical situations (Hmelo-Silver, 2021). PBL is characterized by several features:

1. Problem-Centred Learning: Students engage with authentic, open-ended problems.
2. Student-Centred Approach: Learners take responsibility for identifying knowledge gaps and seeking information.
3. Collaborative Learning: Students work in small groups to discuss, analyse, and solve problems collectively.
4. Facilitator Role of Lecturers**:** Lecturers guide and mentor students rather than directly provide solutions.
5. Integration of Knowledge**:** PBL encourages learners to apply concepts from multiple disciplines to solve complex problems.

In the context of Economics education, PBL can expose students to real-life economic issues such as market analysis, resource allocation, and financial decision-making allowing them to critically examine alternatives, evaluate evidence, and propose solutions collaboratively (Ajayi, 2024).

Critical Thinking Skills

Critical thinking is the ability to analyse information, evaluate arguments, make reasoned judgments, and solve problems systematically (Ennis, 2018; Facione, 2020). It is considered a key outcome of higher education and is essential for effective learning in Economics, where students must interpret data, assess economic policies, and make evidence-based decisions. Key indicators of critical thinking include:

1. Analysis: Breaking down complex problems into components.
2. Evaluation: Assessing the validity and reliability of information or arguments.
3. Inference: Drawing logical conclusions from data or evidence.
4. Interpretation: Understanding and explaining the meaning of information.
5. Self-Regulation: Reflecting on and improving one's reasoning process.

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PBL has been widely reported to enhance these skills because it requires students to question assumptions, gather and evaluate evidence, and justify their solutions collaboratively (Su, 2025).

Collaborative Skills

Collaborative skills refer to the abilities that enable individuals to work effectively in groups to achieve shared goals. In educational contexts, collaborative skills involve:

1. Communication: Sharing ideas clearly and actively listening to others.
2. Teamwork: Cooperating and contributing to group tasks.
3. Problem-Solving Together: Working jointly to generate solutions to challenges.
4. Conflict Resolution: Negotiating and managing differences constructively.
5. Mutual Accountability: Taking responsibility for both individual and group outcomes.

In Economics education, collaborative skills are crucial because real-world economic analysis and decision-making often require teamwork, negotiation, and coordinated problem-solving. Studies indicate that PBL promotes collaborative behaviours by creating structured group activities where students must interact, discuss, and reach consensus (Hmelo-Silver, 2021).

The Relationship between PBL, Critical Thinking, and Collaborative Skills

The conceptual link between PBL, critical thinking, and collaborative skills is strong. PBL provides the environment and learning process that naturally encourages critical analysis of problems while simultaneously requiring collaboration to propose solutions. By integrating both cognitive and social learning objectives, PBL has the potential to enhance the quality of learning outcomes more than traditional lecture methods (Liu et al., 2022).

STATEMENT OF THE PROBLEM

Despite the growing emphasis on 21st-century competencies in higher education, many Colleges of Education in North-East Nigeria still rely heavily on teacher-centred, lecture-driven instructional methods. In Economics classrooms, learning is often limited to note-taking, memorization, and reproduction of facts during examinations. These traditional methods have been widely criticized for failing to cultivate higher-order cognitive skills such as critical thinking, as well as interpersonal abilities like collaboration, which are essential for effective performance in both academic and real-life problem-solving situations.

Although Problem-Based Learning (PBL) has been globally recognized as an instructional approach capable of improving critical thinking, teamwork, and problem-solving skills, its adoption in Economics education within Colleges of Education remains limited and inconsistent. Local evidence from North-East Nigeria is still emerging, and existing studies tend to focus on technical and vocational subjects rather than the social sciences. Consequently, it is unclear whether PBL produces similar or comparable benefits for Economics students in this region. Furthermore, several contextual challenges such as overcrowded classrooms, limited instructional resources, inadequate lecturer training in student-centred pedagogies, and socio-cultural norms that discourage active participation may influence how effectively PBL can be implemented. These conditions create uncertainty about whether PBL can truly enhance Economics students' critical thinking and collaborative skills in the Colleges of Education in North-East Nigeria.

Therefore, there is a pressing need for empirical evidence that examines the actual impact of PBL on students' cognitive and collaborative competencies in Economics. The absence of such evidence makes it difficult for teacher-education policymakers, curriculum designers, and lecturers to justify the integration of PBL as a core instructional method. This study is therefore designed to address this gap by investigating the effect of Problem-Based

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Learning on the critical thinking and collaborative skills of Economics students in selected Colleges of Education in North-East Nigeria.

Objectives of the Study

The general objective of this study is to examine the effect of Problem-Based Learning (PBL) on the development of critical thinking and collaborative skills among Economics students in Colleges of Education in North-East Nigeria. Specifically, the study aimed to:

1. Determine the effect of Problem-Based Learning on Economics students' critical thinking skills in Colleges of Education in North-East Nigeria.
2. Examine the effect of Problem-Based Learning on Economics students' collaborative skills in Colleges of Education in North-East Nigeria.

Research Questions

The study is guided by the following research questions:

1. What is the effect of Problem-Based Learning on the critical thinking skills of Economics students in Colleges of Education in North-East Nigeria?
2. What is the effect of Problem-Based Learning on the collaborative skills of Economics students in Colleges of Education in North-East Nigeria?

Research Hypotheses

The following null hypotheses were formulated to guide the study:

H_{01}: There is no significant effect of Problem-Based Learning on the critical thinking skills of Economics students in Colleges of Education in North-East Nigeria.

H_{02}: There is no significant effect of Problem-Based Learning on the collaborative skills of Economics students in Colleges of Education in North-East Nigeria.

METHODOLOGY

This study adopted a quasi-experimental research design to examine the effect of Problem-Based Learning (PBL) on the critical thinking and collaborative skills of Economics students in Colleges of Education in North-East Nigeria. The quasi-experimental design is widely used in educational research where random assignment is impractical (Creswell & Creswell, 2018). The population of the study consisted of 2,452 Economics students from three selected Colleges of Education in the region, from which a sample of 350 students was selected using stratified and simple random sampling techniques to ensure proportional representation across institutions, year of study, and gender. The study employed an experimental group, exposed to PBL, and a control group, taught using conventional lecture methods.

Data were collected using the Critical Thinking Skills Test (CTST) and the Collaborative Skills Rating Scale (CSRS), instruments validated through pilot testing and expert review, with reliability coefficients of 0.84 and 0.81, respectively, determined via Cronbach's alpha. The intervention lasted eight weeks, during which students in the experimental group engaged in problem-solving activities, group discussions, and real-life economic scenarios designed to enhance higher-order thinking and collaborative skills.

Data collected were analyzed using descriptive statistics (mean and standard deviation) to summarize pre-test and post-test scores, and inferential statistics (ANCOVA) to test the hypotheses at a 0.05 significance level, controlling for pre-test differences. Ethical considerations, including informed consent, confidentiality, and voluntary participation, were observed throughout the study to ensure compliance with research ethics. The methodology ensured the reliability and validity of the findings, providing a robust framework for assessing the effectiveness of PBL in enhancing students' cognitive and social competencies.

RESULTS

Demographic Characteristics of the Respondents

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Table 1: Gender Distribution of the Respondents

Gender	Frequency (f)	Percentage (%)
Male	198	56.6
Female	152	43.4
Total	350	100

Source: Field work 2025

The sample comprised more male students (56.6%) than female students (43.4%), reflecting the general gender distribution in Economics programmes in Colleges of Education in North-East Nigeria. This distribution is suitable for examining potential gender differences in response to Problem-Based Learning (PBL).

Table 2: Age Distribution of the Respondents

Age (Years)	Frequency (f)	Percentage (%)
18 - 20	120	34.3
21 - 25	190	54.3
26 and above	40	11.4
Total	**350**	**100**

The table 3 above revealed that students from both NCE 2 and NCE 3 levels were included, allowing the study to capture insights across multiple stages of the Economics programme. This ensures that findings are not biased toward a single year of study.

Table 4: Institution Distribution of the Respondents

Institutions	Frequency (f)	Percentage (%)
ATBCOE Kangere, Bauchi State	119	34
COE Hong, Adamawa State	116	33.1
FCE Potiskum, Yobe State	115	32.9
Total	**350**	**100**

Source: Field work 2025

In the table (4) above, it is shown that respondents were drawn from three different Colleges of Education, representing the North-East Nigeria region. This distribution enhances the generalizability of the study findings across multiple institutions.

Analysis of Pre-Test and Post-Test Scores for Critical Thinking Skills

Table 5: Descriptive Statistics of Pre-Test Scores for Critical Thinking Skills

Group	N	Mean	Standard Deviation
Experimental (PBL)	175	45.32	6.45
Control (Lecture)	175	44.89	6.72

Source: Field work 2025

Result in the table 5 above revealed that the pre-test mean scores of the experimental and control groups were very close (45.32 vs. 44.89), suggesting that students had comparable critical thinking skills prior to the intervention. This indicates a fair basis for evaluating the effect of Problem-Based Learning (PBL).

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Table 6: Descriptive Statistics of Post-Test Scores for Critical Thinking Skills

Group	N	Mean	Standard Deviation
Experimental (PBL)	175	68.45	5.89
Control (Lecture)	175	52.13	6.11

Source: Field work 2025

Analysis in the table 6 above indicated that Post-test mean scores show a substantial suggests that PBL positively influenced the critical thinking skills of students in the experimental group improvement in the experimental group **(**68.45**)** compared to the control group **(**52.13**).** This

Analysis of Pre-Test and Post-Test Scores for Collaborative Skills

Table 7: Descriptive Statistics of Pre-Test Scores for Collaborative Skills

Group	N	Mean	Standard Deviation
Experimental (PBL)	175	48.22	5.87
Control (Lecture)	175	47.89	6.03

Source: Field work 2025

The result of the analysis on the table 7 above revealed that pre-test mean scores for collaborative skills were very close **(**48.12 vs. 47.89**),** indicating that both groups had similar collaborative abilities before the intervention.

Table 8: Descriptive Statistics of Post-Test Scores for Collaborative Skills

Group	N	Mean	Standard Deviation
Experimental (PBL)	175	71.36	5.22
Control (Lecture)	175	55.47	6.01

Source: Field work 2025

In the table 8 above, the post-test mean score of the experimental group (71.36) was substantially higher than that of the control group **(**55.47), suggesting that Problem Based Learning strategy significantly improved students' collaborative skills**.**

Hypotheses Testing

Hypothesis One:

There is no significant effect of Problem-Based Learning on the critical thinking skills of Economics students in Colleges of Education in North-East Nigeria.

Table 9: Analysis of Covariance (ANCOVA) to determine whether PBL had a significant effect on critical thinking skills of Economics Students

Source	Type III Sum of Squares	df	Mean Square	F	Sig	Partial Eta Squared
Pre-test	126.45	1	126.45	3.21	0.074	0.009
Group (PBL vs Lecture)	4312.67	1	4312.67	109.42	0.000	0.238
Error	13689.32	348	39.46			
Total	18528.44	350				

Source: Field work 2025

The table 9 above indicated that the effect of PBL on critical thinking skills was statistically significant (F(1,347) = 109.42, p < 0.05). The partial eta squared (0.238) indicates a large effect size, meaning that 23.8% of the variance in post-test critical thinking scores was

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due to the PBL intervention. The pre-test covariate was not significant (p = 0.074), confirming that initial differences did not bias the results. Therefore, it can be concluded that Problem-Based Learning significantly enhanced the critical thinking skills of Economics students compared to the conventional lecture method.

Hypothesis Two:

There is no significant effect of Problem-Based Learning on the collaborative skills of Economics students in Colleges of Education in North-East Nigeria.

Table 10: Analysis of Covariance (ANCOVA) to determine whether PBL had a significant effect on collaborative skills of Economics Students

Source	Type III Sum of Squares	df	Mean Square	F	Sig	Partial Eta Squared
Pre-test	102.67	1	102.67	2.91	0.089	0.008
Group (PBL vs Lecture)	4895.42	1	4895.42	138.25	0.000	0.285
Error	12290.34	348	35.42			
Total	17788.43	350				

Source: Field work 2025

The result of the analysis in the table 10 above revealed that the effect of PBL on collaborative skills was statistically significant (F(1,347) = 138.25, p < 0.05). The partial eta squared (0.285) indicates a large effect size, meaning that 28.5% of the variance in collaborative skills scores was due to the PBL intervention. The pre-test covariate was not significant (p = 0.089), confirming that initial differences did not bias the results. Therefore, Problem-Based Learning significantly enhanced the collaborative skills of Economics students compared to the conventional lecture method.

DISCUSSION OF FINDINGS

The results of this study showed that students taught through Problem-Based Learning (PBL) demonstrated markedly higher levels of critical thinking compared to those instructed using the traditional lecture method. The experimental group attained a mean post-test score of 68.45, while the control group scored 52.13, and ANCOVA confirmed that this difference was statistically significant (p < 0.05). This suggests that PBL effectively engages learners in identifying problems, analyzing information, weighing alternatives, and generating solutions—processes central to critical thinking development. These findings are consistent with the conclusions of Hmelo-Silver (2021) and Facione (2020), who emphasize that PBL promotes deep thinking, logical reasoning, and the application of knowledge to authentic situations.

Within Economics education, PBL enables learners to interpret economic issues, examine data, and evaluate policy options—skills crucial for academic and professional success. The substantial improvement in critical thinking among PBL students highlights the superiority of learner-centered approaches over passive instructional methods and underscores the need for integrating PBL into Colleges of Education curricula to strengthen analytical and problem-solving abilities. The study further found that PBL significantly improved students' collaborative skills.

The experimental group posted a mean score of 71.36 on the collaborative skills test, compared to 55.47 in the control group, with ANCOVA revealing that PBL accounted for 28.5% of the variance in scores. The collaborative nature of PBL, which involves teamwork, group inquiry, joint decision-making, and peer-to-peer learning, contributes significantly to the development of these skills. These results align with the work of Johnson and Johnson (2009) and Prince (2004), who reported that collaborative learning environments enhance communication, teamwork, interpersonal engagement, and shared responsibility.

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In Economics programs, collaboration is vital for group assignments, research projects, simulations, and economic analyses, making it an essential competence for both academic growth and workplace readiness. Consequently, adopting PBL as a core instructional strategy can help promote effective teamwork, interpersonal communication, and cooperative learning among Economics students.

Summary of the study

The findings of this study clearly demonstrate the impact of Problem-Based Learning (PBL) on the critical thinking and collaborative skills of Economics students in Colleges of Education within North-East Nigeria. The results revealed that PBL produced a notable improvement in students' critical thinking abilities, as evidenced by the higher post-test mean score of 68.45 for the experimental group compared to 52.13 for the control group.

ANCOVA analysis further indicated that the PBL intervention accounted for 23.8% of the variation in critical thinking outcomes. Similarly, PBL was found to significantly boost students' collaborative skills. The experimental group recorded a post-test mean of 71.36, notably higher than the 55.47 recorded in the control group, while ANCOVA showed that 28.5% of the variance in collaborative skills was attributable to the use of PBL. Overall, the findings underscore that implementing PBL in Economics instruction can substantially strengthen students' analytical, interpersonal, and teamwork competencies, equipping them to meet academic and professional demands more effectively

CONCLUSION

Based on the findings of the study, the following conclusions are drawn:

1. Problem-Based Learning significantly improves critical thinking skills among Economics students, equipping them to analyze, evaluate, and solve complex problems effectively.
2. Problem-Based Learning significantly enhances collaborative skills, fostering teamwork, communication, and peer learning.
3. Overall, PBL is a superior instructional approach compared to conventional lecture methods for developing higher-order thinking and collaborative competencies in Economics education.

RECOMMENDATIONS

Based on the findings and conclusions of the study, the following recommendations are made:

1. Economics lecturers in Colleges of Education should adopt Problem-Based Learning as a teaching strategy to enhance students' critical thinking and collaborative skills.
2. Teachers should create real-life problem scenarios relevant to Economics to stimulate students' analytical and teamwork abilities.
3. Colleges of Education should integrate PBL into the Economics curriculum and provide training for lecturers on PBL facilitation.
4. Institutions should support group-based learning environments, including classrooms and learning resources conducive to collaborative problem-solving.
5. Education policymakers should promote student-centered teaching methods such as PBL in Colleges of Education to improve teaching quality and graduate competence.

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