

THE EFFECTIVENESS OF THE LMS EDUKATI ASSISTED FLOBLE LEARNING MODEL ON ECONOMIC CRITICAL THINKING SKILLS

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Abstract

Students' critical thinking skills have not yet reached an optimal level. The 2022 Programme for International Student Assessment (PISA) results indicate Indonesia's lowest performance since its first participation in 2000. This study aims to examine the effectiveness of the integrated Flipped Classroom and Problem-Based Learning (FLOBLE) model, supported by the Edukati Learning Management System (LMS), in improving students' critical thinking skills in economics. This study employed a quasi-experimental method with a non-equivalent control group design. The sample consisted of Class X-5 as the experimental group and Class X-4 as the control group at SMA Negeri 16 Semarang during the 2025/2026 academic year. Primary data were collected through pretests and posttests and analyzed using an independent-samples *t*-test, normalized gain (N-gain), and effect size analysis. The results show that the FLOBLE model effectively improves students' critical thinking skills in economics. The experimental group achieved an N-gain score of 71.96% (moderately effective), while the control group obtained 53.86% (less effective). The effect size value of 0.819 indicates a large effect. These findings demonstrate that the FLOBLE model is more effective than Problem-Based Learning (PBL) and provides an effective alternative for enhancing students' critical thinking skills in economics.

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INTRODUCTION

Deep learning is a learning approach currently implemented within the Merdeka Curriculum. The Ministry of Primary and Secondary Education states that the implementation of this approach is driven by unpredictable future changes, challenges related to educational quality—including literacy, numeracy, higher-order thinking skills, and educational disparities—as well as the need to develop competencies required for the future. One of the eight dimensions of the graduate profile fostered through deep learning is critical reasoning. This is consistent with previous studies indicating that improving education in the twenty-first century requires the development of several essential skills and competencies, one of which is problem-solving or critical thinking skills (Fauziah & Kuswanto, 2020; Septiany et al., 2024). Critical thinking is one of the essential soft skills in the contemporary era, particularly for young people of productive age who will eventually enter the professional workforce (Fridayani et al., 2022). Furthermore, the increasingly competitive labor market requires students to possess stronger critical thinking abilities. Previous research has emphasized the importance of teaching materials and learning media in equipping students with the knowledge and competencies needed to achieve twenty-first-century skills and address the challenges of the Fourth Industrial Revolution (Pane et al., 2021). In addition, society is currently facing the VUCA era—characterized by volatility, uncertainty, complexity, and ambiguity—which demands the ability to think critically, make sound judgments, and respond effectively to rapidly changing situations (Fridayani, 2021).

One of the factors that influences critical thinking skills is the learning model. Well-designed learning can have a significant impact on students by fostering creativity, critical and analytical thinking, enabling them to apply and identify concepts, and facilitating the construction of new understanding to deepen their mastery of learning (Widyanto & Viententia, 2022). A learning approach that encompasses these characteristics is Student-Centered Learning (SCL). According to the comparison presented by Treve (2024), SCL emphasizes student engagement, achievement, and individual development through formative assessment, whereas Teacher-Centered Learning (TCL) places greater emphasis on instructional methods, teacher competence, and summative evaluation. However, classroom instruction continues to be dominated by teacher-centered lectures for content delivery. Previous research by González-Velasco et al. (2021) argued that the traditional approach cannot even be considered a learning model but rather merely a teaching model, in which most learning occurs through memorization and the passive reception of knowledge. The study further highlighted that such passive learning neglects the need to develop students' learning processes, including the integration of cognitive and external factors that influence learning. This finding is further supported by Pertiwi et al. (2019) demonstrating that students' perceptions of teachers' instructional methods have a significant negative effect on learning difficulties, indicating that more effective teaching

practices can reduce students' learning difficulties and create more meaningful learning experiences.

One of the schools in Semarang City that requires strengthening of students' critical thinking skills is SMA Negeri 16 Semarang. The selection of SMA Negeri 16 Semarang as the research site was based on an analysis of students' academic performance, research and innovation achievements over the past three years, and the school's absence from the Top 1000 LTMPPT ranking in 2022. Additional supporting data indicated that students' participation and achievements in research and innovation activities at the school have remained limited during the last three years. This limited engagement in research and innovation suggests insufficient critical thinking skills, as research activities require students to demonstrate analytical thinking, inference, and the ability to draw conclusions (Amelia et al., 2020). Overall, these findings indicate that students' critical thinking skills remain at a level requiring improvement, highlighting the need for the implementation of innovative learning models to enhance these skills.

The strategic integration of instructional models and learning media has been recognized as an effective approach to enhancing learning quality and preparing students to meet the challenges of the modern workforce and industry (Safira & Oktarina, 2025). One learning model that integrates technology while maintaining face-to-face classroom interaction and aligns with the Student-Centered Learning (SCL) approach is the flipped classroom (Darmawati, 2022). Kwon (2021) explained that this approach encourages students to develop independent learning by watching instructional videos before attending class, followed by quizzes and discussions as part of in-class learning activities. Another SCL approach widely used in education is Problem-Based Learning (PBL). Research has shown that SCL encompasses various instructional methodologies, including problem-based learning, in which students engage with scenarios, cases, and real-world problems to promote self-directed learning (Tang, 2023). Integrating these two approaches requires appropriate instructional support, particularly during the flipped classroom phase. Therefore, this study employed the Edukati Learning Management System (LMS) as the learning platform. An LMS serves as a web-based platform for designing and delivering learning materials, managing instructional activities, and monitoring students' learning outcomes (Pratomo & Wahanisa, 2021). Edukati is a web-based application that supports online learning by enabling teachers to upload instructional videos, create discussion forums, and develop quizzes. The platform is accessible through desktop computers, laptops, and smartphones, providing flexibility for both teachers and students (Tandirerung & Mangesa, 2022). The interface of the Edukati LMS is presented as follows :

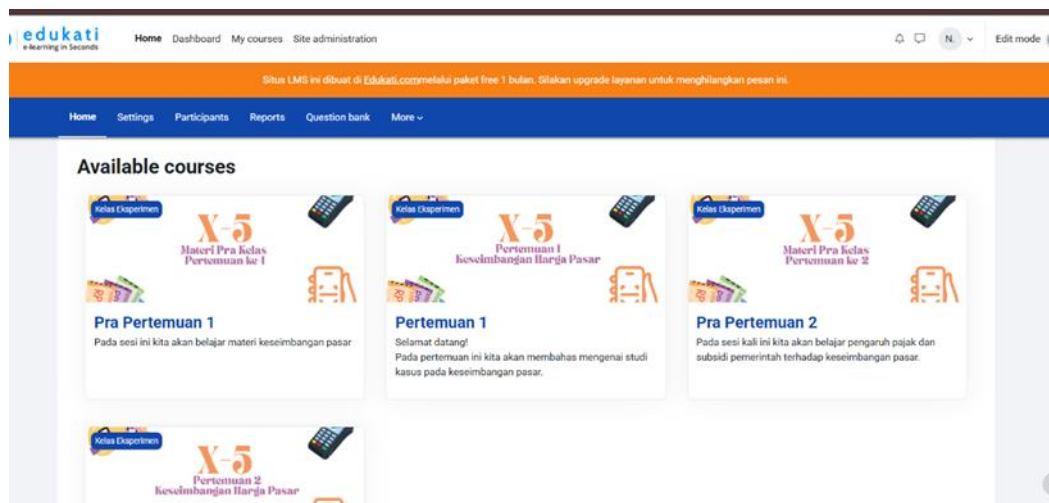


Figure 1. Edukati LMS Interface

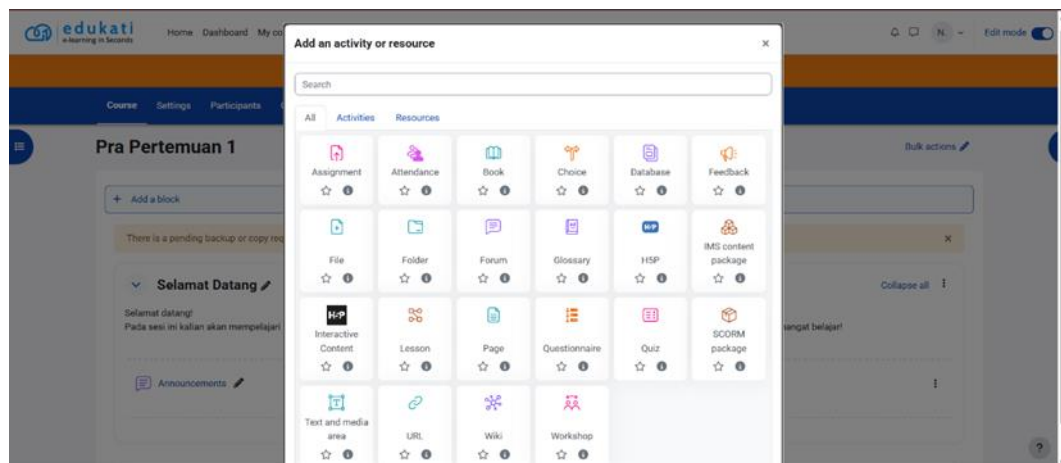


Figure 2. Edukati LMS Features

Based on the problems identified and supported by empirical data from the school, this study aims to examine the effectiveness of an integrated flipped classroom and Problem-Based Learning (PBL) model supported by the Edukati Learning Management System (LMS) in economics instruction for improving the critical thinking skills of Grade X students at SMA Negeri 16 Semarang.

METHODS

This study employed a quantitative approach using a quasi-experimental design with a non-equivalent control group design. The research was conducted at SMA Negeri 16 Semarang during the 2025/2026 academic year. The sample consisted of one experimental class (X-5) and one control class (X-4). The experimental class was taught using an integrated flipped classroom and Problem-Based Learning (FLOBLE) model

supported by the Edukati Learning Management System (LMS), whereas the control class received instruction using the Problem-Based Learning (PBL) model. The research instrument was a multiple-choice test consisting of 35 valid items designed to measure students' critical thinking skills on the topic of market equilibrium. Data were collected through pretests and posttests. Prior to administration, the instrument was tested for validity, reliability, item difficulty, and discrimination index. Data were analyzed using IBM SPSS Statistics version 31 through descriptive and inferential statistical analyses. The prerequisite tests included normality and homogeneity tests. Hypothesis testing was conducted using an independent-samples *t*-test at a significance level of 0,05. The effectiveness of the learning model was evaluated using the normalized gain (N-gain) score, while the magnitude of the treatment effect was determined using effect size analysis.

RESULT AND DISCUSSION

The implementation of the FLOBLE learning model can improve students' critical thinking skills in economics

The results showed that the implementation of the FLOBLE learning model, which integrates the flipped classroom and Problem-Based Learning (PBL) approaches, had a positive effect on students' critical thinking skills in economics. The improvement in students' critical thinking skills was reflected in the difference between the mean pretest and posttest scores of the experimental class. Before the intervention, the mean pretest score was 55.16. After participating in learning through the FLOBLE model, the mean posttest score increased to 87.78. This represents an improvement of 32.62 points from the pretest to the posttest.

Table 1. Pretest & Posttest Experiment Class

	N	Minimum	Maximum	Mean	Std. Deviation
Pre test Experiment	36	42,86	68,57	55,16	6,215
Post test Experiment	36	68,57	97,14	87,78	7,248

Source : Processed by the authors (2026)

The findings were further supported by the normalized gain (N-gain) analysis, which yielded a score of 0.719, indicating a high level of improvement. Based on the N-gain effectiveness interpretation, the effectiveness percentage was 71.9%, which falls into the moderately effective category. These results suggest that the FLOBLE learning model contributes to improving students' critical thinking skills in economics. This finding is consistent with the study by (Prasetyo et al., 2025), which reported that the integration of the flipped classroom and Problem-Based Learning (PBL) approaches positively contributes to students' critical thinking skills. This finding indicates that pre-class learning shifted lower-order cognitive activities outside the classroom, allowing face-to-face sessions to focus on analysis, evaluation, and collaborative problem solving. Consequently, students had greater opportunities to practice higher-order thinking skills. The following table presents the N-gain results:

Table 2. N-Gain Score Experiment Classs

	N	Minimum	Maximum	Mean	Std. Deviation
N Gain Score	36	0,31	0,95	0,719	0,175
N Gain Percentage	36	31,24	94,73	71,96	17,51
Valid N (listwise)	36				

Source : Processed by the authors (2026)

The improvement in students' critical thinking skills is closely associated with the characteristics of the FLOBLE model, which integrates the flipped classroom and Problem-Based Learning (PBL) approaches into a coherent learning sequence. During the flipped classroom phase, students independently study the learning materials before face-to-face instruction through the Edukati Learning Management System (LMS). This finding is consistent with previous research, which reported that the flipped classroom model provides students with the flexibility to learn independently before attending class according to their own learning pace, preferred resources, and learning environment (Ortin et al., 2023). This activity enables students to acquire a preliminary understanding of the concept of market equilibrium, allowing them to enter classroom learning with sufficient prior knowledge to engage in more in-depth learning activities. Similarly, Prasetyo et al. (2025) argued that students' prior understanding of the learning material facilitates their participation in classroom instruction. Adequate learning readiness enables students to better understand the economic problems presented and allows classroom time to be devoted to analysis, discussion, and problem-solving activities that require higher-order critical thinking skills. This finding is also supported by Aghaei et al. (2020), who stated that the flipped classroom approach allows more classroom time to be allocated to active learning activities. Therefore, the flipped classroom component of the FLOBLE model establishes a strong foundation for higher-order learning by ensuring that students enter classroom activities with sufficient conceptual understanding, enabling them to engage more effectively in critical thinking and problem-solving tasks.

In the subsequent Problem-Based Learning (PBL) phase, students are presented with economic problems related to the learning topic. This phase involves problem identification, information gathering, group discussion, the development of alternative solutions, and the presentation of discussion results, all of which encourage students to employ higher-order thinking skills. These activities are consistent with the PBL syntax, which includes problem orientation, organizing students for learning, guiding individual and group investigations, developing and presenting solutions, and analyzing and evaluating the problem-solving process (Muhartini et al., 2023). Through this process, students are encouraged to analyze available information, evaluate alternative solutions, and draw conclusions based on the evidence and data obtained. These findings are also consistent with Liu & Liu (2021), who described four key characteristics of PBL. First, PBL is oriented toward problem solving as its primary learning objective. Second, it provides learning experiences that enable students to develop problem-solving skills through authentic problems. Third, it promotes interdisciplinary learning by encouraging students to solve complex problems using multiple perspectives and methods. Finally, PBL is more effective in developing students' thinking skills, communication skills, learning independence, and professional readiness. As a student-centered learning approach, PBL provides broader opportunities for developing critical thinking skills than teacher-centered instruction that primarily focuses on content delivery. This finding supports the study by Masruro et al. (2021) , which concluded that PBL emphasizes

student-centered learning, allowing learners to construct their own knowledge through experiences closely related to everyday life. These findings suggest that the problem-solving activities embedded in the PBL phase play a crucial role in fostering students' critical thinking by engaging them in analysis, evaluation, and evidence-based decision-making.

Based on the findings and discussion, it can be concluded that the FLOBLE learning model makes a positive contribution to improving students' critical thinking skills. Its effectiveness is supported by the integration of independent pre-class learning and problem-solving activities during classroom instruction, which provides students with opportunities to critically analyze, evaluate, and draw conclusions from various economic problems. Furthermore, the combination of flipped classroom, Problem-Based Learning, and the Edukati Learning Management System (LMS) creates a complementary learning environment that promotes active, collaborative, and problem-oriented learning, thereby fostering the development of students' critical thinking skills.

The FLOBLE learning model is more effective in improving students' critical thinking skills in economics

The results indicate that the FLOBLE learning model is more effective than the Problem-Based Learning (PBL) model in improving students' critical thinking skills in economics. This finding is evidenced by the difference in the mean pretest and posttest scores between the experimental and control groups. The experimental group achieved a mean posttest score of 87,78, whereas the control group obtained a mean posttest score of 79,98.

Table 3. Pretest and Posttest Scores of the Experimental and Control Groups

	N	Minimum	Maximum	Mean	Std. Deviation
Pre test Control	36	20,00	71,43	53,25	13,52
Post test Control	36	57,14	94,29	79,98	8,853
Pre test Experiment	36	42,86	68,57	55,16	6,215
Post test Experiment	36	68,57	97,14	87,78	7,248
Valid N (listwise)	36				

Source : Processed by the authors (2026)

The positive effect of implementing the FLOBLE learning model was also reflected in the normalized gain (N-gain) results. The experimental group achieved an N-gain of 71.96%, which falls within the moderately effective category, whereas the control group obtained an N-gain of 53.86%, which is classified as less effective. These findings indicate that the FLOBLE learning model produces more optimal learning outcomes in developing students' critical thinking skills in economics than the Problem-Based Learning (PBL) model. This result is consistent with a previous study that implemented a similar integrated learning model, in which students' critical thinking skills, as measured by the mean posttest score, reached 81.46%, indicating a good level of performance (Ontowijoyo et al., 2022). This finding suggests that integrating flipped classroom and problem-based learning creates a more effective learning sequence, enabling students to acquire conceptual understanding before class and apply that knowledge to solve authentic problems during classroom activities, thereby promoting greater improvement in critical

thinking skills. The following table presents the N-gain results of the experimental and control groups:

Table 4. Normalized Gain (N-Gain) of the Experimental and Control Groups

	N	Minimum	Maximum	Mean	Interpretation
N Gain Experiment	36	31,24	94,73	71,96	Moderately Effective
N Gain Control	36	36,37	91,67	53,86	Less Effective

Source : Processed by the authors (2026)

The greater effectiveness of the FLOBLE learning model can be explained by its integration of the strengths of the Flipped Classroom (FC) and Problem-Based Learning (PBL) approaches. In the experimental group, students studied the learning materials before the classroom session, enabling them to enter the problem-solving stage with better learning readiness. Singh (2020) argued that the flipped classroom model offers greater flexibility, thereby encouraging students' motivation to learn independently at their own pace. This learning environment promotes more active engagement and enables students to participate more deeply in critical thinking processes. In contrast, students in the control group, who were taught using the PBL model, learned the instructional content and solved problems simultaneously during classroom instruction. This is consistent with the PBL syntax described by Muhartini et al. (2023), in which learning begins with problem orientation. As a result, a considerable portion of classroom time is devoted to understanding fundamental concepts, leaving less time available for the analysis and evaluation processes that are essential for developing critical thinking skills.

Another advantage of the FLOBLE learning model is reflected in the quality of classroom discussions during the learning process. Students in the experimental group were generally better prepared to express their opinions, provide arguments, and respond to their peers' ideas because they had studied the learning materials before the classroom session. This finding is consistent with the study by Shang & Attan (2024), which reported that teachers do not introduce new content during face-to-face instruction but instead assign students to study the material before class, allowing classroom time to be devoted to problem-solving, discussion, and practical activities. Similarly, Novalinda et al. (2023) reported that integrating Problem-Based Learning with the flipped classroom approach effectively helps students understand concepts and solve problems more optimally while creating an engaging learning environment that accommodates students' characteristics and learning interests. In contrast, students in the control group were still focused on understanding the fundamental concepts, resulting in less active participation in discussions and less effective problem analysis. These differences in the learning process contributed to the greater improvement in critical thinking skills observed in the experimental group. This finding is further supported by Mardiyah & Sunarsi (2024), who argued that although Problem-Based Learning emphasizes authentic problem solving, its effectiveness can be enhanced when combined with complementary instructional approaches that provide students with sufficient prior knowledge before engaging in problem-solving activities. Taken together, these findings indicate that the integration of flipped classroom and Problem-Based Learning not only improves students' conceptual readiness but also enhances the quality of classroom interactions, creating more meaningful learning experiences that foster the development of critical thinking skills.

The findings were further supported by the effect size value of 0.819, which is classified as a large effect. The results of the effect size analysis are presented in the following table :

Table 5. Effect Size Analysis Results

		Standarizer	Point Estimate	95% Confidence Interval	
				Lower	Upper
Students' Economics Learning Outcomes	Cohen's d	8,138	0,819	1,298	0,335
	Hedges' correction	8,226	0,811	1,284	0,332
	Glass's delta	7,247	0,920	1,424	0,406

Source: Processed by the authors (2026)

The effect size value indicates that the implementation of the FLOBLE learning model had a strong effect on improving students' critical thinking skills in economics. This substantial effect can be explained by the characteristics of FLOBLE, which integrates the flipped classroom and Problem-Based Learning (PBL) approaches. Rossely et al. (2023) reported that this integrated model is well aligned with the demands of twenty-first-century education because it encourages students to study learning materials independently before class and utilizes face-to-face sessions to deepen conceptual understanding and enhance problem-solving skills. Based on these findings, the FLOBLE learning model can be considered an effective instructional alternative for improving students' critical thinking skills in economics.

The findings of this study are consistent with constructivist theory, which emphasizes the importance of students' active engagement in constructing knowledge. The integration of the flipped classroom and Problem-Based Learning within the FLOBLE model provides a more comprehensive learning experience, as students not only receive information but also analyze, evaluate, and apply it to solve authentic problems. Zhang & Wang (2024) similarly reported that the results indicate that the 'PBL + Flipped Classroom' teaching model can significantly enhance students' learning motivation and participation, promote the improvement of academic performance, and effectively strengthen students' cross-cultural communication skills. The findings of the present study further support previous research demonstrating that integrating the flipped classroom and PBL approaches leads to greater improvements in critical thinking skills than implementing either instructional model independently.

Biased on the results and discussion, it can be concluded that the FLOBLE learning model is more effective than the Problem-Based Learning (PBL) model in improving students' critical thinking skills in economics. Its effectiveness is supported by the combination of independent pre-class learning, which enhances students' learning readiness, and problem-solving activities during classroom instruction, which encourage students to think analytically, logically, and reflectively when addressing various economic problems.

CONCLUSION

This study concludes that the integrated Flipped Learning and Problem-Based Learning (FLOBLE) model is more effective than the conventional Problem-Based Learning (PBL)

model in improving students' critical thinking skills in economics. The integration of independent pre-class learning and collaborative problem-solving activities provides students with greater opportunities to analyze, evaluate, and apply economic concepts. These findings suggest that integrating flipped learning and problem-based learning through a Learning Management System (LMS) is a promising instructional strategy for promoting higher-order thinking and supporting student-centered learning in economics education. Future research should examine the long-term effectiveness of the FLOBLE model across different educational contexts and explore its potential to enhance other twenty-first century competencies, such as creativity, collaboration, and self-regulated learning.

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