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Implementation of Project-Based Learning in Improving Critical Thinking Skills of Middle School Students

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ABSTRACT

This study aims to examine the implementation of project-based learning in improving the critical thinking skills of high school students through a qualitative approach. The background of the study stems from the demands of 21st-century education that emphasize higher-order thinking skills, while conventional learning practices still tend to be memorization-oriented and teacher-centered. The project-based learning approach is considered relevant because it provides authentic learning experiences that require active student involvement in problem-solving. This study used a case study design with teachers and students directly involved in project-based learning. Data collection was conducted through classroom observations, in-depth interviews, and analysis of learning documents. Data analysis was conducted thematically through the stages of reduction, presentation, and drawing conclusions. The results show that project-based learning encourages a change in the role of teachers to facilitators and increases student participation, independence, and reflective abilities. Project activities train students in analyzing problems, evaluating information, and making decisions based on arguments. The collaborative learning environment and evaluation that emphasizes the thinking process strengthen the development of critical thinking skills. This study concludes that project-based learning is an effective and relevant pedagogical strategy for developing high school students' critical thinking skills in a sustainable manner.

Keywords: *Project-Based Learning, Critical Thinking, Middle School*

INTRODUCTION

The need for critical thinking skills is growing stronger as educational demands emphasize analytical, reflective, and evaluative abilities in secondary school students. Schools are no longer positioned solely as spaces for transferring knowledge, but rather as environments that encourage students to build understanding through active thinking processes. Learning realities show that many students still struggle to connect theoretical concepts to real-world situations that require in-depth reasoning. This situation indicates a gap between curriculum objectives and classroom learning practices. Overly structured and teacher-centered learning processes often limit students' opportunities to ask critical questions. This learning pattern results in students' low ability to identify problems and formulate solutions. These challenges demand a more contextual and participatory learning approach. The need for learning innovation is an important basis for guiding changes in learning strategies in secondary schools (Darwis et al., 2025; Isnaini & Djamilah, 2019).

Project-based learning has emerged as a pedagogical alternative that positions students as active participants in the learning process. This approach encourages students to directly engage in solving real-world problems through a series of planned activities. Systematically designed projects encourage students to integrate knowledge

across subjects. This process demands critical thinking skills from the planning stage through to the evaluation of project outcomes. Learning activities are oriented not only toward the final product but also toward the thought processes that occur during project implementation. Interactions between students in group work enrich perspectives and deepen conceptual understanding. This learning environment opens up space for constructive dialogue and reflection. The dynamics of project-based learning provide a more meaningful learning experience than traditional learning methods.

Critical thinking skills develop through a process involving information analysis, argument evaluation, and evidence-based decision-making. Project-based learning provides a learning context that requires students to examine problems in depth. Each project challenges students to identify needs, formulate goals, and determine solutions. These activities naturally cultivate logical and systematic thinking skills. The discussion and collaboration process encourages students to defend their opinions based on rational reasoning. Reflection on their work helps students assess the effectiveness of their strategies. Repeated learning experiences reinforce critical thinking patterns on an ongoing basis. This mechanism demonstrates the close relationship between project-based learning and the development of critical thinking skills.

Implementing project-based learning requires careful planning to optimally achieve learning objectives. The teacher acts as a facilitator, guiding the learning process without dominating student activity. Project design must be tailored to student characteristics and expected learning outcomes. The alignment of project topics with real-life situations enhances the relevance of learning. Clear instructions help students understand the workflow and their respective responsibilities. Monitoring the learning process is key to ensuring all students' engagement. Constructive feedback strengthens the process of reflection and continuous improvement. The quality of implementation is crucial for the success of project-based learning in enhancing critical thinking (Waryanti et al., 2025).

A supportive learning environment is a crucial factor in the success of project-based learning. A classroom culture that values differences of opinion encourages students to express their ideas boldly. A sense of psychological safety allows students to take intellectual risks without fear of making mistakes. The availability of diverse learning resources enriches the project exploration process. Access to technology helps students process information more effectively (Novitasari et al., 2025). Collaboration between teachers and students creates a more equal learning relationship. Student activeness in the learning process increases intrinsic motivation. These conditions create a learning climate conducive to the development of critical thinking.

Evaluation of project-based learning should emphasize the thinking process in addition to the final product. Authentic assessment allows teachers to observe the development of students' critical thinking skills holistically. Clear assessment rubrics help students understand the project's success criteria. Individual and group reflection processes provide insight into how students interpret learning experiences. Documentation of the learning process serves as an important data source for ongoing evaluation. Student engagement in self-assessment enhances metacognitive awareness. Process-focused assessment encourages refinement of thinking strategies. This evaluation approach aligns with the goal of developing critical thinking skills.

The implementation of project-based learning faces various challenges that must be anticipated. Time constraints often hinder comprehensive project implementation. Differences in student abilities require appropriate differentiation strategies. Teacher readiness in designing and managing projects affects the quality of learning. Institutional support from schools plays a role in the sustainability of implementation. Professional

training helps teachers improve pedagogical competence. Collaboration between teachers enriches more contextual project designs. Efforts to overcome these challenges strengthen the effectiveness of project-based learning.

The implementation of project-based learning significantly contributes to the development of high school students' critical thinking skills. Authentic learning experiences foster more reflective and analytical thinking patterns. Active student engagement fosters deeper conceptual understanding. Collaborative processes enhance students' ability to evaluate multiple perspectives. Continuous reflection helps students recognize the development of their thinking. The integration of projects into learning strengthens the relevance of education to real life. Improved critical thinking skills impact students' readiness to face academic and social challenges. This approach underscores the importance of project-based learning as a transformative pedagogical strategy

METHODS

This research uses a qualitative approach with a case study design to deeply understand the implementation of project-based learning in improving critical thinking skills of secondary school students. The research focuses on the process of designing, implementing, and interpreting learning by teachers and students in the natural context of the school, with the researcher as the main instrument. Research subjects were selected purposively, including teachers and students actively involved in project-based learning. Data were collected through observation, in-depth interviews, and document analysis, then analyzed interactively through reduction, presentation, and drawing conclusions. Data validity was maintained through triangulation and trustworthiness criteria, while research ethics were applied by ensuring consent, confidentiality, and participant rights throughout the research process.

RESULTS AND DISCUSSION

1. Implementation of Project-Based Learning in Secondary School Learning Practices

The implementation of project-based learning in secondary schools demonstrates a paradigm shift in learning from a transmissive pattern to a participatory one. Teachers no longer act as central transmitters of information, but rather as designers of meaningful learning experiences. Project planning is based on learning objectives that emphasize the development of higher-order thinking skills. Learning activities are directed at solving authentic problems relevant to students' lives. This process encourages deeper cognitive engagement. The learning structure provides space for independent and collaborative exploration of ideas. Students are actively involved from the planning stage through project evaluation. This implementation pattern creates a more interactive and reflective classroom dynamic.

Implementing project-based learning requires teachers to be pedagogically prepared to manage complex learning processes. Teachers systematically design project workflows to ensure student activities remain focused. The project's stages are structured to balance learning freedom and academic achievement. Support is provided through strategic guidance without compromising student autonomy. Teacher-student interactions are dialogue-based throughout the learning process. Continuous feedback is provided to strengthen conceptual understanding. Clarity about the teacher's role helps students navigate challenges during project implementation. This support pattern strengthens the effectiveness of project-based learning implementation (Rullyta & Sri, 2025; Afriani & Zuhri, 2025).

Student engagement is a key indicator of successful project-based learning implementation. Project activities encourage students to take responsibility for their own learning. Decision-making regarding project completion strategies fosters independent thinking. Group discussions enrich understanding through the exchange of diverse ideas. Collaborative processes demand communication skills and rational argumentation. Students' emotional engagement increases as the project becomes more relevant to their real-life experiences. Intrinsic motivation develops through a sense of ownership of the work. This active engagement strengthens the quality of the learning process.

The learning environment also influences the quality of project-based learning implementation. A classroom culture that values open dialogue encourages optimal student participation. Diversity of opinion is seen as a valuable learning resource. A sense of psychological safety allows students to express ideas without undue anxiety. Supportive learning facilities facilitate the project exploration process. Access to digital learning resources broadens students' horizons. Collaboration between students is fostered through intensive interaction. A conducive learning environment strengthens the effectiveness of project implementation. These conditions create a productive learning ecosystem.

Sustainable project-based learning implementation requires consistent institutional support. School policies that support learning innovation strengthen teachers' pedagogical practices. Flexible time allocation allows for optimal project implementation. Professional training enhances teachers' competency in designing project-based learning. Collaboration among teachers enriches project design variations. Continuous evaluation helps identify areas for implementation improvement. Managerial support strengthens the commitment of the entire school community. This synergy ensures the sustainability of project-based learning in secondary schools.

2. Developing Critical Thinking Skills through Project Activities

Critical thinking skills develop through challenging and reflective learning experiences. Project-based learning provides learning situations that require in-depth analysis of real-world problems. Students are challenged to systematically identify problems. The process of formulating project objectives trains logical thinking skills. Information gathering encourages critical evaluation of sources. Data processing demands synthesis and interpretation skills. Argument-based decision-making strengthens rational reasoning; these activities form a sustainable critical thinking structure (Nabila et al., 2025).

Group discussion plays a crucial role in developing students' critical thinking. The exchange of ideas allows students to compare different points of view. The arguments they construct encourage logical, evidence-based reasoning. The process of clarifying ideas deepens conceptual understanding. Differences of opinion trigger a re-evaluation of initial assumptions. Shared reflection strengthens metacognitive awareness. The ability to assess the quality of arguments develops through social interaction. Group discussions are an effective vehicle for learning critical thinking.

Reflection on the project process and outcomes strengthens the internalization of critical thinking skills. Students are encouraged to assess the effectiveness of strategies used throughout the project. Analysis of successes and challenges encourages evaluative thinking. The reflective process helps students understand the relationship between actions and outcomes. Awareness of mistakes opens up opportunities for continuous improvement. Individual reflection strengthens personal responsibility for the learning process. Group reflection enriches perspectives through shared experiences. Reflective activities deepen students' critical thinking skills.

The teacher's role in facilitating the development of critical thinking is crucial. Provocative questions are designed to encourage in-depth analysis. Cognitive challenges are presented gradually, according to the student's abilities. Feedback focuses on the thinking process, not just the end result. Scaffolding strategies help students reach more complex levels of thinking. Teacher observations of the learning process form the basis for pedagogical interventions. Appropriate mentoring fosters the development of critical thinking. The role of the facilitator enriches the quality of the student's learning experience.

The integration of critical thinking skills into project-based learning impacts students' academic readiness. Problem-analyzing skills enhance understanding across subjects. Evaluative skills strengthen decision-making. Reflective thinking patterns support lifelong learning. Students demonstrate increased ability to solve complex problems. Project experiences build intellectual confidence. Critical thinking skills become essential assets for facing the challenges of further education. This integration underscores the strategic value of project-based learning.

3. Qualitative Evaluation of the Process and Impact of Project-Based Learning

Qualitative evaluation provides in-depth understanding of the project-based learning process. The evaluation focuses on the dynamics of student interactions and learning experiences. Classroom observations generate data on student participation and engagement patterns. In-depth interviews explore the meanings constructed by students and teachers. Document analysis enhances understanding of the project process and outcomes. Qualitative data allows for contextual interpretation. The evaluation process emphasizes the holistic quality of learning. This approach aligns with the goal of developing critical thinking.

Thematic analysis was used to identify key patterns in the research data. The coding process helped group similar learning experiences. Emerging themes reflected project-based learning implementation practices. Relationships between themes were analyzed to understand learning dynamics. Data interpretation was conducted reflectively and iteratively. Consistency of findings was checked through triangulation of data sources. The analysis process continued throughout the research. This approach yielded a comprehensive picture.

Data validity is a crucial aspect of qualitative evaluation. Credibility is strengthened through ongoing researcher involvement. Member checks are used to verify interpretations of findings, and contextual descriptions support the transferability of research results. Systematic documentation maintains the reliability of the research process. Researcher reflection helps control potential bias. Data trail audits strengthen the confirmability of findings. These efforts ensure the quality of evaluation results (Rehman et al., 2024).

The impact of project-based learning is reflected in changes in student learning patterns. Students demonstrate increased independence and responsibility for their learning. Critical thinking skills develop through authentic learning experiences. Social interactions strengthen communication and collaboration skills. Continuous reflection deepens metacognitive awareness. Teachers observe improvements in the quality of classroom discussions. The learning process becomes more meaningful and relevant. These impacts strengthen the pedagogical argument for project-based learning.

Qualitative evaluations have important implications for developing learning practices. Research findings inform improvements to project-based learning designs. Teachers gain insights into effective facilitation strategies. Schools can formulate more appropriate supporting policies. Teacher professional development can be more

specifically targeted. Further research can broaden understanding of project implementation. Continuous evaluation supports learning innovation. These implications underscore the strategic value of qualitative approaches.

CONCLUSIONS

Project-based learning has proven to be a pedagogical approach capable of delivering meaningful learning experiences for secondary school students. Implementation of this approach encourages a shift in the role of teachers to facilitators who guide the learning process in a reflective and participatory manner. Active student involvement during project planning, implementation, and evaluation strengthens the quality of learning interactions. Project activities require students to develop analytical, synthesizing, and evaluating skills on an ongoing basis. The collaborative process fosters the exchange of ideas and deepens conceptual understanding. A conducive learning environment supports students' courage in expressing opinions and making intellectual decisions. Qualitative evaluations provide a comprehensive overview of the dynamics of learning and the development of students' critical thinking. Observation, interview, and documentation data reveal the link between authentic learning experiences and the improvement of higher-order thinking skills. Continuous reflection strengthens students' metacognitive awareness of the learning process. Implementation challenges can be overcome through careful pedagogical planning and consistent institutional support. The research findings confirm the relevance of project-based learning as an adaptive learning strategy to the demands of 21st-century education. This approach significantly contributes to the development of critical thinking skills and students' readiness to face the complexity of academic and social issues.

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