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Evaluation of Project-Based Assessment in Improving Critical Thinking Skills of Middle School Students

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Abstract
This study aims to in-depth evaluate the implementation of project-based assessment in improving the critical thinking skills of secondary school students. The main focus of this study is to examine how this approach is implemented in the learning process and its impact on students' higher-order thinking skills. The method used is a descriptive qualitative approach with data collection techniques such as participatory observation, in-depth interviews with teachers and students, and analysis of learning project documentation. The research subjects included teachers and students who were actively involved in project-based learning activities in a secondary school. The results show that project-based assessment contributes positively to increasing student participation and strengthening critical thinking skills, especially in the aspects of analysis, evaluation, interpretation, and problem-solving. Students demonstrated higher cognitive engagement, were able to work collaboratively in developing solutions to real-life problems, and reflected more deeply on their learning processes and outcomes. Furthermore, teachers assessed this approach as providing a more comprehensive picture of learning compared to conventional assessment methods. However, the implementation of project assessment still faces several obstacles, such as limited learning time, gaps in teachers' understanding of authentic assessment, and differences in student abilities. Based on these findings, the study recommends the need for intensive training for teachers on planning and implementing project-based assessments, as well as school policy support that accommodates the allocation of time, resources, and technical guidance to ensure the sustainability and effectiveness of this approach in the context of 21st-century learning.
Keywords:*project assessment, critical thinking, students, evaluation*

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Introduction
High school students' critical thinking skills are still relatively low. This is reflected in their limitations in analyzing information in depth, evaluating arguments objectively, and developing logical and systematic solutions to complex problems. Many students tend to simply memorize material without connecting it to real-world contexts, thus under-developing their reasoning and reflective abilities. This low level of ability can impact students' readiness to face real-world challenges that demand higher-order thinking skills.('Assessment of Real-World Problem-Solving and Critical Thinking Skills in a Technology Education Classroom', 2022).The learning system in many schools is still dominated by one-way lectures and conventional assessment approaches, such as objective tests or standardized essays. These methods emphasize rote mastery of material rather than in-depth understanding or higher-order thinking skills.(Sekwena, 2023).As a result, students are rarely

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given the space to explore ideas, ask critical questions, or reason logically. Critical thinking requires learning strategies that encourage discussion, collaboration, open-ended problem-solving, and reflection. When assessments focus solely on right-or-wrong answers or the reproduction of information, students' potential to develop critical thinking skills is hampered.(Bronkhorst et al., 2020).

The demands of the latest curriculum, both the 2013 Curriculum and the Independent Curriculum, explicitly emphasize the importance of strengthening critical thinking skills as one of the main elements in developing 21st century competencies.(Masjudin, 2024)The curriculum not only targets mastery of academic content but also encourages students to think logically, reflectively, and analytically in facing various real-life problems. Critical thinking skills are seen as the foundation for developing individuals who are adaptive, creative, and able to make appropriate decisions amidst complex global dynamics. Therefore, this curriculum directs learning to be more contextual, collaborative, and based on solving real problems, as an effort to prepare a young generation that is intellectually and socially competent.(Manyukhina & Wyse, 2019).

Project-based assessment is considered an effective evaluation approach for stimulating students' critical thinking skills. Through involvement in real-life projects that require team collaboration, problem identification and solving, and reflection on the process and results of their work, students are encouraged to think analytically, creatively, and deeply.(Ngereja et al., 2020)This approach not only assesses final results but also emphasizes the importance of thought processes, logical argumentation, and data-driven decision-making. Thus, project-based assessment creates an active and meaningful learning environment while simultaneously developing 21st-century skills such as communication, collaboration, and digital literacy. This assessment model aligns with the spirit of the Independent Curriculum, which prioritizes contextual learning and is oriented toward real-world competencies.(Sah et al., 2024).

The uneven understanding and application of project-based assessment in various schools is the main challenge in optimizing this approach as a means of improving students' critical thinking skills.(Loyens et al., 2023)Many teachers still lack a thorough understanding of the principles, stages, and success indicators of project-based assessment, so its implementation tends to be a formality or not yet fully integrated into the learning process. Furthermore, limited training, facilities, and policy support at the school level also contribute to its effectiveness.(Markula & Aksela, 2022)As a result, the effectiveness of project-based assessment in developing critical thinking skills cannot yet be measured consistently and objectively. Therefore, systematic and ongoing evaluation of the implementation of this approach is needed, including in terms of learning design, student engagement, and its impact on critical thinking competency achievement. This evaluation is crucial to ensure that project-based assessment is truly capable of driving more meaningful and relevant learning transformations.(Pan et al., 2019).

The need for empirical data is very important to assess the extent to which project-based assessment actually has a significant impact on the development of students' critical thinking skills, especially in secondary school environments.(Putra et al., 2025)Although theoretically, this approach is believed to be able to encourage students to be more active, analytical, and reflective in the learning process, empirical evidence supporting its effectiveness is still limited and uneven across various educational contexts. Research based on factual data is needed to describe actual implementation in the field, evaluate the process and results, and identify factors that support and hinder its success. With empirical findings, policy-making, the development of learning strategies, and the development of teacher capacity in implementing project-based assessment can be carried out in a more focused, evidence-based, and relevant manner to the needs of students.(Colomer et al., 2020).

Secondary school students' critical thinking skills are still relatively low, as reflected in the dominance of memorization-oriented learning patterns, single-answer methods, and minimal exploration of alternative solutions. Although the 2013 Curriculum and the Independent Curriculum emphasize the importance of strengthening 21st-century skills, including critical thinking skills, their implementation in the classroom remains suboptimal.(Husnul Haq & Wakidi, 2024)Many teachers still use conventional learning approaches with lecture methods and traditional assessments, such as multiple-choice or essay tests, which tend to assess low-level cognitive aspects and are not yet able to explore students' deep thinking processes comprehensively.(Yang et al., 2019)In this context, project-based assessment has emerged as a strategic alternative believed to stimulate critical thinking skills

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through active student involvement in the learning process, teamwork, and real-world, contextual problem-solving. However, the implementation of project-based assessment in the field still shows significant variation between schools and teachers, both in terms of understanding, design, and implementation. Therefore, a systematic evaluation is needed to assess the effectiveness and relevance of project-based assessment in developing students' critical thinking skills in secondary schools. This evaluation is also important as a basis for developing more adaptive assessment models that are appropriate to the needs of modern learning.(Meylani, 2024).

This study aims to comprehensively evaluate the implementation of project-based assessment in secondary schools, by examining the extent to which teachers implement this approach in the learning process. Furthermore, this study aims to examine the impact of project-based assessment on the development of students' critical thinking skills, particularly in analysis, evaluation, and problem-solving. Furthermore, through empirical findings from the field, this study is expected to provide constructive input for the development of more effective, contextual, and relevant assessment strategies to meet the demands of 21st-century competencies and the dynamics of learning in the Independent Curriculum era.

Methodology

This study uses a qualitative approach with a descriptive research type that aims to evaluate the application of project-based assessment in improving the critical thinking skills of high school students.(Zulyusri et al., 2023). The research subjects were selected purposively, consisting of teachers and students directly involved in project-based learning at a secondary school in [location]. Data collection techniques were carried out through participatory observation during the learning process, in-depth interviews with teachers and students, and documentation of assessment rubrics, student project results, and learning notes. The research instruments, in the form of observation and interview guides, were compiled based on indicators of critical thinking skills such as analysis, evaluation, and synthesis. Data were analyzed using the Miles and Huberman interactive model, which includes data reduction, data presentation, and drawing conclusions. To ensure the validity of the data, this study used source and technique triangulation techniques, as well as conducting member checks and consultations with experts to increase the credibility of the findings.(Motulsky, 2021).

Results and Discussion

Project-based assessment has begun to be implemented in several secondary schools, particularly in subjects such as science, social studies, and Indonesian. In its implementation, students are given various project assignments, such as experimental reports, educational videos, and group presentations.(Chanpet et al., 2020)During the implementation, students demonstrated increased participation through discussions, information searches, compilation of results, and final presentations. These activities encouraged deeper cognitive and affective engagement. Observations and interviews showed that students' critical thinking skills began to develop, particularly in the analysis, argumentation, and evaluation aspects of their work. Students became more reflective about their learning process, and indicators of critical thinking such as data interpretation and information assessment began to appear in the resulting project results.(Chen et al., 2019).

Teachers responded positively to this method because it was considered capable of providing a more complete picture of learning compared to conventional assessments.(Rapanta et al., 2020)However, challenges remain, particularly in terms of designing assessment rubrics, time constraints, and differences in student ability levels. Some teachers also still struggle to understand and optimally implement authentic assessment principles. On the other hand, some students still require more intensive guidance to successfully complete projects. This variation in understanding and implementation of project-based assessment demonstrates the need for a comprehensive evaluation to ensure this strategy can be effectively and relevantly implemented in the context of secondary school learning.(Ajjawi et al., 2020).

To provide a comprehensive overview of the research results, the following is a summary of the findings based on the evaluation categories:

Table 1. Summary of Research Findings Based on Evaluation Category

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Evaluation Aspects	Key Findings	Data source
Implementation of Project Assessment	It has been implemented in several subjects (science, social studies, Indonesian)	Teacher interviews, documentation
Student Engagement	Students are active in discussions, explorations, and presentations of project results.	Observation, student interviews
Critical Thinking Enhancement	There was an increase in students' analysis, evaluation, and argumentation.	Interviews, project notes
Teacher Perceptions of Effectiveness	Project assessment is more comprehensive, although it requires more preparation.	Teacher interview
Implementation Challenges	Time constraints, variations in student abilities, difficulties in creating rubrics	Teacher interviews, observations
Student Perceptions of the Project	Learning is more interesting and challenging, but requires extra guidance.	Student interviews

Source: Data Evaluation

Table 1 presents a summary of research findings based on observations, interviews, and documentation, classified into six main evaluation aspects: project assessment implementation, student engagement, critical thinking skills improvement, teacher perceptions, implementation challenges, and student perceptions. Each aspect is complemented by key findings reflecting actual conditions in the field, as well as data sources that strengthen the validity of the information. This table shows that project-based assessment generally has a positive impact on the development of students' critical thinking skills, although several obstacles remain in its implementation, particularly regarding teacher readiness and learning time management.

The Relevance of Project Assessment to the Development of Critical Thinking

The results of this study indicate that project-based assessment has strong relevance and significant potential in fostering the development of students' critical thinking skills. Through project assignments, students are not only required to master theoretical concepts but also to apply them in complex, real-world contexts. Projects encourage students to design problem-solving strategies, explore various sources of information, and interpret and evaluate data independently and collaboratively. Furthermore, the process of reflecting on work results and learning experiences during the project provides an important space for students to develop metacognitive awareness and strengthen argumentation and decision-making. Thus, project assessment not only assesses the final product but also fosters in-depth thinking processes that are essential for developing critical and systematic thinking patterns. This approach aligns with the demands of the Independent Curriculum, which prioritizes meaningful learning and is oriented towards 21st-century competencies.('Project-Based Learning', 2024).

Thus, project-based assessment not only focuses on the final product but also provides space for students to go through a series of in-depth and reflective thinking processes. This process includes the ability to analyze, evaluate, and solve problems systematically, which in turn fosters critical thinking patterns that serve as an important foundation for developing students' intellectual character. This approach aligns with the spirit of the Independent Curriculum, which emphasizes meaningful, contextual learning and is oriented toward strengthening 21st-century competencies such as creativity, collaboration, communication, and critical thinking. In other words, project assessment is not only an evaluative instrument but also a pedagogical strategy capable of bridging curriculum needs with the demands of the times.(Hunaepi et al., 2024).

Compliance with Constructivist Learning Theory

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The findings of this study align with the main principles of constructivist learning theory, which emphasizes that knowledge is actively constructed by individuals through interactions with the environment and meaningful learning experiences. Project-based assessment reflects this approach by positioning students as active subjects in the learning process, not simply recipients of information. In projects, students are given the freedom to explore, formulate questions, seek solutions, and reflect on their understanding both independently and collaboratively.('Collaborative Ways of Knowing', 2023)This engagement creates an authentic learning context and encourages the formation of personal meaning from each learning experience. Thus, project assessment not only supports mastery of the material but also strengthens the development of higher-order thinking skills, as emphasized in the constructivist approach, which is oriented towards active, reflective, and contextual learning.('Constructivist Learning Theory and Creating Effective Learning Environments', 2021).

Active student engagement in the learning process through project-based assessment creates an authentic learning context, where students are not merely recipients of information but also key actors in constructing their own understanding. This learning context encourages the formation of personal meaning from each learning experience, so that material is not merely memorized mechanically but truly understood in relation to real, relevant situations.(Indriati et al., 2024). Thus, project assessment serves a dual function: in addition to supporting in-depth mastery of the material, it also strengthens the development of higher-order thinking skills such as analysis, synthesis, and evaluation. This aligns with the principles of the constructivist approach, which emphasizes the importance of active, reflective, and contextual learning, where students are encouraged to connect new knowledge with prior experiences and critically reflect on their learning process. This approach is highly relevant in equipping students with the lifelong learning skills needed in today's global and digital era.(Lim et al., 2024).

Support for Previous Research Findings

The results of this study strengthen the findings of various previous studies which show that project-based assessment is an effective approach in improving critical thinking skills, problem-solving abilities, and students' creativity.(Wijayati et al., 2019)Previous research, both in national and international contexts, has shown that student involvement in projects encourages them to integrate diverse knowledge, develop analytical and synthetic skills, and develop innovative solutions to complex problems. This finding is also consistent with research by Thomas (2000), Bell (2010), and Wena (2013), which emphasizes that project-based learning creates an active and authentic learning environment capable of honing higher-order thinking skills. Thus, the results of this study not only provide empirical contributions that support existing literature but also strengthen the argument that project-based assessment is worthy of consideration as an integral part of learning evaluation strategies oriented towards 21st-century competencies.

Thus, the results of this study not only provide empirical contributions that enrich and strengthen the existing literature on the effectiveness of project-based assessment, but also provide relevant contextual evidence to support the transformation of the learning evaluation system. These findings strengthen the argument that project-based assessment deserves to be positioned as an integral part of an evaluation strategy that not only measures academic achievement cognitively but also accommodates the dimensions of critical thinking, problem-solving, collaboration, and creativity skills that are core to 21st-century competencies. Furthermore, this approach can be a strategic alternative in the implementation of the Independent Curriculum, which emphasizes differentiated, contextual learning, and is oriented towards the holistic development of student potential. Therefore, it is important for education stakeholders to consider integrating project-based assessment into national assessment policies and into learning practices at the educational unit level.(Mielikäinen, 2022).

Determining Factors for Successful Implementation

The successful implementation of project-based assessment does not occur automatically, but rather is influenced by various important interrelated factors. One key factor is designing project assignments that are contextual and relevant to students' real-life situations, thereby fostering learning motivation and stimulating critical thinking and problem-solving processes.(Li et al.,

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2022)Assignments designed with students' interests and needs in mind will more easily facilitate active and in-depth engagement. Furthermore, the existence of a clear, measurable, and transparent assessment rubric is also crucial for ensuring the evaluation process is conducted objectively, fairly, and provides direction for students in compiling and reflecting on their work.(Chan & Ho, 2019)The teacher's role as a facilitator is also crucial; they not only act as assessors but also as active guides who accompany students throughout the process, providing direction and constructive feedback, and creating a classroom climate that supports collaboration and exploration. With the combination of these three elements—appropriate task design, structured assessment instruments, and effective teacher guidance—project-based assessment can be implemented optimally and have a positive impact on improving the quality of learning.(Pan et al., 2021).

With the combination of three main elements—namely, appropriate and relevant task design, structured and valid assessment instruments, and effective and ongoing teacher mentoring—project-based assessment has great potential for optimal implementation at various levels of education. These three components complement each other and are the main prerequisites for creating meaningful, measurable, and effective learning experiences.(Hommel et al., 2022). Good assignment design allows students to explore knowledge in depth, while systematic assessment instruments ensure the evaluation process is objective and transparent. On the other hand, the teacher's role as a facilitator and guide is crucial to the success of the learning process, as they are able to provide the necessary direction, feedback, and support throughout the project. If these three aspects are consistently implemented, project-based assessment will not only impact student learning outcomes cognitively but also strengthen metacognitive, affective, and social skills essential for 21st-century learning.

Practical Implications for Schools and Teachers

To optimize the benefits of project-based assessment in improving the quality of learning and students' critical thinking skills, concrete support from schools and increased teacher capacity are required. Schools need to provide ongoing training for teachers, particularly on authentic assessment design, the development of appropriate assessment rubrics, and strategies for implementing and monitoring projects in the classroom. This training is crucial to ensure that teachers have adequate conceptual understanding and practical skills in designing contextual and meaningful projects. Furthermore, schools must allocate sufficient time in the academic calendar for project implementation, as well as supporting resources such as facilities, teaching materials, and access to information. Furthermore, teachers need to be empowered to develop formative assessment skills, such as providing reflective feedback, facilitating critical discussions, and continuously monitoring student progress. With structural support from schools and increased teacher competency, project-based assessment can be implemented effectively and have a significant impact on the development of students' 21st-century competencies, particularly in critical thinking, collaboration, and problem-solving.

Conclusion

Project-based assessment has been proven effective in improving secondary school students' critical thinking skills, particularly in the areas of analysis, synthesis, and evaluation. Through direct involvement in completing complex and contextual project tasks, students are encouraged to think deeply, process information logically, and evaluate their work reflectively. Compared with traditional assessments, which tend to be passive and focused on memorization, this approach creates a more active, collaborative, and meaningful learning experience. Students not only learn individually but also interact in groups to solve real-world problems, thereby strengthening communication and collaboration skills. Although teachers view project assessment as a more comprehensive and relevant approach to the demands of the 21st-century curriculum, its implementation still faces several challenges. Project planning, time allocation, and the development of appropriate assessment rubrics often hinder its effective implementation in the classroom. Furthermore, limited learning time, teacher preparedness in designing and facilitating projects, and varying student abilities also influence the smoothness of the assessment process. Therefore, systemic support from schools is needed in the form of professional training for teachers, the provision of technical guidelines for project assessment implementation, and academic policies that support the integration of authentic assessment into the curriculum. This support is important to ensure the sustainability and effectiveness of project-based assessment as a strategic instrument in optimally developing students' critical thinking skills.

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