



Needs Analysis in Developing PjBL-Based Interactive Media to Improve Student's Critical Thinking Skills

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Abstract

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Effectively improving the quality of student competencies cannot be separated from the development of learning resources through educational innovation. This study aims to provide a description related to the analysis of teacher and student needs in the development of interactive media based on PjBL to improve critical thinking skills of elementary school students. The research method uses descriptive qualitative research with a purposive sampling technique. The sample in this study consisted of 130 teachers and 65 elementary school students in Klaten Regency. Data collection used observation, interview, and questionnaire techniques. The results of the needs analysis, the development of interactive media based on Project Based Learning to improve students' critical thinking skills is very much needed, especially in learning Natural and Social Sciences. The implementation of this study is that the results of this study can be used as an analysis of media development needs that can be continued at the development stage, especially to develop interactive learning media based on PjBL.

Keywords:

Interactive Media, Project Based Learning, Student's Critical Thinking Skills, Elementary School

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INTRODUCTION

21st century learning requires students to be literate in the development and advancement of information and communication technology (ICT). Technological advances undoubtedly bring innovative technologies that can play an important role in restructuring teaching and learning practices. Technological advances make it easier for students to access more information. The use of interactive media is easier for students to understand compared to media in the form of books and printed materials, because it provides an opportunity to train students' critical thinking skills, especially in creating indicator questions that can foster students' thinking skills.

Students must have competencies and knowledge relevant to 21st century learning such as critical thinking skills. Critical thinking is a cognitive process that includes the ability to analyze, evaluate, draw conclusions, and solve problems (Chen, 2017; Jatmiko et al., 2018; Rodzalan & Saat, 2015). In addition, the integration of interactive media in classroom instruction promotes the development of students' critical thinking skills (Rosida et al., 2018). The National



Education Association (Association, 2010) introduced the concept of 21st century skills known as "The 4Cs". These skills, which include critical thinking and problem solving, communication, collaboration, and creativity and innovation, are the main abilities that students need to have in order to play an active role in real life (Wibowo et al., 2018).

Interactive media based on Project Based Learning is a promising alternative in the context of learning innovation that can help students strengthen their critical thinking skills (Tadjer et al., 2022; Zulyusri et al., 2023). This media provides flexibility, accessibility, and various interactive elements that can increase students' learning motivation (Safaruddin et al., 2020; Sari et al., 2024). To help students not only understand concepts but also practice critical thinking in everyday life, interactive media based on PjBL are also created to provide scenarios or challenges that are relevant to everyday life (Pratiwi et al., 2023). To produce more effective and meaningful learning, it is important to develop interactive media and PjBL that meet the demands of teachers, students, and curriculum (Yustina et al., 2020).

However, the availability of interactive media and teaching materials is still inadequate to meet the needs of 21st century education. The problem that occurs in the field is that many educators have not utilized technology optimally in learning. This is due to the limited understanding of teachers regarding the use of technology and the lack of facilities and infrastructure that support technology-based learning (Andriani & Widiyono, 2024). Many education systems still rely on traditional learning methods, which emphasize memorization and mastery of theory, without paying attention to the development of students' critical thinking skills. Many students have difficulty connecting the material they learn with everyday life situations and are not used to solving problems independently (Refnita, 2023).

In addition, the problems posed by teachers can often be applied in the real world, therefore students are trained to solve problems that require creative thinking (Bilgin et al., 2009; Rudyanto et al., 2019). Research (Azizah et al., 2018) shows that the critical thinking skills of elementary school students in Semarang are in the low category. Similar research by (Muniroh et al., 2022) found the same results among elementary school students in Malang that students have relatively low critical thinking skills. In addition, a preliminary study in the form of interviews also showed that the teaching materials currently used are limited to Bupena books and blackboards, resulting in a lack of student interest and learning that tends to be one-way. As a result, students become less focused, inactive, and have difficulty understanding learning, especially in mathematics, due to the lack of direct learning experience.

In integrating the use of interactive media, a learning process is needed that presents a project-based problem. This learning model is known as Project-Based Learning (PjBL). PjBL presents challenges that require students to work together in groups to solve problems so that it can arouse students' curiosity and initiative in solving problems (Dolmans & Schmidt, 2006; Omelianenko & Artyukhova, 2024). Research on this model focuses on scenario design that needs to be well designed (Nurlaela, (Andreani et al., 2019) 2012). One relevant alternative is the Project Based Learning (PjBL) methodology, which emphasizes providing

assistance to students to develop their critical thinking skills by asking them to solve real-world problems that are included in the educational process results ((Alvina Agustin & Ibnu Muthi, 2024; Sabila & Gunawan, 2019). This solution is becoming increasingly important in introducing the concept of project-based learning. PjBL is a learning method that involves students in real-life projects, which forces them to work together, solve problems, and apply knowledge in everyday life (Wulandari et al., 2025).

The Project-Based Learning model emphasizes challenging questions and complex tasks that encourage students to design solutions, solve problems, organize tasks and produce concrete results related to their learning ((Ibarra-Sáiz et al., 2021; Megawati, 2024). Students who use this model to learn tend to be more creative and have better critical thinking skills. This is possible because the PjBL model focuses on providing the stimulus needed by students to actively participate in their learning, thereby maximizing their understanding and critical and creative thinking capacity (Zulyusri et al., 2023). The syntax of the PjBL model is as follows: (1) Identification and formulation of the project; (2) Project completion design; (3) Scheduling; (4) Project completion; (5) Report preparation; (6) Evaluation and presentation of project results (Hendrawati et al., 2024; Permana et al., 2021; Widiastuti & MR, 2024).

The ability to analyze, reason, make decisions, and observe can be improved by mastering critical thinking skills (Thornhill-Miller et al., 2023; Yulianti & Gunawan, 2019). The method of delivering teaching materials has a major influence on students' critical thinking skills (Riti et al., 2021). Based on the results of the student needs analysis questionnaire, students' low critical thinking skills can be caused by the method of delivering teaching materials that are less interesting and unsystematic for some students (Suriyaarachchi, 2022).

One of the effective learning aids in the context of project-based learning and interactive media is the use of HTML files, which can be viewed on a laptop, web browser, tablet, or smartphone. Interactive media is a useful learning aid because of its ability to repeat. The Ecosystem course in the science course is taught using the Project Based Learning (PjBL) learning methodology (Pratiwi et al., 2023). One of the courses in the Independent Curriculum of Natural Sciences and Social Sciences (IPAS).

Several previous studies have shown that the development of interactive learning media based on STEM-PjBL can improve conceptual understanding and learning independence. Linda et al (Linda et al., 2023) revealed that this model encourages active involvement of students in meaningful learning. According to (Salmah et al., 2025) stated that PjBL-STEM is effective in connecting theory with real-world applications, thereby improving critical thinking skills and creativity. Research (Supriatna et al., 2024) also shows that Google Sites as a learning medium has a positive impact on learning outcomes and student involvement in the independent learning process.

Although research on PjBL has been extensive, there are still some gaps that need to be studied further. Most studies still focus on theoretical aspects without in-depth exploration of its application at various levels of education. In addition, research on the long-term impact of implementing this model on improving students' critical thinking skills is still limited.

The novelty of this study lies in the use of interactive media integrated with PjBL to provide an overview of improving students' critical thinking skills. The urgency of this study is based on the increasing need for critical thinking skills in the world of education and work. With the increasing development of technology and the increasing complexity of global problems, students need to be equipped with critical thinking skills. Therefore, this study provides important insights into how interactive media based on PjBL can be optimized to meet these needs.

This study aims to address the gap by exploring the application of interactive media based on PjBL in learning at the elementary school level. This study will identify findings from previous studies related to needs analysis in the development of interactive media based on PjBL to improve students' critical thinking skills. This study is expected to provide a deeper understanding of the development of interactive media based on PjBL to improve students' critical thinking skills. This study is expected to provide a deeper understanding of needs analysis in the development of interactive media based on PjBL to improve students' critical thinking skills. In addition, this study also provides recommendations for educators and policy makers in developing the right curriculum. Thus, project-based learning can continue to develop and provide greater benefits for education.

METHODS

This study uses a descriptive qualitative approach with the aim of providing an overview of the analysis of teacher and student needs in the development of interactive media based on PjBL to improve critical thinking skills of elementary school students, especially in Natural Sciences and Social Sciences (IPAS) subjects in elementary schools. A qualitative descriptive approach is a type of educational research in which the researcher relies on the views of participants; asks broad, general questions; collects data consisting largely of words (or text) from participants; describes and analyzes these words for themes; and conducts the inquiry in a subjective, biased manner (Creswell, 2018).

The scope of this study is limited to qualitative data collection through in-depth interviews with elementary school teachers. This study focuses exclusively on critical thinking skills, intentionally excluding other non-technical skills. This focused methodology ensures a comprehensive exploration of the research questions and provides actionable recommendations for improving educational practices in Indonesia. This study uses a phenomenological approach to investigate students' lived experiences and perceptions of PjBL-based interactive media development in improving students' critical thinking skills.

Participants were selected using purposive sampling to ensure the relevance and richness of the data. Purposive sampling is used to access individuals who have extensive knowledge, namely those who have deep insights into the research topic based on their role, expertise, or experience. The sample of this study was 130 teachers and 65 elementary school students in Klaten Regency who were randomly selected from several sub-districts. This targeted sampling approach is important to capture diverse perspectives, as recommended by (Durso et al., 2021). Prior to the

interviews, participants were briefed on the purpose of the study, and informed consent was obtained for recording and analysis, adhering to ethical guidelines outlined by (Boadu, 2021).

This study used interview, observation, and questionnaire instruments to collect data on the need for interactive media development based on PjBL in elementary schools. The researcher conducted in-depth semi-structured interviews, due to their capacity to produce comprehensive insights into participants' experiences (Rozario et al., 2022). Interviews were conducted in a quiet and private place to minimize distractions and ensure participant comfort. Interview questions were carefully formulated to explore the nuances of critical thinking and collaborative development. Examples of questions include: "What difficulties do you face in developing critical thinking during learning?" and "Have you used gadgets as media?" All interviews were recorded and transcribed for analysis. Reflexivity was maintained throughout the process to increase credibility, as suggested by (Naparan et al., 2022).

Table 1. Overview of interview questions for teachers

Measured Aspects	Indicator	Question
Current learning conditions	<ul style="list-style-type: none"> a. Learning models used b. Availability and utilization of learning media c. Challenges in learning to develop critical thinking skills 	<ul style="list-style-type: none"> a. Have you implemented PjBL? b. During learning, do you use gadgets as media? c. What is the average thinking ability of students? d. In your opinion, what difficulties are often experienced in students' critical thinking skills during classroom learning?
Need for learning media development	<ul style="list-style-type: none"> a. Urgency of interactive media development b. Importance of PjBL-based media c. Potential of interactive media in improving critical thinking skills 	<ul style="list-style-type: none"> a. How important is it to use gadgets as a learning medium? b. Is it still necessary to develop PjBL-based learning media? c. Is media needed to improve critical thinking skills? d. What type of media do you want to use?
Efforts to solve problems	Effort that have been made	Efforts that have been made to improve critical thinking skills

Qualitative data analysis was carried out in four steps, namely: (1) data collected in the form of data from the observation approach with a questionnaire on the teacher and students need questionnaire regarding the model of PjBL-based interactive media; (2) data processing, data processed in the form of data obtained during the teacher and students need analysis process and references from various relevant sources; (3) data presentation, data obtained were then arranged and presented in this study; and (4) drawing conclusions, this study was concluded based on the analysis of the teacher and students need questionnaire regarding the model of PjBL-based interactive media.

RESULTS & DISCUSSION

Analysis of needs in the development of interactive learning media in the subject of science can be found through field study activities by conducting observations or surveys and interview activities on the analysis of needs for the development of interactive learning media based on PjBL. The results of the analysis collected from 130 grade 5 elementary school teachers showed that teachers have used technology-based media (ICT) in the learning process. Media that is often used by teachers in the learning process other than technology-based ones are Student Worksheets, but some teachers use PPT media that they access from the internet. Teachers also mentioned learning models that are still conventional, but some teachers have implemented student-centered learning models.

Field findings show that many teachers have not used interactive media based on Project Based Learning, especially in learning Natural and Social Sciences (IPAS) for grade 5 elementary schools. This problem is caused by the lack of teacher competence in mastering technology and information in implementing it in the learning process. From the interview, information was obtained that the learning media used during the learning process focused more on textbooks. Media development needs to be done more because of many factors. Some of the factors that are the biggest obstacles in media development are time and lack of ability in developing media, especially interactive media.

In addition, another factor that causes teachers to not use interactive media based on Project Based Learning is the lack of teachers in receiving training related to Project Based Learning. According to the results of the interview, many teachers answered that they did not know the stages or syntax of Project Based Learning. The same thing was expressed by (Yani & Rosana, 2024) that so far the learning media used are mobile phones, videos, power points, and e-books, but educators have not utilized interactive teaching materials. This is in line with (Kusuma et al., 2022) which states that educators only use Electronic Books (BSE) which are not interactive during learning.

Based on the results of teacher observation research in implementing interactive media based on Project Based Learning in elementary schools, it is explained that out of 130 elementary school teachers in Klaten Regency, 86.92% of teachers stated that it was necessary to develop interactive media based on Project

Based Learning and 13.08% of teachers stated that they did not need to develop interactive media. Thus, it can be concluded that the development of interactive media based on Project Based Learning still really needs to be developed so that this research is good to be continued to the next stage. The use of interactive learning media can increase student involvement in learning activities and make it easier for students to understand the material (Mahadewi et al., 2020; Qiatina et al., 2019). The results of the analysis of teacher needs for the development of interactive media based on Project Based Learning are presented in Figure 1.

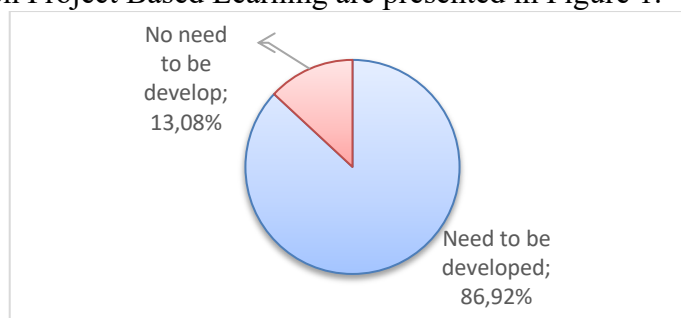


Figure 1. Results of teacher needs analysis for the development of interactive media based on project based learning

In addition to conducting teacher needs analysis, student needs analysis was also conducted. From the initial observation results obtained, most students responded that so far teachers have not used interesting learning media including interactive learning media, especially by using the Project Based Learning model. From the observation results obtained, initial research data regarding student needs analysis can be presented in the following table.

Table 2. Student needs questionnaire results

No	Statement	Student Response			
		SS	S	KS	TS
1	I conduct learning in class with media (books, games, videos, pictures, and the like)	9,7%	19,4%	38,7%	32,2%
2	I like group learning activities	19,4%	71%	9,6%	0%
3	I like question and answer activities	16,1%	61,3%	12,9%	9,7%
4	I like giving opinions	16,1%	58,1%	16,1%	9,7%
5	I like making products/crafts	38,7%	45,2%	9,7%	6,4%
6	I learn only using material books	18,3%	72%	0%	9,7%
7	I like learning media that students can play	14%	63,4%	9,7%	12,9%
8	I like learning media that have lots of pictures/illustrations	75%	15,4%	9,6%	0%
9	I like media that can be used at home	19,3%	71%	9,7%	0%
10	I like media that can help to develop and realize ideas	80%	10%	10%	0%

The results of the analysis show that some students show a low level of interest in learning media (books, games, videos, pictures, and the like) at 19.4%. Meanwhile, 83.9% of students showed interest in making products/crafts. This shows that interactive learning media based on PjBL is very relevant to the characteristics of today's students. PjBL is a learning method that has the potential

to develop students' critical thinking skills. By delivering projects, students are encouraged to be creative, starting from product planning, product creation (building knowledge, understanding and skills, product development), to product presentation and evaluation. Evaluation can be carried out objectively and comprehensively, not only based on the final results. Project-based learning is an innovative approach that focuses on situational learning through complex activities. Complex activities are based on challenging questions and tasks that require students to plan, solve, make decisions, and work independently (Fisher et al., 2020).

According to research (Rosiyannah et al., 2019), the use of interactive project-based learning media can improve students' critical thinking skills. Learning activities that use interactive media based on PjBL require students to be more active and think critically in teaching and learning activities. The use of interactive media based on PjBL requires students to learn actively and trains students to produce a project. The existence of interactive learning media based on PjBL will have an impact on students' learning achievement, abilities and critical thinking skills (Huda et al., 2025). According to Triling and Fadel, critical thinking skills can be trained through project-based learning that is driven by authentic questions and problems (Usman et al., 2024). This is also clarified by the results of research findings (Anica-Popa et al., 2024) that in addition to providing an interesting learning experience, the PjBL model can improve students' critical thinking skills.

Based on the results of the analysis of literature studies related to interactive media based on PjBL, analysis of student needs through questionnaires given, and the results of interviews with several teachers, it can be concluded that it is necessary to develop interactive learning media based on PjBL that can improve students' critical thinking skills. The results of this preliminary study are supported by previous research conducted by (Fitri et al., 2025) showing that the Tringo-based PjBL learning model supported by VR technology can be an effective alternative to improve students' critical thinking and problem-solving skills.

Research Results (Pertiwi et al., 2024) that the results of the effectiveness test analysis showed an N-Gain score of 0.7 in the category of quite effective in improving students' critical thinking skills. According to the research results (Alvina Agustin & Ibnu Muthi, 2024; Sabila & Gunawan, 2019) it is explained that the Project Based Learning model provides effectiveness on the critical thinking skills of elementary school students. This is reinforced by research conducted by (Safaruddin et al., 2020) which explains that Project Based Learning has a positive impact on students' learning motivation. In line with the research results (Huda et al., 2025) that the PjBL model used also helps students develop critical thinking skills. The PjBL model can help students in group learning, develop project skills that are worked on which can provide personal experience to students.

CONCLUSION

Based on the needs analysis, the development of interactive media based on Project Based Learning to improve students' critical thinking skills is very much needed, especially in Natural and Social Sciences learning, so that it is easier for

teachers to manage learning in the classroom. Students tend to be more adaptable to the use of technology because of their diverse backgrounds and higher levels of digital literacy. The integration of interactive learning media based on PjBL can overcome this challenge and support the improvement of critical thinking. Through the PjBL model, students can more actively explore the material and relate it to real life through project activities. Meanwhile, the use of interactive technology in learning media will facilitate access and support more interesting interactions, which in turn will improve students' critical thinking skills. Thus, the development of this media is expected to help students learn more critically.

The contribution of this research is very important because it can provide new understanding about the development of more effective and efficient technology-based learning at the elementary education level. In addition, the results of this study can be a guideline for educators, principals, and educational policy makers in designing learning models that are in accordance with the demands of the 21st century, which not only focus on mastering the material but also on developing critical and creative thinking skills that students need to achieve success in an increasingly digitalized world.

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