The Effect of Edmodo-Based Project Based Learning on Students' Critical Thinking Skills: Meta-analysis

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Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh edmodo berbasis project based learning terhadap keterampilan berpikir kritis siswa. Penelitia ini adalah penelitian meta-analisis. Sumber data berasal dari 11 jurnal nasional dan Internasional terbitan tahun 2019-2024. Proses pencarian sumber data melalui database google scholar, ERIC, ScienceDirect, Researchgate dan Taylor of Francis. Kata kunci pencarian adalah pembelajaran melalui edmodo, Project Based Learning, Etnomodo berbasis project based learning, dan pengaruh edmodo berbasis project based learning terhadap keterampilan berpikir kritis siswa. Penyeleksian data melalui metode PRISMA 2020. Analisis data dengan aplikasi JSAP. Hasil penelitian menyimpulkan bahwa penerapan edmodo berbasis project based learning berpengaruh signifikan terhadap keterampilan berpikir kritis siswa dengan nilai rata-rata effect size sebesar 1.03 dengan kriteria tinggi. Temuan ini menunjukan bahwa edmodo berbasis project based learning memberikan pengaruh positif untuk meningkatkan keterampilan berpikir kritis siswa di sekolah.

Kata Kunci: *Edmodo; Project Based Learning; Berpikir Kritis, Effect Size*

The Effect of Edmodo-Based Project Based Learning on Students' Critical Thinking Skills: Meta-analysis

Abstract

This study aims to determine the effect of project-based learning edmodo on students' critical thinking skills. This is a meta-analysis. Data sources come from 11 national and international journals published in 2019-2024. The process of searching for data sources through the databases of google scholar, ERIC, ScienceDirect, Researchgate and Taylor of Francis. Search keywords are learning through edmodo, Project Based Learning, Etnomodo based project based learning, and the influence of edmodo based project based learning on students' critical thinking skills. Data selection through PRISMA 2020 method. Analyze data with SAP applications. The results of the study concluded that the application of project-based learning edmodo had a significant effect on students' critical thinking skills with an average effect size value of 1.03 with high criteria. This finding shows that project-based learning edmodo has a positive influence on improving students' critical thinking skills in schools

Keywords: Edmodo; Project Based Learning; Critical Thinking, Effect Size

Introduction

Critical thinking skills are one of the important skills that must be mastered by students in this modern era (Que et al. 2022; Elfira

et al., 2023; Nurtamam et al. 2023) . Critical thinking skills enable students to analyze information in depth, question different assumptions and viewpoints, and make decisions and solve problems wisely (Zulyusri et al.,2023; Putra and Linuwih 2020; Fradila et al. 2021; Adnan et al. 2021). Students who have good critical thinking skills tend to be better able to understand lesson concepts well, evaluate multiple viewpoints objectively, and make decisions based on logical reasoning and solid evidence (Suharyat et al., 2023; Azmi et al. 2022). Therefore, it is important for teachers to be able to develop students' critical thinking skills through classroom learning (Utomo et al. 2023).

Furthermore, there are several strategies that teachers can use to develop students' critical thinking skills including encouraging interactive class discussions, providing case studies to solve, and providing open-ended questions that challenge students to think analytically and evaluatively (Rahman et al. 2023; Darhim et al. 2020). In addition, teachers also need to create a learning environment that supports students to constantly question and challenge assumptions, and respect diverse points of view. With good critical thinking skills, students can learn more deeply about the subject matter.

But in reality, students' critical thinking skills in school are still relatively low (Suryono et al. 2023; Rahman and Ristiana 2020) so that students cannot achieve the specified learning objectives. In learning activities, teachers do not involve students to be active and think critically in the learning process (Inayah et la.,2021; Putra et al. 2023). Furthermore, these results are supported by research *Trends in International Mathematics and Science Study* (TIMSS) In 2015, Indonesian students' critical thinking skills in science and mathematics obtained a score of 396, ranked 44 out of 49 member countries (Wantu et al. 2023; Luciana et al., 2023; Setiawan et al. 2018; Ichsan et al. 2022). Low critical thinking skills in Indonesia are influenced by various problems. According to Fitriyah and Ramadani (2021) Low critical thinking skills of students are caused by improper selection of learning models. So there needs to be proper learning to encourage students' critical thinking skills.

Edmodo is a web-based learning platform specifically designed for educational purposes (Mujib 2020). Edmodo provides a safe online learning environment for teachers, students, and parents to connect and collaborate (Ekawati 2018; Alamsyah et al.,2021). Edmodo's main features include a timeline for posting assignments, quizzes and polls, a library for sharing content and learning resources, and communication tools such as messages and notifications. Edmodo is very beneficial for teachers to expand learning beyond the classroom (Ekici 2017). Teachers can submit assignments, quizzes, polls, and manage student grades on Edmodo. Students can also collaborate with classmates and discuss in study groups (Siahaan 2020). Teachers can also share links, files, and learning resource recommendations to the Edmodo library (Said.,2015; Sefriani 2021). Communication features allow teachers to send announcements and remind students of upcoming assignments or exams. Thus, Edmodo really helps teachers to utilize technology in improving students' learning experience (Ma & Janfeshan, 2018).

Edmodo learning can be combined with a project-based learning model. Project-based learning is a learning model that uses projects/activities as media (Tuaputty et al.,2023). Project based learning models students conduct exploration, assessment, interpretation, synthesis, and information to produce various forms of learning outcomes. This learning model emphasizes student activities to investigate a complex problem (Jalinus et al., 2020; Wanglang &; Chatwattana 2023).

The advantages of the project-based learning model help students develop critical thinking and analytical skills (Syawaludin et al. 2022; Girgin 2020). Students are trained to work independently managing resources and time in order to complete projects well (Yayu et al. 2023). This model is also effective for collaborative learning because students need to work together in small groups to complete project assignments (Sisamud et al.,2023; Lim et al. 2023). Project-based learning models also help students learn about the real world and apply their academic knowledge in authentic learning activities.

Previous research has been conducted regarding the application of Edmodo based on Project Based Learning. Research conducted by Lee et al. (2014) shows that the application of project-based learning based Edmodo can increase student achievement and motivation. Similar research by Ferdiana (2017) also found an

increase in student activity and learning outcomes after applying a project-based learning model using Edmodo. Another study by Handayani (2018) examined student responses to the implementation of PjBL-based Edmodo. The results showed students' positive responses to collaborative and guided online learning through Edmodo features.

Furthermore, Nurhayati's research (2019) also shows an increase in students' 21st century skills such as communication, collaboration, and critical thinking after learning through project-based learning Edmodo. But the gap, the number of studies related to project-based learning-based edmodo in learning has not found an overall meta-analysis of the influence of project-based learning-based edmodo. Therefore, this study aims to determine the effect of project-based learning edmodo on students' critical thinking skills.

Methods

This study uses a meta-analysis method to analyze the effect of the application of project-based learning edmodo on students' critical thinking skills. Meta-analysis is a research method that combines and statistically analyzes the results of previous research (studies) to obtain comprehensive conclusions on a particular topic (Tamur &; Wijaya 2021; Razak et al. 2021; Oktarina et al. 2021; Chamdani et al. 2022; Santosa et al. 2021). This research will collect relevant previous research on the application of edmodo based on project based learning and its effect on students' critical thinking skills. The inclusion and inclusion criteria in this meta-analysis can be seen in Table 1.

Table 1. Inclusion Criteria

No	Inclusion	Inclusion
1	Research must be experimental methods or quasi-experiments.	Studies that do not report complete data to calculate effect size.
2	Research comes from international journals or proceedings indexed by SINTA and Scopus.	Research in the form of theses, dissertations and unpublished scientific papers.
3	Research related to edmodo based on project based learning on students' critical thinking skills.	
4	Research must have complete data to calculate the value of effect size.	
5	Research published in 2019-2024 is open access.	

The search for research articles will be carried out on the online journal databases google scholar, ERIC, ScienceDirect, Researchgate and Taylor of Francis. Furthermore, in the process of searching for data obtained 442 articles. The data obtained in the data search was selected using the PRISMA 2020 method, so 12 articles were obtained that met the predetermined inclusion criteria.

Studies that meet the criteria will be statistically analyzed using JASP software. Furthermore, the criteria for effect size values can be seen in table 2. An analysis was conducted of the effect sizes of each study which were then combined to obtain an average effect size. The results of this meta-analysis are expected to answer research questions about how much influence project-based learning edmodo has on students' critical thinking skills.

Table 2. Effect Size Value Criteria

Effect Size	Category Effect Size
$0.00 \leq ES \leq 0.20$	Low
$0.20 \leq ES \leq 0.80$	Medium
$ES \geq 0.80$	High

Source: (Cohen et al. 2007)

Result and Discussion

Hasil From searching the database of google scholar, ERIC, ScienceDirect, Researchgate and Taylor of Francis related to the influence of edmodo based on project based learning obtained 442 related articles. After that, the data was selected using the PRISMA 2020 method consisting of identification, screening, eligibility

and inclusion, so 12 articles that met the inclusion criteria were obtained. The results of paper selection can be seen in Figure 1.
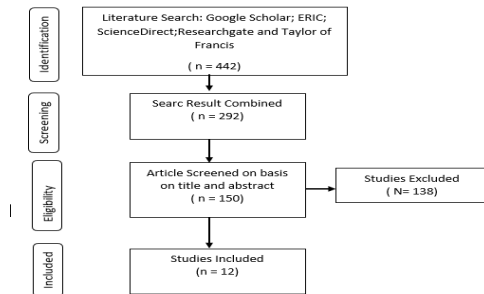

Figure 1. Data Selection Process Through PRISMA Method

Furthermore, data that have met the inclusion criteria are calculated effect size values which can be seen in Table 2.

Table 2. Effect Size Research Data

Study Code	Year	Bound Variables	Effect Size (ES)	Effect Size Criteria
L1	2022	Critical Thinking	1.10	High
L2	2022	Critical Thinking	0.66	Medium
L3	2023	Critical Thinking	1.32	High
L4	2023	Critical Thinking	0.97	Medium
L5	2020	Critical Thinking	0.53	Medium
L6	2019	Critical Thinking	0.79	Medium
L7	2020	Critical Thinking	0.82	High
L8	2019	Critical Thinking	1.42	Medium
L9	2020	Critical Thinking	2.14	High
L10	2021	Critical Thinking	0.92	High
L11	2023	Critical Thinking	1.05	High
L12	2023	Critical Thinking	0.64	Medium
Average Effect Size			**1.03**	**High**

Based on Table 3. The effect size values of the 12 articles analyzed ranged from 0.53 to 2.14. Furthermore, the average value of effect size is 1.03 with high criteria, so the application of

edmodo based on project-based learning has a significant influence on students' critical thinking skills. This research is in line with Bilkisda &; Sudibyo.,(2021) Learning with EDMODO has a positive influence on students' critical thinking skills. Furthermore, the results of the study Handayani et al. (2021) Edmodo-based learning is project based elarning effective for improving students' critical thinking skills. Learning with edmodo based on proejct based leaning helps students be more active and creative in solving a problem (Najib et al.,2022; Hursen 2018). Moreover. Learning through edmodo students learn more independently so as to encourage students to think critically.

The improvement of students' critical thinking skills in this study is thought to be due to several factors. Project-based learning through Edmodo encourages students to investigate problems, collect and analyze data, and finally draw conclusions on the project they are working on. These activities train students to think critically (Tavukcu 2018) . In addition, collaboration between students also broadens the way students think. Feedback from teachers also helps improve students' critical thinking skills. The project-based learning Edmodo model can be used as an alternative learning to improve students' 21st century skills, especially critical thinking (Cola &; Nuswowati, 2020; Tufakur et al. 2023). In addition, teachers need to pay attention to important components in this learning model so that implementation in the classroom can run effectively. Teachers are also advised to provide sufficient scaffolding to students during project completion to optimize their critical thinking skills.

Next, analyzing the effect of the effect of project-based learning-based edmodo on critical thinking skills at the education level. The results of the analysis based on education level can be seen in Table 3.

Table 3. The Effect of PjBL-Based Edmodo on Critical Thinking Skills Based on Education Level

Education Level	Effect Size	Criterion
Elementary School	0.68	Medium
Junior School	0.75	Medium
High School	0.87	High
College	0.92	High

Table 3, explains the results of the effect size analysis based on education level in elementary schools obtaining a value of 0.68 medium criteria, junior high school effect size value 0.75, high school effect size value 0.87 and college effect size value 0.92. This finding concludes that project-based learning edmodo learning is effective to be applied at the educational level. Based on the results of the study, it is known that the application of PjBL-based Edmodo has a positive effect on students' critical thinking skills at every level of education, from elementary to high school (Sari et al., 2019). This is in line with Nurlaila's opinion (2020) which states that Project Based Learning through Edmodo is proven to improve students' critical thinking skills from elementary to high school levels, although with different influences. However, the influence exerted is different at each level. The greatest influence is found at the higher education level, high school, junior high school, and finally elementary school.

This difference in influence is thought to be due to the different levels of readiness and cognitive maturity of students at each level. As stated by Dewi (2018), students at higher education levels generally have better abstract and critical thinking skills, so they can implement critical thinking skills more optimally in project-based learning (Afriani et al., 2019). Despite this, elementary school students also showed improved critical thinking skills after studying with PjBL-based Edmodo. This indicates that this learning model is suitable for developing critical thinking skills early (Kuswidyanarko, 2017).

Conclusion

From this meta-analysis research, it can be concluded that the application of project-based learning edmodo has a significant effect on students' critical thinking skills with an average effect size value of 1.03 with high criteria. This finding shows that project-based learning edmodo has a positive influence on improving students' critical thinking skills in schools. The PjBL-based Edmodo learning model can be recommended to be applied in an effort to improve students' 21st century skills, especially critical thinking skills in schools.

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