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Blended Learning in the Digital Era: An Analysis of Self-Regulated Learning Assisted with Edmodo-GeoGebra

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Abstract

This study aims to describe students' self-regulated learning in mathematics learning supported by Edmodo-GeoGebra on the topic of the volume of rotating objects. The research employs a qualitative approach with a descriptive method. The participants in this study were 36 students from Universitas Bina Bangsa. The data collection technique involved distributing a self-regulated learning questionnaire consisting of 30 statements with 8 indicators. Data analysis was conducted by calculating the percentage of students' responses, which were then described using percentage interpretation criteria. The analysis results for each indicator of self-regulated learning are as follows: 1) learning initiative 76%; 2) diagnosing learning needs 78%; 3) setting learning goals 76%; 4) viewing difficulties as challenges 75%; 5) utilizing and seeking relevant resources 74%; 6) selecting and applying learning strategies 77%; 7) evaluating the learning process and outcomes 76%; 8) self-concept 74%. The overall average of students' self-regulated learning supported by Edmodo-GeoGebra was 75.57%, categorized as high. This study recommends that educational institutions support and optimize the improvement of students' self-regulated learning.

Keywords: Digital era, Edmodo, GeoGebra, blended learning, self-regulated learning.

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1. Introduction

In the current digital era, self-regulated learning has become one of the essential competencies that students must possess. Self-regulated learning refers to students' ability to manage and direct their own learning processes, including time, methods, and learning resources (Silverajah et al., 2017; Duarte, 2020). Technological advancements have opened new opportunities in education, particularly through the implementation of blended learning. Blended learning combines traditional face-to-face instruction with technology-mediated activities (Van & Webb, 2016; Liu et al., 2024). Over the past decade, blended learning has been the focus of numerous studies, emphasizing how technology can enhance students' self-regulated learning. Research by Echeverria & Cobos (2013) and Koh & Lee (2017) has shown that blended learning can improve students' self-regulated learning and motivation through more dynamic and flexible interactions.

Edmodo and GeoGebra are two popular technological platforms used in the implementation of blended learning. Edmodo is a social learning platform that allows teachers and students to interact online, share materials, and manage assignments (Nasrullah et al., 2018; Kahraman & Ozdamli, 2017). As a social learning platform, Edmodo has been discussed in various studies. Research by Ryane & El Faddouli (2018), Ryane (2020), and Alqahtani (2019) found that Edmodo helps learners manage their learning and enhances collaboration between students and teachers. In the context of mathematics learning, GeoGebra has been proven effective in enhancing conceptual understanding through visualization and dynamic interaction, as demonstrated in studies by Schreiberová & Morávková (2023) and Tasman & Widjaja (2023). GeoGebra, on the other hand, is dynamic mathematics software that helps students comprehend mathematical concepts through visualization and interaction (Zhang et al., 2023). However, research combining Edmodo and GeoGebra within the framework of blended learning is still limited. A study by Nasrullah & Mubarika (2023) indicates the great potential of combining GeoGebra with a Learning Management System to improve mathematics learning outcomes, though further research is needed to explore how these two tools can jointly support students' self-regulated learning. Therefore, this article introduces novelty by comprehensively analyzing the simultaneous use of Edmodo and GeoGebra in assessing students' self-regulated learning, an area that has not been extensively studied. As a result, this study offers a novel contribution by examining the simultaneous impact of using Edmodo and GeoGebra on students' self-regulated learning, filling a gap in the existing literature.

A primary issue in education is the low level of student self-regulated learning, particularly in mathematics (Afrizal et al., 2023; Rahmawati et al., 2023; Sergejeva & Zeidmane, 2023). Evidence shows that students often struggle to manage their study time (Trentepohl et al., 2022) and to grasp mathematical concepts without intensive guidance (Sergejeva & Zeidmane, 2023). The proposed hypothesis is that the use of blended learning with Edmodo and GeoGebra can enhance students' self-regulated learning.

The approach to addressing this issue is by implementing blended learning that integrates Edmodo and GeoGebra into the learning process. Edmodo will be used for task management and communication, while GeoGebra will assist in visualizing mathematical concepts. This research aims to identify and analyze the impact of using blended learning with Edmodo and GeoGebra on students' self-regulated learning. Additionally, this study is expected to provide practical recommendations for educators in applying technology to support students' self-regulated learning in the digital era.Geogebra meningkatkan visualisasi

2. Methods

This study employs a qualitative descriptive method aimed at describing students' self-regulated learning in the context of blended learning supported by the Edmodo and GeoGebra platforms. The subjects of this research consist of 36 students from Universitas Bina Bangsa, who are engaged in mathematics learning through a blended learning model on the topic of the volume of rotating objects.

The instrument used in this study is a mathematics self-regulated learning questionnaire, consisting of 30 statements and covering eight indicators of self-regulated learning: 1) learning initiative, 2) diagnosing learning needs, 3) setting learning goals, 4) viewing difficulties as challenges, 5) utilizing and seeking relevant resources, 6) selecting and applying learning strategies, 7) evaluating the learning process and outcomes, and 8) self-concept (Hendriana et al., 2014). The questionnaire employs a Likert scale with four response options: Very Often (SS), Often (SR), Rarely (J), and Very Rarely (JS) (Hendriana et al., 2014).

The questionnaire was distributed online via Google Forms to facilitate student access and participation. Once the data was collected, the results were analyzed statistically to determine the percentage for each indicator of self-regulated learning. This process aimed to provide a comprehensive overview of students' self-regulated learning levels in the implementation of the applied learning model.

The collected data was then analyzed using descriptive statistical techniques to calculate the percentage of responses for each indicator of self-regulated learning. These percentages were interpreted based on predetermined criteria: high category for percentages between 75-100%, moderate category for percentages between 50-74%, low category for percentages between 25-49%, and very low category for percentages between 0-24% (Fadillah et al., 2022). The research data was subsequently analyzed and reduced, with data presentation provided in narrative form to describe the level of student self-regulated learning in the implementation of the blended learning model using Edmodo-GeoGebra.

3. Results and Discussion

The results of the study indicate that the level of students' self-regulated learning in the implementation of the blended learning model supported by Edmodo-GeoGebra falls into the high category, with an overall average of 75.57% (see Figure 1).

Each indicator of self-regulated learning measured provides a more detailed picture of students' ability to manage their learning processes independently. The indicator of diagnosing learning needs recorded the highest percentage, at 78% (see Figure 1), indicating that students have a strong capability in identifying their learning needs.

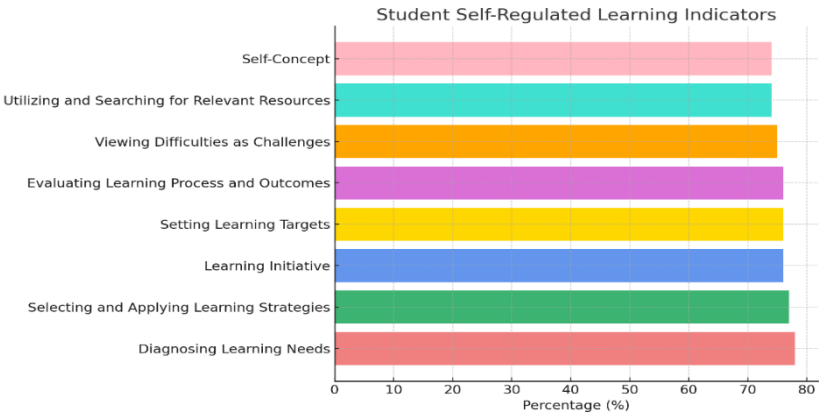

Figure 1. Result of Self-Regulated

This finding aligns with Shi & Fan (2023), which highlights that the ability to diagnose learning needs is crucial for enhancing learning efficiency. Students who understand their learning needs are more likely to succeed in self-directed learning. This is significant because the ability to diagnose learning needs is a critical initial step in ensuring that students can appropriately adjust their learning strategies. With this capability, students can identify what needs to be learned and what resources are required, allowing them to be more efficient in their learning process.

The indicator of selecting and applying learning strategies, with a percentage of 77% (see Figure 1), indicates that students are not only capable of determining what needs to be learned but also how best to learn it. This capability is crucial in the context of self-directed learning, where students are required to develop learning strategies that align with their own learning styles and the situations they encounter. This result is consistent with research by Saqr et al. (2023), which shows that the ability to select effective learning strategies plays a significant role in the success of students' self-directed learning, enhancing their academic achievement. Students who can choose effective learning strategies are more likely to successfully achieve their learning goals.

The indicators of learning initiative, setting learning goals, and evaluating the learning process and outcomes each recorded a percentage of 76% (see Figure 1). This indicates that students are proactively taking initiative in their learning process, setting clear goals, and regularly evaluating what they have achieved. Learning initiative is a crucial indicator of self-regulated learning, as proactive students are generally more motivated and have greater control over their learning process. This finding is consistent with recent research by Zhu et al. (2022) which highlights that learning initiative, goal setting, and process evaluation are key components of self-directed learning. Proactive students with clear goals are more motivated and effective in achieving their learning objectives. Setting learning goals helps students to remain focused and directed in their learning process, while evaluating the learning process and outcomes allows them to identify areas that need improvement or enhancement.

The indicator of viewing difficulties as challenges recorded a percentage of 75% (see Figure 1), indicating that the majority of students perceive difficulties not as obstacles but as challenges to be overcome. This result is consistent with research by Li (2022), which found that students who view difficulties as challenges are more likely to develop perseverance and resilience, which are crucial factors for success in self-directed learning. This attitude is particularly important in self-directed learning, as students who see difficulties as challenges tend to be more persistent and less likely to give up when encountering problems in the learning process.

The indicators of utilizing and seeking relevant resources and self-concept each recorded a percentage of 74% (see Figure 1), indicating that students are reasonably proficient in finding relevant learning resources and possess a positive self-concept. This result is consistent with research by Shi & Fan (2023), which found that students' ability to seek relevant learning resources and maintain a positive self-concept are important factors in developing effective self-directed learning skills. Although these percentages are lower compared to other indicators, they still demonstrate that students have adequate skills in utilizing available resources and maintain a sufficient level of self-confidence in managing their learning process.

Overall, the results of this study indicate that students engaged in blended learning supported by Edmodo-GeoGebra demonstrate a high level of self-regulated learning. Their abilities to diagnose learning needs, select effective learning strategies, take initiative, set goals, and evaluate the learning process show that they have developed the necessary skills to be self-directed and responsible learners. Their positive attitude towards difficulties, as well as their ability to seek relevant resources and maintain a positive self-concept, further support the conclusion that this learning model is effective in enhancing students' self-regulated learning.

These results are closely related to the fundamental concept that blended learning, which combines face-to-face and online instruction, can enhance students' self-regulated learning. This is supported by research indicating that the blended learning model enables students to be more proactive in seeking relevant learning resources and developing a positive self-concept, which ultimately supports their self-directed learning skills (Castro-Rodríguez et al., 2021). The hypothesis that the use of technology in education can encourage students to become more autonomous is validated by this study. Students demonstrated strong abilities in diagnosing learning needs, selecting learning strategies, and evaluating both the process and outcomes of their learning, all of which are crucial components of self-regulated learning.

These results also indicate that blended learning provides students with the flexibility to learn at their own pace and according to their learning styles (see Figure 2). Technologies such as Edmodo and GeoGebra enable students to access learning resources anytime and anywhere, allowing them to manage their learning processes more effectively. Additionally, the more dynamic interaction between students and learning materials through online platforms encourages them to be more proactive in their studies. This is evidenced by the high percentages in the indicators of diagnosing learning needs (78%) and selecting and applying learning strategies (77%). Thus, technology plays a crucial role in enhancing students' self-regulated learning.

Figure 2. The environment created Edmodo-GeoGebra (blended learning)

Based on the analysis presented in Figure 1, the use of technology in education allows students to take greater responsibility for their own learning processes. Blended learning provides broader and faster access to various learning resources, which in turn encourages students to be more autonomous in seeking information and completing academic tasks. Mathematics students have already understood the properties of concepts or geometry based on informal analysis of parts and component attributes (Nopriana et.al, 2021). This finding aligns with research by Bedenlier et al. (2020), which discovered that technology in learning can enhance student engagement and foster autonomy in managing their learning. In this new narrative, the role of instructors shifts from primary educators to facilitators who support the development of students' self-regulated learning. Students who are able to diagnose their learning needs, select appropriate learning strategies, and evaluate their learning outcomes

are more likely to succeed in achieving their academic goals. This result demonstrates that the integration of technology in education not only enhances understanding of the material but also fosters a more independent and responsible learning attitude.

A key finding of this study is that the blended learning model supported by Edmodo and GeoGebra significantly enhances students' self-regulated learning. This is evidenced by the high percentages in the indicators of diagnosing learning needs, selecting learning strategies, and setting learning goals. Students engaged in this technology-assisted learning approach are able to manage their learning processes more effectively and exhibit a positive attitude towards the challenges they face. These findings affirm that technology can be an effective tool in developing self-regulated learning, ultimately contributing to students' academic success. Students' self-concept is also considered sufficient in geometry learning using guided discovery learning (Sundawan & Nopriana, 2019).

The factors contributing to the results of this study include access to technology, the learning methods employed, and student characteristics. Blended learning provides students with greater flexibility, aligning with their individual needs. Access to platforms like Edmodo and GeoGebra facilitates a more interactive and in-depth learning process. Additionally, students' characteristics, such as high motivation and good time management skills, also contribute to these outcomes. Students who have full access to technology and are able to utilize it effectively demonstrate higher levels of self-regulated learning (see Figure 3).

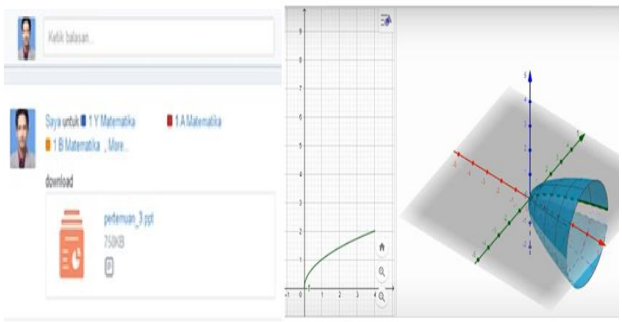

Figure 3. Learning in Edmodo-GeoGebra

The strengths of this study include the use of a relevant blended learning approach and the effective integration of technology, which facilitates the enhancement of students' self-regulated learning. However, there are several limitations to consider. This study involved only one university with a relatively small sample size, so the findings may not be generalizable to a broader population. Additionally, the data collected solely through questionnaires may not fully capture students' learning behaviors in a broader context. Employing a more diverse research methodology, such as direct observation or in-depth interviews, could provide more comprehensive insights.

This study aligns with previous research indicating that blended learning models can enhance students' self-regulated learning. Research by Ramadhan (2023) also shows that technology in education not only improves learning outcomes but also develops critical thinking and self-regulated learning. However, this study offers additional contributions by focusing on the use of Edmodo and GeoGebra platforms, which have not been extensively covered in prior research. This underscores that the appropriate technology can help students overcome learning challenges and achieve greater autonomy.

The implications of this study are significant both theoretically and practically. Theoretically, the findings reinforce the concept that technology can be an effective facilitator in enhancing self-regulated learning. Practically, these results contribute to curriculum development and teaching methods in higher education. Implementing a blended learning model supported by technologies such as Edmodo and GeoGebra can be an effective strategy for improving students' self-regulated learning. This, in turn, enhances academic success and prepares students to face challenges in the workforce.

4. Conclusions

In conclusion, the average result of the self-regulated learning analysis is 75.57%, indicating that students demonstrate strong abilities in diagnosing learning needs, selecting effective learning strategies, and evaluating their learning processes and outcomes. The high percentages in these autonomy indicators reflect that students are capable of managing their learning processes independently, which is crucial for achieving academic success. This study confirms that the integration of technology in education not only enhances material understanding but also fosters independent and responsible student characteristics, preparing them to face challenges in the workforce. These findings support the concept that technology can be an effective facilitator in education and promote the development of essential self-directed learning skills for future student success.

For future research, it is recommended to expand the scope of the study by involving more educational institutions and a more diverse sample to enhance the validity and generalizability of the findings. Additionally, further studies could explore the use of other technology platforms within blended learning models to determine if similar outcomes can be achieved with different tools. Qualitative methodological approaches, such as in-depth interviews or direct observations, are also suggested to gain a deeper understanding of the dynamics and experiences of students in developing self-regulated learning. Longitudinal studies should be conducted to evaluate the long-term impact of self-regulated learning on academic achievement and career success.

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Conflict of Interest

The authors declare no conflicts of interest.

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