

THE EFFECT OF BLENDED LEARNING ASSISTED BY GOOGLE CLASSROOM ON MATHEMATICS LEARNING OUTCOMES

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ABSTRACT

This study was motivated by the low mathematics learning outcomes of students. Preliminary observations at MTs Muhammadiyah Sukarame showed that many eighth-grade students had not achieved the minimum mastery criteria (KKM). In addition, previous studies have reported that low student engagement and ineffective learning strategies contribute to poor mathematics learning outcomes. Therefore, an innovative learning model is needed. This study aimed to determine differences in mathematics learning outcomes between students taught using blended learning assisted by Google Classroom and those taught using conventional learning, based on students' learning motivation levels. This study employed a quasi-experimental design with a population of 106 eighth-grade students at MTs Muhammadiyah Sukarame. The sample was selected using cluster random sampling. Data were collected through a mathematics learning outcomes test and a learning motivation questionnaire and analyzed using a two-way ANOVA test. The results showed that there was no interaction between the learning model and learning motivation (p -value = 0.848 > 0.05). However, students taught using blended learning assisted by Google Classroom achieved better mathematics learning outcomes compared to those taught using conventional learning.

Keywords: blended learning, google classroom, learning motivation, mathematics learning outcomes.

ABSTRAK

Penelitian ini dilatarbelakangi oleh rendahnya hasil belajar matematika siswa. Hasil observasi awal di MTs Muhammadiyah Sukarame menunjukkan bahwa sebagian besar siswa kelas VIII belum mencapai Kriteria Ketuntasan Minimal (KKM). Selain itu, penelitian terdahulu juga menunjukkan bahwa rendahnya keterlibatan siswa dan kurang efektifnya strategi pembelajaran berkontribusi terhadap rendahnya hasil belajar matematika. Oleh karena itu, diperlukan inovasi dalam model pembelajaran. Penelitian ini bertujuan untuk mengetahui perbedaan hasil belajar matematika antara siswa yang diajar menggunakan blended learning berbantuan Google Classroom dan siswa yang diajar menggunakan pembelajaran konvensional, ditinjau dari tingkat motivasi belajar siswa. Penelitian ini menggunakan desain quasi eksperimen dengan populasi seluruh siswa kelas VIII MTs Muhammadiyah Sukarame yang berjumlah 106 siswa. Sampel dipilih menggunakan teknik cluster random sampling. Data dikumpulkan melalui tes hasil belajar matematika dan angket motivasi belajar, kemudian dianalisis menggunakan uji ANOVA dua arah. Hasil penelitian menunjukkan bahwa tidak terdapat interaksi antara model pembelajaran dan motivasi belajar (p -value = 0,848 > 0,05). Namun demikian, siswa yang diajar menggunakan blended learning berbantuan Google Classroom memiliki hasil belajar matematika yang lebih baik dibandingkan dengan siswa yang diajar menggunakan pembelajaran konvensional.

Kata kunci: blended learning, google classroom, motivasi belajar, hasil belajar matematika.



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Introduction

Education is an essential process aimed at developing students' potential so that they can adapt to the rapid advancement of science and technology. Through education, individuals are expected to acquire knowledge, skills, and attitudes necessary for social life. In the educational process, learning activities become a crucial component in determining students' success in achieving learning objectives (Irawati, 2015; Masykur et al., 2017).

One of the subjects that plays an important role in education is mathematics. Mathematics not only functions as a tool for calculation but also develops logical, analytical, systematic, critical, and creative thinking skills (Sari et al., 2020). However, empirical studies have shown that students' mathematics learning outcomes are still relatively low. For instance, research indicates that many students experience difficulties in understanding mathematical concepts, which negatively impacts their achievement (Pujingsih, 2020; Nurwahid, 2021). Preliminary observations at MTs Muhammadiyah Sukarame also revealed that a considerable number of students have not achieved the minimum mastery criteria (KKM), highlighting the urgency of improving instructional practices.

These conditions indicate the need for more effective and innovative learning approaches. One factor contributing to low learning outcomes is the use of teacher-centered learning models, which limit student engagement and reduce learning motivation (Syarifah & Sumardi, 2015). In contrast, student-centered and technology-based learning approaches are considered more effective in promoting active learning.

Blended learning, which integrates face-to-face instruction with online learning, has been widely reported as an effective approach to improve learning outcomes and student engagement (Hermawanto et al., 2013; Tong et al., 2022). This model provides flexibility and broader learning experiences through the use of digital technology. One of the platforms that supports blended learning is Google Classroom, which facilitates the distribution of materials, assignments, and communication between teachers and students (Irawati & Fahyuni, 2022).

In addition to learning models, learning motivation is another important factor influencing students' learning outcomes. Students with high motivation tend to be more active and achieve better academic results (Nurwahid, 2021). Therefore, it is important to consider motivation when implementing innovative learning models.

However, previous studies have rarely examined the effect of blended learning assisted by Google Classroom on mathematics learning outcomes by simultaneously considering students' learning motivation levels. This indicates a research gap that needs to be addressed.

Based on this gap, this study aims to:

1. Determine the differences in mathematics learning outcomes between students taught using blended learning assisted by Google Classroom and those taught using conventional learning.
2. Examine the effect of learning motivation on students' mathematics learning outcomes.
3. Analyze the interaction between learning models and learning motivation on mathematics learning outcomes.

Research Methods

Research Design

This study employed a quantitative approach using a quasi-experimental research design. A quasi-experimental design allows researchers to investigate causal relationships between variables without random assignment of participants to experimental groups (Creswell, 2016). The design used in this study was a 2×3 factorial design, which examined the influence of two independent variables on one dependent variable.

The first independent variable was the learning model, consisting of the blended learning model assisted by Google Classroom and the conventional learning model. The second independent variable was learning motivation, which was categorized into three levels: high, moderate, and low. The dependent variable in this study was students' mathematics learning outcomes. The factorial design was chosen because it allows researchers to analyze the main effects of each variable as well as the interaction between variables (Sugiyono, 2017).

Participants

The population of this study consisted of all eighth-grade students at MTs Muhammadiyah Sukarame in the academic year 2021/2022, totaling 106 students. The students were divided into three classes: VIII U1 (35 students), VIII U2 (38 students), and VIII U3 (33 students).

The sampling technique used in this study was cluster random sampling, where the sample was selected based on intact groups or classes rather than individual participants. Cluster sampling is commonly used in educational research when the population is naturally grouped into classes (Sugiyono, 2017).

Two classes were randomly selected as the research sample. One class was assigned as the experimental class, which received the blended learning model assisted by Google Classroom, while the other class served as the **control class**, which received conventional learning.

Research Instruments

Two main instruments were used in this study to collect the data:

1. Learning Outcomes Test

A mathematics learning outcomes test was used to measure students' understanding after the learning process. The test consisted of essay questions designed based on cognitive indicators such as knowledge, comprehension, application, analysis, synthesis, and evaluation. Learning outcomes represent the level of students' mastery of learning material after participating in the learning process (Castillo et al., 2025)

2. Learning Motivation Questionnaire

A learning motivation questionnaire was used to measure students' motivation in learning mathematics. The questionnaire items were developed based on learning motivation indicators proposed by Uno, including students' desire to succeed, learning needs and encouragement, future aspirations, appreciation of learning, interesting learning activities, and a conducive learning environment (Uno, 2016).

Before being used in the study, the instruments were tested for validity and reliability to ensure the accuracy and consistency of the measurement results.

3. Data Collection Techniques

Data were collected using several techniques, including tests, questionnaires, and documentation. The test technique was conducted through the administration of a post-test to measure students' mathematics learning outcomes after the implementation of the learning model. Learning outcomes tests are commonly used to assess students' mastery of the material and their level of understanding after participating in the learning process (Castillo et al., 2025).

In addition, a questionnaire was used to measure students' learning motivation. The learning motivation questionnaire was distributed to students to determine their level of motivation in learning mathematics. Questionnaires are widely used in educational research to capture students' attitudes, perceptions, and motivational levels in a structured manner (Sari et al., 2023).

Furthermore, documentation techniques were employed to obtain supporting data, such as students' attendance records, student lists, and other relevant information related to the research. Documentation serves as an important complementary data source that enhances the validity of research findings by providing factual and administrative evidence (Sugiyono, 2022).

Data Analysis

The data obtained in this study were analyzed using statistical techniques. Before hypothesis testing, prerequisite tests were conducted, including normality and homogeneity tests.

The normality test was conducted using the Kolmogorov–Smirnov test with a significance level of 0.05 to determine whether the data were normally distributed. Meanwhile, the homogeneity test was conducted to determine whether the variance between groups was homogeneous.

After the prerequisite tests were fulfilled, hypothesis testing was conducted using two-way analysis of variance (two-way ANOVA). Two-way ANOVA was used to determine:

1. The effect of the blended learning model assisted by Google Classroom on students' mathematics learning outcomes.
2. The effect of students' learning motivation on mathematics learning outcomes.
3. The interaction effect between the learning model and students' learning motivation on mathematics learning outcomes (Sugiyono, 2017).

Results and Discussion

The results of this study describe the influence of the blended learning model assisted by Google Classroom on students' mathematics learning outcomes viewed from their learning motivation. The data obtained from the post-test and learning motivation questionnaire were analyzed using descriptive statistics and two-way ANOVA analysis.

Mathematics Learning Outcomes

The descriptive statistics of students' mathematics learning outcomes in the experimental and control classes are presented in Table 1.

Table 1. Descriptive statistics of students' mathematics learning outcomes

Group	Maximum	Minimum	Mean	Median	Mode	Range	SD
Experimental	100	68.75	86.56	85.94	78.13	31.25	8.84
Control	96.88	60.94	76.46	75.00	73.44	35.94	8.82

Table 1 shows that students in the experimental class obtained a higher average score ($M = 86.56$) compared to students in the control class ($M = 76.46$). The difference in the mean score between the two classes was approximately 10 points, indicating that students who learned using the blended learning model assisted by Google Classroom tended to achieve better mathematics learning outcomes than those who learned through conventional methods.

The maximum score obtained in the experimental class was 100, while the maximum score in the control class was 96.88. Similarly, the minimum score of the experimental class (68.75) was higher than that of the control class (60.94). These findings indicate that the performance of students in the experimental class was generally better across the overall score distribution.

Furthermore, the standard deviation values of the experimental and control classes were 8.84 and 8.82, respectively. These relatively similar standard deviation values indicate that the spread of scores in both groups was almost the same. Therefore, although the variability of students' scores was similar, the experimental class demonstrated higher overall learning achievement.

The higher learning outcomes in the experimental class may be attributed to the characteristics of the blended learning approach, which combines face-to-face learning with online learning activities. Through the use of Google Classroom, students were able to access learning materials, assignments, and learning resources more flexibly. This learning environment allowed students to review materials repeatedly and engage with learning resources beyond the classroom. The findings of this study support the notion that the integration of technology into classroom instruction can enhance students' understanding of mathematical concepts. Technology-supported learning environments provide opportunities for students to explore learning materials independently and to strengthen their conceptual understanding.

Nevertheless, several limitations of this study should be acknowledged. First, the relatively small sample size may limit the generalizability of the findings to a wider population. Second, the duration of the treatment was relatively short, which may not fully capture the long-term effects of the blended learning approach on students' learning outcomes. Third, the instrument used to measure students' learning motivation had certain limitations, particularly in representing the complexity of students' internal motivational constructs comprehensively.

Therefore, future research is recommended to involve a larger and more diverse sample, implement the treatment over a longer period, and employ more

comprehensive and well-validated instruments to obtain more robust and generalizable findings.

Students' Learning Motivation

Students' learning motivation was measured using a questionnaire and categorized into three levels: **low, moderate, and high motivation**. The descriptive statistics of students' learning motivation are presented in Table 2.

Table 2. Descriptive Statistics of Students' Learning Motivation

Motivation Level	Group	Mean	Minimum	Maximum	SD
Low	Experimental	90.00	86	90	1.38
Low	Control	91.00	80	91	4.12
Moderate	Experimental	101.93	95	108	4.68
Moderate	Control	102.13	96	109	3.48
High	Experimental	123.00	119	129	3.38
High	Control	117.86	115	122	2.73

Based on Table 2, it can be observed that students in the experimental class tended to have slightly higher motivation scores compared to students in the control class. In the high motivation category, the experimental class obtained a mean score of 123, while the control class obtained 117.86.

Although the differences in motivation scores between the two groups were not very large, these results indicate that the blended learning model supported by Google Classroom may contribute to increasing students' engagement during the learning process.

The use of digital learning platforms such as Google Classroom allows students to interact with learning materials in a more flexible and interactive manner. Students can access learning materials at any time, submit assignments, and communicate with teachers and peers through online discussion features. In addition, the platform enables teachers to organize instructional content systematically, distribute assignments efficiently, and facilitate asynchronous learning activities. These features support the development of an engaging learning environment that enhances students' participation and involvement in the learning process (Hrastinski, 2008; Garrison & Vaughan, 2008).

From a pedagogical perspective, the implementation of blended learning in mathematics education provides several advantages. It promotes student-centered learning, fosters independent learning, and allows students to revisit learning materials to strengthen their conceptual understanding. Furthermore, blended learning accommodates diverse learning styles and supports flexible instructional practices, which are essential in mathematics learning (Graham, 2013).

However, the influence of learning motivation on students' mathematics learning outcomes was further examined through hypothesis testing. Based on the results of the two-way ANOVA analysis, the p-value for the interaction between the learning model and learning motivation was 0.848, which is greater than the significance level of 0.05. This indicates that there was no significant interaction

between the blended learning model assisted by Google Classroom and students' learning motivation on mathematics learning outcomes.

Moreover, the analysis revealed that learning motivation did not significantly influence students' mathematics learning outcomes, as indicated by the obtained p-value of 0.625, which is also greater than 0.05. This finding suggests that the effectiveness of the blended learning model is not solely determined by students' motivational levels. One possible explanation is that the structured features provided by Google Classroom such as assignment management, access to learning materials, and online discussions can support students' learning processes regardless of their initial motivation.

The absence of a significant interaction effect may also be attributed to the influence of other factors that play a more dominant role in determining mathematics learning outcomes. These factors include students' prior knowledge, learning strategies, and conceptual understanding. According to constructivist learning theory, prior knowledge plays a crucial role in shaping new understanding, as learners actively construct knowledge based on their existing cognitive structures (Piaget, 1972; Bruner, 1960). In addition, effective learning strategies enable students to process information more efficiently, while strong conceptual understanding supports problem-solving abilities in mathematics.

This finding is in line with previous studies which indicate that mathematics learning outcomes are influenced by multiple factors beyond motivation alone. For instance, Hiebert and Grouws (2007) emphasize the importance of conceptual understanding in mathematics learning, while other studies highlight the role of prior knowledge and cognitive abilities as significant predictors of academic achievement.

Therefore, it can be concluded that although blended learning supported by Google Classroom provides a conducive and flexible learning environment, its effectiveness in improving students' mathematics learning outcomes is influenced by a combination of cognitive, instructional, and individual factors, rather than motivation alone.

These findings suggest that although students in the experimental class obtained higher average learning outcomes, differences in students' motivation levels did not significantly affect their mathematics learning performance. This indicates that motivation alone may not be a determining factor in achieving higher learning outcomes in mathematics.

One possible explanation for this finding is that mathematics learning outcomes are more strongly influenced by students' conceptual understanding, problem-solving abilities, and accuracy in answering questions rather than solely by motivational factors. In this study, students with different levels of motivation appeared to demonstrate relatively similar levels of accuracy in completing the post-test. This result is consistent with previous studies which emphasize that cognitive factors, such as prior knowledge and conceptual understanding, play a more dominant role in mathematics achievement than affective factors alone (Hiebert & Grouws, 2007)

Another possible explanation relates to classroom dynamics during the learning process. Some students were observed to be less active during group discussions or collaborative activities. As a result, the influence of motivation on

learning outcomes may not have been fully reflected in the assessment results. From the perspective of self-regulated learning theory, effective learning outcomes depend not only on motivation but also on students' ability to regulate their learning processes, such as planning, monitoring, and evaluating their understanding (Zimmerman, 2002)

Furthermore, the absence of a significant interaction effect between the learning model and motivation can also be explained through constructivist learning theory, which posits that learning is an active process in which students construct knowledge based on prior experiences (Bruner, 1960, Piaget, 1972). In a blended learning environment, students are provided with opportunities to explore learning materials independently through technology. However, without sufficient prior knowledge or effective learning strategies, the impact of motivation may become less pronounced.

From the perspective of technology-enhanced learning and blended learning theory, the use of digital platforms such as Google Classroom provides structured support that can reduce the dependency on individual motivational differences. As suggested by Garrison and Vaughan (2008) and Graham (2013), blended learning environments integrate online and face-to-face interactions in a way that supports flexibility, accessibility, and continuity of learning (Graham, 2006)

The descriptive analysis of students' learning motivation, which categorized students into high, medium, and low motivation groups, also supports this interpretation. Although variations in motivation levels were identified, these differences were not substantial enough to produce significant differences in learning outcomes. This suggests that other factors, such as instructional design, teacher support, and students' engagement with learning materials, may have played a more critical role in determining learning success.

Despite the absence of interaction effects, the results of this study indicate that the blended learning model assisted by Google Classroom can serve as an effective instructional strategy for improving students' mathematics learning outcomes. This finding is supported by previous research indicating that technology-integrated learning environments can enhance engagement and conceptual understanding (Hrastinski, 2008)

In terms of pedagogical implications, this study highlights the importance of designing blended learning environments that not only support students' motivation but also strengthen their conceptual understanding and learning strategies. Teachers are encouraged to integrate technology in a way that promotes active learning, facilitates meaningful interactions, and supports students' self-regulated learning processes.

Therefore, the implementation of blended learning in mathematics instruction can be considered a promising approach for improving students' learning experiences. The contribution of this study lies in providing empirical evidence that the effectiveness of blended learning is influenced by multiple factors beyond motivation, particularly cognitive and instructional factors. This finding reinforces the need for a more comprehensive approach in mathematics education that integrates motivation, cognition, and technology to optimize learning outcomes.

Conclusion and Suggestion

Based on the results of the study, it can be concluded that the implementation of the blended learning model assisted by Google Classroom showed better mathematics learning outcomes compared to conventional learning. Students who learned using the blended learning approach obtained higher average scores, indicating that the integration of face-to-face learning and online learning platforms can support students' understanding of mathematical concepts.

However, the results of the statistical analysis indicate that learning motivation did not significantly influence students' mathematics learning outcomes, and there was no significant interaction between the learning model and learning motivation. This finding suggests that although the blended learning model can improve students' learning outcomes, the differences in students' motivation levels did not significantly affect their mathematics learning performance in this study.

The implementation of blended learning assisted by Google Classroom provides opportunities for teachers to create more flexible and interactive learning environments. Through digital learning platforms, students can access learning materials more easily, review learning resources outside the classroom, and communicate with teachers more effectively.

Based on these findings, it is recommended that teachers consider implementing blended learning supported by digital learning platforms as an alternative instructional strategy in mathematics learning. Teachers should also design learning activities that encourage active student participation and improve students' engagement during the learning process.

Future researchers are also encouraged to conduct further studies with larger sample sizes, longer research durations, and additional variables such as students' digital literacy, learning engagement, and self-regulated learning to obtain a deeper understanding of the effectiveness of blended learning in improving students' mathematics learning outcomes.

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