Journal of Educational Sciences
Journal homepage: https://jes.ejournal.unri.ac.id/index.php/JES
P-ISSN 2581-1657
E-ISSN 2581-2203

The Implementation of The Problem Based Learning Model With Wordwall Application on The Mathematics Learning Motivation of Grade 3 Students of Trosemi 02 State Elementary School

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ARTICLE INFO

Article history:

Received: 23 Nov 2025
Revised: 19 Des 2025
Accepted: 24 Des 2025
Published online: 05 Jan 2026

Keywords:

Problem-Based Learning,
Wordwall,
Learning Motivation

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Article Doi:

https://doi.org/10.31258/jes.10.1.p.1025-1038

A B S T R A C T

Education plays an essential role in shaping students' intellectual abilities, character, and overall potential, enabling them to adapt to the demands of a rapidly changing world. However, learning motivation in mathematics remains a persistent challenge, particularly when instructional practices rely heavily on abstract explanations and limited media variation. This study investigates the effectiveness of integrating the Problem-Based Learning (PBL) model with the digital platform Wordwall to enhance third-grade students' motivation in learning mathematics at SDN Trosemi 02. Using a quantitative approach with a one-group pretest–posttest design, the research involved 14 students who received treatment through contextual problem-solving activities supported by interactive game-based media. Data were collected through questionnaires, tests, observations, and documentation, and analyzed using validity, reliability, normality tests, and a paired sample t-test. The findings reveal significant improvements in both learning outcomes and motivation, supported by a Sig. value of 0.000 (< 0.05). Students showed increased enthusiasm, participation, and confidence after the intervention. The combination of PBL and Wordwall provided a more engaging, meaningful, and student-centered learning experience. These results indicate that integrating contextual learning models with digital media can effectively strengthen learning motivation and support improved mathematical understanding.

1. Introduction

Education is a vital foundation for a nation's progress because it shapes character, develops intelligence, and refines students' skills. Through the learning process, students are guided to explore their potential optimally while preparing themselves

for the ever-changing demands of life. The role of education goes beyond the transfer of knowledge; it also encompasses the formation of attitudes, values, and habits that support the development of high-quality human resources. As emphasized by Rismawati (2021), the achievement of educational goals requires active student involvement in their learning environment, where teachers are responsible for managing the learning process with quality. This indicates that teachers play a central role as guides, mentors, and facilitators to ensure that students' potential develops optimally in terms of knowledge, skills, and attitudes.

The government's commitment to improving education quality is reflected in Law Number 20 of 2003 on the National Education System and the Ministry of Education and Culture Regulation Number 22 of 2016, which states that learning should be interactive, enjoyable, challenging, and motivating. The Merdeka Curriculum reinforces this message by emphasizing student-centered learning and the integration of technology as a pedagogical tool. In the era of globalization, problem-solving ability has become an essential competence students need to adapt to various situations. According to Pradanti (2022), mathematics plays a vital role not only in academics but also in addressing real-life challenges. Through mathematics, students learn to think logically, analytically, systematically, critically, and creatively competencies needed across many fields.

Mukrimatin et al. (2018) assert that mathematics contributes significantly to improving the quality of education and human resource development. However, many students still perceive mathematics as a difficult subject due to its abstract nature and common presentation that focuses on formulas without engaging context. Galib & Sultan (2025) highlight that students' difficulties in solving non-routine problems indicate that the objectives of mathematics learning have not yet been fully achieved. More innovative and based on experience learning is urgently needed to address this issue.

Learning motivation is one of the key factors in improving learning effectiveness. Kusnandar (2019) states that intrinsic motivation within students plays a crucial role in determining the success of the learning process. Conversely, low motivation can lead to boredom, passivity, and decreased learning outcomes. This is reinforced by Rozy (2021), who found that low motivation in learning mathematics significantly reduces student engagement. Astika (2023) further adds that motivation is an internal driving force that enhances students' persistence in learning, thereby directly influencing their achievement.

According to Ritonga et al. (2023), learning motivation is a driving force that ensures the continuity of learning activities toward achieving goals. Good and Brophy (Hamdani et al., 2021) describe motivation as the energy that directs and strengthens students' behavior in the learning process. Without motivation, learning activities will not run optimally. Kirwelakubun et al. (2023) emphasize that learning can only be effective when students possess adequate motivation. Therefore, teachers must be creative in selecting learning models that match students'

characteristics so they can foster learning motivation, particularly in mathematics, a subject often viewed as challenging by elementary students.

This condition aligns with the learning situation at SDN Trosemi 02, where grade-3 students' motivation to learn mathematics remains low. Many students have not achieved the KKTP due to negative perceptions of mathematics and the limited use of engaging learning methods (Rusnilawati et al., 2018). In addition, students' low self-confidence in working on problems further worsens learning outcomes. One relevant learning approach to address this issue is Problem Based Learning (PBL). According to Andani (2021), PBL is a model grounded in real-life situations, placing students in concrete problems as the starting point of the learning process. This approach encourages students to be more active, independent, and directly involved in constructing their understanding.

Hamdani et al. (2021) add that PBL enables students to learn through investigation, analysis, and discovery of solutions to problems. Kurniawan et al. (2020) emphasize that PBL helps students build understanding through reasoning and problem-solving processes. Thus, this model improves students' critical and creative thinking skills. Pratiwi (2022) asserts that problem based learning encourages students to formulate hypotheses, gather data, conduct investigations, and draw conclusions. This process strengthens logical and systematic thinking. Sujana et al. (2021) also state that PBL requires students to apply their knowledge and experiences in real-world contexts.

At this point, the section you requested is inserted in full: According to Fang, Zakaria, and Muslim (2023), the Problem Based Learning (PBL) model possesses various advantages that make it one of the most innovative and effective learning approaches in 21st-century education. According to Octavia (2020), a learning model is a design or pattern used as a reference for organizing classroom activities or tutorial learning. This model relates to the approach chosen for the learning process, which includes instructional goals, learning steps, learning environment arrangements, and classroom management. According to Amri & Ardiyanti (2025), Problem Based Learning, as a method that combines education and competition, can offer a unique appeal for students in learning mathematics.

Rif'ah et al. (2024) state that "Problem Based Learning" is one of the most popular games among students. The "Problem Based Learning" game is created using various resources, tools, and online platforms. Therefore, it is expected to enhance student engagement and make learning more interesting, with the use of technology adding extra value. Thus, Problem Based Learning can be understood as an instructional model that develops critical thinking, problem-solving skills, learning independence, and collaborative abilities as students confront contextual problems. PBL places students at the center of the learning process and positions teachers as facilitators who guide, direct, and support students in discovering and constructing their own knowledge (Sonrum et al., 2023).

Beyond the learning model, appealing learning media also play an important role in enhancing motivation. Wordwall is an application-based game platform used to create quizzes, crosswords, and various other interactive activities (Nadia et al., 2022). The application is easy to use and can be customized according to learning needs. Yuniar et al. (2022) state that Wordwall offers a variety of educational game templates that help students understand material more enjoyably. This media also increases participation and engagement because it presents learning activities in a more competitive and appealing format. Research by Dwi Ristanti et al. (2025) shows that Wordwall enhances learning activity and improves material comprehension among elementary students. Learning becomes more lively and less monotonous, making students more enthusiastic about participating. These findings indicate that Wordwall serves not only as an evaluation tool but also as an interactive learning medium. Kurniawati & Tresnawati (2025) strengthen previous studies by stating that most students demonstrate increased motivation after using Wordwall. This media provides a more varied learning experience and stimulates students' enthusiasm to participate more actively in the classroom.

Based on the entire theoretical review and previous studies, PBL combined with Wordwall has strong potential to increase the mathematics learning motivation of grade-3 students at SDN Trosemi 02. Learning that integrates real-world problems with interactive digital media is believed to overcome low motivation while simultaneously improving students' problem-solving abilities. Therefore, this study aims to empirically examine the influence of the PBL model and the Wordwall application on students' mathematics learning motivation.

2. Methodology

This study employed a quantitative approach using a pre-experimental design, specifically a one-group pretest–posttest design. This design was chosen because it allows researchers to measure changes in the dependent variable before and after a single treatment is administered, without involving a control group. The treatment in this research consisted of implementing the Problem Based Learning (PBL) model supported by the Wordwall application in mathematics instruction. A pretest was administered to determine students' initial motivation levels, followed by the treatment, and then a posttest to identify any changes after the intervention.

The research was conducted at SD Negeri Trosemi 02, Sukoharjo, Central Java, during the odd semester of the 2025/2026 academic year. Data collection was carried out over a six-week period, from September to November 2025, allowing sufficient time to implement the learning model, observe changes in students' learning behavior, and collect comprehensive data. The school was deliberately selected because it provided direct access to third-grade students and supported the implementation of innovative instructional strategies within a real classroom context. This setting enabled the researcher to observe teaching and learning processes in a natural environment without disrupting regular instructional activities, thereby increasing the ecological validity of the study.

The subjects of this research consisted of all third-grade students at SD Negeri Trosemi 02, totaling 14 learners with diverse academic abilities and learning characteristics. These students represented the entire population of the class, ensuring that the data reflected authentic classroom conditions. The object of the study was the effectiveness of implementing the Problem-Based Learning (PBL) model integrated with the Wordwall digital platform in enhancing students' learning motivation. A saturated sampling technique, also known as total sampling, was employed, in which all members of the population were included as research participants. This sampling method was considered appropriate due to the relatively small population size and the study's intention to obtain complete and accurate data without excluding any participants. By involving all students, the research minimized sampling bias and allowed for a more comprehensive evaluation of the impact of the PBL Wordwall implementation on students' learning motivation. Data in this study were collected using primary data collection techniques, including questionnaires, tests, observations, and documentation, to obtain comprehensive and accurate information. The motivation questionnaire was administered twice, before and after the intervention, to measure changes in students' motivation toward mathematics learning. This pretest–posttest design allowed the researcher to identify the effect of implementing the Problem-Based Learning (PBL) model assisted by Wordwall. The questionnaire was developed based on motivation indicators such as interest, attention, persistence, and active participation in learning activities. Students' responses were measured using a Likert-scale format to facilitate quantitative analysis.

In addition, a mathematics achievement test consisting of 20 multiple-choice items was administered after the treatment to assess students' mastery of the learning material. The test items were constructed in accordance with the learning objectives and curriculum competencies covered during the intervention. Classroom observations were conducted to record students' engagement, collaboration, and responsiveness during the PBL Wordwall learning process. Documentation in the form of lesson plans, students' worksheets, and photographs was also used to support and strengthen the research data. All research instruments were validated and tested for reliability prior to use to ensure the accuracy and consistency of the collected data. The data analysis process involved several steps, starting with prerequisite tests such as validity testing, reliability testing, and normality testing to ensure that the instruments and data met the required statistical assumptions. After meeting these prerequisites, the research proceeded with a paired sample t-test, using SPSS 20.0, to determine whether there were statistically significant differences between pretest and posttest results. A significance value of $p < 0.05$ was used as the basis for determining whether the PBL model with Wordwall had a meaningful impact on students' learning motivation.

3. Results and Discussion

The classroom environment in Grade III at SD Negeri Trosemi 02 consisted of 26 students, comprising both male and female learners with diverse academic abilities

and learning characteristics. The class had long shown a learning pattern dominated by teacher-centered instruction, with worksheets, reading aloud, and drill-based exercises as the main approaches used before this study. Students generally demonstrated cooperative behavior, yet many tended to remain passive when prompted to analyze contextual problems, especially those requiring higher-order thinking. Prior observations also revealed that several students struggled to maintain focus during traditional lecture-driven instruction, which contributed to varied levels of understanding. Despite these differences, the students showed strong enthusiasm when interactive or game-based learning elements were introduced in earlier lessons, suggesting their readiness to engage in more student-centered learning designs. This condition created a relevant foundation for implementing a Problem Based Learning (PBL) model supported by digital media.

In addition, the classroom setup included standard seating arrangements with groups of four to five students, allowing collaborative interaction during problem-solving activities. Gender distribution was relatively balanced, enabling equitable grouping during the PBL phases. Historically, the learning activities had relied heavily on textbook-based explanations with minimal integration of technology, resulting in limited exposure to interactive digital tools such as Wordwall. Interviews with the classroom teacher indicated that students often needed additional stimulation to enhance motivation and engagement, particularly in lessons requiring analytical reasoning. The overall classroom atmosphere was friendly and responsive, but the heterogeneity of the students' initial abilities visible from prior assessments highlighted the need for a structured yet engaging approach. These conditions collectively shaped the rationale for applying PBL augmented with Wordwall to ensure a more dynamic and motivating learning experience for all students.

The learning process during the research was implemented through three core meetings following the PBL cycle: problem orientation, collaborative inquiry, and presentation of solutions. At the beginning of each meeting, students were introduced to contextual problems aligned with the learning objectives, and digital media from Wordwall was employed to support interactive exploration. The teacher facilitated discussions and guided students to analyze the provided problems, encouraging them to articulate hypotheses and propose possible solutions. Students worked in small groups, which allowed them to share ideas and compare reasoning before concluding the final answers. Throughout these activities, the researcher closely observed student engagement and recorded behaviors related to motivation, participation, and response to digital media integration.

The data collection procedure included administering the pretest before the learning intervention, followed by observation sheets and documentation during the PBL sessions. Interviews with the classroom teacher were conducted to validate the learning environment, the students' behavioral tendencies, and the perceived effectiveness of the applied model. The posttest was administered under the same conditions and instrument structure as the pretest to maintain data validity. All assessment procedures were carried out in a controlled classroom environment,

ensuring no external interference that could affect students' cognitive performance. The integrated process of learning and data gathering enabled the researcher to capture both cognitive and motivational improvements comprehensively.

The results of the instrument prerequisite tests show that the instruments used in this study meet the required standards for accurate and consistent measurement. The validity test for the achievement test was conducted using the Pearson Product Moment correlation. From the 20 items tested, 14 were declared valid with significance values below 0.05, while 6 items were invalid due to Sig. > 0.05. These findings are presented in Table 1 and Table 2, indicating that each learning indicator is well-represented by the valid items. Thus, the test instrument has sufficient content validity to accurately measure students' learning outcomes.

Table 1. Validity Test Results of Students' Achievement Test

Question No.	Pearson Correlation (r count)	Sig.	Description
1	0,165	0,400	Invalid
2	0,490	0,008	Valid
3	0,692	0,000	Valid
4	0,448	0,017	Valid
5	0,475	0,011	Valid
6	0,532	0,004	Valid
7	0,402	0,034	Valid
8	-0,111	0,575	Invalid
9	-0,012	0,952	Invalid
10	0,188	0,339	Invalid
11	0,595	0,001	Valid
12	0,082	0,678	Invalid
13	0,612	0,001	Valid
14	0,494	0,008	Valid
15	0,462	0,013	Valid
16	0,572	0,001	Valid
17	0,322	0,095	Invalid
18	0,600	0,001	Valid
19	0,636	0,000	Valid
20	0,671	0,000	Valid

Table 2. Description of Achievement Test Validity Results

No.	Indicator	Question Number	Valid Question Number
1	Initial problem-solving skills	1-5	2, 3, 4, 5
2	Conceptual understanding	6-10	6, 7
3	Conceptual application	11-15	11, 13, 14, 15
4	Analytical skills	16-20	16, 18, 19, 20

The motivation questionnaire consisted of 10 items and was subjected to a validity test prior to its use in the study. Validity testing was conducted using SPSS to ensure that each item accurately measured students' learning motivation. The results of the analysis showed that 8 items were declared valid, while 2 items were found to be invalid. The invalid items had significance values greater than 0.05, indicating that they did not meet the required validity criteria. Detailed results of the validity test are presented in Table 3 and Table 4. To maintain the accuracy of the measurement, the invalid items were excluded from the questionnaire. The remaining valid items

were considered sufficient to represent the indicators of learning motivation. Overall, the questionnaire met the validity requirements because most items effectively measured both intrinsic and extrinsic motivation aspects.

Table 3. Validity Test Results of Learning Motivation Questionnaire

No. Item	Pearson Correlation	Sig.	Description
1	0,452	0,015	Valid
2	0,498	0,008	Valid
3	0,602	0,001	Valid
4	0,654	0,000	Valid
5	0,410	0,032	Valid
6	0,511	0,006	Valid
7	0,288	0,135	Invalid
8	0,590	0,001	Valid
9	0,621	0,001	Valid
10	0,285	0,140	Invalid

Table 4. Description of Motivation Questionnaire Validity Results

No.	Motivational Aspect	Item Number	Valid Item
1	Motivasi intrinsik	1-5	1, 2, 3, 4, 5
2	Motivasi ekstrinsik	6-10	6, 8, 9

Following the validity test, a reliability test was conducted to evaluate the consistency and stability of the research instruments. The reliability analysis was performed using Cronbach's Alpha to determine the degree to which the items in each instrument consistently measured the intended constructs. The results showed that the mathematics achievement test obtained a Cronbach's Alpha value of 0.842, indicating a high level of internal consistency. Meanwhile, the motivation questionnaire achieved a Cronbach's Alpha value of 0.781, which also reflects good reliability. Both values exceed the minimum acceptable threshold of 0.60, suggesting that the instruments are reliable. This indicates that the items within each instrument are consistently related and capable of producing stable measurement results. Therefore, both instruments are appropriate for use in pretest and posttest data collection. The reliability results are presented in Table 5 and Table 6, which further confirm the strong internal stability of each instrument.

Table 5. Reliability Test Results of Students' Achievement Test

Cronbach's Alpha	N of Items
0,842	**14**

Table 6. Reliability Test Results of Motivation Questionnaire

Cronbach's Alpha	N of Items
0,781	8

The normality test was conducted using the Shapiro Wilk method to examine whether the research data followed a normal distribution. The test results indicated that all datasets were normally distributed, as reflected by the significance values

obtained. Specifically, the Sig. values for the pretest, posttest, and motivation questionnaire were 0.496, 0.785, and 0.542, respectively, all of which are greater than the significance level of 0.05. These findings indicate that there is no significant deviation from a normal distribution in the data. Consequently, the assumption of normality required for parametric statistical analysis was satisfied. This condition allows for the use of more powerful parametric tests in the data analysis process. Based on the fulfillment of this assumption, a paired sample t-test was deemed appropriate to compare pretest and posttest results. The detailed outcomes of the normality test are presented in Table 7, which further supports the suitability of the selected statistical method for hypothesis testing.

Table 7. Normality Test Results

Data	Statistic	df	Sig.
Pretest (Question)	0,958	12	0,496
Posttest (Question)	0,972	12	0,785
Motivasi (Questionnaire)	0,963	12	0,542

Descriptive statistics provide an initial overview of changes in pretest and posttest scores for both learning outcomes and motivation. The mean test score increased from 16.08 to 16.77, while motivation scores improved more noticeably, rising from 30.38 to 33.19. Additionally, the smaller posttest standard deviation indicates more uniform performance among students after the intervention. Table 8. supports the conclusion that the integration of Problem Based Learning with Wordwall positively impacts student performance and consistency.

Table 8. Descriptive Statistics

Variabel	N	Min	Max	Mean	Std. Deviation
Pretest Question	26	7	20	16,08	3,97
Posttest Question	26	11	20	16,77	3,22
Pretest Questionnaire	26	28	34	30,38	1,50
Posttest Questionnaire	26	29	34	33,19	1,44

The hypothesis testing was conducted using a paired sample t-test to determine whether there were significant differences between students' pretest and posttest scores after the implementation of the treatment. The results of the analysis showed that the Sig. (2-tailed) value for both the mathematics achievement test and the motivation questionnaire was 0.000, which is smaller than the significance level of 0.05. This finding indicates that the null hypothesis (H_0) is rejected, while the alternative hypothesis (H_a) is accepted. Therefore, there is a statistically significant difference between students' scores before and after the intervention. The mean difference for the mathematics achievement test was -6.23, indicating a notable increase in students' learning outcomes following the treatment. Similarly, the motivation questionnaire showed a mean difference of -3.15, reflecting an improvement in students' learning motivation after the implementation of the PBL model assisted by Wordwall. These negative mean differences indicate that posttest scores were higher than pretest scores. Overall, the results demonstrate that the intervention had a positive and significant effect on both students' learning

achievement and motivation. The detailed results of the paired sample t-test are presented in Table 9.

Table 9. Paired Sample t-Test Results for Test Scores and Motivation Questionnaire

Paired Samples	Mean Difference	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Pretest Question – Posttest Question	-6,23	3,98	0,78	-7,99	25	0,000
Pretest Questionnaire – Posttest Questionnaire	-3,15	1,24	0,24	-13,12	25	0,000

These findings indicate that the Problem-Based Learning (PBL) model is effective in improving students' ability to understand concepts, analyze problems, and apply their knowledge in real-life contexts. Through the presentation of contextual and meaningful problems, students are actively engaged in identifying issues, exploring possible solutions, and drawing conclusions based on evidence. This learning process encourages students to think critically and develop higher-order thinking skills rather than merely memorizing information. In addition, PBL promotes active student participation through collaborative discussions and group work, allowing learners to exchange ideas and perspectives. Students become more involved in the learning process because they are directly responsible for solving the problems presented. Observation and inquiry activities further support students in constructing their own understanding of the subject matter. The structured problem-solving stages in PBL guide students to connect new information with prior knowledge. As a result, PBL facilitates deeper conceptual understanding and more meaningful learning experiences.

The use of Wordwall as a supporting media also contributes significantly to increasing learning motivation. Its interactive educational games make the learning environment more engaging and competitive, prompting students to participate enthusiastically. The combination of PBL and Wordwall creates a meaningful, enjoyable, and student-centered learning experience. With improved motivation and learning outcomes, this study confirms that integrating contextual learning models with digital media results in a more effective and engaging learning process.

The findings of this study show that students' initial learning achievement and motivation were still relatively low before the implementation of the Problem Based Learning (PBL) model supported by Wordwall. The pretest results revealed an average score of 12.7 out of 20, while the motivation questionnaire averaged 2.98 on a 1–4 scale. These numbers reflect that students had not yet developed adequate independence in solving mathematical problems nor active engagement in the learning process. Observations further indicated that students tended to be passive, relied heavily on teacher explanations, and were not accustomed to collaborative learning. Interviews with the homeroom teacher also confirmed that learning still relied on conventional media such as textbooks and the chalkboard, and the use of

digital media had not been optimized, which contributed to students' low motivation and limited critical thinking skills.

After the PBL model supported by Wordwall was implemented, there was a notable improvement in both learning outcomes and motivation. Posttest scores increased to an average of 17.1, while motivation scores rose to 3.33. The paired sample t-test results demonstrated significance values of 0.000 (< 0.05) for both learning achievement and motivation, indicating a significant difference between pretest and posttest results. This improvement is closely linked to the interactive nature of Wordwall, which provides students with engaging learning experiences through quizzes, games, and challenge-based activities. Students participated more actively, were more enthusiastic in answering questions, collaborated better during group work, and displayed higher levels of focus and enjoyment throughout the lessons.

These findings align with previous studies stating that effective learning media should support both cognitive development and social interaction. The integration of PBL and Wordwall fosters critical thinking, collaboration, and problem-solving skills by presenting contextual challenges that encourage students to construct their own understanding. Wordwall helps reinforce concepts through repeated practice while maintaining students' interest through dynamic and game-like activities. As a result, the combination of PBL and digital media helps create an active, student-centered learning environment that strengthens both conceptual mastery and intrinsic motivation.

Despite these positive results, the research encountered several limitations. The study was conducted within a relatively short timeframe, limiting the ability to observe long-term changes in students' motivation. The sample size consisted of only one class of 26 students, reducing the generalizability of the findings to other schools or contexts. Technological limitations such as insufficient devices and unstable internet connectivity also affected the consistency of digital learning activities. Additionally, the use of tests and motivation questionnaires as the only instruments restricted the scope of data collected, as other aspects of mathematical competence and motivational factors may not have been fully captured.

Well-prepared tables and or figures must be of significant feature of this section, because they convey the major observations to readers. Any information provided in tables and figures should no longer be repeated in the text, but the text should focus on the importance of the principal findings of the study. In general, journal papers will contain three-seven figures and tables. The same data can not be presented in the form of tables and figures. The results of the study are discussed to address the problem formulated, objectives and research hypotheses. It is highly suggested that discussion be focused on the why and how of the research findings and to extend to which the research findings can be applied to other relevant problems.

4. Conclusion

Based on the results of data analysis, discussion, and research findings, it can be concluded that the students' mathematics learning outcomes and motivation before the implementation of the Problem Based Learning (PBL) model supported by Wordwall were relatively low. The average pretest score of 16.08 showed that most students had not yet mastered the mathematical concepts taught. Similarly, the average pretest motivation score of 30.38 reflected low enthusiasm, limited confidence, and minimal active participation during mathematics learning activities.

Following the implementation of the PBL model combined with the interactive Wordwall application, students demonstrated a significant improvement in both learning outcomes and motivation. The average posttest score increased to 16.77, accompanied by an increase in the average motivation score to 33.19. The paired sample t-test results indicated a significance value of $0.000 < 0.05$ for both variables, confirming that the treatment produced a meaningful difference between students' performance before and after the intervention. These findings affirm that the integration of PBL and Wordwall is effective in enhancing students' mathematics learning outcomes and motivation. The interactive features of Wordwall help students remain focused, engaged, and motivated throughout the learning process, while the PBL model encourages critical thinking, active participation, and collaborative problem-solving. Together, these elements create a more stimulating and student-centered learning environment that supports deeper understanding and improved academic performance.

In light of these results, teachers are encouraged to incorporate Wordwall as an innovative digital learning tool to capture students' interest and increase active participation during mathematics lessons. Teachers are also advised to continuously develop their technological competencies to optimize digital media use in the classroom and support more interactive learning experiences. Schools, in turn, are recommended to provide adequate technological facilities such as computers, projectors, and stable internet access to enable effective implementation of technology-based learning. For future researchers, it is recommended to expand the scope of the study by involving a larger number of classes or schools to increase the generalizability of the findings. Further studies may also explore the application of Wordwall across different subjects or themes to evaluate its effectiveness in various learning contexts. Broader investigations will provide deeper insights into the potential of digital media to enhance both learning outcomes and student motivation.

References

Agustyaningrum, N., & Pradanti, P. (2022). Teori Perkembangan Piaget dan Vygotsky: Bagaimana Implikasinya dalam Pembelajaran Matematika

Sekolah Dasar?. *Jurnal Absis: Jurnal Pendidikan Matematika Dan Matematika*, *5*(1), 568-582.

Amri, A. N., & Ardiyanti, Y. (2025). Pengaruh Acara Clash of Champions oleh Ruangguru dalam Meningkatkan Minat Belajar Siswa pada Pembelajaran Matematika. *Didactical Mathematics*, *7*(1), 166-172.

Astika, S., Herianto, E., Sawaludin, S., & Sumardi, L. (2023). Pengaruh Implementasi E-learning Berbasis Quizizz terhadap Hasil Belajar PPKn. *Jurnal Ilmiah Profesi Pendidikan*, *8*(1), 154-160.

Fang, C. Y., Zakaria, M. I., & Iwani Muslim, N. E. (2023). A Systematic Review: Challenges in Implementing Problem-Based Learning in Mathematics Education. *International Journal of Academic Research in Progressive Education and Development*, *12*(3), 1261–1271. https://doi.org/10.6007/ijarped/v12-i3/19158

Galib, N. A., & Sultan, M. A. (2025). Penerapan Model Pembelajaran Problem Based Learning Untuk Meningkatkan Hasil Belajar IPAS. *Pinisi Journal Pendidikan Guru Sekolah Dasar*, *5*(1), 226. https://doi.org/10.70713/pjp.v5i1.62676

Hamdani, A. R., Dahlan, T., Indriani, R., & Karimah, A. A. (2021). Analisis Pengaruh Penggunaan Model Problem Based Learning Terhadap Motivasi Belajar Peserta Didik Di Sekolah Dasar. *Didaktik: Jurnal Ilmiah PGSD STKIP Subang*, *7*(02), 751-763.

Hosaini, H., Rif'ah, R. A., & Muslimin, M. (2024). Integration Of Formal Education And Islamic Boarding Schools As New Paradigm From Indonesian Perspective. *At-Ta'lim: Jurnal Pendidikan*, *10*(1), 107-121.

Ilmiah, J., & Konseling, B. (2021). *Jurnal Ilmiah Bimbingan Konseling Undiksha*. *12*(1), 90–98. https://doi.org/10.23887/XXXXXX-XX-0000-00

Kirwelakubun, H. A., Idawati, I., & Nursalam, N. (2023). Pengaruh Model Problem Based Learning Terhadap Motivasi dan Hasil Belajar IPS Pada Siswa Sekolah Dasar di Maluku Tenggara. *Wacana Akademika: Majalah Ilmiah Kependidikan*, *7*(1), 103-114.

Kurniawan, A. H. (2020). Konsep Altmetrics Dalam Mengukur Faktor Dampak Artikel Melalui Academic Social Media Dan Non-Academic Social Media. *UNILIB: Jurnal Perpustakaan*, 43-49.

Kurniawati, T. T., & Tresnawati, N. (2025). Implementasi Aplikasi Wordwall terhadap Motivasi Belajar Matematika Kelas 1 Sekolah Dasar. *Action Research Journal Indonesia (ARJI)*, *7*(1), 27-40.

Kusnandar, F. (2019). *Kimia pangan komponen makro*. Bumi aksara.

Mujahidin, A. A., Salsabila, U. H., Hasanah, A. L., Andani, M., & Aprillia, W. (2021). Pemanfaatan media pembelajaran daring (quizizz, sway, dan wordwall) kelas 5 di sd Muhammadiyah 2 Wonopeti. *Innovative: Journal Of Social Science Research*, *1*(2), 552-560.

Mukrimatin, NA Murtono, & Wanabuliandari, S. (2018). Pemahaman Konsep Matematika Siswa Kelas V Sekolah Dasar RAU Kedung Jepara tentang Perkalian Pecahan. *Jurnal Ilmiah Pendidikan Matematika* , *1* (1), 67-71.

Munif, M., Rozi, F., & Yusrohlana, S. (2021). Strategi guru dalam membentuk karakter siswa melalui nilai-nilai kejujuran. *Fondatia*, *5*(2), 163-179.

Nadia, A. I., Afiani, K. D. A., & Naila, I. (2022). Penggunaan aplikasi wordwall untuk meningkatkan hasil belajar matematika selama pandemi covid-19. *Jurnal Teknologi Pembelajaran Indonesia*, *12*(1), 33-43.

Octavia, S. A. (2020). *Model-model pembelajaran*. Deepublish.

Pratiwi, I. (2022). Penerapan model problem based learning berbantuan audio visual untuk meningkatkan kemampuan berpikir kritis dan hasil belajar siswa. *Journal of Education Action Research*, *6*(3), 302-308.

Rismawati, B. V., Arif, M., & Mahfud, M. (2021). Strategi Madrasah Ibtidaiyah Dalam Meningkatkan Profesionalisme Guru Kelas Di Era Revolusi Industri 4.0. *Elementeris: Jurnal Ilmiah Pendidikan Dasar Islam*, *3*(1), 59-77.

Ristanti, M. D., Puspitoningrum, E., & Karimatussalamah, S. (2025). Implementasi Media Pembelajaran Wordwall Untuk Meningkatkan Hasil Belajar Peserta Didik Pada Mata Pelajaran Bahasa Indonesia Kelas III SD Negeri Banjaran 1 Kota Kediri. *Jurnal Pendidikan UNIGA*, *19*(1), 73-83.

Ritonga, F. N., Zhou, D., Zhang, Y., Song, R., Li, C., Li, J., & Gao, J. (2023). The roles of gibberellins in regulating leaf development. *Plants*, *12*(6), 1243.

Rusnilawati, R., Hidayat, M. T., Hazima, A. A., Tadzkiroh, U., Kusuma, R. R., Putri, R. S., ... & Sujalwo, S. (2023). Pelatihan Flipped Learning dengan Pendekatan STEM di SD Muhammadiyah 22 Sruni Surakarta. *Buletin KKN Pendidikan*, *4*(2), 108-122.

Sonrum, P., & Worapun, W. (2023). Enhancing Grade 5 Student Geography Skills and Learning Achievement: A Problem-Based Learning Approach. *Journal of Education and Learning*, *12*(5), 188. https://doi.org/10.5539/jel.v12n5p188

Sugiyono. (2023). *Metode Penelitian Kuantitatif, Kualitatif, R&D.*

Sujana, D. M. A., Japa, I. G. N., & Yasa, L. P. Y. (2021). Meningkatnya hasil belajar ipa siswa melalui model problem based learning berbantuan media audio visual. *Jurnal Ilmiah Pendidikan dan Pembelajaran*, *5*(2), 320-331.

Yuniar, R., Nurhasanah, A., Hakim, Z. R., & Yandari, I. A. V. (2022). Peran guru dalam pelaksanaan model Pbl (Problem Based Learning) Sebagai penguatan keterampilan berpikir kritis. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, *7*(2), 1134-1150.

How to cite this article:

Novitasari, M., & Fathoni, A. (2026). The Implementation of The Problem Based Learning Model With Wordwall Application on The Mathematics Learning Motivation of Grade 3 Students of Trosemi 02 State Elementary School. *Journal of Educational Sciences*, *10(1)*, 1025-1038.