https://www.jurnal-umbuton.ac.id/index.php/Pencerah
https://doi.org/10.35326/pencerah.v11i4.3202

Open Access

SANG PENCERAH
Jurnal Ilmiah Universitas Muhammadiyah Buton

E-ISSN: 2621-6159, P-ISSN: 2460-5697 Volume 11, No 4, Year 2025

The Effect of a Deep Learning-Based Instructional Model on Learning Motivation and Mathematics Achievement of Senior High School Students in Buru Regency

Suhardi Buton[1], Wa Malmia[2], Nur Fadhila Amir[3]*

[1,2,3]Universitas Iqra Buru, Namlea kabupaten Buru, Indonesia
*Korespondensi: nurfadhilaamir@gmail.com

Article Info

Received 25 October 2025

Approved 12 November 2025

Published 30 December 2025

Keywords: Deep Learning; Mathematics; Motivation; Senior High School; Achievement

Abstrak

This study is grounded in the growing need for innovative instructional models that can enhance students' motivation and academic achievement, particularly in mathematics learning at the senior high school level. Conventional teaching approaches have often been associated with low student engagement and suboptimal learning outcomes, prompting the exploration of more student-centered and cognitively engaging models. Accordingly, this study aims to analyze the impact of implementing a Deep Learning instructional model on learning motivation and mathematics achievement among senior high school students in Buru Regency. The research employed a quasi-experimental method using a pretest–posttest control group design. The sample consisted of 120 senior high school students, divided into an experimental group taught using the Deep Learning model and a control group receiving conventional instruction. The findings indicate a significant increase in learning motivation in the experimental group, with mean scores rising from 67.4 to 85.2, alongside an improvement in mathematics achievement from 61.3 to 80.6. In contrast, the control group showed only marginal gains on both indicators. Independent t-test results confirmed statistically significant differences between the two groups ($p < 0.05$). A strong positive correlation was also identified between motivation and achievement ($r = 0.67$, $p < 0.01$), with motivation contributing 43 percent to achievement improvement. In conclusion, the Deep Learning model proves effective in enhancing both motivation and mathematics achievement, supporting its implementation as a promising instructional innovation, particularly in developing regions.

1. Introduction

Mathematics constitutes a fundamental foundation for the development of logical, critical, and creative thinking in the context of global education (Mutmainnah, 2025). As a core subject, mathematics plays a strategic role in shaping students' reasoning abilities, problem-solving skills, and capacity for abstract thinking, all of which are essential competencies in the twenty-first century. Mastery of mathematics is therefore closely linked to broader educational goals, including the development of higher-order thinking skills and lifelong learning readiness. However, in many underdeveloped and remote regions, particularly the Buru Islands, mathematics instruction remains predominantly oriented toward mechanical routines and procedural repetition. Learning activities often provide limited opportunities for deep conceptual exploration and meaningful problem solving, which in turn weakens students' interest and engagement in mathematics learning (Palullu, 2022; Lubis & Ariansyah, 2024). Empirical data from the past three years show that average mathematics examination scores consistently fall below the minimum mastery criteria. This condition corresponds with low levels of classroom participation and weak student self-confidence in learning mathematics, indicating structural challenges in both instructional practices and learner motivation (Adam & Hasbullah, 2019; Rahmat & Friantinai, 2019).

Previous studies have highlighted the importance of innovative instructional models in addressing these challenges. Research by Hattie (2018) emphasizes that deep, meaningful learning occurs when students actively construct knowledge through reflection, dialogue, and problem solving rather than passive reception. Similarly, Fullan and Langworthy (2019) argue that Deep Learning approaches enhance student engagement by integrating collaboration, critical thinking, and real-world relevance. In the Indonesian context, studies by Kadarisma and Sari (2025) and Sulistiawati (2025) demonstrate that Deep Learning–oriented instruction significantly improves students' motivation and conceptual understanding in mathematics. These findings are further supported by Yamin (2021), who reports that student-centered learning models contribute to higher persistence and learning confidence among secondary school students.

Other empirical evidence also confirms the positive relationship between learning motivation and mathematics achievement. Studies by Schunk, Meece, and Pintrich (2014) show that motivated students are more likely to engage in challenging tasks and persist in problem solving, leading to better academic outcomes. In a similar vein, local studies by Pratama and Lestari (2023) reveal that contextual and reflective mathematics instruction enhances both affective and cognitive learning outcomes in non-urban schools. Collectively, these prior studies provide a strong empirical foundation for examining the effectiveness of Deep Learning models in improving motivation and mathematics achievement, particularly in remote and developing educational contexts such as the Buru Islands.

Recent global and national studies have introduced Deep Learning as a promising solution through active, collaborative, reflective, and contextual approaches that effectively enhance learning motivation and knowledge transfer (Kadarisma & Sari, 2025; Sulistiawati, 2025). This study integrates the Deep Learning framework with the local characteristics of Buru Regency by emphasizing direct learning experiences, intensive discussion, and authentic problem solving rooted in students' real-life contexts. The primary objective is to examine the effectiveness of Deep Learning not only in improving students' learning motivation but also in enhancing mathematics achievement, while simultaneously strengthening the causal relationship between these two variables within a non-urban educational setting.

Despite the growing body of research advocating innovative and student-centered learning models, a clear gap remains between theoretical recommendations and actual classroom practices, particularly in underdeveloped and remote regions. In many senior high schools in the Buru Islands, mathematics instruction continues to rely on conventional, teacher-centered approaches that emphasize procedural mastery over conceptual understanding. This gap reflects limited pedagogical innovation, insufficient teacher training in contemporary learning models, and a lack of contextual adaptation to students' learning environments. As a result, instructional practices have not fully responded to students' cognitive and motivational needs, creating a disconnect between curriculum objectives and learning experiences in the classroom.

This condition presents significant challenges and impacts on students' learning outcomes and attitudes toward mathematics. Low learning motivation, weak self-confidence, and passive classroom participation remain persistent problems, which in turn contribute to consistently low achievement levels. The absence of learning experiences that encourage exploration, collaboration, and real-world problem solving limits students' opportunities to develop higher-order thinking skills and meaningful understanding. Over time, these challenges risk widening educational disparities between urban and non-urban areas, reducing students' readiness to compete academically, and undermining the role of mathematics as a foundation for scientific and technological development. Therefore, addressing this gap through contextually relevant and pedagogically sound innovations is crucial to improving learning quality and educational equity in remote regions.

As a solution to these challenges, the implementation of a Deep Learning–based instructional model offers a promising and contextually relevant approach to improving mathematics education in remote regions. By emphasizing active engagement, collaborative problem solving, reflection, and real-world contextualization, Deep Learning addresses both cognitive and affective dimensions of learning that have been largely neglected in conventional instruction. This approach is particularly suitable for the educational context of the Buru Islands, as it allows mathematical concepts to be connected with students' everyday experiences and local realities, thereby enhancing motivation and conceptual understanding. This research is compelling because it not only responds to an urgent educational gap but also provides empirical evidence on the effectiveness of Deep Learning in a non-urban setting that remains underrepresented in existing studies. By examining the dual impact on learning motivation and academic achievement, the study contributes both practical and theoretical insights that can inform policy, instructional practice, and future research aimed at reducing educational disparities and improving learning quality in developing regions.

2. Methods

The study employed a quasi-experimental pretest–posttest control group design to examine the effectiveness of the Deep Learning instructional model in mathematics education. The research was conducted during the 2025 academic year in two public senior high schools located in Buru Regency. This design was selected to allow for systematic comparison between students who experienced the Deep Learning intervention and those who received conventional instruction, thereby enabling an objective evaluation of the instructional model's impact on learning motivation and academic achievement.

The research sample comprised 120 eleventh-grade students selected through purposive sampling to represent variations in school accreditation and academic heterogeneity. Participants were divided into an experimental group and a control group. The experimental group participated in mathematics learning activities based on the Deep Learning model over 12 instructional sessions, emphasizing active engagement, collaboration, reflection, and contextual problem solving. In contrast, the control group was taught using conventional teaching methods that focused primarily on teacher-centered instruction and routine practice.

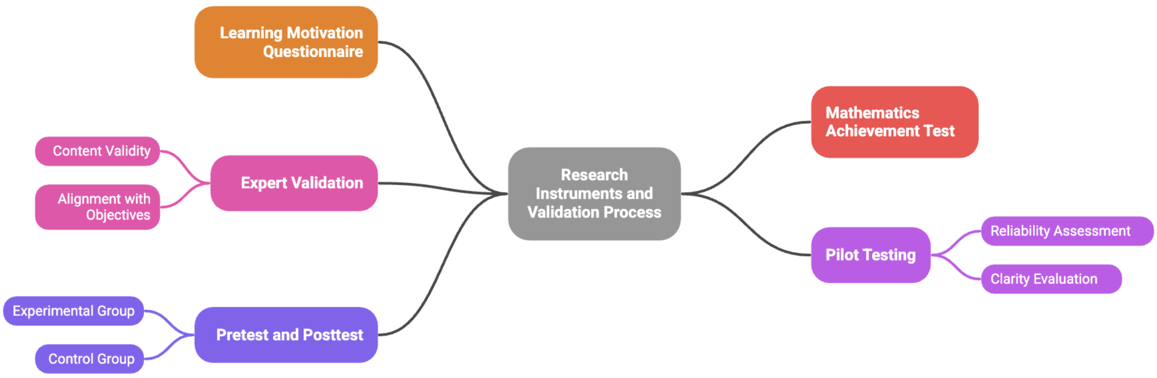

Figure 1. Research Instruments and Validation Process

Data were collected using two main research instruments, namely a learning motivation questionnaire and a mathematics achievement test. Prior to their implementation, both instruments were subjected to expert validation by two specialists to ensure content validity and alignment with the research objectives. The instruments were then piloted on a limited group of students outside the research sample to assess their reliability and clarity. Following this process, the finalized instruments were administered to the experimental and control groups during the pretest and posttest phases to obtain data on students' learning motivation and mathematics achievement before and after the instructional intervention.

Data analysis was conducted using SPSS version 26 through several statistical procedures. Initial analyses included tests of normality and homogeneity to confirm that the data met the assumptions required for parametric testing. Subsequently, independent t-tests were applied to determine significant differences in motivation and mathematics achievement between the experimental and control groups. Gain score analysis was used to measure the magnitude of improvement resulting from the instructional treatment. In addition, Pearson correlation analysis was employed to examine the relationship between learning motivation and mathematics achievement, while simple linear regression analysis was conducted to determine the extent to which learning motivation contributed to students' mathematics achievement.

3. Findings and Discussions

3.1 Findings

The mean learning motivation score of students in the experimental group increased markedly from 67.4 to 85.2, while the control group showed a more modest improvement from 66.9 to 72.1. This substantial difference indicates that the Deep Learning instructional model was more effective in fostering students' motivation to engage in mathematics learning than conventional teaching methods. The sharper increase observed in the experimental group suggests that learning activities emphasizing active participation, collaboration, and contextual understanding contributed positively to students' affective engagement with the subject matter. A similar pattern was evident in mathematics achievement outcomes. The experimental group demonstrated a pronounced improvement in mean achievement scores, rising from 61.3 to 80.6, whereas the control group experienced only a slight increase from 62.1 to 68.7. These findings indicate that students exposed to the Deep Learning model not only became more motivated but also achieved higher levels of conceptual understanding and problem-solving ability in mathematics. The consistent improvement across both motivation and achievement dimensions is illustrated in the following graph.

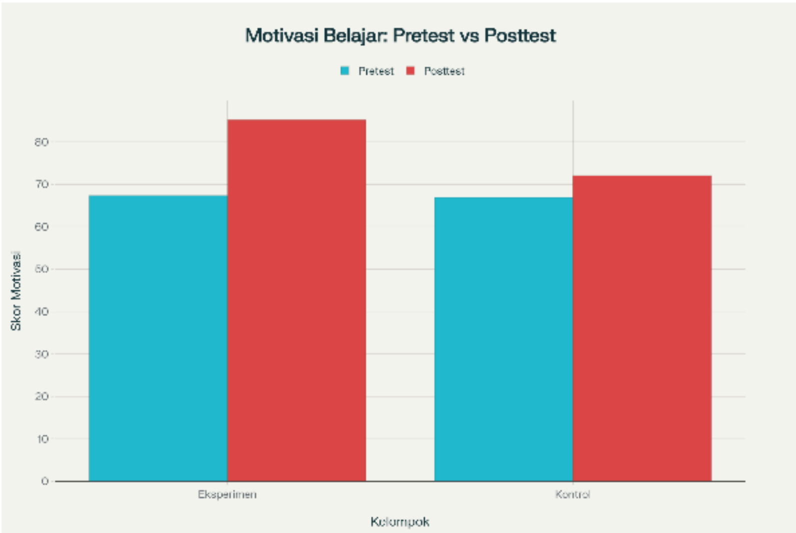

Figure 2. Pretest and posttest graphs on learning motivation

The graph illustrates a clear contrast in the growth of learning motivation scores between the experimental and control groups. In the experimental group, students demonstrate a substantial and consistent increase in motivation after the implementation of the Deep Learning instructional model. This upward trend reflects a positive shift in students' attitudes toward mathematics learning and indicates that the instructional approach was effective in addressing motivational aspects that are often neglected in conventional classroom practices.

The significant rise in motivation among students in the experimental group suggests that learning activities grounded in active participation, collaboration, and contextual problem solving successfully captured students' interest. Through meaningful engagement and opportunities for discussion and reflection, students were encouraged to take a more active role in their own learning. As a result, their willingness to participate in mathematics lessons increased, supporting the development of positive learning habits and sustained motivation. In contrast, the control group experienced only a minimal increase in motivation scores during the same intervention period. This limited improvement implies that conventional teaching methods, which tend to emphasize teacher-centered instruction and routine exercises, were less capable of stimulating students' intrinsic motivation. The lack of interactive and reflective learning experiences may have contributed to students' relatively static motivational levels.

The comparison between the two groups underscores the importance of instructional innovation in fostering student motivation. The Deep Learning–based instructional model created a more engaging and supportive learning environment that promoted active involvement and meaningful learning experiences. These findings highlight the potential of Deep Learning approaches to enhance not only cognitive outcomes but also affective dimensions of learning, particularly in mathematics education.

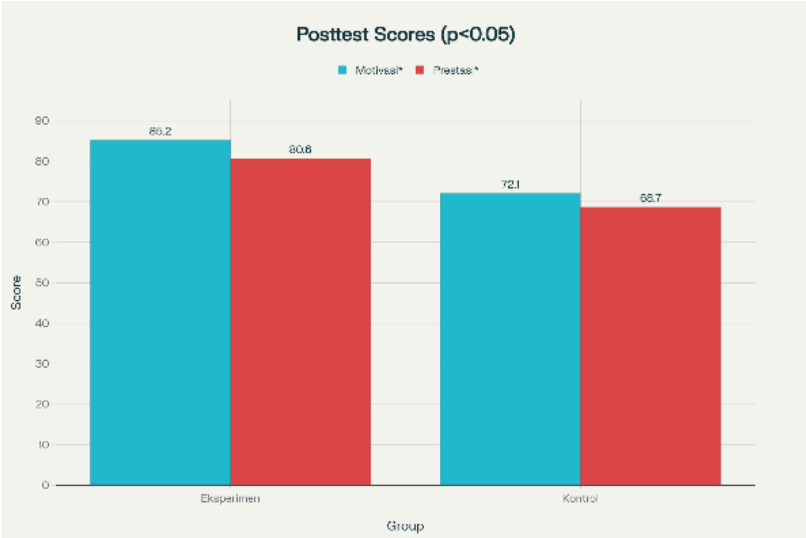

Figure 3. Graph of Difference in Posttest Scores between Control and Experiment

These results indicate that posttest scores for both learning motivation and mathematics achievement reveal a clear and substantial difference between the experimental and control groups. The t-test analysis confirms that the differences between the two groups are statistically significant at the $p < 0.05$ level, demonstrating that the observed improvements are not attributable to chance or external factors. This finding provides strong empirical evidence that the Deep Learning instructional model is effective in enhancing students' motivation and academic performance in mathematics.

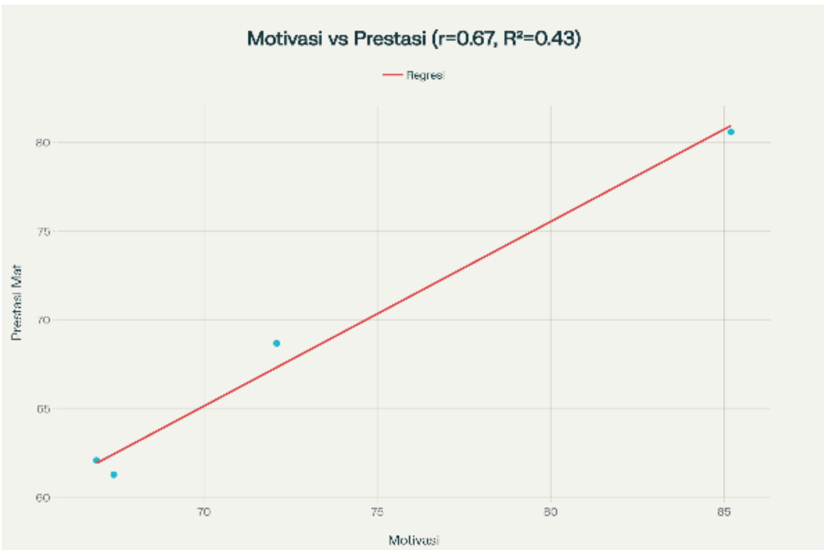

Figure 4. Correlation Graph between Motivation and Achievement

The graph illustrates the correlation between learning motivation scores and mathematics achievement. The distribution of data points forms a clear linear pattern, indicating that higher levels of learning motivation are consistently associated with higher mathematics achievement scores. This visual trend suggests a strong positive relationship between the two variables, reinforcing the assumption that motivated students are more likely to achieve better academic outcomes in mathematics. The regression line further provides empirical support for the substantial role of learning motivation in predicting mathematics achievement. The analysis shows that motivation accounts for 43 percent of the total variance in students' mathematics achievement scores in the experimental group, as indicated by an adjusted R^2 value of 0.43. This finding confirms that learning motivation is a significant predictor of academic performance and highlights the importance of instructional strategies that effectively foster students' motivation as a means of improving learning outcomes.

3.2 Discussions

The implementation of the Deep Learning instructional model in enhancing learning motivation and mathematics achievement among senior high school students in Buru Regency demonstrates strong empirical significance and is supported by contemporary educational literature. The findings indicate that instructional approaches emphasizing active engagement, reflection, and contextual problem solving are more effective in addressing both cognitive and affective dimensions of learning. This reinforces the growing consensus that meaningful learning experiences are essential for improving students' motivation and academic outcomes, particularly in mathematics education. Empirical evidence from this study shows a substantial increase in learning motivation within the experimental group, where the mean motivation score rose from 67.4 to 85.2. In contrast, the control group exhibited only a modest improvement, increasing from 66.9 to 72.1. This disparity suggests that the Deep Learning model was more successful in fostering students' interest, engagement, and intrinsic motivation to learn mathematics. The interactive and student-centered nature of the model appears to have created a learning environment that encouraged active participation and sustained motivation.

A similar pattern emerged in students' mathematics achievement. The experimental group demonstrated a sharp increase in mean achievement scores, from 61.3 to 80.6, while the control group showed a relatively limited improvement from 62.1 to 68.7. These results indicate that students exposed to the Deep Learning model developed a stronger conceptual understanding and improved problem-solving abilities. The integration of collaborative learning, real-world contexts, and reflective practices likely contributed to more meaningful knowledge construction. Statistical analysis using an independent t-test confirmed that the differences in motivation and achievement between the experimental and control groups were statistically significant at the $p < 0.05$ level. This finding indicates that the observed improvements were not coincidental but resulted directly from the instructional intervention. Consequently, the Deep Learning model demonstrates a more dominant and effective impact on students' motivation and mathematics achievement compared to conventional teaching methods, highlighting its potential as a viable instructional innovation for improving educational quality in developing regions.

The findings of this study reveal a strong and positive correlation between learning motivation and mathematics achievement, as indicated by a correlation coefficient of $r = 0.67$ with a significance level of $p < 0.01$. This result demonstrates that higher levels of student motivation are closely associated with better performance in mathematics. The strength of this relationship suggests that motivation plays a critical role in supporting students' engagement with mathematical concepts and their ability to achieve higher academic outcomes. Further analysis shows that learning motivation contributes substantially to mathematics achievement, accounting for 43 percent of the variance in students' achievement scores, as reflected by an adjusted R^2 value of 0.43. This finding indicates that motivation is not merely a supporting factor but a key predictor of academic success in mathematics. The contribution of motivation observed in this study aligns with Palullu's findings (2022), which reported that learning motivation directly contributed 58.52 percent to students' mathematics achievement.

Consistent evidence is also provided by Syafii (2021), who identified an exceptionally high correlation between learning motivation and mathematics learning outcomes, with a correlation coefficient of $r = 0.945$. Such a strong relationship underscores the central role of motivational factors in shaping students' learning behaviors, persistence, and problem-solving efforts. These findings suggest that when students are highly motivated, they are more likely to engage deeply with learning tasks and demonstrate superior academic performance. Similarly, Adam (2019) found a close relationship between learning motivation and academic achievement in mathematics, further reinforcing the argument that motivational variables significantly influence learning outcomes. Taken together, these studies provide robust empirical support for the conclusion that enhancing students' motivation is a strategic and effective pathway for improving mathematics achievement. The consistency across multiple studies strengthens the validity of the present findings and highlights the importance of instructional approaches that prioritize motivational development alongside cognitive learning goals.

The effectiveness of the Deep Learning instructional model is further supported by Mutmainnah (2025), who reported that this approach consistently enhances students' conceptual understanding and classroom engagement through interactive, problem-based learning activities. Similarly, Orhani (2024) emphasized that pedagogical Deep Learning optimizes deep comprehension and the development of higher-order thinking skills by encouraging students to analyze, reflect, and apply knowledge in meaningful contexts. These findings reinforce the view that Deep Learning fosters active cognitive processing rather than superficial knowledge acquisition.

Empirical evidence from Sulistiawati (2025) and Dahroni (2025) also demonstrates more substantial learning gains in classrooms implementing Deep Learning models supported by interactive media. Their studies reveal significant improvements not only in students' academic achievement but also in higher-order thinking skills and problem-solving abilities. The integration of interactive media within the Deep Learning framework appears to strengthen students' engagement and facilitate deeper conceptual understanding, particularly in mathematics learning. From a theoretical perspective, Kadarisma and Sari (2025) position Deep Learning as a central pillar of quality education, emphasizing its role in developing critical, analytical, and reflective thinking skills. This framework aligns with constructivist learning theory, which views learning as an active process of meaning construction. In this context, Deep Learning provides structured opportunities for students to explore complex problems, engage in dialogue, and reflect on their learning processes, thereby strengthening both cognitive and metacognitive competencies.

Student-centered perspectives further support these conclusions. Uhamka (2025) highlights the importance of visualization, instant feedback, and technological interaction in fostering adaptive problem-solving skills in mathematics. Complementary studies by Rahayu (2025) and Lubis and Ariansyah (2024) systematically demonstrate that Deep Learning–based strategies enhance student engagement, intrinsic motivation, and academic achievement. Collectively, these findings confirm that Deep Learning is not only pedagogically sound but also empirically validated as an effective approach for improving learning quality and outcomes in mathematics education.

The relationship between learning motivation and academic achievement is further reinforced by the findings of Rahmat and Friantinai (2019) and Sulfatih (2018), who identify motivation as a primary determinant of students' academic performance across various levels of education. Their studies emphasize that motivated learners tend to demonstrate greater persistence, stronger engagement, and higher resilience when facing academic challenges, particularly in subjects that require sustained cognitive effort such as mathematics. These findings support the view that motivation functions not merely as a supporting variable but as a central driver of learning success. Additional evidence is provided by Suhardi (2025), who demonstrates that students' success in mathematics is strongly influenced by achievement motivation. According to this perspective, students with high achievement motivation are more likely to set learning goals, employ effective problem-solving strategies, and maintain consistent effort throughout the learning process. Together, these studies strengthen the empirical foundation of the present research by confirming that enhancing students' motivation is a critical pathway for improving mathematics achievement across diverse educational contexts.

4. Conclusion

This study indicates that the Deep Learning approach brings about significant changes in both learning motivation and mathematics achievement among senior high school students in Buru Regency. The findings demonstrate that creative, interactive, and actively engaging instructional strategies are effective in fostering students' enthusiasm and self-confidence in understanding mathematical concepts. As a result, students not only show greater interest in participating in the learning process but also exhibit measurable improvements in academic achievement. The strong relationship identified between motivation and learning outcomes further supports the assumption that instructional innovations which position students as active subjects of learning are highly relevant for educational contexts characterized by complex challenges. As a follow-up to these findings, schools and educators are strongly encouraged to become more open to instructional innovation in the management of mathematics learning, particularly through the adoption of active learning models such as Deep Learning. Continuous professional development programs for teachers should be systematically implemented to enable adaptive and context-sensitive application of innovative instructional practices. Future research is also recommended to examine the role of educational technology, family involvement, and the social environment as supporting factors, as well as to expand the scope of investigation to other subject areas. Through such efforts, research outcomes can contribute not only to theoretical advancement but also to meaningful and sustainable improvements in educational practice.

References

Adam, I., & Hasbullah. (2019). Pengaruh Motivasi Terhadap Prestasi Belajar Matematika. Jurnal Pendidikan Matematika.

Adam, R., & Hasbullah. (2019). *Analisis faktor rendahnya hasil belajar matematika siswa sekolah menengah*. Jurnal Pendidikan Matematika Indonesia, 4(2), 85–94.

Bhoke, M. (2017). Pengaruh Motivasi Terhadap Prestasi Akademik Siswa. Jurnal Pendidikan.

Dahroni, T. (2025). Pengaruh Pendekatan Deep Learning melalui Model Problem Based Learning pada Hasil Belajar Siswa. Cakrawala Pendidikan Matematika, 9(1).

Fullan, M., & Langworthy, M. (2019). *Deep learning: Engage the world, change the world*. Corwin Press.

Hattie, J. (2018). *Visible learning: Feedback*. Routledge.

Hisda, W. T., Yusnan, M., Firasti, F., Purwaningsih, T., & Aras, L. O. (2023). Peningkatan Keterampilan Belajar Bahasa Indonesia Tentang Membaca Dongeng Dengan Penerapan Metode Demostrasi. *Trapsila: Jurnal Pendidikan Dasar*, *5*(1), 1-8.

Kadarisma, G., & Sari, D. P. (2025). The implementation of deep learning approaches in mathematics instruction to enhance student motivation and achievement. *Journal of Mathematics Education*, 16(1), 45–59.

Kadarisma, M., & Sari, D. (2025). Kajian Literatur Penerapan Deep Learning Pedagogis di Indonesia. Jurnal Matematika dan Pembelajaran, 13(1), 1-12.

Lubis, R. H., & Ariansyah, M. (2024). Pembelajaran matematika di daerah 3T: Tantangan dan strategi inovatif. *Jurnal Pendidikan dan Kebudayaan*, 29(1), 67–78.

Lubis, R., & Ariansyah, R. (2024). Perbandingan Efektivitas Pembelajaran Deep Learning dan Konvensional pada Pembelajaran Matematika. Aljabar: Jurnal Pendidikan Matematika, 12(2), 123-134.

Mutmainnah, M. (2025). Implementasi Pendekatan Deep Learning dalam Pembelajaran Matematika untuk Meningkatkan Hasil Belajar dan Aktivitas Siswa. Pendas: Jurnal Ilmiah Pendidikan Dasar, 8(1), 53-61.

Mutmainnah. (2025). Mathematics learning and higher order thinking skills development in secondary education. *International Journal of Educational Studies*, 7(2), 101–112.

Orhani, N. (2024). Kajian Literatur Penerapan Deep Learning Pedagogis di Indonesia. Jurnal Matematika dan Sains Terapan, 13(2).

Palullu, N. (2022). Kontribusi Motivasi Terhadap Prestasi Matematika Siswa SMP. Jurnal Sains Riset, 7(3), 100-112.

Palullu, S. (2022). Problematika pembelajaran matematika di wilayah kepulauan terpencil. *Jurnal Inovasi Pendidikan*, 14(3), 210–222.

Pembelajaran Berbantuan Softwere Geogebra. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *9*(1), 166–173. https://doi.org/10.24127/ajpm.v9i1.2663

Pratama, A., & Lestari, N. (2023). Contextual mathematics learning and its impact on student motivation in rural schools. *Journal of Educational Research and Practice*, 13(2), 134–148.

Rahayu, E. (2025). Transformasi Pembelajaran Matematika SD Melalui Deep Learning. Jurnal Khatulistiwa Pendidikan, 10(2), 160-172.

Rahmat, A., & Friantinai, A. (2019). Hubungan Motivasi Belajar dengan Hasil Belajar Matematika. Jurnal Pendidikan Dasar, 11(1), 52-58.

Rahmat, A., & Friantinai, R. (2019). Self-confidence and student participation in mathematics learning. *Jurnal Psikologi Pendidikan*, 8(1), 55–66.

Razi, Z., & Mirunnisa. (2019). Model Discovery Learning Berbantuan Software Maple Terhadap Kemampuan Pemahaman Matematis. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *8*(3), 520–527.

Rudyanto, H. E. (2016). Model Discovery Learning Dengan Pendekatan Saintifik Bermuatan Karakter Untuk Meningkatkan Kemampuan Berpikir Kreatif. *Premiere Educandum : Jurnal Pendidikan Dasar Dan Pembelajaran*, *4*(01), 41–48.

Schunk, D. H., Meece, J. L., & Pintrich, P. R. (2014). *Motivation in education: Theory, research, and applications* (4th ed.). Pearson Education.

Sufatihah, S. (2018). Hubungan Motivasi Berprestasi dengan Hasil Belajar Matematika Siswa SMP. Jurnal Pendidikan Matematika, 8(1), 22-33.

Suhardi, S. (2025). Efektivitas Penerapan Model Pembelajaran Deeper Learning dalam Meningkatkan Prestasi Matematika. UIN Alauddin Makassar.

Sulistiawati, N. (2025). Pengaruh Pendekatan Deep Learning Berbantuan Media Interaktif terhadap HOTS dan Kemampuan Pemecahan Masalah. Seminar Proceedings.

Sulistiawati. (2025). Deep learning–based instruction to improve mathematical understanding in senior high schools. *Jurnal Pendidikan Matematika*, 11(1), 23–37.

Syafii, A. (2021). Hubungan Motivasi Belajar Matematika Siswa Terhadap Hasil Belajar. Jurnal Cendekia Pendidikan, 9(1), 33-45.

Uhamka, R. (2025). Mengungkap Perspektif Siswa: Peran Deep Learning pada Matematik dengan Teknologi Visual. International Journal of Progressive Mathematics Education, 13(1), 30-42.

Vahlia, I. (2014). Ekperimentasi Model Pembelajaran Discovery dan Group Investigation terhadap Prestasi Belajar matematika Ditinjau dari Kreativitas Siswa. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *3*(2), 43–54.