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IMPROVING ELEMENTARY SCHOOL STUDENTS' COUNTING AND READING ABILITY WITH A DEEP LEARNING-BASED MULTISENSORY APPROACH

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ABSTRACT

Kemampuan berhitung dan membaca berperan penting dalam mendukung literasi dan numerasi pada abad ke-21. Berbagai penelitian menunjukkan bahwa kemampuan tersebut masih tergolong rendah sehingga diperlukan inovasi pembelajaran yang mampu meningkatkan keterlibatan dan pemahaman peserta didik. Penelitian ini membuktikan implementasi pendekatan multisensori berbasis deep learning dapat meningkatkan kemampuan berhitung dan membaca peserta didik sekolah dasar. Penelitian kuantitatif dengan desain two-group pretest–posttest. Subjek penelitian terdiri dari 87 siswa kelas III SD Negeri IV Wadas yang terbagi menjadi kelas eksperimen (43 siswa) dan kelas kontrol (44 siswa). Instrumen penelitian terdiri dari 15 soal kemampuan berhitung dan 15 soal kemampuan membaca. Data dikumpulkan melalui pretest dan posttest kemudian dianalisis menggunakan uji statistik dan N-Gain. Hasil penelitian menunjukkan bahwa kedua kelompok mengalami peningkatan kemampuan berhitung dan membaca setelah pembelajaran, namun peningkatan pada kelas eksperimen lebih tinggi dibandingkan kelas kontrol. Nilai N-Gain pada kelas eksperimen mencapai 0,54 (kategori sedang) untuk kemampuan berhitung 0.53 (kategori sedang) untuk memampuan membaca, sedangkan kelas kontrol memperoleh 0,32 dan 0,27 untuk kemampuan berhitung dan membaca. Temuan ini menunjukkan bahwa integrasi pendekatan multisensori berbasis deep learning dalam pembelajaran Problem Based Learning memberikan dampak lebih signifikan terhadap peningkatan kemampuan berhitung dan membaca siswa sekolah dasar.

Keywords:
multisensory; deep learning; numeracy; literacy; elementary school

ABSTRACTS
Numeracy and literacy skills play an important role in supporting literacy and numeracy in the 21st century. Various studies show that these skills are still relatively low, so learning innovations are needed to increase student engagement and understanding. This This study demonstrates that the implementation of a deep learning-based multisensory approach can improve the numeracy and literacy skills of elementary school students. This quantitative study used a two-group pretest-posttest design. The research subjects consisted of 87 third-grade students at SD Negeri IV Wadas, divided into an experimental class (43 students) and a control class (44 students). The research instruments consisted of 15 counting ability questions and 15 reading questions. Data were collected through pretest and posttest and then analyzed using statistical tests and N-Gain. The results showed that both groups experienced an increase in counting ability and reading ability after learning, but the increase in the experimental class was higher than that in the control class. The N-Gain score in the experimental class reached 0.54 (moderate category) for counting ability skills and 0.53 (moderate category) for reading ability, while the control class scored 0.32 and 0.27 for counting ability and reading ability, respectively. These findings indicate that integrating a deep learning-based multisensory approach into Problem Based Learning has a more significant impact on improving the counting ability and reading ability of elementary school students.

A. INTRODUCTION

Numeracy and literacy skills, are basic skills that students must master in the 21st century (Deda et al., 2023). Numeracy skills are related to basic problem-solving skills in everyday life that involve numbers and numeracy (Safitri et al., 2025). A broader meaning of numeracy is also associated with the ability to organize and develop creativity in order to solve problems encountered at each level of education (Saifullah & Novitasari, 2025). Reading ability are the ability to understand texts and give meaning in accordance with the values of life and learning (Ratnaya et al., 2024).

Although numeracy is a basic skill that students must possess, the facts show that there are many difficulties and obstacles encountered in learning numeracy. Research reports show that students' counting ability still tend to be in the low category (Rediani, 2024).Students have difficulty solving problems related to numeracy and designing methods to solve the problems they encounter (Fatimah & Wahyudin, 2025). Students also have difficulty understanding and analyzing the meaning of the questions given, so that the solutions they provide do not match the actual concepts (Nurfarijah & Herman, 2025). Thus, students still have difficulty implementing mathematical concepts in real contexts.

In addition, research has also shown that students' reading ability are low, which has a direct impact on the suboptimal implementation of learning (Khuni Mu et al., 2024). The basic difficulties often experienced by students are recognizing letters and new vocabulary (Sukma et al., 2019). These low reading ability are certainly caused by various factors. For example, students have a low interest in reading, so their skills cannot be developed optimally (Khofifah & Ramadan, 2021). In addition, an environment that does not pay attention to and provide support in literacy is also a factor in low reading ability (Mahrani et al., 2022). Furthermore, basic factors such as cognitive level also contribute to low reading ability in students (Yustisia & Salsabila, 2023).

Various studies have been conducted to improve students' numeracy and literacy skills. The use of PBL has been proven effective in improving counting ability because it uses contextual problems in its implementation so that students gain direct and real experiences (Fadiana et al., 2022). Learning that is linked to real contexts can provide a more meaningful understanding of students' numeracy and literacy skills. Other studies have also shown that learning integrated with adaptive technology also has a positive impact on students' numeracy and literacy skills (Khairah et al., 2025).

Several studies have shown the need for new innovations as methods to improve students' numeracy and literacy skills more optimally. Another promising method is the use of a multisensory approach based on deep learning. The multisensory approach can support learning effectiveness because it actively involves students in every learning process through the five senses. This is also supported by deep learning, which directly focuses on the cognitive and emotional involvement of students in the classroom learning process. Thus, students' understanding structure can be formed more optimally and in accordance with their cognitive development.

Based on the background description above, this study aims to analyze the impact of implementing a deep learning-based multisensory approach on students' numeracy and reading ability at the elementary school level. The findings of this study are expected to provide theoretical and meaningful information regarding the use of multisensory and deep learning approaches in elementary school learning.

B. METHOD

The study used a quantitative approach to examine the impact of implementing a deep learning-based multisensory approach on students' numeracy and reading abilities. The research design referred to a two-group pretest-posttest design that used two different treatment groups. This design compared the average numeracy and reading test scores based on pretest-posttest scores and between the experimental and control classes.

Experiment	**O_1**	**X**	**O_2**
Control	**O_3**	**Y**	**O_4**

Figure 1. Research design

O_1 : pretest experiment
O_2 : posttest experiment
X : treatment experiment
Y : treatment control
O_3 : pretest control
O_4 : posttest control

The research was conducted at SD Negeri IV Wadas to implement numeracy and literacy learning. The research was conducted in experimental and control classes with 43 and 44 students, respectively. The research was conducted from January to February 2026. The research instrument used 30 multiple-choice questions divided into 15 counting ability questions and 15 reading questions. The research instrument met the criteria for validity and was suitable for use as a test instrument and research measurement tool.

The research data was obtained through pre-tests and post-tests in each research class. The pre-test data was obtained before the implementation of learning, and the post-test data was obtained after the implementation of learning. Both classes used the Problem-Based Learning model. The difference between the two was that the experimental class used a deep learning-based multisensory approach, while the control class used the general PBL model without a deep learning-based multisensory approach.

The research data was analyzed using statistical analysis. A prerequisite test was used to test the assumption that the research data must meet the criteria of validity and reliability. The research data was then tested for differences to examine whether there were significant differences between the pretest and posttest scores in the experimental and control classes. Further analysis was conducted using the N Gain test, which aims to explain the extent of the differences and impacts of the treatment in the study.

C. RESULT AND DISCUSSION

Counting Ability Profile

The student numeracy profile contains an overview of numeracy achievement based on pretest and posttest scores. These scores are used as data for further statistical analysis. The student numeracy profile is presented in Figure 2.

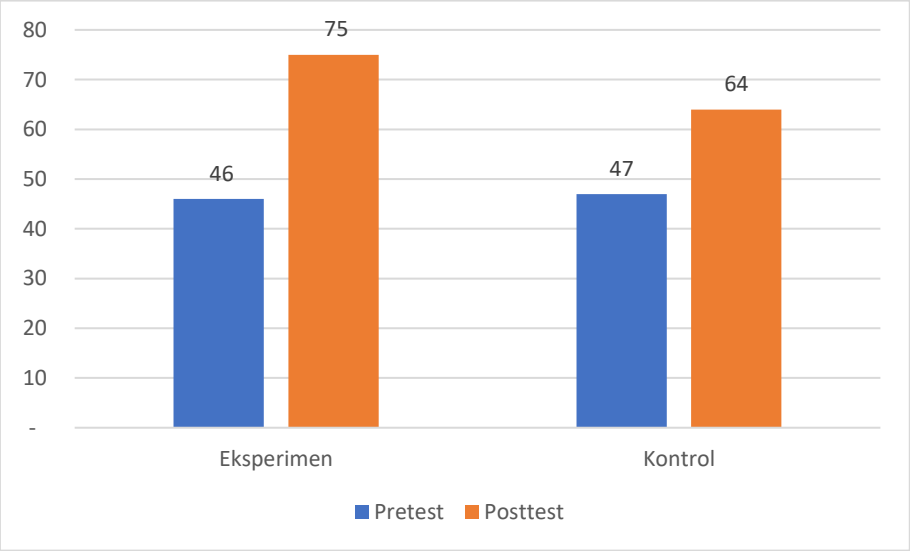


Figure 2. Students' counting ability

Figure 2 shows that there was an increase in the counting ability of students in the experimental and control classes. The initial pretest scores in each class group showed relatively similar results. This indicates that students in both the experimental and control classes had relatively similar and uniform initial abilities. Then, in the post-test data, both classes also showed an increase in counting ability ability, but it can be seen in Figure 2 that the post-test scores in the experimental class were higher than those in the control class. This result is certainly an initial indication that the implementation of a deep learning-based multisensory approach in Problem-Based Learning has a better impact than the Problem-Based Learning model without a deep learning-based multisensory approach.

Reading Ability Profile

The reading ability profile of students provides an overview of their ability to accurately represent and interpret a reading and writing. Students are able to find the main points and topics of a narrative and understand its meaning accurately. The profile of students' reading ability achievements is presented in Figure 3.

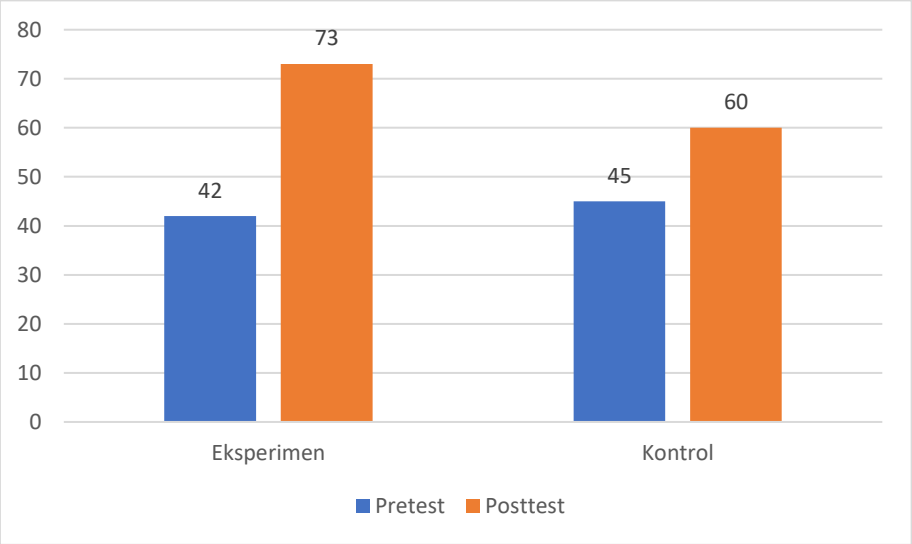


Figure 3. Students' reading ability profile

Figure 3 shows a relatively uniform trend with the achievement of students counting ability have relatively the same initial reading ability between the experimental and control classes. This proves that students have the same initial understanding and that the intervention carried out in the study really had an impact on the students. Both classes (experimental and control) showed an increase in students' reading ability after the implementation of the Problem-Based Learning model, which was complemented by a deep learning-based multisensory approach in the experimental class. This represents the result that students who received learning with a deep learning-based multisensory approach had better final comprehension scores.

Statistical Analysis

Statistical analysis was performed if the research data met the prerequisite analysis test. The initial research data was analyzed to determine the distribution of data obtained from the research results. The analysis results showed that some of the data was not normally distributed, as presented in Table 1.

Table 1. Data normality test results

Data Research	Sig.	Category
Pretest counting ability (experiment)	0.010	not normally
Posttest counting ability (experiment)	0.024	not normally
Pretest reading ability (experiment)	0.003	not normally
Posttest reading ability (experiment)	0.014	not normally
Pretest counting ability (control)	0.002	not normally
Posttest counting ability (control)	0.001	not normally
Pretest reading ability (control)	0.011	not normally
Posttest reading ability (control)	0.001	not normally

The results in Table 1 determine the data analysis to be performed. Table 1 shows that all research data are not normally distributed. Therefore, data analysis was performed using the Wilcoxon test as an alternative.

Table 2. Results of statistical analysis of students' counting and reading ability

Variable	**Data**	**Sig. 2 tailled**	**Interpretation**
counting ability	Pretest-posttest experiment	< 0.001	Significant
	Pretest-posttest control	< 0.001	Significant
reading ability	Pretest-posttest experiment	< 0.001	Significant
	Pretest-control	< 0.001	Significant

Table 2 shows that the pretest and posttest data in the experimental class and control class have statistically significant differences. These results indicate that the treatment in the experimental class and control class had a significant impact on the students' counting ability. Table 2 also shows that the pretest and posttest data in the experimental class and control class have statistically significant differences. These results indicate that the research treatment in both the experimental class and control class had a significant impact on the reading ability of the students.

Further data analysis was conducted using the N-Gain test to examine the extent of the impact and influence of the research treatment on the students' numeracy and reading abilities. The N-Gain test results are presented in Table 4.

Table 3. N-Gain score results

Jenis data	Gain score	Category
Pretest-posttest counting ability (experiment)	0.54	Medium
Pretest-posttest counting ability (control)	0.32	Medium
Pretest-posttest reading ability (experiment)	0.53	Medium
Pretest-posttest reading ability (control)	0.27	Low

The N-Gain test scores show that both the experimental and control classes experienced an increase in numeracy scores in the moderate category. The experimental class obtained a gain score of 0.54 and the control class obtained a gain score of 0.32. Although both were in the moderate category, the experimental class showed a more significant impact because the level of improvement was greater than that of the control class. A similar trend was also shown by the reading ability gain scores in the experimental and control classes. The reading ability gain score of 0.53 in the experimental class in the moderate category and 0.27 in the control class in the low category showed that the experimental class had a better percentage increase than the control class. The overall results of the analysis showed that the implementation of PBL had a significant impact on numeracy and reading ability. Another result is that the implementation of a deep learning-based multisensory approach in PBL learning has a more significant impact than the implementation of PBL without a deep learning-based multisensory approach.

Discussion

The research findings show that the implementation of a multisensory approach based on deep learning has a significant impact on the counting ability and reading abilities of third-grade elementary school students. The improvement that occurred was in the moderate category according to the gain score interpretation. These results indicate that the use of a multisensory approach can be a solution to the problem of low

counting ability and reading abilities among elementary school students. The multisensory approach can optimize students' direct involvement in learning activities. This allows them to contextually apply the concepts they have learned and interpret them through their five senses. The use of this approach will provide enjoyable and meaningful learning in line with the concept of deep learning.

The findings of this study support various previous studies. A multisensory approach can support deeper learning of mathematics because it involves various modalities and real activities to help stimulate students' creativity (Chestnutt, 2025). Previous research also explains that involving the five senses in learning supports memory and has an impact on students' cognitive achievements (Nurjanah et al., 2024), including numeracy and reading ability in this study. The deep learning approach used and integrated with multisensory learning can provide understanding in a procedural and critical thinking framework (Siregar et al., 2025).

The involvement of the five senses in the learning process also helps students recognize letters and understand the reading process more effectively, which has an impact on improving their reading ability (Gomwalk & Bok, 2024; Syerlyana et al., 2025). The use of various modalities and preferences in language learning can make it easier for students to improve their reading ability (Paul et al., 2025). In reading learning, deep learning emphasizes deep understanding through the cognitive and emotional involvement of students in learning (Azzahra & Jaya, 2025). Thus, a multisensory approach based on deep learning helps the learning process of students better, as found in this study.

The findings of this study can provide new and factual information about innovative concepts as an effort to improve the numeracy and literacy skills of elementary school students. Teachers can implement similar approaches in other learning schemes to provide more meaningful understanding to students by involving them directly in the learning process. This approach can also be used by teachers in managing more communicative learning and enhancing student creativity through enjoyable learning activities.

Although this study was able to answer the research questions and was in line with the research objectives, limitations still exist and must be further identified so that the findings and results of the study can describe the actual conditions. The use of a limited research sample also resulted in limited research results, so further research with a broader research sample is needed. This study also ignores several factors that may affect students' numeracy and literacy skills, such as the independent learning environment at home and the tutoring that students receive. Therefore, further research can be conducted by considering several other variables that may influence the numeracy and literacy skills of elementary school students.

D. CONCLUSION

The results of the study indicate that the implementation of a deep learning-based multisensory approach has a positive effect on improving the counting ability and reading ability of third-grade elementary school students. Both classes experienced improvement after learning, but the improvement in the experimental class was higher than in the control class. Statistical tests showed a significant difference between pretest and posttest scores, while N-Gain analysis showed that the improvement in the

experimental class was in the moderate to high range compared to the control class. These findings indicate that integrating a multisensory approach with deep learning principles can create more meaningful learning experiences that support improvements in student literacy and numeracy.

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REFERENCES

Azzahra, Y., & Jaya, C. A. (2025). Pendekatan Deep Learning: Transformasi Mindful, Meaningful, dan Joyful dalam Pembelajaran Holistik. *EduInovasi: Journal of Basic Educational Studies*, *5*(3). https://doi.org/10.47467/edu.v5i3.9245

Chestnutt, C. (2025). *Multisensory Mathematics Instruction for Differentiation in the Elementary Mathematics Classroom*. https://doi.org/10.5772/intechopen.1010220

Deda, Y. N., Disnawati, H., & Daniel, O. (2023). How Important of Students' Literacy and Numeracy Skills in Facing 21st-Century Challenges: A Systematic Literature Review. *Indonesian Journal of Educational Research and Review*, *6*(3), 563–572. https://doi.org/10.23887/ijerr.v6i3.62206

Fadiana, jizatin, Yulaikah, Y., & Taufikurrizal, Z. (2022). Improving Numeracy Skills Of Elementary School Students Through Problem-Based Learning: An Implementation Of Lesson Study. *ElementerIs: Jurnal Ilmiah Pendidikan Dasar Islam*, *4*, 2022. https://doi.org/https://doi.org/10.33474/elementeris.v4i1.14387

Fatimah, F. H., & Wahyudin, W. (2025). Elementary Students' Difficulties in Solving Numeracy Problems. *The 7th International Conference on Elementary Education*, *7*(1), 246–258. https://proceedings2.upi.edu/index.php/icee/article/view/4064

Gomwalk, N. V, & Bok, K. T. (2024). Sensory Approach On Reading Performance Of Pupils With Reading Disability In Jos Metropolis, Plateau State. *Research Journal in Education*, *8*(2), 1–15.

Khairah, N. N., Cem, C., & Info, A. (2025). Adaptive Technology-Based Learning To Improve Literacy And Numeracy Skills Of Elementary School Students. *JOBE: Journal of Basic Education*, *1*(2), 59–68. https://journal.zmsadra.or.id/index.php/fej

Khofifah, S., & Ramadan, Z. H. (2021). Literacy Conditions of Reading, Writing and Calculating for Elementary School Students. *Journal of Educational Research and Evaluation*, *5*(3). https://ejournal.undiksha.ac.id/index.php/JERE

Khuni Mu, I., Niwangtika, W., Nuriana, E., & Ayu Wulandari, R. (2024). The Low Reading Literacy of Indonesian Children: A Qualitative Perspective through Literature Review. *Journal of Indonesian Elementary Education ISSN*, *2*(2), 92–101.

Mahrani, M., Sari, S. M., & Depalina, S. (2022). Students' Difficulties at Elementary School in Increasing Literacy Ability. *Attractive : Innovative Education Journal*, *4*(1). https://www.attractivejournal.com/index.php/aj/

Nurfarijah, E. S., & Herman, T. (2025). Analysis of Students' Ability in Solving Numeracy Problem. *The 7th International Conference on Elementary Education*, *7*(1), 234–245. https://proceedings2.upi.edu/index.php/icee/article/view/4063

Nurjanah, Kansil, I. C., Masturoh, I., & Hanwar, D. (2024). Multisensory Learning: Improving Conceptual Understanding Through an Intuitive Sensory Approach. *Journal of Pedagogi*, *1*(6), 56–64. https://doi.org/10.62872/7ygyx095

Paul, J., Espino, A., & Mangindra, A. P. (2025). Multisensory Approach in Teaching Students with Reading Challenges. *International Journal of Arts, Sciences and Education*, *6*(1), 11–20. https://ijase.org

Ratnaya, I. G., Fitriani, S. N., Durasa, H., & Erlin, E. (2024). The Relationship Between Literacy and Numeracy Skills of Prospective Primary Education Teachers. *Al-Adzka: Jurnal Ilmiah Pendidikan Guru Madrasah Ibtidaiyah*, *14*(1), 1–12. https://doi.org/10.18592/aladzkapgmi.v14i1.12201

Rediani, N. N. (2024). Exploring the World of Numeracy: An Analysis of Third-Grade Elementary School Students. *International Journal of Elementary Education*, *8*(1), 39–46. https://doi.org/10.23887/ijee.v8i1.68455

Safitri, R., Lanya, H., Nurillah, N., Khoir, A., & Zayyadi, M. (2025). Parents's Role in Improving Numeracy Literacy of Elementary School Students through Mathematics Competitions. *Jurnal Axioma : Jurnal Matematika Dan Pembelajaran*, *10*(1), 94–101. https://doi.org/10.56013/axi.v10i1.3562

Saifullah, A., & Novitasari, M. (2025). Analysis of Numeracy Literacy in Developing Students Mathematical Creativity in Elementary School. *Lembaran Ilmu Kependidikan*, *54*(1), 165–175. https://doi.org/10.15294/lik.v54i1.21455

Siregar, T., Fauzan, A., Yerizon, Y., & Syafriandi, S. (2025). Designing Mathematics Teaching through Deep Learning Pedagogy: Toward Meaningful, Mindful, and Joyful Learning. *Journal of Deep Learning*, 188–202. https://doi.org/10.23917/jdl.v1i2.11969

Sukma, E., Rahmatina, R., Indrawati, T., Suriani, A., & Fadillah, N. (2019). Difficulties in Learning Early Literacy in Primary Schools. *Proceedings of the Proceedings of the 2nd International Conference on Language, Literature and Education, ICLLE 2019, 22-23 August, Padang, West Sumatra, Indonesia*. https://doi.org/10.4108/eai.19-7-2019.2289491

Syerlyana, A., Islami, R. M., Yanti, F. R., Kusmana, S., & Rahayu, I. (2025). Application of Multisensory Strategies in Differentiated Classroom Learning to Overcome Reading Delay in Elementary School Students. *JTP - Jurnal Teknologi Pendidikan*, *27*(2), 487–499. https://doi.org/10.21009/jtp.v27i2.57001

Yustisia, K. K., & Salsabila, D. L. E. (2023). Reading Difficulties among Elementary Students in a Rural Area: A Qualitative Study. *EnJourMe (English Journal of Merdeka) : Culture, Language, and Teaching of English*, *8*(1), 106–112. https://doi.org/10.26905/enjourme.v8i1.10733