

Implementing Problem-Based Learning with Teaching at The Right Level Approach to Improve Numeracy Literacy


Junita Ulfa Munah Wati¹, Vera Dewi Susanti^{*2}, Yuliana Endang Sulastris³

¹ PGRI Madiun University, Indonesia

² PGRI Madiun University, Indonesia

³ State Vocational School 1 Madiun, Indonesia

junitaulfa17@gmail.com¹, vera.mathedu@unipma.ac.id^{*2}, yulendmat1972@gmail.com³

 <http://dx.doi.org/10.30595/alphamath.v10i2.23723>

ABSTRACT

This study aimed to improve students' numeracy literacy skills by implementing the Problem-Based Learning model with the Teaching at The Right Level approach. The study was conducted in Class X DPIB 1 SMKN 1 Kota Madiun, Kartoharjo District. Thirty-six students participated in this study, with 30 males and six females as samples. In the 2023-2024 academic year, the research period took place from February to May, beginning the second semester. The study was conducted in two cycles, with four sessions, each meeting lasting 2 JP (2 x 45 minutes). Class X DPIB 1 students had an average numeracy literacy ability score of 55.50 in the Cycle 1 evaluation. This indicates that there is still considerable room for improvement. In addition, most students have not met the minimum required level of completeness, as seen from the percentage of classical completeness, which only reached 36.11% (13 students scored ≥ 75). Meanwhile, the analysis of the data from cycle 2 showed that there were no students in the inferior category, two students in the poor category, five in the pretty good category, twenty-two in the excellent category, and seven in the outstanding category. The implementation of cycle 2 showed a significant increase, where the average score of numeracy literacy skills of class X DPIB 1 students increased to 72.94, and the percentage of classical completion also increased to 58.33% (21 students scored ≥ 75). Students' numeracy literacy skills can be improved by combining the Problem-Based Learning model with the Teaching at The Right Level Approach.

Keywords: *Problem-Based Learning*, TaRL, Numeracy Literacy

ABSTRAK

Tujuan dari penelitian ini ialah untuk meningkatkan kemampuan literasi numerasi siswa dengan menerapkan model *Problem Based Learning* dengan pendekatan *Teaching at The Right Level*. Penelitian dilakukan di Kelas X DPIB 1 SMKN 1 Kota Madiun, Kecamatan Kartoharjo. Sebanyak 36 siswa berpartisipasi dalam penelitian ini, dengan 30 laki-laki dan 6 perempuan sebagai sampel. Pada tahun akademik 2023-2024, periode penelitian berlangsung dari bulan Februari hingga Mei, pada awal semester kedua. Penelitian dilakukan dalam dua siklus, dengan masing-masing empat sesi per siklus, dengan setiap pertemuan berlangsung selama 2 JP (2 x 45 menit). Siswa Kelas X DPIB 1 memiliki nilai kemampuan literasi numerasi rata-rata sebesar 55,50 pada evaluasi Siklus 1. Hal ini menandakan bahwa masih ada ruang yang cukup besar untuk peningkatan. Selain itu, sebagian besar siswa belum memenuhi tingkat kelengkapan minimum yang dipersyaratkan, dilihat dari persentase kelengkapan klasiknya yang hanya mencapai 36,11% (13 siswa memperoleh nilai ≥ 75). Sedangkan, analisis data hasil siklus 2 didapat bahwa tidak ada siswa dengan kategori sangat kurang, dua siswa dengan kategori kurang, lima siswa dengan kategori cukup baik, dua puluh dua siswa dengan kategori baik, dan tujuh siswa dengan kategori sangat baik. Pelaksanaan siklus 2 terdapat peningkatan yang signifikan, di mana rata-rata skor kemampuan literasi numerasi siswa kelas X DPIB 1 meningkat menjadi 72,94 dan persentase ketuntasan klasikal juga meningkat menjadi 58,33% (21 siswa mendapat nilai ≥ 75). Kemampuan literasi numerasi siswa dapat ditingkatkan dengan menggabungkan model Pembelajaran Berbasis Masalah dengan Pendekatan *Teaching at The Right Level*.

Kata kunci: *Problem Based Learning*, TaRL, Literasi Numerasi

Received : August 24, 2024
Accepted : November 28, 2024
Published : November 28, 2024

Introduction

Education in Indonesia is a complex and continuously developing system, consisting of several levels ranging from early childhood education (PAUD) to higher education, which has continued to experience development and change since the independence era. Education is a crucial element in life for individuals and the national context. Education is one of the main factors that drives a country's progress. The importance of education lies in its ability to form an intelligent, disciplined, critical, and democratic society. Therefore, Efforts to improve a country's education system are ongoing and can be modified (Susanti, 2018). Raising a capable and competitive generation on a global scale requires investing in education by modernizing and enhancing its quality (As'ad et al., 2023).

Education is about more than just teaching children facts and figures; it's also about helping them understand how to put that knowledge to use in the real world (Asrobanni et al., 2024) . Creating a pleasant learning atmosphere is very important to provide a positive learning experience for students. This can be achieved by building a learning environment that is cheerful, engaging, safe, and free from bullying. In addition, it is essential to apply various learning methods, pay attention to student aspirations, and not only focus on activities in the classroom (Pratiwi, 2023) .

Education in Indonesia faces significant challenges related to literacy and numeracy. Even though the government is always trying to raise the bar on education, many students are still behind in basic reading and mathematics skills (Suharyani et al., 2023). A numerate person can use mathematical ideas in real-world contexts (Salvia et al., 2022). This ability is very important in the era of globalization, requiring individuals to have critical and analytical thinking skills.

According to previous studies, the literacy skills of Indonesian students across all educational levels remain poor (Astuti et al., 2019; Jannah et al., 2023; Kurniawati & Mahmudi, 2019; Setiani et al., 2018; Wijayanti et al., 2018). Pakpahan (2017) also emphasized that, despite modifications to the international exam format for use in Indonesia, pupils' mathematics literacy remains inadequate at the secondary school level. These various studies show that many students still experience difficulties understanding mathematical concepts and applying them in problem-solving. Faridah et al. (2022) Assert that early protection against low income, bad health, and unemployment is best provided by numeracy literacy abilities.

Low literacy is also influenced by several factors, including: 1) selection of materials, 2) teacher learning content, 3) educational environment, 4) supportive home environment, 5) willingness to take exams, 6) ability to identify problems and facts faced by each student (Wardani et al., 2023). Low mathematical literacy causes various problems in mathematics, including (1) problems in interpreting mathematical problems, resulting in difficulties in planning problem-solving and failing to find solutions (Maslihah et al., 2020); (2) students' lack of critical thinking skills regarding the problems they face (Maslihah et al., 2020; Rizki & Priatna, 2019; Sukestiyarno et al., 2019; Susanti & Krisdiana, 2021). Besides, inappropriate steps cause low mathematical literacy or the selection of learning models used in class (Sulfayanti, 2023). There is also a lack of understanding of the questions, a lack of practice regarding forms of literacy, a lack of accuracy, and a lack of self-efficacy in students (Setiawan et al., 2023). This shows that choosing a suitable learning model can improve mathematical literacy. Mathematical innovation in the classroom is one strategy for raising students' numeracy literacy levels and addressing their inadequate mathematical literacy. To ensure that their students learn effectively, teachers should use techniques that enhance classroom instruction and student engagement (Halawati & Saepudin, 2020; Susanti et al., 2022).

Putri et al. (2020) Additionally, it may be argued that students should prioritize developing their mathematical literacy abilities since it simplifies the process of studying mathematics and prepares them for higher education, like college. However, many kids still struggle with basic arithmetic comprehension.

According to my observations in class X at DPIB 1 SMKN 1 Madiun, the pupils' proficiency in numeracy is poor. Their inability to properly construct mathematical problems and apply mathematical principles and their problem-solving method provide conclusive evidence of this. By paying more attention to differences in students' ability levels, the Teaching at the Right Level (TaRL) method may help vocational school students improve their numeracy and reading abilities. By understanding and adapting learning according to individual skills, teachers can organize the learning process to suit the needs of each student better. This improves the overall effectiveness of learning and ensures that every pupil has an equal opportunity to achieve their highest potential (Putri & Siswanto, 2024).

Problem-Based Learning is a learning model in the form of a problem that is used as a context where students will be trained to improve numeracy literacy and try to solve a problem and gain knowledge (Awami et al., 2022). *The Problem-Based Learning (PBL)* learning model is an alternative that can be applied to overcome this problem (Ulil et al., 2023). PBL encourages students to learn actively by solving authentic problems.

This kind of learning starts when students encounter a real-world issue and their instructor helps them figure out how to fix it via various learning activities (Novianti et al., 2020). The cooperative learning model, namely PBL through lesson study, also emphasizes practice questions, and students tend to memorize the material and procedures for solving problems delivered by the teacher (Purnomo, 2020). In previous research, Supono et al., (2024) conducted research related to MCM-assisted PBL learning. This research shows that MCM-assisted PBL learning is efficacious in improving students' mathematical connections, and AQ influences students' mathematical connection abilities in MCM-assisted PBL learning.

Furthermore, PBL may be enhanced by using the Teaching at the Right Level (TaRL) method, which ensures that every student gets instruction tailored to their skill level. The findings from the study Rahma & Nursasongko (2024), Research conducted during the even semester of the 2023/2024 academic year at SMA Negeri 7 Semarang found that students in class XI-1 might benefit from enhancing their mathematical literacy abilities through the use of The Problem-Based Learning model in conjunction with the TaRL method. After cycle I, pupils' mathematical literacy improved, achieving an average score of 68.75% (with 4 pupils falling into the lowest ability groups). In the second cycle, students' average SAT score for collaborative skills rose to 82.43%, and not a single student was deemed poor.

Meanwhile, Fitria et al., (2024) based on the results of the evaluation of cycles I and III, it can be concluded that the use of The Problem-Based Learning (PBL) learning model utilizing the Teaching at the Right Level (TaRL) approach improved the mathematical learning outcomes of fifth graders at SDN Pekunden in the KPK and FPB chapters. Classroom action research using the TaRL method and PBL paradigm may enhance students' learning outcomes.

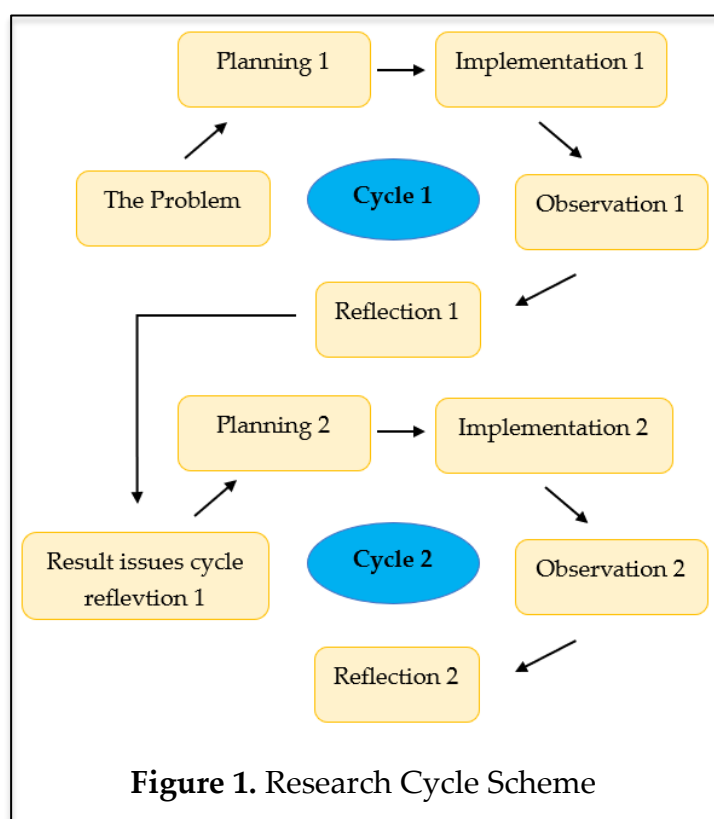
The difference between my research and previous research lies in the objectives, indicators of success, and implementation focus—previous research aimed to improve students' learning outcomes in mathematics. The scope of the material was specific to the topic, with success measured through increased learning outcomes in specific chapters. Meanwhile, my research aims to improve students' numeracy literacy, which includes broad mathematical thinking skills, such as problem-solving and logic. The focus of the application of previous research was to deepen understanding of specific material, while my research focuses on developing holistic numeracy skills relevant to the needs of 21st century skills. These issues motivated me to do classroom action research with students in class X at DPIB 1 SMKN 1 Madiun, using the Problem-Based learning model and the Teaching at the Right Level method, to improve their numeracy literacy.

Research Methods

The study was conducted at SMKN 1 Madiun in the Kartoharjo District of Madiun City. Thirty-one male and six female students from class X at DPIB 1 participated in this study. The study was conducted from February to May, at the start of the second semester of the 2023/2024 academic year.

This study is an example of classroom action research, an approach to classroom action research. Leony (2019) states that classroom action research is a strategy for enhancing education by introducing new practices that immediately impact student achievement. The four phases of action research are preparation (planning), execution (activity), observation and evaluation (process and outcomes), and reflection (reflection). The procedure is iterated until the desired results are achieved, as determined by the success criteria (Hunaepi et al., 2016).

The study was conducted in two cycles, with four sessions each cycle. Each meeting lasted 2 hours or 45 minutes. Figure 1 displays the research flow model.



In the cycle described, action research begins with diagnosing the problem before selecting an action. Implicitly, this problem diagnosis is written in the background of the problem. After diagnosing the issue, the researcher identifies potential actions and selects one that is deemed suitable to address the problem. The next step in the research procedure is integrating the action into the learning process. The expected

behavioral changes are observed during the implementation of the action. If the desired behavior is not achieved, the researcher can repeat the process by identifying the problem and planning a new action that is more appropriate to address the issue. Conversely, if the desired behavioral changes are observed, the next step involves measuring the results (through tests/examinations) to assess the progress made. The outcomes of this measurement are then evaluated to decide whether further corrective actions are necessary, using a new plan or refining the action that has already been planned.

The instruments used in the research are observation instruments and test instruments. Observation instruments are used to observe the learning process in class each cycle (Waldi et al., 2022). Meanwhile, the test instrument is used to determine students' numeracy literacy level and as reflection material (Mumpuni et al., 2022). The assessment tool makes use of a six-question essay format. An improvement in the average percentage of literacy abilities in numeracy after each learning cycle indicates a certain degree of achievement.

The data analysis technique in this research involves both qualitative and quantitative approaches. Qualitative data, obtained through observation instruments, are analyzed using descriptive techniques to assess the effectiveness of the learning process during each cycle. This includes identifying patterns and evaluating the implementation of the Problem Based Learning model with the Teaching at the Right Level (TaRL) approach. Quantitative data, derived from test instruments in the form of six-question essays, are analyzed by calculating the percentage increase in students' numeracy literacy skills after each learning cycle. The improvement is determined by comparing the average scores of students' performance across cycles. This combined approach provides a comprehensive understanding of the impact of the applied learning model on students' numeracy literacy development.

Results and Discussion

Figure 1 illustrates the implementation of Problem-Based Learning (PBL) with the Teaching at the Right Level (TaRL) approach during the problem orientation stage or the initial phase of learning. The Problem-Based Learning (PBL) approach combined with Teaching at the Right Level (TaRL) can be applied in the teaching of trigonometry in grade X to enhance students' numeracy literacy. The first step is to identify contextual problems relevant to everyday life, such as calculating the height of a building using angles of elevation. In this stage, an initial discussion is held to explore students' understanding of the problem. Next, students are divided into small groups to encourage collaboration and discussion. In these groups, students are expected to explore the problem, formulate questions, and seek solutions using trigonometric

concepts. After that, they conduct research and data collection, either through experiments or observations. The groups then present their findings to the class, followed by a class discussion to deepen understanding and provide mutual feedback. Finally, evaluation is conducted by assessing students' understanding of the trigonometric material learned, as well as their ability to apply numeracy literacy in real-world contexts. This approach not only enhances understanding of trigonometric concepts but also encourages students to think critically and creatively in solving problems. The application of PBL combined with the TaRL approach has been shown to improve numeracy literacy, as demonstrated in the study by Aldiyansah, et al. (2024). The study found that Problem-Based Learning using the Teaching at the Right Level approach can enhance students' mathematical literacy. This improvement occurs because students are engaged in problem-solving methods, and the TaRL approach is tailored to align with the student's ability levels, making the learning process more effective.

Cycle 1

There were a total of four JP sessions, each lasting 45 minutes, that were used to execute cycle 1. These sessions were held on Wednesday, 06 March 2024, and Thursday, 07 March 2024. Researchers in the first cycle used the PBL model in conjunction with the TaRL strategy to assess pupils' numeracy literacy skills.

Table 1. Cycle 1 Results Data on Numeracy Literacy Skills

Score Aspects	Category	Number of Students
0 – 20	Very less	2
21 – 40	Not enough	5
41 – 60	Enough	14
61 – 80	Good	12
81 – 100	Very good	3
Total		36

Based on [Table 1](#), which presents the analysis of Numeracy Literacy skills for Grade X DPIB students in Cycle I, it can be concluded that 2 students fall into the "Very less" category, and 5 students are in the "Not enough" category regarding their Numeracy Literacy skills. Meanwhile, 14 students are classified as "Enough" in terms of their Numeracy Literacy abilities. Additionally, 12 students are in the "good" category, and 3 students are classified as "very good" in their Numeracy Literacy performance. For the first cycle to be implemented, there were various kinds of numeracy literacy abilities among class X DPIB 1 students, where some students were still in the deficient and very deficient categories. This shows that they experience difficulties in developing numeracy literacy skills, things include grasping the fundamentals of

mathematics, performing computational procedures, and finding real-world applications for these ideas. But most kids have shown that they can read and write numbers. The majority of pupils had a strong grasp of the notion of numeracy and performed well on the test, which supports this idea. The ability to confidently solve arithmetic problems and apply numeracy principles in diverse circumstances are common traits among students who have achieved excellent grades.

This is because the implementation of learning in Cycle I was not optimal. Several students experienced difficulties in developing their Numeracy Literacy skills, particularly because some students tended to struggle with understanding and summarizing the provided readings. In mathematical calculations involving decimal numbers, some students also had trouble performing these correctly. Furthermore, students were not able to articulate conclusions effectively, even though they had arrived at the correct answers in their work. Nevertheless, the majority of students have demonstrated progress in enhancing their Numeracy Literacy skills. While some students may face challenges in this area, most have shown significant improvement. With appropriate support and guidance, students who are still struggling can continue to refine their Numeracy Literacy skills. Therefore, it is hoped that in the long run, all students will be able to comprehend problems that require Numeracy Literacy skills to understand and achieve satisfactory outcomes in their problem-solving discussions. However, students who are still in the less and very less category need special attention. To help them comprehend the content and develop their numeracy abilities, they need ongoing guidance and supplementary instruction. A more individual learning approach, the use of more varied teaching strategies, and the provision of more intensive training can be the solution to help them (Arahmah et al., 2021). The evaluation results in cycle 1 showed that the average numeracy literacy ability score for class X DPIB 1 students was 55.50. This indicates that there is still considerable room for improvement. Apart from that, the percentage of classical completeness which only reached 36.11% (13 students (Figure 2) got a score ≥ 75). Also shows that most students have not reached the expected minimum standard of completeness.

Cycle 2

A total of four juries (two 45-minute sessions) were held on Wednesday, 24 April 2024, and Thursday, 25 April 2024 to carry out the implementation of cycle 2. In the second cycle of research, researchers evaluated students' numeracy literacy using the PBL model in conjunction with the TaRL technique. The implementation of cycle 2 is the result of reflection from cycle 1.

Based on Table 2, which presents the analysis of Numeracy Literacy skills for Grade X DPIB students in Cycle II, it can be concluded that no students fall into the "very little"

category, and only 2 students are in the "not enough" category regarding their Numeracy Literacy skills. Meanwhile, 5 students are classified as "Enough" in terms of their Numeracy Literacy abilities. Furthermore, 22 students are in the "good" category, and 7 students are classified as "very good."

Table 2. Cycle 2 Results Data on Numeracy Literacy Skills

Score Aspects	Category	Number of Students
0 – 20	Very less	0
21 – 40	Not enough	2
41 – 60	Enough	5
61 – 80	Good	22
81 – 100	Very good	7
Total		36

The data in Table 2 shows that students have made significant progress in understanding problems within the context of literacy, such as interpreting problems and applying mathematical concepts. This achievement in Cycle II can be attributed to a significantly improved learning process, where students have become increasingly accustomed to addressing Numeracy Literacy problems. The implementation of the Teaching at the Right Level (TaRL) approach by the teacher has proven to be more effective in guiding students based on their individual abilities. As a result, students are now actively engaging in solving complex mathematical problems involving decimal units and are demonstrating greater comfort with literacy challenges that require deeper analytical skills.

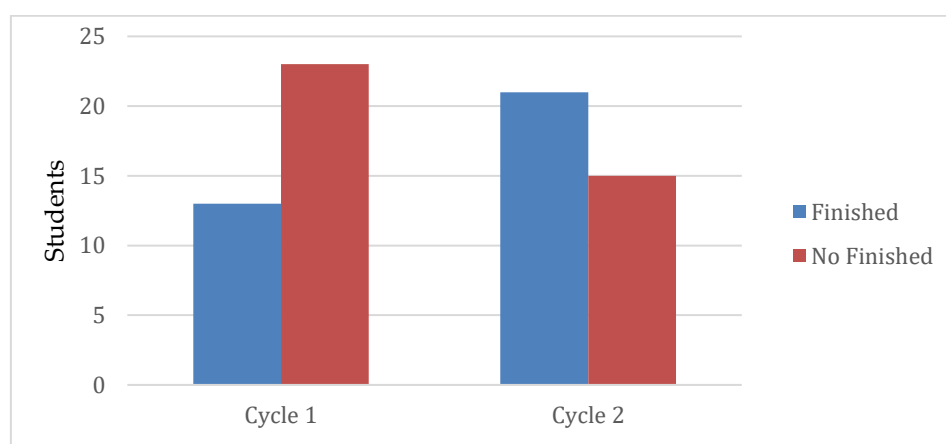


Figure 2. Recapitulation of Student Numeracy Literacy

Furthermore, their reliance on their peers has notably decreased, indicating a shift towards greater independence in their learning. This transformation is evident in the learning process itself, where students initially take the initiative to actively work on

the material provided by the teacher. They then engage in discussions within their groups to explore and reconcile any differing opinions or approaches. It is only when necessary that they seek the teacher's guidance, reflecting a more autonomous and confident learning environment. Consequently, the Problem-Based Learning (PBL) model, combined with the TaRL approach, encourages students to refrain from passively waiting for answers from their peers. Instead, they are motivated to begin thinking independently and critically before engaging in discussions about the problems presented by the teacher. This proactive approach enables them to work at a pace and level that aligns with their individual capabilities and strengths (Rahma et al., 2024). The students' Numeracy Literacy skills, assessed based on the percentage of mastery, have successfully met the predetermined success indicators, demonstrating clear improvement in each cycle of the study. Given the consistent progress observed in each cycle and the positive outcomes achieved, the research was concluded after Cycle II, marking a significant milestone in the enhancement of students' learning experiences and outcomes.

Discussion

Results from the study of cycles 1 and 2 using the Problem-Based Learning (PBL) model in conjunction with the Teaching at the Right Level (TaRL) method demonstrate a notable improvement in student engagement and learning outcomes. In particular, the completion rate in cycle 2 improved significantly to 58.33%, a marked increase from the 36.11% completion rate observed in cycle 1. This improvement indicates that we have not only accomplished our research goals but also fulfilled our success indicators, effectively solved the problem formulation we set out to address, and provided strong evidence in support of our research hypothesis. The PBL paradigm, when effectively implemented in the classroom, has shown a potential to help students become more engaged in their learning experiences while simultaneously developing their critical thinking skills. Additionally, Class X students at DPIB 1 SMKN 1 Madiun have demonstrated a capacity to enhance their numeracy literacy abilities through the integration of the TaRL method alongside the PBL model. The flexibility of TaRL allows it to be customized to match the individual skill levels and specific requirements of each student, making it an effective approach to increase student engagement and ultimately improve learning outcomes. This combined approach not only promotes a deeper understanding of mathematical concepts but also fosters an environment where students feel more confident in their abilities, thereby preparing them for future academic challenges and real-world applications of their numeracy skills.

Consistent with other studies, this one found that the findings of a two-cycle classroom action research project on mathematics conducted by Listyaningsih et al. (2023)

demonstrate that the Problem-Based Learning (PBL) paradigm, when implemented, can significantly enhance students' mathematical understanding of course content. In the case of 5B SDN Good Day, both the average score and the degree of classical completion increased in the assessments administered during cycles I and II, indicating a clear improvement in the learning outcomes for the students. Specifically, a total of 72% (18 students) completed the classical component and achieved the Minimum Completeness Criteria (KKM) in cycle I, with an average score of 75.4. Concurrently, in cycle II, 22 students achieved a completion rate of 88%, resulting in an increased average score of 82.

Moreover, research conducted by As'ad et al. (2023) reinforced these findings. Their classroom action research concluded that the Problem-Based Learning (PBL) model, when integrated with the Teaching at the Right Level (TaRL) approach, positively impacted the class's performance. In cycle I, the class had an average score of 75, with 58% of students completing the course. By cycle II, this average score rose to 82, with a notable 83% of students completing the course. These results align with numerous studies that indicate the Problem-Based Learning (PBL) model can significantly enhance students' Numeracy Literacy skills, as demonstrated in the research article by Fitria et al. (2024). This study found that implementing the Problem-Based Learning model alongside the Teaching at the Right Level (TaRL) approach leads to substantial improvements in students' Numeracy Literacy abilities. The TaRL approach effectively increases students' motivation and engagement, making learning more effective as it is tailored to meet the diverse abilities and needs of students. Additionally, the PBL model itself further enhances learning outcomes by fostering active participation and critical thinking among students, thereby creating a more dynamic and effective learning environment. The combination of Problem-Based Learning (PBL) with Teaching at the Right Level (TaRL) supports personalized learning. TaRL adapts materials based on students' cognitive abilities, enabling progressive learning through appropriate scaffolding, which significantly improves overall class outcomes (Rofiqi & Ervina, 2024; Smith et al., 2022). Additionally, PBL enhances collaboration skills through group discussions, allowing students to integrate theoretical knowledge with practical skills, thereby increasing their engagement and effectiveness in learning (Smith et al., 2022).

Conclusion

The study and data processing findings indicate that class X DPIB 1 SMKN 1 Madiun students' numeracy literacy may be improved by using the Problem-Based Learning model in conjunction with the Teaching at the Right Level method. The results of cycle 1 demonstrated this with an average score of 55.50 for students' numeracy literacy

abilities; in cycle 2, that score increased to 72.94. Meanwhile, the percentage of classical completeness in cycle 1 only reached 36.11% (13 students got a mark ≥ 75). It also increased in cycle 2 to 58.33% (21 students (Figure 2) got a mark ≥ 75).

Acknowledgment

We would like to express our sincere gratitude to all individuals and institutions that contributed to the successful completion of this research titled "Implementing Problem-Based Learning with Teaching at the Right Level Approach to Improve Numeracy Literacy." Special thanks to the teachers and administrative staff of SMKN 1 Madiun in the Kartoharjo District of Madiun for their cooperation during the research process. We are also grateful to the students of Grade X DPIB for their enthusiastic participation and dedication to the learning activities, which made this study possible. Additionally, we acknowledge our fellow researchers and colleagues for their insightful feedback and encouragement, which significantly enriched our work. Lastly, we express our heartfelt appreciation to our families for their unwavering support throughout this research journey.

References

- Aldiyansah, R., Kurniawati, R. P., & Hadi, N. (2024). Integrasi Model Problem Based Learning Dengan Pendekatan Teaching At The Right Level Untuk Meningkatkan Literasi Matematis Siswa. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, 9(3), 417-427.
- Arahmah, F., Banindra Yudha, C., & Ulfa, D. M. (2021). Peningkatan Kemampuan Literasi Numerasi pada Matematika Melalui Metode Student Facilitator and Explaining. *Prosiding Seminar Nasional Pendidikan STKIP Kusuma Negara III SEMNARA 2021*, 2015, 209–218.
- As'ad, M. C., Sulistyarsi, A., & Sukirmawati, J. (2023). Penerapan Model Pembelajaran Problem Based Learning (PBL) dengan Pendekatan Teaching at the Right Level (TaRL) dalam Meningkatkan Hasil Belajar kognitif Siswa kelas X pada Materi Inovasi Teknologi Biologi SMA. *EduInovasi: Journal of Basic Educational Studies*, 4(1), 76–85. <https://doi.org/10.47467/edui.v4i1.4366>
- Asrobanni, N., Lestari, H., & Rukiyah, S. (2024). Penerapan Pembelajaran Model Problem Based Learning Dengan Pendekatan Teaching At The Right Level Guna Meningkatkan Hasil Belajar Siswa Pada Materi Teks Tanggapan Siswa Di Kelas VIII.3 Smp Negeri 10 Palembang. *Jurnal Sains Students and Research*, 2(2), 45–54.
- Astuti, N. K., Fahinu, F., & Masuha, J. (2019). Analisis Kemampuan Literasi Matematika Siswa Kelas Viii Smp Swasta Di Kota Kendari. *Jurnal Penelitian Pendidikan Matematika*, 6(1), 99. <https://doi.org/10.36709/jppm.v6i1.7401>
- Awami, F., Yuhana, Y., & Nindiasari, H. (2022). Meningkatkan Kemampuan Literasi Numerasi Dengan Model Problem Based Learning (PBL) Ditinjau Dari Self

- Confidence Siswa SMK. *MENDIDIK: Jurnal Kajian Pendidikan Dan Pengajaran*, 8(2), 231–243. <https://doi.org/10.30653/003.202282.236>
- Faridah, N. R., Afifah, E. N., & Lailiyah, S. (2022). Efektivitas Model Pembelajaran Project Based Learning Terhadap Kemampuan Literasi Numerasi dan Literasi Digital Peserta Didik Madrasah Ibtidaiyah. *Jurnal Basicedu*, 6(1), 709–716. <https://doi.org/10.31004/basicedu.v6i1.2030>
- Fitria, L., Sari, E. F., & Khairunnikmah, Z. F. (2024). Upaya Meningkatkan Hasil Belajar Matematika Melalui Penerapan Pendekatan Teaching at The Right Learning (TARL). *Joyfull Learning Journal*, 13(1), 27–34.
- Halawati, F., & Saepudin, A. (2020). Penerapan Model Cooperative Learning Tipe Bamboo Dancing Terhadap Kemampuan Kognitif Matematika Siswa. *Math Educa Journal*, 4(2), 202–213. <https://doi.org/10.15548/mej.v4i2.1457>
- Hunaepi, Prayogi, S., Samsuri, T., Firdaus, L., Fitriani, H., & Asy'ari, M. (2016). Pelatihan Penelitian Tindakan Kelas (PTK) dan Teknik Penulisan Karya Ilmiah Bagi Guru di MTs. NW MERTAKNAO. *Lambung Inovasi*, 1(1), 38–40.
- Jannah, H. I., Susanti, V. D., & Suprpto, E. (2023). Analysis of Student's Mathematical Literacy Ability on Linear Program Material Reviewed from Cognitive Styles. *AL-ISHLAH: Jurnal Pendidikan*, 15(4), 6425–6436. <https://doi.org/10.35445/alishlah.v15i4.2465>
- Kurniawati, N. D. L., & Mahmudi, A. (2019). Analysis of mathematical literacy skills and mathematics self-efficacy of junior high school students. *Journal of Physics: Conference Series*, 1320(1). <https://doi.org/10.1088/1742-6596/1320/1/012053>
- Leony, S. L. (2019). Peningkatan Konsentrasi Belajar Mahasiswa Melalui Pemanfaatan Evaluasi Pembelajaran Quizizz Pada Mata Kuliah Kimia Fisika I. *Jurnal Dinamika Pendidikan*, 12(1), 29–39.
- Listyaningsih, E., Nugraheni, N., & Yuliasih, I. B. (2023). Peningkatan Hasil Belajar Melalui Pendekatan Tarl Model PBL Dalam Matematika Kelas V SDN Bendan Ngisor. *Madani: Jurnal Ilmiah Multidisiplin*, 1(6). <https://doi.org/10.5281/zenodo.8139269>
- Maslihah, S., Waluya, S. B., Rochmad, & Suyitno, A. (2020). The Role Of Mathematical Literacy To Improve High Order Thinking Skills. *Journal of Physics: Conference Series*, 1539(1), 012085. <https://doi.org/10.1088/1742-6596/1539/1/012085>
- Mumpuni, A., Azizah, S., Rahma, S. A., Utami, D., Indah Safitri, N., Aswat Tiana, F., Kartika Putri, D. A., & Aditya Pratama, A. (2022). Pemanfaatan Barang Bekas sebagai Media Pembelajaran untuk Meningkatkan Literasi Numerasi Peserta Didik di Sekolah Dasar. *JAMU: Jurnal Abdi Masyarakat UMUS*, 3(01), 8–14. <https://doi.org/10.46772/jamu.v3i01.748>
- Novianti, R. E., Andari, T., & Susanti, V. D. (2020). Efektivitas Model PBL Berbasis STEM Terhadap Prestasi Belajar Ditinjau Dari Berpikir Kritis Matematis Pada

- Peserta Didik Kelas XI SMA. Konferensi Ilmiah Pendidikan Universitas Pekalongan 'Meneropong Wajah Pendidikan Di Era Merdeka Belajar', 1–6.
- Pakpahan, R. (2017). Faktor-Faktor Yang Memengaruhi Capaian Literasi Matematika Siswa Indonesia Dalam Pisa 2012. *Jurnal Pendidikan Dan Kebudayaan*, 1(3), 331. <https://doi.org/10.24832/jpnk.v1i3.496>
- Pratiwi, R. R. (2023). Penerapan Model Problem Based Learning bagi Sikap Kritis Peserta Didik Melalui Media E-Modul. *De Cive : Jurnal Penelitian Pendidikan Pancasila Dan Kewarganegaraan*, 3(3), 91–95. <https://doi.org/10.56393/decive.v3i3.1851>
- Purnomo, E. A. (2020). Implementasi Lesson Study Melalui Model Pembelajaran Problem Based Learning Materi SPLTV Kelas X IIK. *AlphaMath : Journal of Mathematics Education*, 6(1), 36. <https://doi.org/10.30595/alphamath.v6i1.7619>
- Putri, D. A., Susanti, V. D., & Apriandi, D. (2020). Pengembangan Modul Berbasis Rme Untuk Meningkatkan Kemampuan Literasi Matematika Siswa Kelas Xi Smk. *Prima Magistra: Jurnal Ilmiah Kependidikan*, 1(2), 138–146. <https://doi.org/10.37478/jpm.v1i2.470>
- Putri, H. A., & Siswanto, D. H. (2024). Teaching at The Right Level (TaRL) as an Implementation of New Education Concepts in the Insights of Ki Hajar Dewantara. *Indonesian Journal of Educational Science and Technology*, 3(2), 89–100. <https://doi.org/10.55927/nurture.v3i2.9297>
- Rahma, I. U., & Nursasongko, A. (2024). Penerapan Model PBL Dengan Pendekatan TaRL Untuk Meningkatkan Kemampuan Literasi Matematika Siswa Kelas XI-1 Sma N 7 Semarang. 786–794.
- Rizki, L. M., & Priatna, N. (2019). Mathematical literacy as the 21st century skill. *Journal of Physics: Conference Series*, 1157, 042088. <https://doi.org/10.1088/1742-6596/1157/4/042088>
- Rofiqi, A., & Ervina, Y. V. (2024). Effectiveness Problem Based Learning with Teaching at the Right Level Approach on Learning Outcomes and Group Discussion Skills of Environmental Change Material for Class X Students of SMAN 1 Jember. *INKUIRI: Jurnal Pendidikan IPA*, 13(1), 114–123. <https://doi.org/10.20961/inkuiri.v13i1.79785>
- Salvia, N. Z., Sabrina, F. P., & Maula, I. (2022). Analisis Kemampuan Literasi Numerasi Peserta Didik Ditinjau Dari Kecemasan Matematika. *ProSANDIKA UNIKAL (Prosiding Seminar Nasional Pendidikan Matematika Universitas Pekalongan)*, 3(2019), 352–360.
- Setiani, C., Waluya, S. B., & Wardono. (2018). Analysis of mathematical literacy ability based on self-efficacy in model eliciting activities using metaphorical thinking approach. *Journal of Physics: Conference Series*, 983(1). <https://doi.org/10.1088/1742-6596/983/1/012139>

- Setiawan, A., Sukestiyarno, Y. L., Man, Y. L., Marfu'ah, S., & Wati, Y. I. (2023). Mathematical literacy ability: How in terms of self-efficacy? (F. Tangreti (ed.); p. 040092). AIP Conference Proceedings. <https://doi.org/10.1063/5.0125789>
- Smith, K., Maynard, N., Berry, A., Stephenson, T., Spiteri, T., Corrigan, D., Mansfield, J., Ellerton, P., & Smith, T. (2022). Principles of Problem-Based Learning (PBL) in STEM Education: Using Expert Wisdom and Research to Frame Educational Practice. *Education Sciences*, 12(10), 728. <https://doi.org/10.3390/educsci12100728>
- Suharyani, Suarti, N. K. A., & Astuti, F. H. (2023). Implementasi Pendekatan Teaching At The Right Level (Tarl) Dalam Meningkatkan Kemampuan Literasi Numerasi Anak Di SD IT Ash-Shiddiqin. *Jurnal Teknologi Pendidikan Jurnal Penelitian Dan Pengembangan Pembelajaran*, 8(2), 470.
- Sukestiyarno, Y. L., Cahyono, A. N., & Pradnya, I. N. (2019). Integrating character education in mathematics learning in Indonesia and Denmark. *Journal of Physics: Conference Series*, 1321(3), 032014. <https://doi.org/10.1088/1742-6596/1321/3/032014>
- Sulfayanti, N. (2023). Kajian Literatur: Faktor dan Solusi untuk Mengatasi Rendahnya Literasi Matematis Siswa. *Jurnal Jendela Pendidikan*, 3(04), 382–388. <https://doi.org/10.57008/jjp.v3i04.590>
- Supono, L., Agoestanto, A., & Wijayanti, K. (2024). Mathematical Connections of Students Viewed From Adversity Quotient in Problem-Based Learning Using Math City Map. *AlphaMath: Journal of Mathematics Education*, 10(1), 74. <https://doi.org/10.30595/alphamath.v10i1.21662>
- Susanti, V. D. (2018). Analisis Kemampuan Kognitif dalam Pemecahan Masalah Berdasarkan Kecerdasan Logis-Matematis. *JMPM: Jurnal Matematika dan Pendidikan Matematika*, 3(1), 71–83. <https://doi.org/10.26594/jmpm.v3i1.998>
- Susanti, V. D., & Krisdiana, I. (2021). The Effect of Literacy Skills on the Critical Thinking Skills of Mathematics Education Students. *AL-ISHLAH: Jurnal Pendidikan*, 13(1), 72–79. <https://doi.org/10.35445/alishlah.v13i1.371>
- Susanti, V. D., Sukerstriyarno, Y. L., Kharisudin, I., & Agoestanto, A. (2022). Pengembangan Perangkat Pembelajaran Matematika Pada Model Literacy Inquiry Learning untuk Mengukur Literasi Matematika dan Self-Efficacy Siswa. <http://pps.unnes.ac.id/prodi/prosiding-pascasarjana-unnes/>
- Waldi, A., Putri, N. M., Indra, I., Ridalfich, V., Mulyani, D., & Mardianti, E. (2022). Peran Kampus Mengajar dalam Meningkatkan Literasi, Numerasi dan Adaptasi Teknologi Peserta Didik Sekolah Dasar di Sumatera Barat. *Journal of Civic Education*, 5(3), 284–292. <https://doi.org/10.24036/jce.v5i3.725>
- Wardani, E. P., Susanto, H. A., & Astutiningtyas, E. L. (2023). Mathematical Literacy Analysis of Class XI Students of the PISA Model in View of Adversity Quotient (AQ). *AlphaMath: Journal of Mathematics Education*, 9(2), 108. <https://doi.org/10.30595/alphamath.v9i2.17529>

Wijayanti, R., Waluya, S. B., & Masrukan. (2018). Analysis of mathematical literacy ability based on goal orientation in model eliciting activities learning with murder strategy. *Journal of Physics: Conference Series*, 983(1). <https://doi.org/10.1088/1742-6596/983/1/012141>