

Optimizing Fifth-Grade Students' Mathematics Learning Outcomes Through the Teaching at the Right Level (TaRL) Approach

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ABSTRACT

This study was conducted based on classroom observations and interviews with the fifth-grade teacher at SD Negeri 3 Sedong Lor, Cirebon Regency. The findings indicated that students' mathematics learning outcomes were still unsatisfactory, particularly in addition operations involving whole numbers. One of the contributing factors was the implementation of uniform instruction that did not adequately accommodate differences in students' learning readiness and abilities. As a result, many students experienced difficulties in understanding concepts, analyzing problems, and drawing conclusions during learning activities. Therefore, this study aimed to examine the effectiveness of the Teaching at the Right Level (TaRL) approach in improving students' mathematics learning outcomes. The study employed a quantitative approach using a pre-experimental one-group pretest-posttest design. The participants consisted of 23 fifth-grade students selected through total sampling. Data were collected using observation sheets and learning achievement tests. The results revealed improvements in several aspects of the learning process, including the quality of teaching modules, teacher performance, student learning activities, and cognitive achievement. Statistical analysis showed a significant difference between students' scores before and after the implementation of TaRL ($t = 107.861$; $p < 0.000$). These findings indicate that the TaRL approach effectively supports mathematics learning by aligning instruction with students' actual learning needs and levels of understanding.

Keywords: *Teaching at the Right Level (TaRL); Learning Outcomes; Mathematics.*

ABSTRAK

Penelitian ini dilatarbelakangi oleh hasil observasi dan wawancara dengan wali kelas lima SD Negeri 3 Sedong Lor, Kabupaten Cirebon, yang mengungkapkan bahwa hasil belajar matematika siswa masih rendah, terutama pada materi operasi hitung penjumlahan bilangan cacah. Kondisi ini menunjukkan perlunya pendekatan instruksional yang dapat mengakomodasi perbedaan kesiapan dan kemampuan belajar siswa. Oleh karena itu, penelitian ini bertujuan untuk mengetahui efektivitas penerapan pendekatan *Teaching at the Right level (TaRL)* terhadap peningkatan hasil belajar matematika peserta didik. Penelitian ini menggunakan pendekatan kuantitatif dengan desain *pre-experimental* jenis *one-group pretest-posttest*. Subjek penelitian berjumlah 23 peserta didik kelas V yang dipilih menggunakan teknik total sampling. Data dikumpulkan melalui lembar observasi dan tes hasil belajar. Hasil penelitian menunjukkan adanya peningkatan pada berbagai aspek pembelajaran setelah penerapan pendekatan *TaRL*, meliputi kualitas modul ajar, kinerja guru, aktivitas belajar peserta didik pada aspek afektif dan psikomotorik, serta hasil belajar kognitif. Hasil uji hipotesis menunjukkan nilai t hitung sebesar 107,861 dengan signifikansi 0,000, yang mengindikasikan adanya perbedaan yang signifikan antara hasil belajar sebelum dan sesudah penerapan *TaRL*. Temuan ini menunjukkan bahwa pendekatan *TaRL* dapat menjadi alternatif instruksional yang efektif untuk meningkatkan

hasil belajar matematika siswa sekolah dasar melalui kegiatan pembelajaran yang selaras dengan kebutuhan dan tingkat kemampuan aktual mereka.

Kata Kunci: Pendekatan *Teaching at the Right Level (TaRL)*; Hasil Belajar; Matematika.

INTRODUCTION

Education is a planned process that supports the intellectual, emotional, and spiritual development of learners while cultivating character, moral values, and life skills. In Indonesia, educational practices are guided by Law Number 20 of 2003 concerning the National Education System, which emphasizes the creation of a learning environment that helps students develop their potential and competencies for personal and social life (Zulvani et al., 2024). In addition, education prepares students to face twenty-first-century challenges by strengthening critical thinking, creativity, collaboration, and communication skills (Budiyanto et al., 2024).

Achieving these educational goals requires learning processes that accommodate students' diverse characteristics, abilities, and learning needs. According to (Purnomo & Karim, 2024), the achievement of learning objectives is closely related to teachers' ability to design and implement instructional practices that respond to students' needs effectively. This perspective is consistent with the findings of (Prastiwi & Abduh, 2023), who emphasized that inclusive learning practices should accommodate student diversity and provide equitable opportunities for all learners to achieve optimal learning outcomes.

In mathematics education, accommodating learner diversity is particularly important because students often demonstrate varying levels of readiness and understanding. One fundamental concept taught in elementary school is whole-number arithmetic. Mastery of whole-number operations serves as the foundation for learning more advanced mathematical concepts, including fractions, algebra, measurement, and problem-solving. Consequently, gaps in students' understanding at the elementary level may hinder their future mathematical development. Therefore, mathematics instruction should be designed according to students' actual learning abilities and readiness levels. (Seffi & Perseveranda, 2025).

However, mathematics learning in elementary schools is often implemented through uniform instructional practices that overlook differences in students' competencies. As a result, learning outcomes frequently remain below expectations. This issue was observed among fifth-grade students at SD Negeri 3 Sedong Lor, Cirebon Regency. Initial observations revealed unsatisfactory mathematics learning outcomes. None of the 23 students achieved the minimum mastery criterion of 70. Several factors contributed to this condition, including teacher-centered instruction, the absence of diagnostic assessments, limited implementation of differentiated learning, and the lack of competency-based student grouping. Consequently, many students experienced difficulties in understanding and solving whole-number addition problems. Similar findings were reported by (Maemunah, 2024), who identified a mismatch between instructional strategies and students' learning characteristics as a major challenge in elementary mathematics education.

One such approach is Teaching at the Right Level (TaRL), which was developed by Pratham in India. TaRL uses diagnostic assessments to identify students' current competencies and provides instruction based on learning readiness rather than age or grade level (Muammar & Muslimin, 2026). Through flexible grouping and differentiated learning activities, TaRL enables teachers to accommodate diverse student abilities more effectively (Fitriani, 2022). In

addition, aligning instruction with learners' mastery levels helps reduce learning gaps and promote more equitable educational outcome (Sefriyana et al., 2025).

Previous research by (Apriliani et al., 2024) found that TaRL contributed significantly to improvements in mathematics learning outcomes. However, a comparative review of existing studies indicates several limitations. First, previous research has predominantly examined TaRL in a general context. Second, most studies have focused on literacy and numeracy improvement broadly rather than on specific mathematical topics. Third, research investigating the effectiveness of TaRL in whole-number arithmetic remains limited. Finally, studies conducted in specific elementary school contexts, particularly in regional settings, are still relatively scarce.

These limitations indicate a research gap. While TaRL has been widely studied as an approach to improving literacy and numeracy skills, there is still limited evidence regarding its effectiveness in teaching whole-number arithmetic concepts. Moreover, empirical studies conducted in specific elementary school contexts remain insufficient. The novelty of the present study lies in its focus on examining the effectiveness of the Teaching at the Right Level approach in improving learning outcomes in whole-number addition, a fundamental mathematical concept that serves as the basis for more advanced mathematical learning. In addition, this study provides empirical evidence from a specific elementary school context, namely SD Negeri 3 Sedong Lor, Cirebon Regency, where research on the implementation of TaRL remains limited. Therefore, this study seeks to address these gaps by examining the effectiveness of the Teaching at the Right Level approach in teaching whole-number addition to fifth-grade students at SD Negeri 3 Sedong Lor, Cirebon Regency.

Therefore, this study aims to determine the effectiveness of the Teaching at the Right Level approach in improving fifth-grade students' learning outcomes in whole-number addition.

METHODS

Type and Design

This study employed a quantitative research method because it allows researchers to objectively examine the effect of the Teaching at the Right Level (TaRL) approach on students' learning outcomes (Siska et al., 2025). The study employed a one-group pretest-posttest pre-experimental design, in which a single group was measured before and after treatment (Sugiyono, 2019). This design was selected because the study aimed to examine changes in students' learning outcomes before and after the implementation of TaRL in a naturally existing classroom setting. The effectiveness of TaRL was determined by comparing students' pretest and posttest scores. However, the absence of a control group limits the ability to eliminate external factors that may influence learning outcomes (Fadhli et al., 2023).

The study was conducted at SD Negeri 3 Sedong Lor, Sedong District, Cirebon Regency, Indonesia. The site was selected based on preliminary observations and interviews with the fifth-grade teacher, which revealed that learning activities had not accommodated differences in students' initial abilities, competency-based grouping had not been implemented, and learning materials and exercises had not been adjusted to students' learning needs. Consequently, students' mathematics learning outcomes remained low.

The population included all fifth-grade students at SD Negeri 3 Sedong Lor. Because the population was small, all 23 students were selected as the sample using a total sampling technique. The participants consisted of fifth-grade students aged approximately 10-11 years, with different levels of mathematics readiness and achievement.

Research Procedure

The study was conducted through the following stages:

1. Administering a pretest to determine students' initial learning outcomes in whole-number addition.
2. Conducting a diagnostic assessment consisting of two whole-number addition problems to identify students' readiness levels.
3. Grouping students into low-, medium-, and high-readiness categories.
4. Dividing each category into two groups, resulting in six learning groups consisting of three to five students.
5. Implementing the TaRL approach in two learning sessions, each lasting 2×35 minutes.
6. Administering a posttest after the intervention.
7. Analyzing the improvement in students' learning outcomes using descriptive statistics, a paired-sample t-test, and N-Gain analysis.

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Data and Data Sources

The data consisted of students' mathematics learning outcomes before and after the implementation of TaRL. The primary data source was fifth-grade students at SD Negeri 3 Sedong Lor. The research instruments included observation sheets and essay tests. The test measured students' mathematics learning outcomes, whereas the observation sheet documented the implementation of TaRL during learning activities. The test consisted of two essay items on whole-number addition administered as both a pretest and a posttest. The items were developed based on the indicators presented in Table 1.

Tabel 1. Test Blueprint

No	Indicator	Cognitive Aspect	Item Number
1	Identifying known and required information in whole-number addition problems	Analyzing (C4), Evaluating (C5), Creating (C6)	1
2	Solving whole-number addition problems and providing justification for the solution	Analyzing (C4), Evaluating (C5), Creating (C6)	2

Tabel 2. Scoring Rubric for Pretest and Posttest

Assessment Aspect	Score
Identifying known information (C4)	10
Identifying required information (C4)	5
Providing the answer correctly	20
Providing justification (C5)	10
Drawing conclusions (C6)	5
Final score per item	50

The maximum score for the two essay items was 100.

The observation sheet documented: (1) diagnostic assessment, (2) competency-based grouping, (3) differentiated learning activities, (4) student participation, and (5) evaluation activities.

Prior to data collection, the test instrument was examined for validity and reliability. Validity indicates the accuracy of an instrument, whereas reliability reflects its consistency (Elosua, 2022). All items were valid, and the reliability coefficient was 0.946, indicating high reliability. Therefore, the instrument was suitable for use in this study. The results are presented in Tables 3 and 4.

Table 3. Results of the Validity Test of the Learning Outcomes Test

Item Number	r-count	r-table	Criteria
1	0.978	0.361	Valid
2	0.973	0.361	Valid

Table 4. Results of the Reliability Test of the Learning Outcomes Test

r-count	r-table	Criteria
0.946	0.361	Reliable

Based on these results, all test items were declared valid and reliable and were therefore eligible for use as research instruments.

Data Collection Technique

Data were collected through observation and tests. Observation was used to document the implementation of TaRL based on predetermined indicators (Widoyoko, 2020). Classroom observations were conducted in structured learning situations (Kohake, 2024). Tests were used to measure students' mathematics achievement, as assessment plays an important role in monitoring learning progress and achievement of learning objectives (Kushari & Septiadi, 2022).

Data Analysis

The data were analyzed using descriptive and inferential statistics. Descriptive statistics were used to summarize students' learning outcomes before and after the implementation of the TaRL approach. Before hypothesis testing, a normality test was conducted to determine whether the data were normally distributed. Since the pretest and posttest scores were obtained from the same group of students, a homogeneity test was not considered a primary requirement for the paired-sample t-test analysis. (Field, 2018).

After meeting the prerequisite test assumptions, hypothesis testing was conducted using a paired-sample t-test in SPSS version 22 to determine whether there was a significant difference between students' pretest and posttest scores after the implementation of the TaRL approach.

The hypotheses were formulated as follows:

H_0 : There is no significant difference between students' pretest and posttest scores after the implementation of TaRL.

H_1 : There is a significant difference between students' pretest and posttest scores after the implementation of TaRL.

After the prerequisite test was met, a paired-sample t-test was conducted using SPSS version 22 to examine differences between pretest and posttest scores.

The decision criteria were as follows:

- If Sig. < 0.05, H_0 is rejected and H_1 is accepted.
- If Sig. $\geq$ 0.05, H_0 is accepted and H_1 is rejected.

The N-Gain test was used to measure the effectiveness of the intervention in improving students' mathematics learning outcomes (Nani et al., 2022).

$$\text{N-Gain} = (\text{Posttest Score} - \text{Pretest Score}) / (\text{Maximum Score} - \text{Pretest Score})$$

The interpretation criteria for N-Gain scores were:

N-Gain Score	Category
$g < 0.30$	Low
$0.30 \leq g < 0.70$	Moderate
$g \geq 0.70$	High

The N-Gain score was used to determine the level of improvement in students' learning outcomes after the implementation of the TaRL approach.

RESULTS

Students' Mathematics Learning Outcomes

Students' mathematics learning outcomes were the primary focus of this study. Prior to the implementation of the Teaching at the Right Level (TaRL) approach, students demonstrated low achievement in whole-number addition. Most students experienced difficulties in understanding mathematical concepts and solving addition problems correctly. The results of students' learning outcomes before and after the implementation of the TaRL approach are presented in Table 5.

Table 5. Students' Mathematics Learning Outcomes Before and After the Implementation of TaRL

Aspect	Pretest	Posttest
Average Score	32,65	89,56
Students Achieving Mastery	0 (0%)	23 (100%)
Students Not Achieving Mastery	23 (100%)	0 (0%)

As shown in Table 5, the average score increased from 32.65 to 89.56 after the implementation of the TaRL approach. Furthermore, none of the students achieved mastery

learning before the intervention, whereas all students (100%) achieved mastery learning after the intervention.

Statistical Effectiveness Test

To verify whether the observed improvement was statistically significant, normality testing and hypothesis testing were conducted. The results of the normality test are presented in Table 6.

Table 6. Results of the Normality Test for Learning Outcomes Tests

		<i>Test of Normality</i>					
		<i>Kolmogorof-Smirnov</i>			<i>Shapiro-Wilk</i>		
	Kategori	Statistic	Df	Sig.	Statistic	Df	Sig.
Results	<i>Prestest</i>	,138	23	,200*	,941	23	,190
	<i>Posttest</i>	,164	23	,112	,928	23	,101

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

The results indicate that both pretest and posttest data were normally distributed because the significance values exceeded 0.05. Hypothesis testing was conducted using a paired-sample t-test. The results are presented in Table 7.

Table 7. Results of Hypothesis Testing of Learning Outcomes Tests

		Paired Samples Test							
		Paired Difference					T	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest								
	-	-56,565	2,515	,524	-57,653	-55,478	-107,861	22	,000
	Posttest								

The paired-sample t-test produced a significance value of 0.000 ($p < 0.05$), indicating a statistically significant difference between students' pretest and posttest scores. The paired-sample correlation analysis is presented in Table 8.

Table 8. Sample Pair Correlation Test

		<i>Paired Samples Correlation</i>		
		<i>N</i>	<i>Correlation</i>	<i>Sig.</i>
Pair 1	Pretest Score & Posttest Score	23	,887	,000

The paired-sample correlation coefficient of 0.887 indicates a very strong relationship between students' scores before and after the intervention. Overall, the findings indicate that the implementation of the TaRL approach was associated with significant improvement in students' mathematics learning outcomes. However, because this study employed a one-group pretest-posttest design without a control group, the observed improvement cannot be attributed solely to the intervention. Other factors, such as learning experience, instructional time, and external influences, may also have contributed to the improvement.

Students' Learning Activities

The implementation of the TaRL approach also improved students' learning activities in the affective and psychomotor domains. The pre-implementation results of students' learning activities are presented in Table 11-12.

Table 11. Observation Results of Student Learning Activities (Affective and Psychomotor) Before Implementing the TaRL approach

Aspect	Affective	Psychomotor
Number of Students with Good Criteria	3	3
Percentage (%)	13,04%	13,04%

Table 12. Observation Results of Student Learning Activities (Affective and Psychomotor) After Implementing the TaRL approach

Aspect	Affective	Psychomotor
Number of Students with Good Criteria	22	23
Percentage (%)	95,65%	100%

The percentage of students achieving good criteria increased from 13.04% to 95.65% in the affective domain and from 13.04% to 100% in the psychomotor domain. These findings suggest that TaRL contributed to a more engaging and participatory learning environment, in which students became more actively involved in learning activities and demonstrated greater confidence in solving mathematical problems.

Teaching Module Quality

The implementation of TaRL improved the quality of the teaching module. Learning objectives, activities, and assessments were developed based on students' readiness levels and diagnostic assessment results. As shown in Table 9, the teaching module quality improved from the fair to the very good category after the implementation of TaRL.

Table 9. Results of Observations of Teaching Modules

Aspect	Before Implementing the TaRL approach	After Implementing the TaRL approach
Score	14	27
Percentage (%)	51,58%	100%
Criteria	Fair	Very Good

The results indicate that the quality of the teaching module improved considerably after the implementation of TaRL. This improvement was associated with the use of diagnostic assessment results to design learning activities that better matched students' needs and learning readiness.

Teacher Performance

Teacher performance improved after the implementation of TaRL. Observation results showed better classroom management, student facilitation, and differentiated instruction practices. As presented in Table 10, teacher performance increased from the fair category before implementation to the very good category after implementation.

Table 10. Results of Teacher Performance Observations

Aspect	Before Implementing the TaRL approach	After Implementing the TaRL approach
Score	11	20

Percentage (%)	52,38%	95,23%
Criteria	Fair	Very Good

The findings suggest that the implementation of TaRL supported teachers in managing instruction more effectively and responding to students' diverse learning needs.

DISCUSSION

Students' Mathematics Learning Outcomes

The improvement in students' affective and psychomotor activities indicates that Teaching at the Right Level (TaRL) approach promotes active participation and engagement in learning. Students become more confident and motivated because learning activities are designed according to their ability levels. TaRL increases student engagement by providing instruction that matches students' actual learning needs and readiness levels. When learning activities are aligned with students' abilities, learners tend to participate more actively and develop greater confidence in classroom interactions (Mansyur et al., 2025).

Similarly, differentiated instruction has been found to enhance students' motivation because learning tasks are adapted to their readiness, interests, and learning profiles. This personalized approach makes learning more accessible and meaningful while reducing learning difficulties and anxiety, particularly in mathematics learning (Ndia et al., 2025).

Furthermore, students become more actively involved in learning when instructional activities are designed according to their readiness levels. Such alignment promotes participation, collaboration, and persistence in completing learning tasks while strengthening students' confidence in problem-solving activities (Pagiling et al., 2024).

In addition, (Widiana et al., 2023) state that appropriately designed learning tasks improve students' positive attitudes toward learning and increase their willingness to participate actively. This shows that learning environment design strongly influences student engagement and behavior. Overall, TaRL creates a learning environment that supports both emotional and behavioral engagement. Students not only improve in participation but also show increased confidence, motivation, and responsibility in learning activities.

Students' Learning Activities

Overall, the implementation of the TaRL approach contributes not only to cognitive achievement but also to the development of students' affective and psychomotor competencies. (Afandi et al., 2024) reported that integrating differentiated learning through TaRL significantly improves students' learning interest and learning outcomes. By providing learning experiences that match students' readiness levels, TaRL promotes greater engagement, motivation, and active participation in classroom activities.

Furthermore, (Putri & Muldash, 2024) found that the integration of Problem-Based Learning with the TaRL approach increases students' interest and involvement in mathematics learning. Learning activities designed according to students' competency levels encourage them to participate more actively in problem-solving processes and collaborative learning experiences.

In addition, (Ananda & Adi, 2024) emphasized that differentiated learning implemented through the TaRL approach creates a more inclusive learning environment by

accommodating differences in students' abilities and learning needs. Such an environment encourages students to develop confidence, responsibility, and positive attitudes toward learning while improving their academic performance.

These findings indicate that TaRL is an effective instructional approach for supporting holistic student development. By aligning instruction with students' readiness levels and learning needs, TaRL not only enhances academic achievement but also strengthens students' motivation, engagement, classroom participation, and overall learning experience. Therefore, TaRL can be considered a comprehensive and sustainable instructional approach for improving learning quality in elementary education.

Teaching Module Quality

The improvement in teaching module quality indicates that the TaRL approach supports instructional planning that is more responsive to students' learning needs. Through diagnostic assessment, teachers can identify students' readiness levels and design learning activities accordingly. According to (Prasetyo et al., 2024), TaRL improves instructional design by aligning learning activities with students' competencies, making instruction more focused and meaningful.

This finding supports the principle of differentiated instruction principles. (Nihayah & Tirtoni, 2026) emphasize that diagnostic assessment helps teachers map students' initial competencies and develop instruction that matches their needs. Likewise, (Putri & Muldash, 2024) state that differentiated instruction creates flexible learning environments that accommodate differences in students' readiness, interests, and learning pace.

Furthermore, (Yantoro et al., 2024) found that integrating TaRL into instructional planning improves teachers' ability to develop structured, competency-based learning activities. Therefore, TaRL supports more adaptive instructional planning and strengthens pedagogical competence.

Teacher Performance

The improvement in teacher performance suggests that TaRL supports more effective instructional practices. Through diagnostic assessment and differentiated instruction, teachers can better identify students' learning needs and provide appropriate support (Abidin et al., 2024) TaRL strengthens teachers' pedagogical competence by encouraging them to understand students' learning levels and adapt instruction accordingly.

Similarly, (Wardani et al., 2024) found that differentiated assessment within TaRL helps teachers monitor students' progress more accurately and make data-driven instructional decisions. In addition, TaRL encourages teachers to act as facilitators and knowledge providers. (Aryani & Atok, 2025) explain that TaRL promotes a more inclusive and student-centered learning environment by organizing instruction according to students' readiness levels.

Furthermore, (Adawiyyah et al., 2024) reported that TaRL requires teachers to group students based on their level of understanding, design appropriate learning plans, and provide learning experiences that match students' needs. Consequently, TaRL supports the development of teachers' instructional competence and classroom management skills.

CONCLUSION

This study indicates that the implementation of the Teaching at the Right Level (TaRL) approach was associated with improved mathematics learning outcomes in whole-number

addition among fifth-grade students at SD Negeri 3 Sedong Lor, Cirebon Regency. The findings showed that the average student score increased from 32.65 on the pretest to 89.56 on the posttest, while the percentage of students achieving mastery learning improved from 0% to 100%. Furthermore, the paired-sample t-test revealed a statistically significant difference between pretest and posttest scores ($\text{Sig.} = 0.000 < 0.05$), indicating a substantial improvement in students' mathematics learning outcomes following the implementation of the TaRL approach.

In addition to improving learning outcomes, the implementation of TaRL was associated with enhanced student learning activities in the affective and psychomotor domains, as well as improvements in teaching module quality and teacher performance. These findings suggest that differentiated instruction based on students' learning readiness can support more inclusive and meaningful mathematics learning experiences.

However, this study was limited to one classroom and focused only on the topic of whole-number addition. Therefore, the findings cannot be generalized to other mathematics topics, subjects, or grade levels without further investigation. Future studies are recommended to examine the implementation of TaRL in broader educational contexts and with more rigorous research designs. From an educational perspective, the findings highlight the importance of diagnostic assessment and differentiated instruction in accommodating students' diverse learning needs and improving mathematics learning outcomes.

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