

# Empowering Elementary Students: A Model for Enhancing Literacy and Numeracy Skills to Overcome Learning Loss

Mufarrihul Hazin<sup>1</sup>, Nur Wedia Devi Rahmamawati<sup>2</sup>, Muhammad Turhan Yani<sup>3</sup>, Suyatno Ladiqi<sup>4</sup>

<sup>1</sup> Universitas Negeri Surabaya, Surabaya, Indonesia; mufarrihulhazin@unesa.ac.id

<sup>2</sup> Universitas Islam Negeri Syarif Hidayatullah, Jakarta, Indonesia; nurwediadevirahmawati@gmail.com

<sup>3</sup> Universitas Negeri Surabaya, Surabaya, Indonesia; turhanyani@unesa.ac.id

<sup>4</sup> Universiti Sultan Zainal Abidin, Malaysia; yatno.ladiqi@gmail.com

## ARTICLE INFO

### Keywords:

Elementary School  
Learning Loss;  
Literacy;  
Numeracy

### Article history:

Received 2023-06-29

Revised 2024-05-26

Accepted 2025-01-10

## ABSTRACT

Quality education is essential for national progress, but low literacy and numeracy competencies among students negatively affect Indonesia's educational outcomes. This study aimed to identify learning losses in literacy and numeracy among elementary school students, provide targeted interventions and mentoring, and evaluate their impact. A qualitative field study was conducted in 10 elementary schools in Hulu Sungai Selatan Regency, South Kalimantan. The study involved 20 students per school, spanning grades 2 to 6. Data were collected through 10-question assessments for each student, interviews with principals, teachers, and parents, as well as observation and documentation. The findings revealed significant learning losses during the pandemic, with a 56.5% decline in numeracy competence and a 62.95% decline in literacy competence. Targeted interventions included inquiry learning, quantum teaching, project-based learning, and contextual learning models. Post-intervention, literacy competence increased by 31.2%, while numeracy competence improved by 17.5%. The results demonstrate that tailored learning models and strategies effectively address learning losses. Teachers play a critical role in adapting these approaches to match students' cognitive development and targeted competencies. Enhancing literacy and numeracy requires innovative teaching models and continuous adaptation of strategies to students' needs. These findings emphasize the importance of flexible and student-centered learning practices to mitigate learning losses and improve educational outcomes.

*This is an open access article under the [CC BY-NC-SA](#) license.*



## Corresponding Author:

Mufarrihul Hazin

Universitas Negeri Surabaya, Surabaya, Indonesia; mufarrihulhazin@unesa.ac.id

## 1. INTRODUCTION

Improving the quality of education is intrinsically linked to enhancing students' reading skills (Usmeldi, 2016). Literacy is a cornerstone of education, encompassing the ability to assimilate, analyze, and critically engage with information. In today's digital era, where internet access facilitates rapid information exchange, strong reading skills are essential, particularly for students and the younger

generation. However, literacy and numeracy competencies among Indonesian students remain alarmingly low.

According to the Program for International Student Assessment (PISA), Indonesia ranks 74th out of 79 countries, placing it among the bottom five nations with the lowest literacy levels (Hewi & Shaleh, 2020). As a global benchmark for assessing students' competencies, PISA highlights the urgent need for focused attention and intervention in Indonesia's education system (Ladyawati & Rahayu, 2022). From 2000 to 2018, Indonesia's PISA scores in literacy, science, and mathematics have consistently indicated critical challenges, underscoring the need for comprehensive efforts to address these deficits and improve students' overall learning outcomes.

This situation is exacerbated by the Covid-19 pandemic which has forced students to study at home. The lack of teacher preparation for learning and the lack of supporting infrastructure caused learning activities to stop. A study by the Ministry of Education and Culture (Rohati et al., 2021) found that 67.11% of teachers experienced problems using digital devices. On the other hand, 88.7 percent of students lack support services such as laptops, electricity, internet and equipment. As a result students do not focus on learning (51.1%). According to a survey by the Indonesian Child Protection Commission, 76.7% of students do not like studying at home. This is because 37.1% of students feel they lack rest and are tired of completing assignments for all subjects (Muliantara & Suarni, 2022). Finally, there is a fatal effect; decreased student learning ability (loss of learning).

The COVID-19 pandemic has profoundly impacted various aspects of life, including education, where it has resulted in widespread "literacy loss" and "learning loss." Prolonged school closures to curb the virus's spread, the shift to home-based learning requiring parental involvement, and the need for teachers to adopt new strategies have all contributed to disruptions in students' learning abilities (Hazin et al., 2022).

Learning loss is defined as a decline in knowledge and skills or a reversal in academic progress due to extended gaps in education (Huong & Jatturas, 2020). Hazin et al. (2021) further attribute learning loss in Indonesia to limited technological access, low teacher quality, and insufficient parental commitment in the learning process. Addressing these challenges requires targeted efforts to enhance literacy and numeracy skills while improving access to education, refining curriculum quality, and optimizing the learning process (Hazin & Rahmawati, 2021). This study aims to contribute to these efforts by addressing learning loss and improving student competencies, particularly in literacy and numeracy, to strengthen Indonesia's position in international assessments.

The novelty of this research lies in its proactive approach to combating learning loss through a model that focuses on active learning, critical thinking, and problem-solving. Unlike traditional remedial programs, this model integrates innovative pedagogical strategies and technology to equip elementary students with essential skills for the digital era. This study explores three main research questions: (1) How have the literacy and numeracy skills of elementary students been affected during the pandemic? (2) What models and strategies can mitigate learning loss effectively? (3) What are the outcomes of implementing these strategies?

The primary aim of this research is to identify the extent of literacy and numeracy losses among elementary school students caused by the COVID-19 pandemic and to develop effective models and strategies to address these challenges. By implementing targeted interventions, the study seeks to enhance students' competencies in reading, writing, and arithmetic, thereby mitigating the adverse effects of learning loss. Furthermore, the research aims to evaluate the outcomes of these interventions, offering evidence-based recommendations for improving educational practices and student performance.

The significance of this research lies in its potential to address critical gaps in elementary education. For students, the study introduces innovative and engaging approaches that foster active learning and critical thinking, ultimately helping them regain lost skills and build a solid foundation for future academic success. For teachers, the research provides practical strategies and tools to adapt

their pedagogy to meet the diverse needs of learners in a post-pandemic context. Moreover, for policymakers and educational leaders, the findings offer valuable insights to inform reforms in curriculum design, teaching methodologies, and resource allocation, contributing to the broader goal of improving educational quality and equity in Indonesia. By addressing learning loss and advancing literacy and numeracy skills, this research holds the potential to enhance Indonesia's educational outcomes and global standing in international assessments.

## 2. METHODS

The research approach utilized in this study is action research. Action research was chosen because it allows the researcher to directly engage in the classroom learning process, identify problems, design and implement interventions, and evaluate their impact. This approach enables the iterative development and testing of models for understanding and improving student literacy and numeracy, taking into account student responses and specific needs, as well as the school context.

The number of students involved in this research is 200 students from 2<sup>nd</sup>-6<sup>th</sup> grade elementary school selected randomly from 10 schools in Hulu Sungai Selatan Regency. The characteristics of the students include ages between 8 and 12 years old, and they have diverse educational backgrounds. The selection of research subjects was based on inclusion criteria that include 2<sup>nd</sup>-6<sup>th</sup> grade elementary school students with diverse literacy and numeracy skill levels. Selection was conducted to ensure balanced representation of various abilities and levels of student understanding.

The implemented intervention model includes problem-based learning approaches, the use of role-playing techniques, and integration of technology in learning. This model was designed to enhance student literacy and numeracy understanding and skills through student-centered learning experiences relevant to their daily lives. This intervention model was adapted to meet the specific needs of students and the school context through the use of teaching materials designed according to the national curriculum and student characteristics, as well as the provision of additional support by teachers and school staff. Measurement tools used to assess student literacy and numeracy before and after the intervention include standardized tests validated to measure reading, writing, and arithmetic abilities. Additionally, questionnaires were used to collect data on student perceptions and experiences of learning.

Data were collected through pre-tests and post-tests, as well as questionnaires administered to students. Interviews were also conducted with teachers and school staff to gain additional insights into the implementation of the intervention model. Analysis techniques used include descriptive and inferential statistical analysis to compare literacy and numeracy score differences between the before and after intervention. Qualitative analysis was also conducted to understand factors influencing model effectiveness. Data validity and reliability were ensured through the use of validated and tested measurement tools, as well as structured and monitored data collection methods. Efforts to ensure the accuracy and reliability of findings include data verification, triangulation of data sources, and continuous reflection by the researcher on biases and assumptions that may affect interpretation of results.

## 3. FINDINGS AND DISCUSSION

### 3.1. Identification of elementary school students' literacy abilities

The study assessed literacy skills among elementary school students in grades 2 through 6 to identify learning gaps, as grade 1 students were newly enrolled and not yet evaluated. In grade 2, the literacy assessment showed promising overall results. However, certain basic competencies were

unmet. Many students struggled to distinguish between vowels and consonants; some could spell but not read fluently, and others faced difficulties in writing words correctly within sentences.

In grade 3, while literacy performance was generally good, specific challenges persisted. Many students did not use capital letters appropriately for names of gods, people, and religions. A small number had trouble interpreting information in animal tales, and some struggled with comprehending children's poetry in Indonesian.

Grade 4 assessments revealed positive results overall, yet several competencies remained unachieved. Many students were unable to interpret messages from written and visual stories, and some had difficulty understanding traffic signs.

For grade 5, significant learning losses were observed. Most students could not identify supporting ideas in texts, struggled to gather information effectively through interviews, and found it difficult to interpret content and messages in students' poetry. Furthermore, many were unable to explore new knowledge from both fiction and non-fiction reading materials.

In grade 6, literacy performance was generally good but revealed gaps in key competencies. Many students were unable to classify information from books into "why," "what," and "how" questions. Most struggled with identifying the content and message in written rhymes, and some found it challenging to analyze information from billboards.

These findings highlight varying degrees of learning loss across grades 2 to 6, prompting a detailed analysis to map the extent of gaps and inform targeted interventions at the schools assessed.

**Table 2.** Results of Initial Literacy Assessment in each school

Schools	Results of Low-Class Analysis (II, III)			Results of High-Class Analysis (IV, V, VI)		
	Low (score <40) %	Moderate (score 40-70) %	High (>70) %	Low (score <40) %	Moderate (score 40-70) %	High (>70) %
SDN BS2	4	46	50	17	52	31
SDN BT	0	62	38	17	40	43
SDN GS2	55	20	25	33	37	30
SDN H2	15	69	16	12	38	50
SDN JHB2	17	50	33	16	27	57
SDN KB2	0	50	50	13	53	37
SDN KK1	5	42	53	3	24	73
SDN KK4	6	47	47	10	24	67
SDN KU2	10	30	60	0	42	58
SDN KJM1	11	67	22	8	58	34
Average Percentage of Mapping Results	12.3	48.3	39.4	12.9	39.5	48

The results of the analysis above show that *learning loss* occurs in students' literacy competencies for the low-class category still looks quite large, because those who get low and medium scores are only around 60.6%, while in the high class, there is a lower *learning loss* which is equal to 52.4% of low and medium scores. Based on these data, it can be interpreted that learning loss in the field of literacy occurs in both low and high classes. The average learning loss resulting from numeracy competence is 56.5%.

### 3.2. Identification of elementary students' numeration abilities

The initial assessment of numeracy skills for 2nd-grade elementary school students showed satisfactory results. However, the research team noted that several basic competencies were still unmet. Some students had difficulty explaining and performing addition and subtraction of whole numbers

up to 20 in everyday situations. Additionally, many students could not recite numbers from 1 to 50 in both ascending and descending order.

The initial numeracy assessment for 3rd-grade students revealed a significant learning loss. The research team found that most students were unable to explain multiplication and division operations within the context of everyday story problems. Many students also struggled to explain fractions  $\frac{1}{2}$ ,  $\frac{1}{3}$ , and  $\frac{1}{4}$  using concrete objects. Furthermore, they experienced confusion when comparing two numbers up to 100.

For 4th-grade students, the initial numeracy assessment indicated a noticeable learning decline. The research team noted that most students could not identify line symmetry and rotational symmetry in geometric shapes using concrete objects. Additionally, many students did not understand the relationship between commonly used units of length and time, such as reading rulers and wall clocks. Students' ability to analyze various forms of data also remained inadequate.

The initial numeracy assessment for 5th-grade students revealed a very significant learning loss. The research team found that most students were unable to determine and calculate the greatest common factor (GCF) and least common multiple (LCM) of two given numbers. Students also had difficulty calculating and distinguishing between the area and perimeter of geometric shapes, determining the square root, and measuring and explaining angles in geometric figures.

For 6th-grade students, the initial numeracy assessment indicated a very significant learning decline. The research team discovered that most students still struggled with identifying and dividing decimal fractions and percentages. Additionally, many students had difficulty determining the scale on maps or plans, understanding the nets of simple three-dimensional shapes such as cubes and blocks, and explaining data related to their environment and how to collect it.

Based on the assessment results from grades 2 through 6 at the target schools, the researchers conducted an in-depth analysis to map the extent of learning loss at each school. The following data presents the distribution of these findings.

**Table 3.** Numerical analysis results for each school

Schools	Results of Low-Class Analysis (II, III)			Results of High-Class Analysis (IV, V, VI)		
	Low (score <40) %	Moderate (score 40- 70) %	High (>70) %	Low (score <40) %	Moderate (score 40-70) %	High (>70) %
SDN BS2	4	22	74	27	67	6.6
SDN BT	0	42	58	22	50	28
SDN GS2	8	50	42	40	60	0
SDN H2	23	46	31	25	75	0
SDN JHB2	6	12	82	36	57	7
SDN KB2	0	30	70	39	48	13
SDN KK1	0	53	47	34	53	13
SDN KK4	0	35	65	13	55	32
SDN KU2	0	5	95	14	76	10
SDN KJM1	23	15	62	44	50	6
Average Percentage of Mapping Results	6.4	31	62.6	29.4	59.1	11.5

The analysis of the research findings indicates that learning loss in numeracy among elementary students is significant, varying across grade levels. In the lower grades, learning loss in numeracy is measured at 37.4%, categorized as moderate. However, in the upper grades, the issue is far more pronounced, with 88.5% of students scoring in the low and moderate categories. This disparity highlights a critical gap in numeracy skills, with older students experiencing more substantial setbacks compared to their younger peers.

The severity of learning loss in the upper grades underscores the cumulative impact of educational disruptions, particularly during formative years when foundational numeracy skills are expected to solidify. Factors such as reduced access to effective instructional strategies, limited engagement with mathematical concepts, and inconsistent reinforcement at home likely contributed to this decline.

In addition to numeracy, the average learning loss in literacy competence across all grades was recorded at 62.95%, indicating a significant challenge in both fields. These findings align with broader trends in learning loss caused by the pandemic, which disproportionately affected higher-order skills such as critical thinking, problem-solving, and comprehension, all of which are essential for both numeracy and literacy.

These results emphasize the urgent need for targeted interventions to address these deficits. Tailored approaches that prioritize interactive and contextually relevant teaching methods, combined with continuous support for students, teachers, and parents, are essential to mitigate these losses and rebuild competencies in both numeracy and literacy.

### 3.3. Literacy and Numeracy Treatment and Assistance

After conducting an initial assessment and learning from some of the results described above, the team made a treatment or handling to overcome learning loss at every grade level, from grade 2 to grade 6. We tested various methods and strategies, and the results of discussions with the team of experts and facilitators in the field works with class teachers in each school to choose the right method and according to needs.

Overall, the methods used in an effort to overcome learning loss are (1) *problem-based learning*, (2) *project-based learning*, (3) *contextual learning and teaching*, (4) *inquiry learning*, and (5) *quantum teaching*. Of the five methods and strategies, we present in detail some of the *treatments* carried out by the Facilitator Team in overcoming the occurrence of *learning loss* in Hulu Sungai Selatan District.

Assistance was provided by the facilitator to increase competence in grade 6 with a project-based learning model, where students made cube nets with cardboard. After they finished working, they appeared in front of the class, then their work was given awards and prizes.



Figure 1. Spatial Learning with *Project-Based Learning*

*Project-based learning* can improve literacy and numeracy competencies effectively (Ladyawati & Rahayu, 2022). Numerical literacy skills are demonstrated by being comfortable with numbers and being able to use mathematical skills practically in meeting the demands of life. This ability also refers



to the appreciation and understanding of information that is expressed mathematically, for example, graphs, charts and tables (Mahmud & Pratiwi, 2019). In addition, increasing project-based numeracy is also carried out as a team, this is in accordance with the *team-based project learning program* (Yustitia & Dian Kusmaharti, 2022).

Increasing literacy competency aspects in grade 5, students have difficulty determining supporting ideas in a reading, gathering information through interviews with a list of questions made, analyzing and understanding the content and message of poetry, as well as difficulties in understanding fiction and non-fiction text reading



**Figure 2.** Exploring the content and message of poetry by *Quantum Teaching*

Based on the illustration above, understanding basic competencies related to the content and message of poetry is facilitated through the Quantum Teaching model. This model incorporates six structured steps, known as TANDUR: Grow, Experience, Name, Demonstrate, Repeat, and Celebrate. By following this approach, students are guided to engage actively with poetry, allowing them to demonstrate their understanding through direct practice. They are encouraged to read poetry aloud, identify its meaning, and analyze its content and message. This interactive and experiential method not only enhances comprehension but also fosters deeper appreciation and critical thinking about the essence of poetry.

The results of the study show that with the *quantum teaching model* carried out by the teacher, students become more enthusiastic in learning, especially for deepening literacy and numeracy. This was conveyed by Wahyuni et al., (2022) the Quantum Teaching and Learning model to be an alternative to increase students' interest in learning in elementary schools. There are several reasons why the *quantum teaching model* is superior, first, this model can connect real experiences with learning materials. Second, it can foster interest and motivation to learn. Third, learning activities become more creative and interactive. Fourth, involving students in active learning (*student center*). Fifth, students feel comfortable in the learning environment (Margadhyata et al., 2013).

Literacy competence in grade 4 occurs in learning loss, in the basic competency of extracting information from a fairy tale. This is done by learning *quantum teaching*. The facilitator prepares learning materials and media by making pictures of fairy tales and pasting them on the blackboard, then, students are instructed to come forward and make fairy tales out of the pictures.

Quantum teaching is also a lively learning model that activates interactions in learning activities that affect student withdrawal and can accommodate student interests (Fitri et al., 2021). Quantum teaching focuses on dynamic relationships within the classroom environment. The dynamic material in question is the interaction that builds a foundation and framework for learning (Rumapea et al., 2017).

In the field of numeracy competence in grade 3 there is *learning loss* which is characterized by difficulties in performing multiplication and division calculations in the practice of everyday life and

difficulties in explaining fractions;  $\frac{1}{2}$ ,  $\frac{1}{4}$ . The facilitator team conducted treatment with various learning models using the concept of *contextual teaching and learning (CTL)*. This is shown in the following figure.



**Figure 4.** Sharing Learning through CTL

The picture above shows that there is a learning model that is adapted to the context, where tribal elementary school children eat candy, and the learning media is in the form of candy. The description above shows that in prohibiting numeration, especially division and extension, it must be carried out in accordance with the existing needs/context. This lesson begins with an explanation of the basic concept of distribution that the facilitator has written on the blackboard, then the facilitator takes out colorful candies and instructs them to distribute 15 pieces of candy to 5 of their friends, then how are each of these friends? *It turns out that* the student directly understands that the candy obtained by each friend is divided by an average of 3 pieces of candy. Apart from that, in competence class 3 in the field of numeracy, the same is done with the CTL learning model to understand fractions of  $\frac{1}{2}$ ,  $\frac{1}{4}$  fractions with donuts, watermelon, and so on learning media.

The contextual approach used in this model, as described by Yani et al. (2021), emphasizes helping students find meaning within a context and relate it to their surrounding environment. This approach encourages educators to design and implement learning experiences that allow students to actively engage with the material and construct knowledge through real-life applications. The Contextual Teaching and Learning (CTL) model shifts learning from passive activities, such as sitting, listening, and taking notes, to an active process where students directly experience the material being taught (Syaifuddin et al., 2021). This demonstrates the effectiveness of the CTL model in enhancing literacy and numeracy competencies among elementary school students.

In Grade 2, two literacy competencies were targeted for intervention based on the basic competencies students had not yet mastered: distinguishing vowels and consonants and spelling words and sentences correctly. To address these gaps, the Facilitator Team employed a range of engaging and hands-on activities, including a creative use of students' five fingers. Students were asked to trace their fingers and assign each finger a vowel (A, E, I, O, U). This interactive activity provided a tactile and visual method to reinforce vowel recognition, making the learning process more engaging and memorable for the students. The following image illustrates this activity during the treatment phase, showcasing its application in the classroom setting.





**Figure 5.** Learning Vocal and Consonant Letters through *Inquiry Learning*

The mentoring model employed in this study is based on the inquiry learning approach. The learning process begins with an engaging activity where students draw and color their hands. After completing their drawings, they are instructed to write the five vowels on each finger. This hands-on activity fosters creativity and provides a foundation for inquiry-based exploration.

The inquiry learning model emphasizes a process in which students discover relationships by formulating hypotheses and testing them through observations or experiments (Alvionita et al., 2022). Unlike traditional teaching methods, this approach allows students to build upon their prior knowledge and apply it to real-world problems, promoting critical thinking and problem-solving skills (Fuadi & Mulyani, 2022). Teachers serve as facilitators, guiding students to construct their own understanding rather than delivering material through extensive explanations.

The findings of this study demonstrate that the inquiry learning model implemented by facilitators significantly enhances literacy and numeracy competencies among elementary school students. This aligns with previous research, which highlights that inquiry-based learning encourages students to actively construct knowledge and deepen their understanding of concepts.

To address learning loss effectively, it is essential for schools, principals, and teachers to adopt "learning by doing" strategies that engage students in active, experiential learning. Based on the initial assessment results, efforts should focus on improving instructional strategies and models to make learning more accessible and impactful. These adjustments can help mitigate learning loss and foster meaningful educational outcomes for students.

### **3.4 Results of Literacy Complementary Final Assessment**

The results of the final assessment for class 2 in the field of literacy experienced an increase after treatment and assistance of 2.12%. The increase in percentage is found in basic competencies in the form of vowels and consonants. While class 3 experienced an increase of 4.9%. The percentage fee is found in the basic competence in the form of writing capital letters. Class 4 literacy has increased by 6.8%. The increase in the percentage is found in basic competencies in the form of students' understanding of traffic symbols and describing stories in text.

The results of the assessment in class 5 amounted to 20.25%. This percentage writing is found in the basic competencies in the form of students' understanding of the pantun message presented in writing and analysis of information conveyed by advertising exposure from print media and observing the use of effective sentences and spelling in letters. Finally, for grade 6 there was an increase of 6.58%. The increase in the percentage is found in the basic competencies in the form of students' understanding

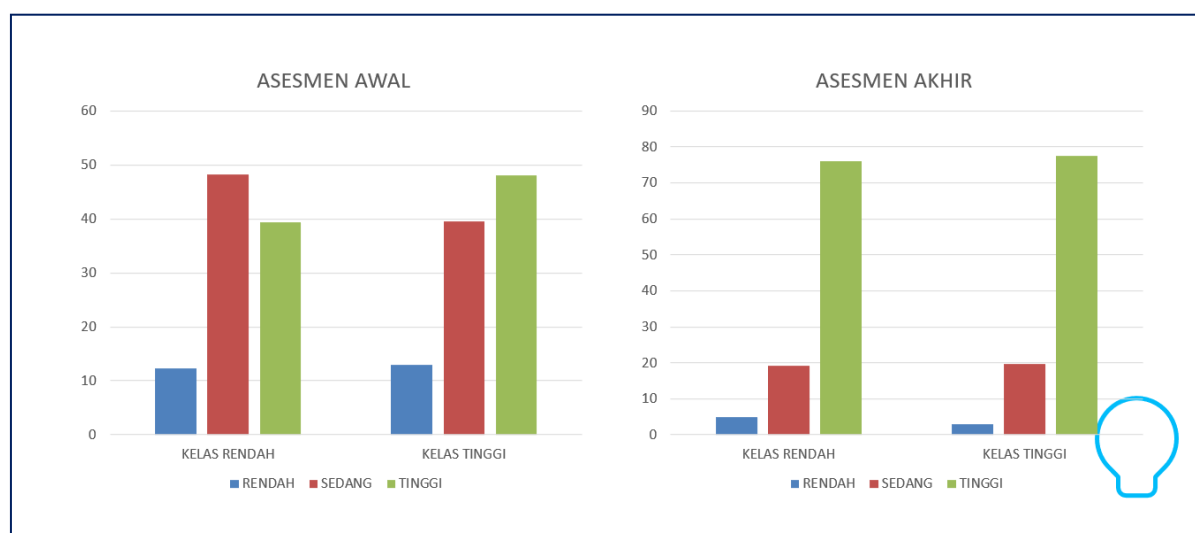
of summarizing information based on the text of reports on observations heard and read and being able to compare the characteristics of poetry texts and prose texts.

Based on the results of the final assessment starting from grade 2 to grade 6 on the target schools, the researcher also conducted an analysis based on each school so that it could be mapped how much improvement occurred after *treatment was carried out* at each target school. The following is the distribution data.

**Table 4.** Results of literacy analysis in each school

Schools	Results of Low-Class Analysis (II, III)			Results of High Class Analysis (IV, V, VI)		
	Low (score <40) %	Moderate (score 40- 70) %	High (>70) %	Low (score <40) %	Moderate (score 40-70) %	High (>70) %
SDN BS2	20	47	33	8	21	71
SDN BT	0	23	77	0	8	92
SDN GS2	0	32	68	4	40	56
SDN H2	14	14	72	0	0	100
SDN JHB2	0	5	95	7	27	66
SDN KB2	0	29	71	0	33	67
SDN KK1	0	16	84	0	11	89
SDN KK4	0	17	83	4	28	68
SDN KU2	0	29	71	6	19	75
SDN KJM1	0	10	90	13	13	74
Average Percentage of Mapping Results	3.4	22.2	74.4	4.2	20	75.8

Based on the data obtained from the results of the initial and final assessments, after *treatment* by the research team and assistants, there was an increase in the literacy competence of the target elementary school students. The increase in literacy needs can be seen in Figure 6 below.



**Figure 6.** Results of the initial and final assessments of literacy competencies

Based on the graph in Figure 5, it can be seen that in the low class there was an increase from 39.4% to 74.4%, while in the high class there was an increase from 48% to 75%. Thus, it can be interpreted that

for the low class there is an increase of 35%, while for the high class it is 27.8%. So that the average increase in literacy competence of elementary school students increased by 31.4%.

### 3.5 Results of the Final Assessment and Numeracy Competency Improvement

The results of the assessment for numeracy competence in grade 2 experienced an increase of 3.7% from the average results of students who took part in the final assessment compared to the initial assessment. The increase in percentage in grade 2 is shown from the competence of addition and subtraction in everyday life. In class 3, this experienced an increase of 1.37%. The increase in this percentage is shown by supplementation and division in everyday life. The increase in class 4 is 11.59%. The increase in this percentage is shown by the competence of FPB and KPK and roots which were lacking during the initial assessment.

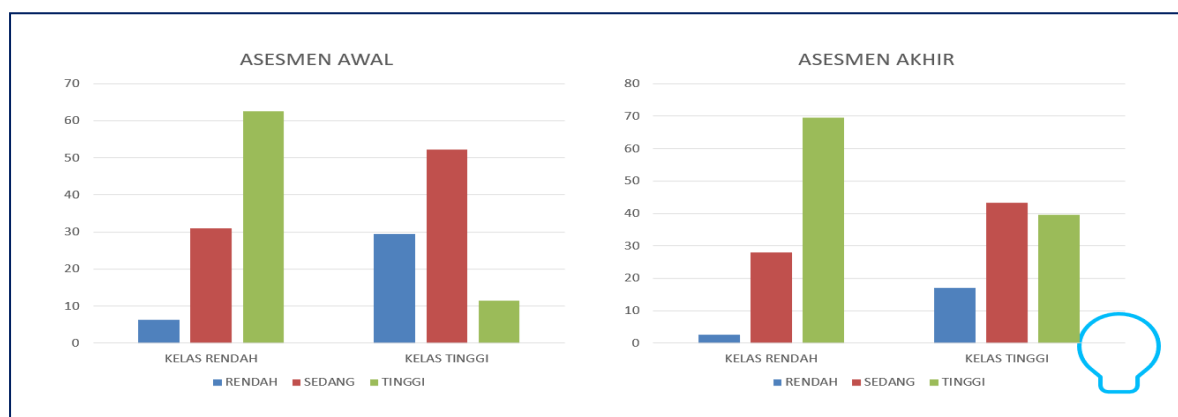
The results of the grade 5 final assessment experienced an increase of 14.67% from the average results of students who took the final assessment compared to the initial assessment. The increase in percentages in the field of numeration in grade 5 shows that from explaining decimal fractions and percents and extending and dividing fractions and decimal scales through plans and percents, students are able to understand the presentation of data related to tables, bar charts or line diagrams. In grade 6, this experienced an increase of 4.83%. The increase in percentage in the field of numeration in grade 6 was shown by students starting to understand mixed arithmetic operations involving whole numbers, fractions, and/or decimals in various forms according to the order of operations and being able to explain cubic shapes.

Based on the results of assessments from grade 2 to grade 6 at the target schools, the researchers also conducted an analysis based on each school so that it could be mapped to what extent learning loss occurred at each target school. The following is the distribution data.

**Table 5.** Numerical Analysis Results at each school

Schools	Results of Low-Class Analysis (II, III)			Result High-Class Analysis (IV, V, VI)		
	Low (score <40) %	Moderate (score 40- 70) %	High (>70) %	Low (score <40) %	Moderate (score 40-70) %	High (>70) %
SDN BS2	4	36	60	24	52	24
SDN BT	0	35	65	4	8	88
SDN GS2	4	41	55	36	50	14
SDN H2	11	22	67	22	45	33
SDN JHB2	0	24	76	21	41	38
SDN KB2	0	24	76	14	55	31
SDN KK1	0	33	67	4	43	53
SDN KK4	7	13	80	11	41	48
SDN KU2	0	26	74	10	29	61
SDN KJM1	0	25	75	25	69	6
Average Percentage of Mapping Results	2.6	27.9	69.5	17.1	43.3	39.6

Based on the data obtained from the results of the initial and final assessments, after *treatment* by the research team and assistants, there was an increase in the numeracy competence of the target elementary school students. The increase in literacy needs can be seen in Figure 6 below.



**Figure 7.** The results of the initial and final assessment of numeracy competence

The data presented in Figure 6 highlights notable improvements in literacy competencies among elementary school students across both lower and upper-grade levels. For the lower grades, literacy competency increased from 62.6% to 69.5%, representing a growth of 6.9%. Meanwhile, the upper grades showed a more substantial improvement, with literacy competency rising from 11.5% to 39.6%, reflecting an increase of 28.1%. These results indicate that the targeted interventions were particularly effective in addressing learning gaps among older students, who typically face more complex literacy challenges.

Overall, the average literacy competency of elementary school students improved by 17.5%. This growth underscores the positive impact of the strategies employed, such as inquiry-based learning, contextual approaches, and interactive activities tailored to students' cognitive levels. The greater increase observed in the upper grades suggests that these interventions successfully addressed significant literacy deficits, helping students catch up on essential skills.

The findings highlight the importance of differentiated teaching strategies that cater to varying levels of student readiness. For lower grades, steady growth in foundational literacy skills lays the groundwork for future learning, while for upper grades, intensive interventions help close more critical gaps. These improvements not only enhance academic outcomes but also equip students with the skills necessary for more advanced learning and real-world applications, emphasizing the value of sustained and tailored support in overcoming literacy challenges.

#### 4. CONCLUSION

The study concludes that the COVID-19 pandemic resulted in significant learning loss among elementary school students, with a decline of 56.5% in numeration competence and 62.95% in literacy competence. Interventions using active learning, quantum teaching, problem-based learning, project-based learning, and contextual learning models were implemented to address these gaps. These efforts led to a 31.2% improvement in literacy competence and a 17.5% increase in numeracy competence, demonstrating the effectiveness of innovative, student-centered learning approaches. The findings emphasize the importance of continuously refining instructional strategies to align with students' cognitive development and the specific competencies being taught.

The implications of this research are critical for education development, as it highlights the value of adaptive and innovative teaching models in mitigating pandemic-induced learning loss. Teachers are encouraged to adopt these methods to enhance student engagement and academic outcomes. Policymakers and educational institutions should also invest in training and resources to support these strategies, ensuring sustainable improvements in literacy and numeracy competencies.

However, the study acknowledges limitations, such as its focus on a specific geographic region and a limited sample size, which may affect the generalizability of the findings. Future research should expand the sample size and include diverse regions to validate the results and explore the long-term impact of these interventions. Additionally, further studies could investigate the integration of these models into broader educational frameworks to enhance their scalability and effectiveness across different contexts.

## REFERENCES

- Alvionita, D. M., Rahayu, W., & Hakim, L. El. (2022). Pengaruh Model Inquiry Based Learning Secara Daring Terhadap Kemampuan Numerasi Ditinjau Dari Locus Of Control. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 11(3), 1775–1788. <https://doi.org/https://doi.org/10.24127/ajpm.v11i3.5492>
- Efendi, D. R., & Wardani, K. W. (2021). Komparasi Model Pembelajaran Problem Based Learning dan Inquiry Learning Ditinjau dari Keterampilan Berpikir Kritis Siswa di Sekolah Dasar. *Jurnal Basicedu*, 5(3), 1277–1285. Retrieved from <https://jbasic.org/index.php/basicedu/article/view/914>
- Fitri, R. A., Adnan, F., & Irdamurni. (2021). Pengaruh Model Quantum Teaching Terhadap Minat dan Hasil Belajar Siswa di Sekolah Dasar. *Jurnal Basicedu*, 5(1), 88–101. Retrieved from <https://doi.org/10.31004/basicedu.v5i1.1230>
- Fuadi, S. I., & Mulyani, P. S. (2022). Online Assessment Pembelajaran Neo Guided Inquiry Berbasis Literasi dan Numerasi Pada Mahasiswa. *Muróbbi: Jurnal Ilmu Pendidikan*, 6(2), 335–358. Retrieved from <https://www.ptonline.com/articles/how-to-get-better-mfi-results>
- Hazin, M., Hidayat, S., Tanjung, A. S., Syamwiel, A., & Hakim, A. (2021). Pendampingan Psikososial dan Modul Pembelajaran Sekolah Dasar Untuk Mengatasi Learning Loss. *Jurnal Pengabdian Dan Edukasi Sekolah*, 1(2), 178–189.
- Hazin, M., & Rahmawati, N. W. D. (2021). Kebijakan Pengembangan Kurikulum Pendidikan Islam (Studi Histori dan Regulasi di Indonesia). *Journal EVALUASI*, 5(2), 293. <https://doi.org/10.32478/evaluasi.v5i2.745>
- Hazin, M., Rahmawati, N. W. D., Hakim, A., & Tanjung, A. S. (2022). Penguatan Mental Dan Sosial Siswa Melalui Pendampingan Psikososial Di Era New Normal. *DEDICATE: Journal of Community Engagement in Education*, 1(1), 78–89.
- Hewi, L., & Shaleh, M. (2020). Refleksi Hasil PISA (The Programme For International Student Assesment): Upaya Perbaikan Bertumpu Pada Pendidikan Anak Usia Dini). *Jurnal Golden Age*, 4(01), 30–41. <https://doi.org/10.29408/jga.v4i01.2018>
- Ladyawati, E., & Rahayu, S. (2022). Efektivitas Implementasi Buku Ajar Matematika Berbasis Literasi dan Numerasi melalui Pembelajaran Project Based Learning ( PBL ) Untuk Siswa Sekolah Menengah Atas. *Seminar Nasional Matematika Dan Pendidikan Matematika (7th SENATIK)*, (November), 193–200.
- Mahmud, M. R., & Pratiwi, I. M. (2019). Literasi Numerasi Siswa Dalam Pemecahan Masalah Tidak Terstruktur. *KALAMATIKA Jurnal Pendidikan Matematika*, 4(1), 69–88. <https://doi.org/10.22236/kalamatika.vol4no1.2019pp69-88>
- Margadhyata, N. M. D., Suarjana, M., & Agustiana, I. A. T. (2013). Pengaruh Model Pembelajaran Quantum Teaching Terhadap Prestasi Belajar IPA Siswa Kelas IV di SD Gugus VI Kecamatan Buleleng. *Mimbar PGSD UNDIKSHA*, 1(1). Retrieved from <https://ejournal.undiksha.ac.id/index.php/JJPGSD/article/view/893/763>
- Muliantara, I. K., & Suarni, N. K. (2022). Strategi Memperkuat Literasi dan Numerasi untuk Mendukung Merdeka Belajar di Sekolah Dasar. *Edukatif: Jurnal Ilmu Pendidikan*, 4(3), 4847–4855. <https://doi.org/10.31004/edukatif.v4i3.2847>
- Murtadlo, M., & Hazin, M. (2018, December). Model of Human Resource Management in Inclusive

- Education in East Java. In 2nd International Conference on Education Innovation (ICEI 2018) (pp. 541-544). Atlantis Press.
- Permatasari, O., Setyaasih, S., Nuraeni, E., & Muhaimin, H. (2021). Peran Perempuan Dalam Membangun Sdm Indonesia Membangun Sinergitas Di Era Pandemi. *Prosiding Seminar Nasional & Call for Paper "Peran Perempuan Sebagai Pahlawan Di Era Pandemi" PSGESI LPPM UWP*, 8(1), 80–85. <https://doi.org/10.38156/gesi.v8i1.35>
- Rohati, E., Anshori, I., & Hazin, M. (2021). Online Learning During the Covid-19 Pandemic from the Perspective of Parsons' Structural Functional Theory. *AJMIE: Alhikam Journal of Multidisciplinary Islamic Education*, 2(1), 38. <https://doi.org/10.32478/ajmie.v2i1.737>
- Rumapea, G., Syahputra, E., & Surya, E. (2017). Application of Quantum Teaching Learning Model As an Effort To Improve Student Learning Outcomes. *International Journal of Novel Research in Education and Learning*, 4(2), 118–130. <https://doi.org/10.33578/pjr.v4i5.8134>
- Syaifuddin, T., Nurlaela, L., & Perdana, S. (2021). Contextual Teaching and Learning (CTL) Model to Students Improve Learning Outcome at Senior High School of Model Terpadu Bojonegoro. *IJORER: International Journal of Recent Educational Research*, 2(5), 528–535. <https://doi.org/10.46245/ijorer.v2i5.143>
- Usmeldi, U. (2016). Pengembangan Modul Pembelajaran Fisika Berbasis Riset dengan Pendekatan Scientific untuk Meningkatkan Literasi Sains Peserta Didik. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, 2(1), 1–8. <https://doi.org/10.21009/1.02101>
- Wahyuni, F. A., Oktavia, M., & Fakhruddin, A. (2022). Efektivitas Model Pembelajaran Quantum Teaching and Learning Berbasis Gamification terhadap Minat Belajar Siswa. *JOURNAL ON TEACHER EDUCATION*, 4(2), 200–212.
- Yani, F., Putri, H. E., & Rahayu, P. (2021). Pengaruh Pendekatan Kontekstual (Contextual Teaching and Learning, Ctl) Dengan Berbantuan Media Komik Bergerak Terhadap Kemampuan Literasi Numerasi Siswa Kelas Rendah [The Effect of Contextual Approach (Contextual Teaching and Learning, Ctl) Assisted by M. *Renjana Pendidikan 1: Prosiding Seminar Nasional Pendidikan Dasar PGSD Kampus UPI Di Purwakarta 2021 Tersedia*, 1(3), 1440–1452.
- Yani, M. T., Rosyanafi, R. J., Hazin, M., Cahyanto, B., & Nuraini, F. (2024). Profil Pelajar Pancasila dari Perspektif Persatuan Guru Nahdlatul Ulama (Pergunu) Kabupaten Kediri. *Jurnal Review Pendidikan Dasar: Jurnal Kajian Pendidikan dan Hasil Penelitian*, 10(1), 1-8.
- Yustitia, V., & Dian Kusmaharti. (2022). Pengaruh Team Based Project Learning Terhadap Nume-Rasi Mahasiswa Calon Guru Sekolah Dasar. *Transformasi: Jurnal Pendidikan Matematika Dan Matematika*, 6(1), 39–47. <https://doi.org/10.36526/tr.v6i1.1942>