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EFFORTS TO IMPROVE THE NUMERATION LITERACY SKILLS OF CLASS V STUDENTS IN KALOY STATE PRIMARY SCHOOL THROUGH CRA METHOD

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Abstract

This study investigates the application of the Concrete–Representational–Abstract (CRA) method to strengthen numeracy literacy among fifth-grade students at SD Negeri Kaloy. Despite national efforts to improve mathematics education, Indonesia's performance in the Program for International Student Assessment (PISA) remains low, with a score of 366 in 2022, down from 391 in 2006. Such results highlight persistent challenges in students' ability to interpret, analyze, and apply mathematical concepts in real-life contexts. Using a classroom action research (CAR) design, data were collected through observation, tests, and reflective cycles involving 25 students during the 2024/2025 academic year. The study focused on four indicators of numeracy literacy: the use of mathematical symbols, question analysis, interpretation/prediction, and decision-making. The CRA method was operationalized through concrete media (paper cutouts), representational tools (visual models and videos), and abstract notation, tailored to students' diverse learning styles—visual, auditory, and kinesthetic. Findings reveal that CRA significantly improved students' ability to use mathematical symbols and draw accurate conclusions, while challenges persist in auditory learning due to technical limitations in video delivery. Visual and kinesthetic learners demonstrate higher consistency and engagement, underscoring the importance of differentiated instruction. Overall, CRA enhanced conceptual understanding, long-term retention, and numeracy literacy across all indicators. This study concludes that CRA is a relevant and effective pedagogical approach to address Indonesia's numeracy literacy gap. Practical implications include the integration of concrete manipulatives, multimodal learning resources, and reflective cycles into mathematics instruction, offering a scalable model for improving student outcomes in primary education.

Keywords: ***Numeracy literacy, CRA method, mathematics learning, classroom action research, primary education***

INTRODUCTION

Survey results from the Program for International Student Assessment (PISA) indicate that Indonesian students' mathematical literacy remains at a low level. In 2022, Indonesia's mathematics score was recorded at only 366, a decline from the 2006 score of 391 (OECD, 2023; Wijaya et al., 2024). This achievement indicates that students' ability to understand, interpret, and use mathematical concepts in real-life situations is still very limited. In today's era of digital transformation, literacy is no longer defined solely as the ability to read and write, but also includes understanding and using information in various forms, including numerical information (Fitriani & Aziz, 2023). Numeracy literacy is an important part of this literacy, representing the ability to access, use, interpret, and communicate mathematical information in various everyday life contexts (Yulia & Eliza, 2024). Numeracy literacy requires students not only to be able to calculate, but also to think logically and systematically in solving contextual problems based on numbers and data. Triwahyu & Sakinah (2021) define numeracy literacy skills as the knowledge and ability to use mathematical symbols, analyze information, interpret results, and draw conclusions. This is slightly different from Ahadiya et al. (2023), who states that numeracy literacy skills are basic skills for solving everyday problems through reasoning, communication, and interaction with the surrounding environment. Therefore, this ability is very important for students at the primary education level, as an initial foundation for analyzing numerical information in order to solve problems. In response to the above issues and the importance of numeracy literacy skills for students, various efforts have been made by education providers, both formal and non-formal. One effort made by SD Negeri Kaloy is to accommodate students to read books before entering the classroom and providing

math exercises in the form of word problems. However, this step has not shown a significant improvement in numeracy literacy, as most students are still unable to observe the available information to answer the given questions. Observations were conducted in upper-grade classes, where 7 out of 10 students had difficulty using mathematical symbols such as writing fractions and performing division operations. Furthermore, 4 out of 10 students also still struggle to interpret the given information, whether in the form of pictures/graphs or tables. Of the four aspects of numeracy literacy assessment, reading information in the form of images or graphs performed better than the others. Therefore, evaluation and reflection on the activity of reading books before entering class and giving math story problems once a week are still needed. On a smaller scale, efforts can be made to implement appropriate learning models. Based on discussions with fellow teachers and supervisors, one approach that has proven effective in improving students' conceptual understanding and numeracy literacy is the CRA (Concrete – Representational – Abstract) method. This approach consists of three stages: (1) Concrete, namely the use of real objects to understand concepts; (2) Representational, namely the use of images or visual models to represent concepts; and (3) Abstract, namely the use of formal mathematical symbols or notation (Miller & Mercer, 2021; Putri et al., 2023). The CRA method helps students connect real experiences with mathematical abstractions, so they not only memorize formulas but also understand the meaning behind each concept. Another advantage is that CRA can reduce conceptual errors and promote meaningful understanding. Students don't simply memorize formulas but truly understand the reasoning and logic behind each mathematical procedure they perform. This gradual process also strengthens students' memory of learned concepts, thereby enhancing long-term retention. Based on various studies (Miller & Mercer, 2021; Putri et al., 2023), the CRA method has proven effective in improving students' mathematics learning outcomes and numeracy literacy at various levels of education. Therefore, CRA is one of the recommended learning approaches to improve students' low numeracy skills in Indonesia.

LITERATURE REVIEW

Numeracy Literacy in Educational Contexts

Numeracy literacy is an integral part of 21st-century literacy, emphasizing not only numeracy skills but also logical, analytical, and systematic thinking skills in solving number- and data-based problems. Fitriani & Aziz (2023) emphasize that literacy in the digital era encompasses the ability to understand and utilize information in various forms, including numerical ones. Yulia & Eliza (2024) add that numeracy literacy requires students to be able to access, interpret, and communicate mathematical information in everyday life.

Numeracy Literacy Indicators

Triwahyu & Sakinah (2021) define numeracy literacy skills as the ability to use mathematical symbols, analyze information, interpret results, and draw conclusions. Meanwhile, Ahadiya et al. (2023) emphasize reasoning, communication, and social interaction as part of numeracy skills. This difference in perspective demonstrates that numeracy literacy is not solely oriented toward technical skills but also focuses on cognitive and social aspects that support contextual problem-solving.

Numeracy Literacy Challenges in Indonesia

PISA data (OECD, 2023; Wijaya et al., 2024) shows that Indonesian students' mathematics scores remain low, indicating limitations in connecting mathematical concepts to real-life situations. Observations in elementary schools also show that many students struggle to use mathematical symbols, interpret information in graphs or tables, and draw conclusions from available data. This underscores the need for a more contextual and incremental learning approach.

CRA (Concrete–Representational–Abstract) Method

The CRA method was developed as a step-by-step learning strategy that connects concrete experiences with mathematical abstractions. Miller & Mercer (2021) explain that CRA consists of three stages:

1. Concrete: the use of real objects to understand concepts,
2. Representational: use of images or visual models,
3. Abstract: use of formal symbols or notation.

Putri et al. (2023) emphasized that CRA helps students understand the meaning behind mathematical procedures, rather than simply memorizing formulas. This approach has proven effective in improving mathematics learning outcomes and numeracy literacy at various levels of education.

CRA in the Context of Learning Styles

Research shows that CRA can be adapted to suit students' learning styles. Visual learners benefit from pictorial representation, auditory learners from narrative or explanation, and kinesthetic learners from exploration with visual aids. Thus, CRA not only enhances conceptual understanding but also supports differentiated learning tailored to student characteristics.

Research Relevance

Based on previous findings, implementing CRA in elementary schools is relevant for addressing the low numeracy literacy of Indonesian students. CRA offers a systematic, contextual, and flexible approach that can improve numeracy skills while strengthening long-term retention.

METHOD

To find answers to the problems above, the research design used in this study is Classroom Action Research (CAR) which aims to analyze each action given to students. The CAR stages consist of 4 stages, namely planning, implementation, observation, and reflection, as in Figure 1. The number of fifth grade students, Kaloy State Elementary School, is 25 students, and was implemented in the even semester of the 2024/2025 academic year. The instrument for measuring numeracy literacy skills consists of 4 indicators; (1) using mathematical symbols; (2) analyzing questions; (3) interpretation/prediction; and (4) making decisions. In each indicator there are several assessment categories as shown in table 1 below.

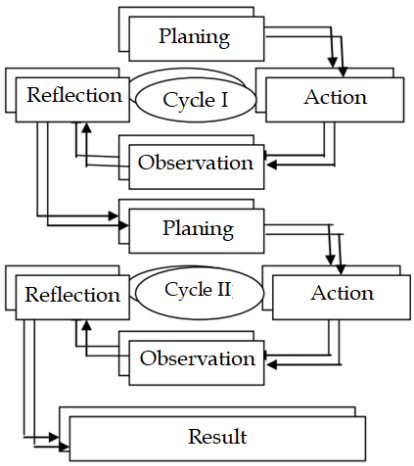


Figure 1.
PTK Cycle (Inayati & Kristin, 2018)

The PTK process is not limited to Cycle II only, but will stop when students achieve a success rate of more than 80%. (Aqib, 2016) and classical completion exceeds 75% (Choerunnisa et al., 2017). The success criteria include: (1) Very Low if <40%; (2) Low if between 41 – 55%; (3) Medium, if between 56 – 70%; (4) High if 71 – 85%; and (5) Very High, if 86 – 100%.

Table 1
Numeracy Literacy Scoring

No	Indicator Numeracy Literacy	Assessment Description	Score
1	Using mathematical symbols	Do not use mathematical symbols	0
		Incorrect spelling of mathematical symbols	1
		Using mathematical symbols, but not precisely	2
		Using mathematical symbols correctly and precisely	3
2	Analyzing the question	Not writing down what is known and what is asked	0
		It is not correct to write the data needed and what is asked	1
		Write down the data needed and the root of the problem.	2
		Write down the data needed and understand the root of the problem and provide reasons for each stage of resolution.	3
3	Interpretation/predicting	Does not provide opinions/explanations/estimates from the analysis results	0
		Provide interpretation/prediction of analysis results even if they are wrong	1
		Provide accurate interpretation/prediction	2
4	Make decisions	Does not provide a conclusion	0
		Giving a wrong conclusion	1
		Giving the correct conclusion	2

RESULTS AND DISCUSSION

With differentiated learning, the numeracy literacy skills of fifth-grade students at SD 067694 have improved in all aspects. Differentiated learning that provides opportunities for students to argue can train students' ability to draw conclusions. Then, learning media in the form of paper strips can train students' ability to write fractions well. Paper strips as teaching aids can reduce the concrete-abstract gap, but do not have a significant impact on the estimation/prediction aspect. Then, the learning activities of students with an auditory learning style will be disturbed by unwanted sounds, they are more interested in appropriate narratives. Then, students with a kinesthetic learning style are more active when given teaching aids to explore. And students with a visual learning style are more consistent during the action. In the planning stage, the implementation team discussed what things would be prepared to take action on fifth grade students whose numeracy literacy skills with learning outcomes sorting decimals and fractions. The implementation team designed learning tools with the CRA (Concrete – Representational – Abstract) model in the form of teaching modules and learning media. The CRA model was designed based on students' learning styles consisting of visual, auditory and kinesthetic. To support the learning design, the learning media that had been designed were in the form of arranging pieces of video props to accommodate students related to the learning stages, related to decimal fractions. In addition to compiling teaching modules with two meetings and learning media (videos and props), the implementation team also designed test instruments to measure the improvement of students' numeracy literacy skills and observation sheets to observe student activities. When the planned action was implemented, the teacher was initially able to manage the class well according to the learning stages in the teaching module. However, during the Representational stage, which is playing a video to students via an infocus, there was a problem in the form of limited audio coming out of the laptop, so that students with a Representational learning style could not absorb the information optimally. Although the teacher had tried to reduce this sound barrier by explaining again what the video was showing, students who faintly heard the sound from the laptop actually felt disturbed. The lack of information or the hampered literacy process when the video was playing was evident in the minimal student response to questions related to the video. Then, when using teaching aids, almost all students actively arranged the pieces of teaching aids that were glued to the student learning activity sheet. At the end of the

second meeting, a summative evaluation was conducted on the learning outcomes and numeracy literacy skills of students and the results are as follows.

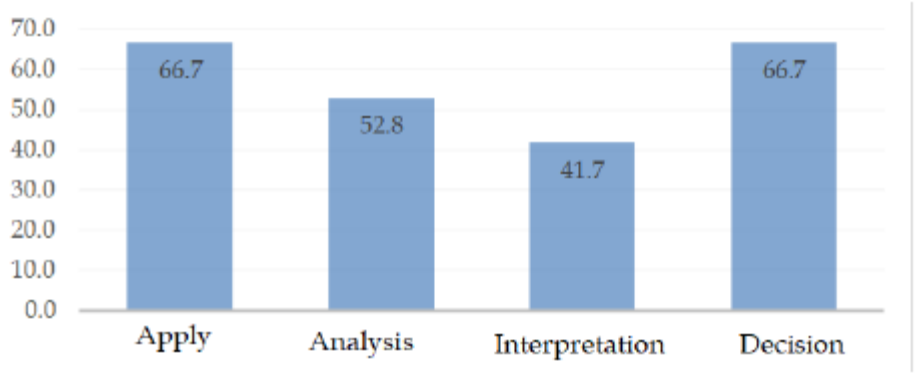
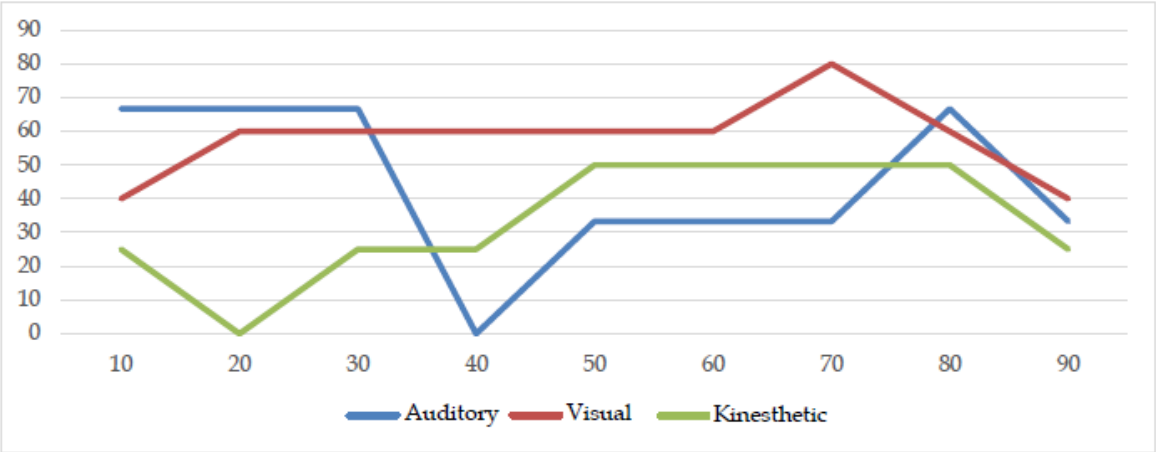


Figure 2.
Numeracy Literacy Abilities in Silus I

In Figure 2 above, it can be seen that the aspects of decision-making and the use of mathematical symbols have shown improvement. When determining decisions, students provide reasons, although some are still lacking, but students try to make decisions. In contrast to when before the action was carried out, students tended to be silent when asked to provide arguments/opinions. Then the lowest aspect is the interpretation/prediction aspect (4), in this aspect most students have not been able to interpret the results of the analysis, there are still limitations in abstract thinking when trying to estimate something in the form of fractions and decimals. Piaget's cognitive learning stages (Huitt & Hummel, 2003) are the main reason, but this can still be minimized with Bruner's learning theory.



Cycle I

During the first cycle of learning activities, students with visual learning styles tended to remain within the range (40% - 80%). In the first 10 minutes, the video visualization was quite interesting for students with visual learning styles. Then, in the last 30 minutes, it showed a decline. After the presentation of group work results, learning activities were dominated by teacher explanations and responses to arguments from other students. For students with auditory learning abilities, there was a significant decline in the 30-40th minute. At that time, there was a problem related to the laptop speaker, which was then assisted by the teacher's explanation without turning off the audio sound. So at that time, students heard two sounds at once, and this would interfere with the hearing sensitivity of auditory students (Budiningtyas & Rejeki, 2022). Meanwhile, students with kinesthetic learning styles tended to experience increased learning activity, although in the first 40 minutes they were less active. However, in the 50th minute and beyond, kinesthetic students were more active, and in the last 10 minutes, there was a decrease. Based on the data shown in the graph above, reflection and evaluation were carried out, as well as interpretation of the data obtained. The results of reflection on the actions in cycle I, firstly, electronic devices such as infocus do not support loudspeakers in the classroom, and there are no other electronic devices in the school that can be used. Secondly,

although at the end of the learning process most students are active, at the beginning of the learning process the dominant kinesthetic students do not carry out the expected learning activities, they prefer to chat and rock their chairs while the teacher fixes the sound problem. Then the third reflection result on learning media is less effective when used for fifth grade students, because the pieces of props are too few, so many are lost and the LAS work is incomplete.

Cycle II

Based on the results of reflection and evaluation in cycle I, the plans to be implemented in cycle II are; (1) designing an attractive visual delivery media (Ms. Power Point) accompanied by detailed teacher explanations; (2) Integrating learning media and students with kinesthetic learning styles through activities of selecting appropriate pieces and standing in front of the class; and (3) adjusting the pieces of teaching aids used so that they are not easily damaged or lost and paying attention to the ease of students in using the teaching aids. Learning outcomes in cycle II are carrying out addition and subtraction operations of fractions which are a continuation of the material implemented in cycle I. Similar to cycle I, cycle II also designs learning tools in the form of teaching modules, test instruments, observation sheets and learning media that are adjusted to the learning outcomes in cycle II. In the implementation of cycle II, students spontaneously formed groups as in the previous meeting and they seemed enthusiastic when the learning media was brought into the classroom. So the teacher did not have to bother grouping student learning and the teacher could use the time to prepare electronic devices for the presentation. When the presentation had no significant obstacles, most students were more conducive in paying attention to the presentation visualization and listening to the information well, this was seen from their responses when asked to provide comments and express opinions. An interesting thing during the presentation when asking students' responses to add the fractions 1/3 + 1/4, some answered 2/4 and some answered 2/7. When this happened, students were given scaffolding by asking several trigger questions about how many fractions for the small part (red), so they were able to name 1/12 and relate it to 1/3 and ¼ in the previous question.

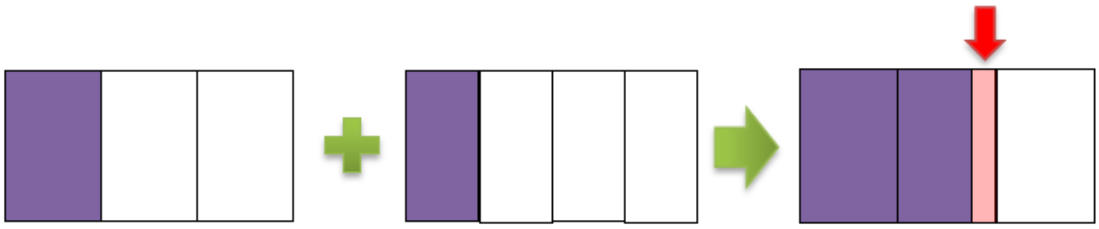


Figure 4.
Illustration of Adding Fractions

However, at the end of the information presentation (minute 32), several students (3 students) began to lose focus by chatting and changing seats. Realizing this, the teacher immediately asked the students to represent their groups to take the learning media package that would be used. After the learning media was distributed to each complete group, an explanation was not given directly regarding the learning media, but rather given a few minutes for students to observe the teaching aids used. This was done because, looking at cycle I, when given a direct explanation, students with visual and kinesthetic learning styles focused more on the teaching aids than listening to the rules for using the teaching aids and what to do on the student activity sheets. This few minutes of action was more successful in directing students to carry out learning activities as in the previous student learning plan, this can be seen from their completed activity sheets. Then, when the presentation of the results, students were also more focused than before, more disciplined when presenting their arguments and the process of changing was faster. This was possible because 2 of the 4 previous meetings had been presented so they knew what to do. At the end of the 5th meeting, a summative assessment was conducted to measure students' numeracy literacy skills. The results can be seen in the diagram below. Compared to cycle I, students' numeracy literacy skills in cycle II improved in every aspect. The decision-making aspect was the highest (87.5%), followed by the use of mathematical symbols (83.33%), and the lowest score was in the interpretation/prediction aspect based on the results of the previous analysis. Although efforts have been made to provide learning media in the form of fraction props to reduce the concrete-abstract gap, students still have difficulty in estimating addition or subtraction accurately without doing calculations. Although there was an increase in learning activity in cycle II reaching 100%, learning activities in each learning style were more diverse. Students with learning styles tended to experience minute-by-minute assessment, although in the first 20 minutes of learning students with this learning style were more passive, and they were active in the 40-80th minute when the fraction

addition props were given to students. Meanwhile, for students with auditory and visual learning styles, they were more stable, although the visualization of fraction operations with Ms. Power Point and clear explanations of the material, these two learning styles were able to maintain student learning activity. In the 30-50th minute, all three learning styles tended to decline, this may be due to the limited level of concentration and focus of students, so that in these minutes students tried to relax to prepare themselves to fiddle with the learning media. The action stopped in cycle II, because two of the four aspects of numeracy literacy had reached 75% and student learning activities also showed stability and improvement for all learning styles. The aspect of data estimation/conclusion still needs attention for further research.

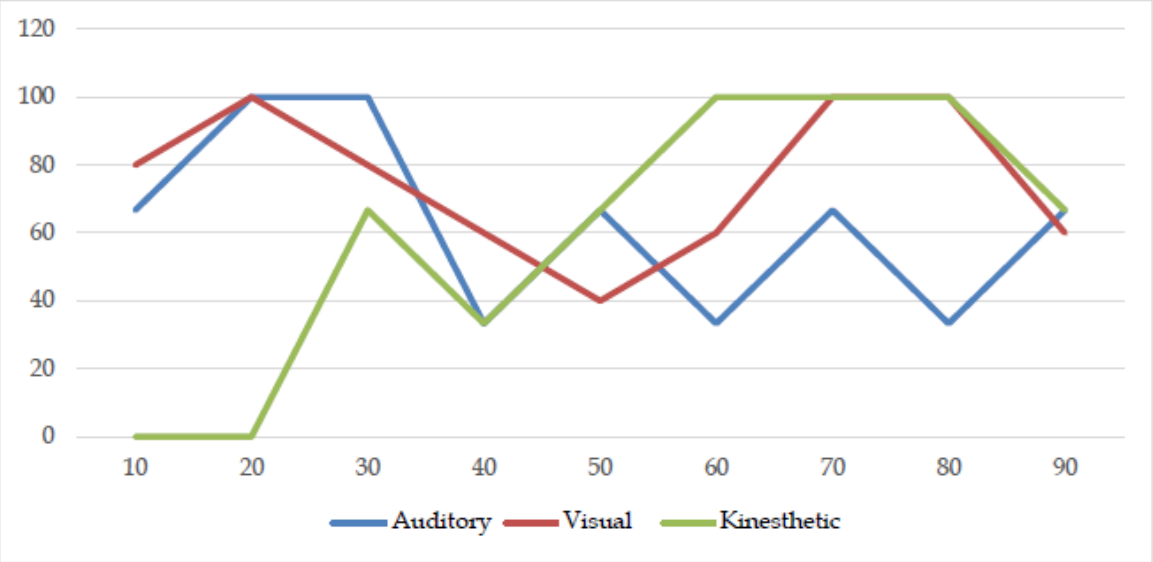


Figure 6.
Student Learning Activities in Cycle II

CONCLUSION

With differentiated learning, the numeracy literacy skills of fifth-grade students at SD 067694 have improved in all aspects. Differentiated learning that provides opportunities for students to argue can train students' ability to draw conclusions. Then, learning media in the form of paper strips can train students' ability to write fractions well. Paper strips as teaching aids can reduce the concrete-abstract gap, but do not have a significant impact on the estimation/prediction aspect. Then, the learning activities of students with an auditory learning style will be disturbed by unwanted sounds, they are more interested in appropriate narratives. Then, students with a kinesthetic learning style are more active when given teaching aids to explore. And students with a visual learning style are more consistent during the action.

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