How do Teachers Enhance Elementary School Students’ Numeracy Through the Integration of Singing and Jarimatika Methods?

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Abstrak
This research aims to reveal teachers’ efforts to improve the numeracy of lower grade elementary school students using singing and Jarimatika methods. This research is a type of qualitative research with a case study approach. Research data was collected from elementary school teachers and low-grade elementary school students using observation and interviews. The results of the research show that the teacher’s efforts to integrate the singing and Jarimatika methods were carried out using the song "Balonku Ada Lima” whose lyrics were replaced with addition and subtraction rules using the Jarimatika method. Jarimatika rules are taught by singing while simulating number symbols to introduce the concept of place value. Improving number operation skills is carried out by combining the concept of scaffolding, peer tutoring, and drill and practice of calculating using Jarimatika. This combination of methods aims to make it easier for students to strengthen their numeracy skills using Jarimatika method.

Keywords: numeracy, jarimatika method, singing

INTRODUCTION
Numeracy is an important skill that must be mastered early on. This appeal is closely related to the role of numeracy as one of the factors that greatly influence the mastery of subsequent mathematics material (Aunio & Räsänen, 2016; Geary et al., 2013; Merkley & Ansari, 2016; Rittle-Johnson et al., 2017; Träff et al., 2020). In fact, early numeracy skills are also recommended as an indicator of children’s performance in arithmetic (Lopez-Pedersen et al., 2021). This recommendation is reinforced by the results of a study by Salminen et al. (2018) that children who have poor numeracy skills are suspected of having low initial numeracy skills. The results of Salminen et al. (2018) at the same time confirm that numeracy is not limited to counting.

The reality that numeracy is not limited to counting skills has not been fully understood. The proof is that there are many people who still equate numeracy with counting skills. That is why learning numeracy is more dominated by counting activities with a contextual approach. As a result, students only tend to be proficient at counting and do not understand the meaning behind it. In other words, students' numeracy skills are more procedural by relying on formal rules. Therefore, it is not surprising that until now the mathematics scores of Indonesian students are still low in the eyes of the world. In fact, after 18 years of joining the Program for International Student Assessment (PISA) survey, Indonesian students’ math scores are still consistently ranked at the bottom. In 2018, Indonesia's mathematics score is still ranked 7th lowest, to be exact 73 out of 79 participating countries (OECD, 2019).
The description of the facts above provides an indication that weak numeracy skills are influenced by numeracy misconceptions and the use of inappropriate methods. Therefore, efforts to improve numeracy skills must be carried out by referring to appropriate numeracy learning procedures. In this regard, Aunio & Räsänen (2016) and Lopez-Pedersen et al. (2021) emphasized that the development of early numeracy skills needs to be supported by the development of skills in understanding numbers, understanding the relationships between numbers, and numeracy skills. To achieve more optimal results, the sub-focus in numeration development needs to be combined with the right method.

Appropriate learning methods can be determined based on the characteristics and needs of students. Elementary school students who are in the concrete operational stage (Santrock, 2018) should be facilitated with concrete things that are close to the child’s world. In this context, the jarimatika method is an alternative method that is considered relevant to the characteristics of elementary school students. The choice of the jarimatika method is related to its characteristics which are focused on using the fingers to count from 1-99. Realizing that students need to understand the rules of jarimatika, singing methods were combined to create a more relaxed learning atmosphere. The choice of singing method is based on the consideration that children have been introduced to songs since they were young, so it is not too difficult for elementary school students to learn while singing. In addition, the jarimatika method also requires a simulation of making number symbols which, when combined with singing activities, are believed to be able to present a learning atmosphere similar to playing activities. The learning environment that carries the concept of learning while playing is clearly in accordance with the characteristics of elementary school students.

Based on the background above, the authors are interested in researching the efforts of elementary school teachers in integrating singing and jarimatika methods to improve the numeracy skills of low-grade elementary school students. This research is focused to answer three objectives. First, describe the teacher’s efforts in integrating the singing method with jarimatika. Second, describes how the teacher introduces the concept of place value using the jarimatika method. Third, describes the teacher’s way of improving addition and subtraction operations skills using the jarimatika method.

METHOD
This research was conducted using a qualitative approach, a case study type (Creswell, 2009). The case that became the object of this research was the teacher’s efforts to integrate singing and jarimatika methods to improve the numeracy skills of low-grade elementary school students. This research is focused to answer three objectives. First, describe the teacher’s efforts in integrating the singing method with jarimatika. Second, describes how the teacher introduces the concept of place value using the jarimatika method. Third, describes the teacher’s way of improving addition and subtraction operations skills using the jarimatika method.

RESULTS AND DISCUSSION
Results
Teachers’ efforts to improve numeracy skills in this study were done by introducing place value, and increasing addition and subtraction skills using the jarimatika method. The results of this study were presented in three sub-topics. First, the
teachers’ way to integrate singing and *jarimatika* methods. Second, the teachers’ way to introduce place value uses the *jarimatika* method. Third, the teachers’ way to improve numeracy skills using the *jarimatika* method.

**The teachers’ way to integrate singing and *jarimatika* methods**

Integration of singing and *jarimatika* methods was carried out by introducing the rules of *jarimatika* using the rhythm of kid's songs. This strategy was carried out through four steps. First, determine the appropriate song rhythm. At this step, the teacher chose the rhythm of "Balonku Ada Lima" song to introduce addition and subtraction rules. The selection of the rhythm of "Balonku Ada Lima" song was based on its' enthusiastic tone and its simplicity to adopt.

Second, changing the "Balonku Ada Lima" song lyric with rules of addition and subtraction. The attention focus when changing the song lyrics was using the easy-to-understand diction and lyric suitabilities with the song rhythms. The lyrics of the *jarimatika* song can be seen in Figure 1.

![Figure 1. Lyrics of song *Jarimatika*](image)

Third, teaching the *Jarimatika* song. The teaching of the *Jarimatika* song was preceded by invited students to sing the "Balonku Ada Lima" song. It was done to make connection between students and the songs’ rhythm. After the students felt comfortable with the songs’ rhythm, teacher started to invite the students to replace the "Balonku Ada Lima" song lyric with the *Jarimatika* song lyric.

Fourth, engaged students to simulate movements according to the song lyrics. In the early stages, simulation was carried out classically with teacher guidance. When carrying out guided simulations, the teacher remained active in singing while the students were only asked to focus on simulating movements according to song lyrics. As a result, more than 50% of the students joined in singing while making number symbol even though they were not yet fluent. This activity repeated continuously and improved until students were able to carry out independent simulations while actively singing. The
ones symbol of addition and subtraction in Jarimatika method can be seen in Figure 2, while the symbol for the tens can be seen in Figure 3.

Figure 2. The ones symbol of addition and subtraction in Jarimatika method

Figure 3. The tens symbol of addition and subtraction in Jarimatika method

When learning to sing the Jarimatika song, the students seem happy and not burdened to memorize the lyrics. The students also enthusiastically in simulating the number symbols. However, when asked to sing the Jarimatika song independently, the students were embarrassed and needed teacher motivation.
The teachers’ way to introduce place value uses the jarimatika method

Place value was introduced after students were fluent in making the number symbol while singing. The introduction of place value began with understanding the concepts of ones and tens. When introducing the concept of ones and tens, the teacher used the concept of finger grouping. At this stage, the teacher invited students to count from 1-10 sequentially while simulating the number symbols. During the transition process of simulating 9’s symbol (right hand) to 10’s symbol (left hand), teacher explained that the forefinger of the left hand represented 10 fingers as the ones, so the fingers of the left hand represent tens.

As an effort to confirm the student’s understanding of the place value concept, the teacher asked the students to make number symbols 1-99 randomly. The procedure for making number symbols in Jarimatika method began by inviting students to recognize tens and ones that make up the numbers to be symbolized. After students were able to recognize the tens and ones, teacher invited them to simulate a number symbol. For example, to make the symbol 32, teacher would stimulate the students to identify tens and ones of 32. In the next step, teacher invited students to understand that the 32 consists of 3 tens and 2 ones, then teacher asked students to make the tens and ones symbols. When simulated a number symbol, teacher accustoms students to pronounced the numbers’ names to kept their concentration. In the end session, teacher gave emphasis again that 32 consists of 3 tens and 2 ones, so each of which has a value of 30 and 2.

Figure 4. Practicum to Make Number Symbols with the Jarimatika Method

When learning to recognize place value, students began to understand that place value was part of the grouping process. Students were also able to identify tens and ones of a number more easily. In addition, the habit of mentioning number values when symbolizing numbers is also proven to make it easier for children to understand the value of numbers.

The teachers’ way to improve numeracy skills using the jarimatika method

The numeracy skills that were improved through the jarimatika method in this study were addition and subtraction. Improving the ability to add and subtract using the jarimatika method began with a sequential counting simulation. The aim of the sequential counting simulation was to open and close fingers habitually because opening and closing fingers were the key activity in adding and subtracting with the jarimatika method. Improved addition skills were supported by forward counting simulations, starting from 1-9 followed by 10-90 to get used to the finger-opening system which was the key to adding. The increase in reduction ability was stimulated by counting.
backward from 9-1 and 90-10 to get used to the finger closing system which was the key to reduction.

After the students were accustomed to opening and closing their fingers according to the rules of the *Jarimatika* method, teacher asked them to make symbols of 1-99 randomly. This stage was part of the retention process so that students’ understanding of place value got stronger. After retention process was considered sufficient, the teacher began to invite students to practice addition and subtraction operations.

The addition operation was introduced by the teacher in 3 steps. First, creation of the first number symbols. Second, when starting to add up, the fingers of the right hand must be opened from left to right, with the palm facing forward. Third, the addition result must read from the left hand to the right hand. The complete procedure for completing the addition operation using the *Jarimatika* method was presented in Figure 5.

![Figure 5. Completion Procedure of Addition with the Jarimatika Method](image)

Like addition, subtraction was also introduced in 3 steps. First, creation of the first number symbol. Second, when starting to reduce, the fingers of the right hand must be closed from right to left, with the palm facing forward. Third, the reading of the subtraction results started from the left hand to the right hand. The completed procedure of subtraction through *jarimatika* method was presented in Figure 6.

![Figure 6. Completion Procedure of Subtraction with the Jarimatika Method](image)

Besides paying attention to the addition and subtraction procedures as shown in Figure 4 and Figure 5, teacher taught addition and subtraction with a gradual practice strategy. The step-by-step practice strategy was carried out based on the difficulty level of the operating numbers. By implementing this strategy, students were able to solve
addition and subtraction well at each stage. On the other hand, students felt motivated to conquer more challenges at the next step.

In the learning process of addition and subtraction using the jarimatika method, students seem to enjoy each stage of learning. Initially, some students seemed difficult to applying the jarimatika method, especially in subtraction operations. But, after studying for a while, students could follow all the learning processes well. Students admit that the jarimatika method is new to them. Students also tell to their teacher that their fingers could only complete 1-digit number operations previously. Therefore, students claimed to be proud when they could complete addition and subtraction of 2-digit numbers with 10 fingers. In addition, when learning addition and subtraction, students were more open to discussing with their friends. Students even began to carry out peer tutoring activities.

Discussion

In general, the teacher’s efforts to integrate singing and jarimatics methods were considered effective in improving the numeracy skills of low-grade elementary school students. The teacher’s creativity in combining singing with jarimatika method was proved to create an effective learning atmosphere which resulted in the convenience of students in understanding the rules of jarimatika. The effectiveness of using this method was certainly inseparable from the suitability of the characteristics of the used method with the elementary school students characteristics. In this context, the application of the finger-based method as a learning medium is also very relevant to the characteristics of elementary school students who are still in the concrete operational stage (Santrock, 2018). The application of singing and simulation methods also tends to be close to the concept of learning while playing which was characteristic of elementary student learning (Coates & Pimlott-Wilson, 2019; Juhasz, 2021; Sohrabi, 2021). In addition, the use of songs was also believed to have contributed to determining the success of instilling the concept of the jarimatika method (Magnussen & Sukying, 2021; Özler, 2022).

Judging from the numeracy enhancement, the teacher’s efforts to integrate singing and jarimatika methods have proven to increase students’ understanding of the meaning and relationships between numbers. Students’ presumptions that numbers can be composed of a combination of values became one of the indicators of the teacher’s success in instilling the meaning of numbers (previously students tended to interpret numbers as a single value). This number understanding enhancement indicates an increase in numeracy skills because number understanding becomes the embryo of number sense which greatly contributes to the success of mathematical operations (Hinton et al., 2015; Purnomo et al., 2014; Yang & Sianturi, 2021). The teacher’s success in increasing the meaning number understanding was inseparable from the application of singing simulations which were conceptualized similarly to playing activities (Ramani et al., 2020).

Based on the perspectives of relationship between numbers, place value understanding was one of indicators that showed numeracy skills enhancement. Elementary school students’ understanding of the place value concept through a system of grouping 10 ones into 1 tens (Paydar & Dogan, 2022; Rojo et al., 2021) was an achievement that deserves appreciation. It was because the place value concept was classified as something difficult to understand (Lambert & Moeller, 2019). On the other hand, understanding place value was one of the best provisions for developing arithmetic skills (Dietrich et al., 2016; Önal & Altiner, 2021).

The teacher’s success in improving addition and subtraction operations skills basically cannot be separated from previous successes. It was because understanding
meaning and relationship between numbers have a positive correlation with mathematical operation skills (Dietrich et al., 2016; Hinton et al., 2015; Lopez-Pedersen et al., 2021; Önal & Altiner, 2021; Yang & Sianturi, 2021). More specifically, students' success in completing mathematical operations can be associated with the application of scaffolding strategies (Cho & Kim, 2020; Elmonayer, 2019; Taylor, 2021) and drills and practice (Adams & Maki, 2020; Beserra et al., 2019). In addition, providing opportunities for students to play an active role in each stage of learning also played a role in creating student learning comfort. This was evidenced by an increase in student participation, which at the highest level was able to carry out peer tutoring (Rusli et al., 2021). The ability of students to do peer tutoring indicates the established skills of addition and subtraction which were part of the numeracy skills.

CONCLUSION

Improving numeracy skills through integrating the singing and jarimatika methods was carried out by introducing the rules of jarimatika using the song "Balonku Ada Lima" whose lyrics were recomposed. The introduction of the jarimatika rules was followed by a simulation of making number symbols and the introduction of place values which contribute to increasing students' understanding of the meaning and relationships between numbers. Improving the ability to operate numbers was focused on adding and subtracting with scaffolding concepts, drills and practice, and peer teaching to strengthen students' skills in arithmetic using the jarimatika method.

This research was conducted with an easy and simple process with the hope that it could be duplicated and developed by further researchers to improve multiplication and division skills. In addition, it is hoped that the simple learning processes and methods can motivate teachers and parents to adopt this learning method to improve students' numeracy skills, especially low-grade elementary school students.

REFERENCES


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