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Comparative Study of the Implementation of Mathematical Literacy in the Merdeka Curriculum at the Junior High School Level

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Keywords

Implementation; Mathematical Literacy; Merdeka Curriculum; Junior High School

Abstract

The low mathematical literacy of Indonesian students has prompted curriculum changes aimed at improving this ability. Judging from the implementation of the curriculum in Indonesia, there are differences in the implementation of the curriculum in public and private schools. This difference is because the education unit has an implementation strategy. This study aims to determine the differences in the implementation of mathematical literacy in the Merdeka curriculum which is focused on the junior high school level. The method used in this study is a comparative method with a qualitative approach. Data in this study were collected through questionnaires and interviews. The data analysis technique used is interactive analysis consisting of data collection, data reduction, data presentation, conclusion drawing, and verification stages. The results obtained in this study were that there were differences in the implementation of the Merdeka curriculum's mathematical literacy at the junior high school level. The difference lies in the frequency with which teachers attend training and assistance in planning, implementing and evaluating learning, as well as the variety of methods, media and learning tools used. The results obtained in this study can provide an overview regarding the planning, implementation, and assessment carried out to improve mathematical literacy.

INTRODUCTION

Information and big data in the development of today's global world are positioned as fundamental and influential in everyday life. So that an individual needs the ability to understand, access, analyze, evaluate, and communicate developing information (Santoso et al., 2023). The ability to access, understand and use information appropriately is known as literacy skills. Literacy skills not only include language literacy but are also related to skills on realm certain such as mathematical literacy, data literacy, technology literacy, and human literacy (Ibda, 2019; Poernomo et al., 2021). The expansion of literacy in this era urges individuals to become lifelong learners so that they can adapt and develop appropriately in facing global developments and the challenges of the next era. The impetus due to this expansion of literacy is also experienced by students during the learning process where students need literacy skills to construct and collaborate between old knowledge that students already have and new knowledge that students are learning. So literacy skills become one of the educational needs while going through the process so that it goes well (Marmoah & Poerwanti, 2022).

Since 2000 Indonesia has participated in surveys that measure students' literacy skills in three domains, namely reading comprehension, numeracy, and scientific literacy. The survey programs participated in by Indonesia included the Program for International Student Assessment (PISA) and Trends in International Mathematics and Science Studies (TIMSS). The PISA program includes literacy tests in reading, math, and science and does not take into account the national curricula of the countries participating in these tests. The test is given to students aged 15 years with random sampling every three years. So that the participants who took the PISA test were students who were in grade 3 junior high school or grade 1 senior high school students. Judging from the results of the PISA test for Indonesian students, reflects the literacy culture of Indonesian students which is still far behind that of developed countries (Faidah et al., 2023). This can be seen from Indonesia's position which is always not far from the lowest ranking among the countries participating in the PISA project. If explored further, the average score obtained by Indonesian students in each year the PISA test is carried out on mathematics as the material being tested as a whole gets the lowest score of the

three materials tested. This shows that Indonesian students have very low mathematical literacy compared to reading and science literacy.

Indonesian students also take part in another international survey, namely Trends in International Mathematics and Science Studies (TIMSS). TIMSS is an international study that assesses the knowledge skills of Grade IV and Grade VIII students in various countries by providing data on student achievement (Utomo, 2021). Indonesia has been one of the TIMSS target countries for the last four periods. According to TIMSS results in mathematics, Indonesia is still below the international level. According to TIMSS research results in 2003, Indonesia's average score was 411 points, while the international average score was 467 points, ranking 35th out of 46 countries. In addition, in the 2007 TIMSS study results, Indonesia was ranked 36th out of 49 countries with an average score of 397 (Retnaningdyah, 2022). Then the results of the 2011 TIMSS study, Indonesia was ranked 32 out of 49 countries with an average score of 386 points, compared to the international average score of 500 points. In the results of the 2015 TIMSS study, Indonesia was ranked 46th out of 51 countries with an average score of 397 (Retnowati & Ekayanti, 2020).

The low achievement of Indonesian students in international surveys such as PISA and TIMSS is due to the fact that Indonesian students are less able to solve and explain problems in various real-life situations. The low mathematical literacy of students is caused by students having difficulty understanding questions and solving math problems and students' low understanding of the material being tested (Febrianti & Nurjanah, 2022). Triggers of errors by Indonesian students at the junior high school level in answering or solving PISA questions, especially in geometric content are students are unable to identify key words in a problem, write down what is known or given, identify a formula or set of plans to solve a given problem (Sapitri et al., 2021; Sumule et al., 2018). Based on the results of studies related to the causes of low mathematical literacy in Indonesian students, it indicates that the competence of students at the stage of understanding, solving problems, interpreting results and communicating results in solving math problems is low.

The results of the PISA assessment and the results of other international studies cannot be used as indicators to assess how well a curriculum is implemented in a country, but even though these results are unsatisfactory, Indonesia continues to make curriculum adjustments so that it can approach the indicators developed by PISA. This adjustment was made by providing a curriculum that includes reading literacy, mathematical literacy, and scientific literacy competencies. This curriculum adjustment is part of the Indonesian government's efforts to advance the quality of education. In accordance with Triwiyanto's statement that with good management of education (curriculum), it will certainly produce good education (Triwiyanto, 2022). Without better curricula, better teaching, and better tests, the emphasis on “21st century skills” (in this case literacy skills) will become superficial, sacrificing long-term gains in favor of short-term performance gains (Lautensach, 2020). Therefore, the curriculum must be able to answer questions and problems related to needs, needs and developments that arise in society (Julaeha, 2019).

Nadiem Makarim, Minister of Education and Culture, developed the Merdeka Curriculum Policy as a strategic effort to anticipate the threat of the COVID-19 pandemic to the education sector, especially for students (Abidah et al., 2020; Sapitri, 2022). The Merdeka Curriculum Policy is a special action by the Ministry of Education and Culture in strengthening students' literacy and numeracy (mathematical literacy). Strategies to strengthen literacy and numeracy (mathematical literacy) to develop the school ecosystem as a place of learning, one of which is to develop a text-rich environment with an emphasis on modeling the process of reasoning and problem-solving (Dewayani et al., 2021). The Merdeka curriculum is a prototype of a more flexible curriculum that is developed according to the profile of Pancasila students and students' abilities, with a focus on basic material, and character development (Cantika et al., 2022; Kusumawardani et al., 2022; Lestari & Arifin, 2023). The Merdeka curriculum also gives students the freedom to be creative and develop soft skills. So that the role of the teacher in the independent learning policy is to carry out learning innovations and create an independent learning atmosphere that meets the needs of students and teachers (Daga, 2021). However, student success in learning is influenced by several factors, including learning infrastructure, teachers, facilities, and parents' abilities, meeting environmental needs and problems, as well as parental attention and supervision. In other words, teachers, parents, schools, and the environment have a strong influence on learning success, especially when addressing the independent learning policy.

The implementation of the Merdeka

Curriculum in educational units can be carried out in two ways, namely the Mobilizing School Program (MSP) and the Implementation of the Merdeka Curriculum. According to the statement of the Acting Head of the Ministry of Education and Culture's Curriculum and Learning Center, Zulfikri Anas said that currently the implementation of the Merdeka Curriculum is still in the introduction stage, so it is not yet mandatory. However, in 2024 the ministry plans to make the Merdeka Curriculum the national curriculum. The uneven distribution of curriculum policies in schools has resulted in disparities in the quality of education. This disparity in the quality of education is also influenced by the readiness of schools to accept the given curriculum policies. Following the results of research conducted by Kulsum, it was found that there are differences between public and private schools in Indonesia which can be seen from the governance of institutions, teachers and educational staff, as well as the learning curriculum (Kulsum, 2020).

Based on the explanation above, it encourages researchers to conduct research related to how to implement mathematical literacy in the Merdeka Curriculum at the junior high school level and see if there are differences in the implementation of mathematical literacy when viewed from the status of the schools, namely public schools and private schools. This study was specifically carried out on learning mathematics. The choice in the field of learning mathematics is because learning mathematics is believed to be a means to develop mathematical literacy (Almarashdi & Jarrah, 2022). Then, the impetus for conducting this research was also based on shifting the attention of the research community from retaining data and findings that highlight student learning outcomes on mathematical literacy tests towards researching how to increase students' opportunities to develop mathematical literacy (Haara et al., 2017). Where the starting point for such a shift in focus or research trend can be started by examining how mathematical literacy is understood, facilitated, and experienced in schools. So that researchers conducted a study entitled "Comparative Study of the Implementation of Mathematical Literacy in the Merdeka Curriculum at the Junior High School Level".

METHODS

The research was conducted in two junior high schools in the city of Bandung, with a distribution of one public school and one private school. The two schools are SMPN 19 Bandung City and Salman Al Farisi Middle School Bandung City. The two schools which are the sources of data in this study have implemented the Merdeka Curriculum and are included in the Mobilizing School Program. This research was conducted in the even semester of the 2022/2023 academic year on 5-16 June 2023. The method used in this study is a comparative method with a qualitative approach. The purpose of the comparative method is to see the differences in two or more situations, events, activities or programs (Ramdhan, 2021). In accordance with the purpose of this research, namely, to see a comparison between the implementation of mathematical literacy in the two schools that have implemented the Merdeka curriculum. Data in this study were collected through questionnaires and interviews. The questionnaire used in this study refers to indicators of strengthening numeracy in the school environment that have been established by the Indonesian Ministry of Education and Culture (Dewayani et al., 2021; Goos et al., 2014). Questionnaires are used to obtain data related to learning strategies starting from the planning, implementation, and assessment determined and carried out by the teacher during the application of mathematical literacy in schools. While the interviews were conducted to strengthen the unclear questionnaire data. The data analysis technique used is interactive analysis which consists of the stages of data collection, data reduction, data presentation, drawing conclusions, and verification.

RESULTS AND DISCUSSION

Implementation of Mathematical Literacy in SMPN 19 Bandung City (Public School)

a. Planning for Mathematical Literacy in Learning Mathematics at SMPN 19 Bandung City

   The results of the research are a series of activities for the mathematics teacher in designing learning by including mathematical literacy strategies at SMPN 19 Bandung City, which can be seen in Figure 1 below.

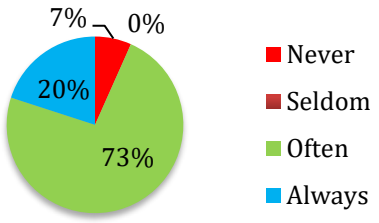

Figure 1. Percentage of Mathematical Literacy Planning Questionnaire Results at SMPN 19 Bandung City

Based on the results of the questionnaire above (see Figure 1), it is clear that 73% of respondents have planned the implementation of mathematical literacy by paying attention to the characteristics and principles of mathematical literacy which must be stated in the RPP. This is also supported by the results of an interview with one of the mathematics teachers at SMPN 19 Bandung City who stated that he always designs learning based on fulfilling the diversity of students' mathematical abilities and numeracy needs. Where fulfilling the diversity and needs of students' mathematical literacy abilities needs to be used as a basis for teachers in designing learning that aims to facilitate students' mastery of mathematical literacy competencies. This is in accordance with the statement by Md-Ali et al. (2016) that teachers in designing learning to increase students' numeracy literacy competencies must have knowledge and understanding of students to support good learning design. Teachers' knowledge of students includes the mathematical literacy needs, knowledge and experiences possessed by each student (Maryani & Widjajanti, 2020).

Based on the results of interviews with mathematics teachers at SMPN 19 Bandung City, in designing learning, teachers also select effective learning models and strategies to support the application of mathematical literacy in learning. The learning model chosen by the teacher should be a learning model that can develop critical and creative thinking patterns in students (Saragih & Napitupulu, 2015; Supena et al., 2021). Apart from that, choosing a learning model is important because the learning model used will greatly influence students' interest in participating in the learning process and ultimately will also influence the achievements obtained by students (Kaya & Ercag, 2023).

b. Implementation of Mathematical Literacy in Learning at SMPN 19 Bandung City

A summary of the mathematics teacher's activities in carrying out learning by including mathematical literacy strategies at SMPN 19 Bandung City can be seen in Figure 2 below.

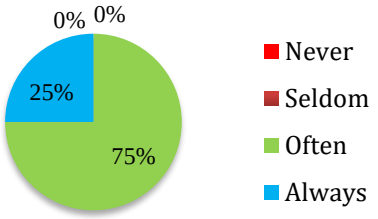

Figure 2. Percentage of Questionnaire Results on Implementation of Mathematical Literacy at SMPN 19 Bandung City

At the stage of implementing mathematical literacy in learning, 75% of respondents were categorized as often carrying out learning using a deductive and scientific approach through observation, question and answer, projects, experiments and assignments. The learning approach used has attempted to increase and develop students' mathematical literacy potential or abilities through a scientific approach. This can be said, because the scientific approach is a learning activity designed so that students can actively develop mathematical concepts and principles (Arnellis et al., 2020; Putri et al., 2020). Apart from that, the scientific approach is believed to be very effective and has a positive influence on learning which can improve students' mathematics learning outcomes at junior high school level (Solihat et al., 2023).

Then learning has also been carried out by involving learning resources or media that facilitate increased motivation and mathematical reasoning in students. Because teachers are creative and innovative, making good use of learning resources in learning can increase students' motivation and interest in learning. Learning motivation has a positive influence on students' mathematics learning achievement (Tella, 2007). Students with a good level of motivation have a greater tendency to achieve maximum achievement. If students have motivation to learn, then the learning process will be successful. Therefore, teachers need to foster students' learning motivation. Meanwhile, it is necessary to facilitate mathematical reasoning abilities in mathematical literacy-based learning, because mathematical reasoning abilities are one of the basic abilities needed in

mathematical literacy (Hayati & Kamid, 2019; Maass et al., 2019; Rizki & Priatna, 2019). Mathematical reasoning is needed to determine whether a mathematical argument is true or false and is also used to construct a mathematical argument. The importance of mathematical reasoning abilities for students to have is basically in line with the vision of mathematics, especially to meet future needs (Bozkuş & Ayvaz, 2018).

c. Assessment of Mathematical Literacy in Learning at SMPN 19 Bandung City

The following are the results of a series of mathematics teacher activity questionnaires in learning assessment by including mathematical literacy strategies at SMPN 19 Bandung City.

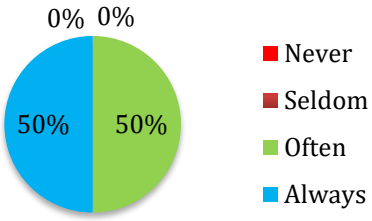

Figure 3. Percentage of Mathematical Literacy Assessment Questionnaire Results at SMPN 19 Bandung City.

Based on the picture above (see Figure 3), 50% of respondents stated that they had assessed mathematical literacy in learning based on the diagnostic function of learning needs. There is diversity in the use of mathematical literacy assessment instruments at SMPN 19 Bandung City which is characterized by the use of non-routine, contextual and HOTs questions. By giving students questions that contain HOTs and are contextual, it is hoped that students will be trained to solve real problems and make decisions so that these questions can develop students' mathematical literacy skills (Widana et al., 2018). Apart from that, applying questions that train high-level thinking is the best way to train students' quality of thinking and problem-solving abilities (Cresswell & Speelman, 2020; Murtafiah et al., 2020; Reinsini et al., 2021).

Implementation in Salman Al Farisi Middle School Bandung (Private School)

a. Planning for Mathematical Literacy in Learning Mathematics at Salman Al Farisi Middle School Bandung

The following is the data from the questionnaire results with the mathematics teacher respondents at Salman Al Farisi Middle School Bandung in planning mathematical literacy in learning mathematics.

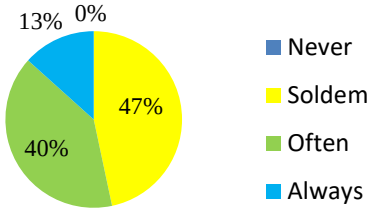

Figure 4. Percentage of Mathematical Literacy Planning Questionnaire Results at Salman Al Farisi Middle School Bandung

Based on the results of the questionnaire, 40% of mathematics teachers at Salman Al Farisi Middle School in Bandung often plan mathematical literacy-based learning with a focus on developing students' mathematical thinking, and teachers strive to develop learning materials that include relationships between various topics and scientific disciplines. Based on these results, the mathematical literacy-based learning planning carried out by the mathematics teacher at Salman Al Farisi Middle School Bandung, includes the principles of mathematical literacy in learning planning. Where teachers need to connect content, context, process, and mathematical tools during the learning process (Purwoko et al., 2019).

Then the mathematics teacher at Salman Al Farisi Bandung Middle School rarely develops teaching modules based on mathematical literacy, but the teacher tries to facilitate learning with other learning resources that support the learning process. The advantage of learning using modules is that modules can provide feedback so that in the learning process there is interaction that occurs, so that teachers can directly interact with students and find out the shortcomings of what they encounter and immediately correct them (Rajabalee & Santally, 2021). Because the teaching modules developed by the teacher themselves will refer to the initial needs and abilities of their students.

Based on the results of an interview with one of the teachers, information was obtained that teachers did not receive enough training and assistance in preparing learning plans and assessments, so teachers rarely developed modules and various learning assessment plans. Training and mentoring are important for teachers to improve teacher skills in creating effective

learning to achieve learning goals (Hairon et al., 2020; Rostini et al., 2022). In essence, teachers need to create lesson plans and syllabi within the given curriculum framework because the teacher's responsibility is to implement the curriculum to meet student needs.

b. Implementation of Mathematical Literacy in Learning at Salman Al Farisi Middle School Bandung

The following is the data from the results of the questionnaire with mathematics teacher respondents at Salman Al Farisi Middle School Bandung in carrying out mathematical literacy in learning mathematics.

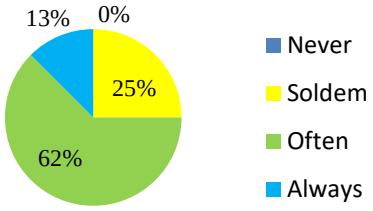

Figure 5. Percentage of Questionnaire Results on the Implementation of Mathematical Literacy at Salman Al Farisi Middle School Bandung

Following the results of the questionnaire, Salman Al Farisi Middle School teachers have carried out mathematical literacy in learning by focusing on interpreting real problems into mathematical models using mathematical reasoning. Learning is also carried out through scientific activities such as observing, asking, reasoning, and creative thinking. However, the implementation of mathematical literacy in learning is rarely done with practical activities or direct field observations. This is supported by the statement of one teacher that learning is only done in the classroom without any field observations outside the classroom, where learning focuses on scientific learning by observing mathematical problems visually in the classroom through the provision of pictures by the teacher (Presmeg, 2020; Utomo & Syarifah, 2021).

c. Assessment of Mathematical Literacy in Learning at Salman Al Farisi Middle School Bandung

The following is data on the results of a questionnaire with math teacher respondents at Salman Al Farisi Middle School Bandung in the assessment of mathematical literacy in learning mathematics.

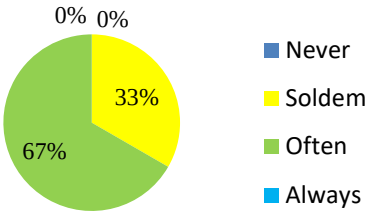

Figure 6. Percentage of Mathematical Literacy Assessment Questionnaire Results at Salman Al Farisi Middle School Bandung

Around 67% of mathematics teachers at Salman Al Farisi Bandung Middle School have carried out learning assessments that follow the principles of mathematical literacy assessment, including providing opportunities for all students to demonstrate their numeracy knowledge, carrying out diagnostic assessments to determine students' level of learning readiness and using contextual assessment tests. Mathematical literacy-based learning needs to provide opportunities for students to convey their knowledge and understanding of learning content (Abidin et al., 2020; Lestari & Arifin, 2023). By providing contextual questions, students' understanding of the content will last longer because they understand the content of the problem by applying mathematical concepts and principles to solve the problem. However, based on the results of interviews, information was obtained that teachers in carrying out learning assessments rarely use test questions that measure HOTs' abilities. Meanwhile, giving questions containing HOTs to students is useful for improving students' ability to think critically, logically and systematically (Esparrago, 2021).

Comparison of the implementation of mathematical literacy at SMPN 19 Bandung and SMP Salman Al Farisi Bandung

The comparison of the implementation of mathematical literacy that will be described aims to obtain information on how the comparison of the implementation of mathematical literacy activities carried out in each school is based on the planning, implementation, and assessment processes carried out by the mathematics teacher. The results will describe how much the comparison score or difference in the implementation of mathematical literacy is. The following is a comparison of the implementation of mathematical literacy in each school.

Table 1. Comparison of the Implementation of Mathematical Literacy at SMPN 19 Kota Bandung and SMP Salman Al Farisi Bandung

	SMPN 19 Bandung	SMP Salman Al Farisi Bandung
Planning	77	67
Implemen-tation	81	72
Assessment	87	67

Based on the picture above, planning the implementation of mathematical literacy in learning mathematics at SMPN 19 Bandung obtained a score of 77 in the "good" category and Salman Al Farisi Bandung Middle School obtained a score of 67 in the "poor" category. In the learning process activities each shows a score of 81 and 72 so that both are classified as "good", in carrying out authentic assessments each shows a score of 87 for SMPN 19 Bandung in the "good" category and a score of 67 for SMP Salman Al Farisi Bandung in the "less good" category. The results of this comparison show that the mathematics literacy implementation scores in the two schools are not much different.

CONCLUSION

The results of this study concluded that the implementation of mathematical literacy at SMPN 19 Bandung received a higher score than SMP Al Farisi Bandung. The low score of Salman Al Farisi Middle School is due to the lack of teachers in planning and assessing learning in developing teaching modules based on mathematical literacy that suit the needs and initial abilities of their students. From the results of this study it can be suggested that private schools facilitate teachers in participating in training and mentoring in the field of learning planning and assessment, not only always focusing on training and mentoring teachers in carrying out creative learning. This is because teachers need to be given continuous and comprehensive guidance regarding learning, especially learning with mathematical literacy strategies. So that as a whole it can be said that there are differences in the application of mathematical literacy in public schools and private schools in terms of the aspects of planning, implementing and evaluating learning.

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