

Research Article

The description of Indonesian student mathematics literacy in the last decade

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ABSTRACT

This study aims to describe the mathematical literacy of Indonesian students based on research articles published in the last decade. This study used a systematic literature review method by collecting 163 relevant journals and then re-selected to meet the inclusion criteria and the criteria for assessing the quality of study results. It was found information on the development of research analyzing the mathematical literacy of Indonesian students starting from elementary school, junior high school, high school, and College Level. The literacy level of students at the elementary level is still considered low, while at the junior high school level it is assessed from various perspectives ranging from the low mathematical literacy of students to the factors that influence it. At the high school level, students' mathematical literacy is also still low even though a mathematical literacy test has been carried out in the Indonesian context. Finally, mathematical literacy at the university level is found that different student learning styles will go hand in hand with different mathematical literacy abilities.

Keywords: Mathematical Literacy; Indonesian Students

1. INTRODUCTION

The achievement of the objectives of the mathematics education curriculum in Indonesia will certainly be seen from the success of its implementation which can be a map of the development of the quality of mathematics education in Indonesia. In the last decade, the mapping of the quality of mathematics education nationally has been based on the results of the Ujian Nasional (UN), which is currently being revised into a National Assessment, based on the Permendikbudristek 17 tahun 2021 tentang Asesmen Nasional (Kemendikbudristek, 2021). At the global level, Indonesia is also active as one of the countries that contribute to international level assessments, in this case the International Program of Student Assessment (PISA) which conducts assessments of 15 year old students (OECD, 2019). However, the results of the latest PISA assessment in 2018 released by the OECD showed that the average score of Indonesian students' mathematical ability reached 379 with an OECD average score of 487 or ranked 72th out of 77 countries participating in the PISA test (OECD, 2019). From the results of this assessment, it can be concluded that the quality of mathematics education in Indonesia has not reached the global average. Knowing this fact, then of course it will be rational to study more about the mathematics achievement of Indonesian students, which of course will be directly proportional to their mathematical literacy.

Understanding the definition of mathematical literacy, it is better to start from the autonomy of the meaning of independent literacy with the term mathematical literacy. Basically literacy presupposes the existence of a symbolic system created and developed by a particular culture for the purpose of coding (what is said) and codifying (what is meant) the world of reference outside the symbolic system. In mathematical literacy, mathematics is a symbolic system and the external world of reference are some aspects of culture, especially those related to quantity, space, and measurement (Jurdak, 2016). Referring to the perspective of Jablonka (Adams, 2020) that the characteristic of mathematical literacy is as a conception of mathematical literacy related to the ability to analyze, reason, and communicate ideas and results by solving mathematical problems. There is a wedge with Bruner's (Schroeder, 1989) opinion that learning refers to the negotiation and re-creation of meaning by students. Along with this, mathematical literacy is also defined as an individual's capacity to formulate, use, and interpret mathematics in various contexts. This specifically includes mathematical reasoning and using mathematical concepts, procedures, facts, and tools to describe, explain, and predict existing phenomena (Summaries, 2019).

Analysis of Indonesian students' mathematical literacy cannot be done with primary studies. Therefore, a more effective study approach is needed with a systematic literature review (SLR). systematic literature review can be defined as "a review of existing research" using explicit and accountable rigorous research methods (Gough et al. 2017). The systematic logic of literature review is that "review" is a form of research, so it can be improved by using appropriate and explicit methods. Thus, the term 'systematic review' is used to refer to an approach which is a form of secondary research analysis that brings together the main research findings to answer the research question (Van Klaveren & De Wolf, 2019).

Based on the problems described, the objectives of this study is to describe the mathematical literacy of Indonesian students, which is sourced from research articles published in the last decade. This is related to the implementation of the curriculum which is still relevant to the 2013 curriculum.

2. RESEARCH METHOD

This research was conducted using a systematic literature review. Systematic literature reviews carefully document and appraise study qualities (Litte et al., 2008) and follows a protocol (a detailed plan) that first sets out its main objectives, concepts, and methods (Juandi, 2021). The method with the following research procedures (Van Klaveren & De Wolf, 2019).

2.1 Develop Research Questions

The author develops research questions, namely;

- a. How is the development of research analyzing the mathematical literacy of Indonesian students?
- b. How are the results of the research in describing students' mathematical literacy?

2.2 Selection Criteria

The selection criteria in this study are shown in the [table 1](#).

Table 1. Selection criteria

Acceptance/Rejection	Criteria
Inclusion (acceptance)	1) Articles are the results of research in Indonesian journal, international journals or proceedings
	2) Discussion of articles according to the research topic.
	3) Publication from 2013 to 2022.
Exclusion (rejection)	1) Articles are not the result of research in Indonesian journal, international journals or proceedings.
	2) Discussion of articles outside the research topic.
	3) Publications before 2013.

2.3 Developing the Search Strategy

The strategy carried out in the research is to collect articles from the research results of mathematical literacy analysis of Indonesian students from electronic databases, such as; ERIC, IOP Science, SINTA, and journals published by Springer, and Google Scholar. The search string is:

- a. Mathematical literacy
- b. Mathematical literacy analysis
- c. Mathematical literacy description

The search string above is necessary for a more specific search and to avoid filtering a large number of articles.

2.4 The Study Selection Process

Identified journal articles are bound to selection criteria or a screening process. Sometimes called screening to make sure the research meets the selection criteria or not. Usually carried out in two stages, where the title and abstract of the research are checked first to determine whether the research is relevant or not to the topic being researched.

2.5 Appraising the Quality of Studies

The data found will be evaluated based on the following quality assessment criteria questions:

QA1. Is the journal article the result of research?

QA2. Was the journal article published in the last decade?

QA3. Does the journal article write a research problem that is relevant to this research?

QA4. Do journal articles describe students' mathematical literacy?

Each journal article, will be given an answer value for each of the questions above with Y (Yes) or T (No).

2.6 Synthesis Results

Next do the data synthesis stage. The purpose of data synthesis is to collect evidence from selected studies to answer research questions.

3. RESULTS AND DISCUSSION

The search results of research articles relating to the analysis of student mathematical literacy in Indonesia, detected as many as 163 articles detected through Google Scholar. The author made a selection according to the inclusion criteria and got 34 articles. The author then proceeded to assess the quality of the study results and determined as many as 15 research

articles that met the criteria. The search and discussion of the 15 articles was carried out to answer research questions and are detailed as **figure (1)**, and **(2)**

3.1 The Development of Research in Mathematical Literacy Analysis in Indonesia

Development of of Research in Mathematical Literacy Analysis in Indonesia with the following details:

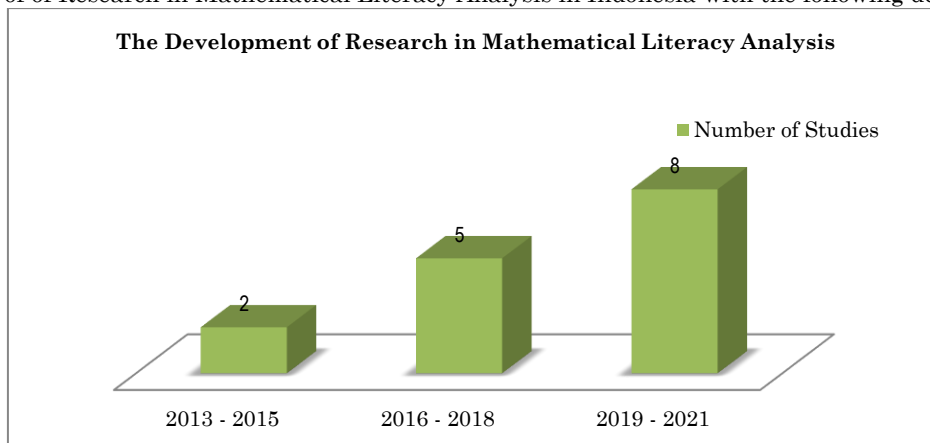


Figure 1. Results of Mathematics Literacy Analysis

The table above shows the development of research analyzing the mathematical literacy of Indonesian students. There is an increase in terms of the number of researches that are increasing until 2021, which means the development of research that analyzes students' mathematical literacy is starting to be enthusiastically carried out.

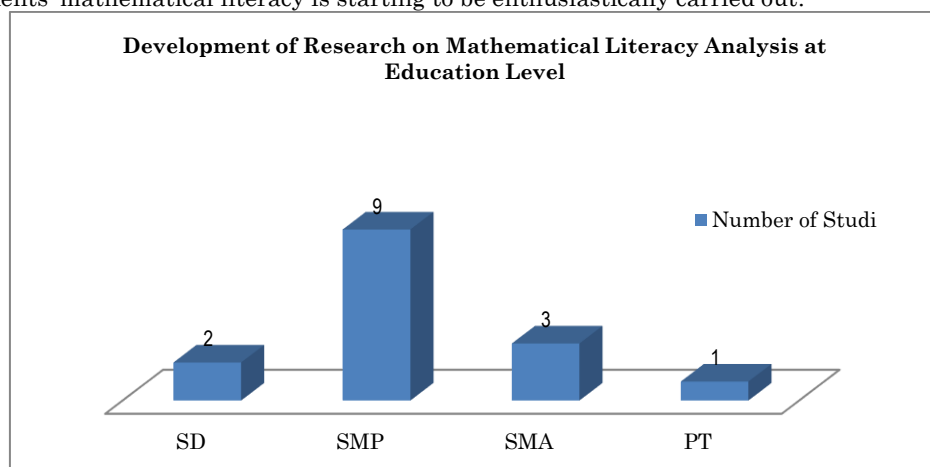


Figure 2. Results of Mathematics Literacy Analysis in Education

The table above illustrates that the number of dominant mathematical literacy studies carried out on junior high school students and equivalent. Although there are also activities carried out at the elementary, high school, and even university levels.

3.2 Description of Research Results of Mathematical Literacy Analysis

1) Research on Mathematical Literacy Analysis at Elementary School Level

There are two research articles that analyze the mathematical literacy of grade 5 students at SDN Sambiroto 01 Semarang and SDN 6 Sintang (Simarmata et al., 2020). While the mathematical literacy of SDN 6 Sintang students is also still low with an average value of 12 and is included in the D category (less), this is due to the low ability of students in reading, writing and numerical abilities. The results of the research show that the mathematical literacy of the students of SDN Sambiroto 01 Semarang (Purwanti et al., 2020) is still low, at level 1 and the problem-solving ability of students is not varied.

2) Research on Mathematical Literacy Analysis at the Junior High School Level

Research on junior high school students was carried out on 8th grade students, there were 6 research articles and 9th grade students two research articles. 1) Research on 8th graders was conducted at SMP N 1 Winong, Pati, Central Java (Munfarikhatin & Natsir, 2020) which showed that students' literacy skills on space shape content were still very low; 2) Research on 8th grade students at SMP Negeri 2 Wonopringgo, Pekalongan, Central Java (Khaerunisak et al., 2017)

showed that students in the low mathematical ability group (S1) were at level 2 of mathematical literacy ability. Furthermore, students in the moderate mathematical ability group (S2) are at level 3 of mathematical literacy ability. Meanwhile, students in the high mathematical ability group (S3) are at level 4 of mathematical literacy ability, which means that they are still at the intermediate level; 3) Research conducted on 8th grade students at one of the Integrated Islamic Junior High Schools in Yogyakarta (Nurutami et al., 2018) showed the results that students with high math skills could achieve PISA math literacy level 2 and level 4, students with average math skills could achieve PISA math literacy level 2, and students with low math skills cannot achieve mathematical literacy level 2, 3 or level 4 PISA; 4) Research conducted on 8th grade students at SMP N 3 Tarakan, North Kalimantan (Rahayu, 2022) showed that the mathematical literacy skills of class VIII students in solving hot questions were at level 4, namely: effectively work with models in concrete but complex situations limited in making assumptions, selecting and combining different representations, relating to real situations, using limited skills with few clear contextual views; 5) Research conducted on 8th grade students at Sultan Agung 4 Islamic Junior High School Semarang, Central Java (Ovan et al., 2018) showed that students with low metacognition had poor mathematical literacy skills, students with moderate metacognition had quite good mathematical literacy skills, and students with high metacognition had literacy skills math is very good; 6) Research on 8th graders at SMP Negeri 1 Tulis (Dessy Eka Jayanti, St. Budi Waluya, 2014) showed that the maximum students' mathematical literacy ability was at level 4, the mathematical literacy test was focused on real-life problems, outside of situations or problems that are often discussed in class during the mathematics learning process; 7) The research was conducted on 9th grade students at SMP Islam Al Azhar 27 Cilegon (Muslimah & Pujiastuti, 2020), which showed that students in the low mathematical ability group (S1) were at level 2 of mathematical literacy ability. Furthermore, students in the moderate mathematical ability group (S2) are at level 3 of mathematical literacy ability. Meanwhile, students in the high mathematical ability group (S3) are at level 4 of mathematical literacy ability, which means that they are still at the intermediate level; 8) The last research to be discussed was conducted on 9th grade students of SMP IT Cordova, East Kalimantan (Anwaril Hamidy, 2020) which showed that the mathematical literacy of SMP IT Cordova students was moderate, with an average score of 57.6. Based on the context domain, students of SMP IT Cordova have more control over the application of mathematical contexts in the context of science compared to other contexts. Although the mathematical literacy of SMP IT Cordova students in the context of work is the lowest, it is still in the medium category. The results of this study indicate variations in the description of students' mathematical literacy. However, in general, it can be categorized that the students' mathematical literacy is still low, although some of them are high. Likewise, PISA describes that around 28% of students in Indonesia aged 15 years, who are predominantly at the junior high school level, reach Level 2 and 1% are at level 5 in the indicators for the assessment of mathematical literacy (OECD, 2019).

3) Research on Mathematical Literacy Analysis at the High School Level

Research on high school students was carried out in several schools in Indonesia. There are three articles that explain the results of research that analyzes the literacy of high school students, namely; 1) research conducted on 10th grade students of SMA N 8 Tangerang City, Banten (Ahmad Fadillah, 2019); The results of this study indicate that mathematical literacy in solving PISA questions gets an average score of 63.28% overall from the ideal score. The mathematical literacy of students in the low category is 31.24% (less), the medium category is 72.39% (enough), the high category is 92.7% (good). Students' errors in working on PISA questions are generally found in the interpreting indicator with an achievement of 57.29%. 2) Grade 10 students of SMA N 1 Kendal (Mulyono, 2016). The results of this study highlight the low mathematical literacy ability and self-efficacy of students. 3) 1,045 X grade students from 35 SMA and MA in the provinces of West Java, Yogyakarta, North Sumatra, South Sumatra, East Kalimantan, East Nusa Tenggara and Southeast Sulawesi (Mahdiansyah, 2014). The results of this study describe that there are a number of determinant factors and achievement of mathematical literacy, namely personal factors, instructional factors, and environmental factors. The conclusion from this study is that students' mathematical literacy is still low, even though the international test design used has been adapted to the Indonesian context.

4) Research on Mathematical Literacy Analysis at the Higher Education Level

Research conducted at the university level was conducted on fourth semester students at a university in Magelang, Central Java, Indonesia (Aprilia Nurul Chasanah, Arief Budi Wicaksono, Sherlya Nurtsaniyah, 2020) who took the course of Inferential Statistics. It is known that the mathematical literacy ability of students with divergent learning styles is only able to arrive at the formulating step. Mathematical literacy abilities of students with convergent learning styles are able to take the mathematical literacy process. Students' mathematical literacy skills from assimilation to interpreting learning styles. The mathematical literacy ability of students with accommodation learning styles is able to understand and check well (formulating and interpreting) but in preparing plans or stating reasons (employing stage) for problem solving has not been able to be done properly. Based on the results of the study, it was found that each different learning style has different mathematical literacy abilities.

4. CONCLUSION

Based on the results of the description and analysis of data in this study, then presented conclusions that; in the last decade, 163 research articles were found based on searches in the Google scholar database and there were 15 research articles that matched the inclusion criteria and the criteria for assessing the quality of study results. The research articles come from

credible publication sources, namely indexed by SINTA 1 to 4 and proceedings at international conferences, which discuss the results of the analysis of mathematical literacy of students in Indonesia. It can be concluded that the development of research related to the analysis of students' mathematical literacy in Indonesia is increasing from year to year. The researchers seemed enthusiastic to reveal the various problems that affect the mathematical literacy of students in Indonesia. The research was conducted at all levels of education units from elementary, junior high school, high school, to College Level. The literacy level of students at the elementary level is still considered low, while at the junior high school level there are various perspectives ranging from the low mathematical literacy of students to the factors that influence it. At the high school level, students' mathematical literacy is also still low even though a mathematical literacy test has been carried out in the Indonesian context. Finally, mathematical literacy at the university level is found that different student learning styles will go hand in hand with different mathematical literacy abilities.

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AUTHOR'S CONTRIBUTIONS

The authors discussed the results and contributed to from the start to final manuscript.

CONFLICT OF INTEREST

There are no conflicts of interest declared by the author.

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