

## Research Article

# Numeracy Literacy Capability of Junior High School Students at Inamosol District

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**Abstract.**

It is important for students to master numeracy literacy as part of the minimum competency assessment, in order to have the thinking skills needed in the 21st century. This research aims to describe the numeracy literacy abilities of junior high school students in mountainous areas. This research uses a mixed method. The data collected is quantitative in the form of numeracy literacy test results and qualitative data in the form of interview results to describe students' weaknesses in numeracy literacy. The research results showed that student's literacy skills still remain at levels 1 and 2. Less than 20% of students were at level 3, and there were no students at levels 5 and 6. The category of students is that intervention and basic literacy skills are needed. The qualitative analysis concluded that the cause of low literacy was low communication, mathematization, and representation skills. In terms of indicators of mathematical ability, there are various basic concepts that students have not mastered so they experience difficulty in solving mathematical problems. Apart from that the reasoning that occurs is still imitation in nature, students still tend to memorize and use standard and imperfect procedures. The strategy used only imitates the teacher's strategy, while students have not used new strategies which causes literacy to still be at a lower level.

**Keywords:** numeracy, literacy, numeracy literacy level, mountains areas

## 1. Introduction

Numeracy literacy is an important factor in the world of education to prepare students to have 21<sup>st</sup>-century skills. Context Literacy does not only focus on the ability to read but also the ability to analyze reading and understand the concepts behind the writing. Meanwhile, numeracy competency means the ability to analyze using numbers. These two things are simplified in the minimum competency assessment starting in 2021 [1]. However, numeracy literacy skills in Indonesia are still not as expected. PISA results, Indonesia got an average mathematics score of 386 from the highest average score of 490 [2]. TIMSS results [3], Indonesia got a mathematics score of 397 from the highest score achieved by Singapore, namely 618. The results of the Mathematical Literacy Contest held by the Pattimura University FKIP Mathematics Education study program

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also show that the numeracy literacy skills of junior high school students in Maluku are still low.

Numeracy literacy skills also have a very big role to play in mastering. According to OECD (2016), good numeracy skills are the best protection against unemployment, low income, and poor health. Numeracy skills are needed in all aspects of life, both at home, at work, and in society. In everyday life, when shopping or planning a holiday, borrowing money from the bank to start a business or build a house, everything requires numeracy. In social life, we need to understand information, for example, regarding health and hygiene. In national life, information about economics and politics cannot be avoided. All this information is usually expressed in numerical or graphical form. To make the right decision, like it or not, we have to be able to understand numeration [1].

This has become a serious concern for the government by establishing numeracy literacy as one of the components in the minimum competency assessment (AKM) in the National Assessment (AN) through Minister of Education and Culture Regulation No. 17 of 2021. AKM, which will be implemented in 2021, is the government's effort to improve students' numeracy literacy skills so they can solve various problems in society. Susanto et al [4] explain that numeracy literacy is the key for students to access and understand the world and equip students with awareness and understanding of the important role of mathematics in the modern world.

The problem that arises is, to what extent do schools prepare their students to be tested in Numeracy literacy? Do teachers have a correct understanding of numeracy literacy and have they integrated it into learning? Has the teacher used a learning model that is appropriate to the student's context to grow and improve students' numeracy literacy? Especially for schools in Maluku, which is an island province, access to literacy reinforcement is still difficult to obtain, so numeracy literacy is a big challenge that must be resolved immediately.

Several research results regarding the causes of students' low numeracy literacy skills show that teachers also contribute to this problem. According to Cahyanovianty and Wahidin [5] and Fauzi, Sawitri and Syahrir [6], the cause is that the teacher's ability to develop material is not yet optimal. There are still teachers who do not know the components of numeracy literacy; 65% of teachers have not tried working on examples of AKM questions [7]. There is a lack of introduction to numeracy-based practice questions given to students to practice their abilities, so students find it difficult to complete them [8]. On the student side, they are not yet able to reason so that the average numeracy literacy results are low [9]. Apart from that, according to Novianti [10],

there is a relationship between AKM for numeracy literacy and problem-solving abilities so that when designing AKM for numerical literacy, it is best to use the student's context.

Middle School in Inamosol sub-district was chosen as the research location, considering that this area is in a mountainous area so teachers with limited access still find it difficult to adapt to current developments, especially AKM. On the other hand, AKM is carried out evenly in all schools, including junior high schools in the mountains, so of course it has an impact on students' numeracy literacy skills. This research will benefit students by increasing literacy skills. This research aims to [1] map students' numeracy literacy abilities; [2] describe students' understanding of numeracy literacy.

Students' numeracy literacy abilities will be mapped according to PISA leveling [11] which consists of 6 levels as in Table 1

TABLE 1: Leveling of Numeracy Literacy abilities according to PISA.

Level 1	Answer questions with known context and all relevant information from the question clear
Level 2	Interpret, recognize situations and use formulas to solve problems
Level 3	Carry out procedures well and select and apply simple problem solving strategies. Interpret and present situations
Level 4	Work effectively with models in concrete but complex situations and represent disparate information and relate it to real situations
Level 5	Work with models for complex situations and select and apply strategies in solving complex problems
Level 6	Make generalizations and use mathematical reasoning in solving problems and communicating them

Then, the description of literacy skills is described according to the indicators of [12] with a rubric as in Table 2.

## 2. Methods

This type of research is a mix method, namely combining quantitative research and qualitative research. The research population was junior high school students in Inamosol District, totaling 6 schools. The sample to be selected is 70 students in 4 schools with details: 21 students at SMP Negeri 9; 17 Kawatu Middle School students; 20 Honitetu Middle Schools and 15 Rambatu Middle Schools. The research instruments used were prepared by researchers and then validated by experts. The instrument contains literacy questions that can measure literacy indicators. The data analysis technique uses quantitative analysis. Quantitative analysis is used to determine the level of students' literacy skills and abilities based on indicators, while qualitative

TABLE 2: Indicators of Literacy Ability.

Indicators of Literacy Ability	Student responses
Communication Skills	Write down the process in reaching a solution Summing up mathematical results
Mathematization Ability	Using conceptual understanding to solve mathematical problems
Representational Abilities	Use different types of representation when solving problems Connecting different types of representation
Reasoning And Argumentation Abilities	Explain the justification for determining the processes and procedures used to determine mathematical results or solutions Deducing the results of various mathematical arguments
The Ability to Choose Strategies to Solve Problems	Using strategies through various procedures that lead to mathematical solutions and conclusions
Ability to Use Symbolic, Formal and Technical Language and Operations	Uses formal forms based on mathematical definitions and rules
Ability to Use Mathematical Tools	Use mathematical tools to recognize mathematical structures or to describe mathematical relationships

analysis is used to describe students' strengths and weaknesses on all numeracy literacy indicators.

### 3. Results and Discussion

The results of the numeracy literacy ability test after being scored based on an assessment rubric with literacy indicators, obtained results as in Table 3.

Students' numeracy literacy abilities are still in a worrying category. At level 1, which is still easy, the percentage of students in this category does not reach 50%. The percentage of students at level 3 does not reach 25%, and at level 4, only 4% of students. There were no students at levels 5 and 6. This finding is in line with research by Laamena and Laurens [13] who called it illiteracy, namely a situation where students' literacy skills are at a very low level, and is likened to illness. The fact that only 32% of students were able to answer questions with a known context and all relevant information from the questions clearly shows students' weaknesses in numeracy literacy which must be resolved immediately. The reason is that the context presented is far from students' experiences. Students who live in mountainous areas far from cities will only understand the problems presented according to the environment where they are.

TABLE 3: Leveling of Literacy Ability of Middle School Students in Inamosol District.

Level	Description	Number of students (Percentage)
Level 1	Answer questions with known context and all relevant information from the question clear	32 (44%)
Level 2	Interpret, recognize situations and use formulas to solve problems	22 (30%)
Level 3	Carry out procedures well and select and apply simple problem solving strategies. Interpret and present situations	16 (22%)
Level 4	Work effectively with models in concrete but complex situations and represent disparate information and relate it to real situations	3 (4%)
Level 5	Work with models for complex situations and select and apply strategies in solving complex problems	-
Level 6	Make generalizations and use mathematical reasoning in solving problems and communicating them	-

On the indicators of interpreting, recognizing situations and using formulas to solve problems, only 30% of students were able to do so. Interpreting or interpreting mathematics is very important in literacy because it includes reflecting on mathematical solutions and interpreting them according to the context of the problem being solved, including evaluating mathematical solutions and determining or checking the correctness and reasons for the results obtained. However, research results still show low figures for this ability. One of the factors causing low interpretation skills according to Saputri et al [14] is students' lack of understanding of mathematical concepts. Effendi and Adang [15] and Rosmayadi et al [16] strengthen this statement by saying that understanding concepts will make it easier for students to understand problems. Interpretation abilities are closely related to mathematical problem-solving. Good interpretation can help students determine solutions accurately. In interpreting, students need to understand the problem by identifying known elements, asking questions, and evaluating the adequacy of the required elements, then selecting or applying solution strategies (drawings, models, etc.) to obtain solutions and verify and reflect the truth solution [17]. This initial ability is in accordance with the meaning of interpretation ability, namely that students must be able to translate questions into mathematical models.

Students' ability to carry out procedures well and choose and apply simple problem solving strategies only reached 22%. This is what makes students fail to solve questions correctly. Procedural knowledge relates to how to determine and carry out the steps in a process, while conditional knowledge is knowledge about when a procedure, skill, or strategy should be used and not used, why the procedure can be used and under

what conditions, and why someone should use it. the procedure. procedure is better than others. According to Badjeber et al [18], procedural knowledge is not only seen from students' skills and abilities in writing down the steps or sequences in solving problems, but they must also understand that the next solving step is a result of the previous stage. Students demonstrate procedural knowledge in mathematics when they select and apply appropriate procedures correctly; verify or justify the correctness of procedures using mathematical models; or modify procedures to address factors in resolving the problem. Next, a qualitative analysis was carried out on student answers and interview results. The results are presented in Table 4.

TABLE 4: Description of Student Literacy Based on Literacy Ability Indicators.

Indicators of Literacy Ability	Description of Student Numeracy Literacy Profile
Communication Skills	The process of reaching a solution has not occurred well Working students have concluded well
Mathematization Ability	There are various basic concepts that have not been mastered, resulting in difficulties in solving mathematical problems
Representational Abilities	Students tend to use one type of representation and there are still some mistakes Representase tunggal membuat siswa belum bisa menghubungkan berbagai jenis representase
Reasoning And Argumentation Abilities	The reasoning that occurs is still imitation, students still tend to memorize and use standard and imperfect procedures The use of arguments is very limited so that conclusions based on arguments are also weak
The Ability to Choose Strategies to Solve Problems	The strategy used only imitates the teacher's strategy, students have not used new strategies
Ability to Use Symbolic, Formal and Technical Language and Operations	Students are able to use formal forms but are not perfect because their initial abilities are not supported
Ability to Use Mathematical Tools	Siswa belum mampu membuat struktur matematika dengan baik

In terms of communication ability indicators, the process or stages of problem solving to reach a solution have not occurred well. Students' understanding of what must be done and how to solve it is generally still far from the truth. According to Tupamahu et al [19], when students are challenged to communicate the results of their thoughts to others orally or in writing, they will learn to be clear, convincing, and precise in their use of mathematical language. It is clear that imperfect written and verbal communication will not produce a perfect solution.

In the view of Laamena and Nusantara [20], representation is a visual backing that is useful for strengthening students' understanding of the problems they face. Visual representation provides students with a better picture, making it easier to solve problems. Students will build arguments at each step of the solution based on visual support. Minimal mastery of basic concepts makes students unable to make mathematics correctly. The problems presented cannot yet be converted into mathematical form. Students are not yet able to use mathematical symbols based on concrete situations in the literacy questions given. According to Amala [21], students who have low understanding cannot achieve all mathematization processes. According to Jediut et al [22], apart from having an impact on problem-solving abilities, low mathematical abilities also cause students to be less able to think critically and creatively. For this reason, it is necessary to carry out various activities that can arouse students' enthusiasm and interest in learning mathematics. Chasanah [23] and Hamidy et al [24] views mathematization as modeling by translating real world problems into the world of mathematics. This stage is carried out by detecting the characteristics of real-world problems that correspond to mathematical concepts.

Students are able to solve the questions given by the teacher using the stages they have learned. However, when the problem given has never been accepted then they experience difficulties. They do not have the ability to think critically and creatively to find new ways or their own way to solve problems. At first glance, students appear to be reasoning, but what happens is only imitation reasoning, because the strategies used only imitate the teacher's strategies. Jonsson et al [25]; Norqvist et al [26] confirms creative reasoning is more efficient in the long term than imitative reasoning. In imitative reasoning, students only tend to recall previous knowledge without any novelty and are superficial, including imitating examples in textbooks or remembering certain mathematical reasoning algorithms [27]. As a result, the mathematical structure constructed by students is by no means perfect. The results Agusti et al [28] research strengthen these findings which say that students have not been able to carry out mathematical creative reasoning well because of the three indicators of mathematical creative reasoning: novelty (novelty); plausibility (reasonable); and the mathematical foundation (mathematically based) has not been fulfilled. Students still tend to do imitative reasoning and are not even able to reason well. This means that imitative reasoning abilities still dominate compared to students' creative mathematical reasoning.

## 4. Conclusion

Students' numeracy literacy skills are still at levels 1, 2 and 3 with percentages of 44%, 30% and 22%. Students have not been able to demonstrate abilities at levels 4, 5, and 6. Students have not been able to work effectively with models in concrete but complex situations and represent different information and relate it to real situations; Work with models for complex situations and select and apply strategies in solving complex problems; and Make generalizations and use mathematical reasoning in solving problems and communicating them. Students' reasoning is still imitative using teacher strategies, making it difficult to solve new problems.

## References

- [1] Kemdikbud. Permendikbudristek nomor 17 tahun 2021. Kementerian Pendidikan, Kebudayaan, Riset, dan Teknol. 2021;1–10.
- [2] OECD. PISA 2018 Results. 2018.
- [3] OECD. OECD WEEK 2 0 1 5 Meeting of the OECD Council at Ministerial Level OECD INNOVATION STRATEGY 2015 AN AGENDA FOR POLICY ACTION. 2016;(June):1–2. Available from: [www.oecd.org/tel/33](http://www.oecd.org/tel/33)
- [4] Susanto NC, Hartati SJ, Setiawan W. Desain Pembelajaran Peningkatan Literasi Numerasi Dan Karakter Berpikir Kritis Siswa Sd Berbasis Etnomatematika. *Cent Educ J*. 2022;3(01):50–61.
- [5] Cahyanovianty A, Wahidin W. Analisis Kemampuan Numerasi Peserta Didik Kelas VIII dalam Menyelesaikan Soal Asesmen Kompetensi Minimum (AKM). *J Cendekia J Pendidik Mat*. 2021;5(2):1439–48.
- [6] Fauzi A, Sawitri D, Syahrir S. Kesulitan Guru Pada Pembelajaran Matematika Di Sekolah Dasar. *J Ilm Mandala Educ*. 2020;6(1):142–8.
- [7] Fauziah A, Sobari EF, Robandi B. Analisis Pemahaman Guru Sekolah Menengah Pertama (SMP) Mengenai Asesmen Kompetensi Minimum (AKM). *Edukatif J Ilmu Pendidik* [Internet]. 2021;3(4):1550–8. Available from: <https://edukatif.org/index.php/edukatif/article/view/608>
- [8] Fiangga SM, Amin S, Khabibah S, Ekawati R, Rinda Prihartiwi N. Penulisan Soal Literasi Numerasi bagi Guru SD di Kabupaten Ponorogo. *J Anugerah*. 2019;1(1):9–18.
- [9] Ahmad DN, Setyowati L, Ati AP. Kemampuan Guru dalam Asesmen Kompetensi Minimum (AKM) untuk Mengetahui Kemampuan Literasi dan Numerasi Peserta Didik. *Pros Disk Panel Nas Pendidik Mat*. 2021;7(1):129–35.



- [10] Novianti DE. Asesmen Kompetensi Minimum (AKM) dan Kaitannya dengan Kemampuan Pemecahan Masalah Matematika. *Semin Nas Pendidik LPPM IKIP PGRI Bojonegoro*; 2021. pp. 85–91.
- [11] Purwasih R, Sari NR, Agustina S. Analisis kemampuan literasi matematik dan mathematical habits of mind siswa SMP pada materi bangun ruang sisi datar. *Numeracy*. 2018;5(1):67–76.
- [12] Anggrieni N, Putri RI. Analisis Kemampuan Literasi Matematika Siswa dalam Menyelesaikan Soal Tipe PISA 2015. *Univ Muhammadiyah Surakarta*. 2011;2018:472–81.
- [13] Laamena CM, Laurens T. Mathematical literacy ability and metacognitive characteristics of mathematics pre-service teacher. *Infin J*. 2021 Aug;10(2):259–70.
- [14] Saputri RA. Analisis Interpretasi Bahasa Matematika Siswa Kelas V SDN Malinau (Loksado, Kal-Sel). *THETA J Pendidik Mat*. 2020;2(1):20–6.
- [15] Effendi A. Implementasi Model Creative Problem Solving Untuk Meningkatkan Kemampuan Metakognitif Berdasarkan Kemampuan Awal Matematis Siswa. *JPPM J Penelit Dan Pembelajaran Mat*. 2016;9(2):165–76.
- [16] Rosmayadi R, Mariyam M, Juliyanti J. Pemahaman Konsep Matematis Siswa Dengan Strategi Pembelajaran Group To Group Exchange Berpendekatan Kontekstual. *J Penelit dan Pembelajaran Mat*. 2018;11(1).
- [17] Kurniadi G, Purwaningrum JP. Kesalahan Siswa Pada Kategori Kemampuan Awal Matematis Rendah Dalam Penyelesaian Tes Kemampuan Pemecahan Masalah Matematis. *J Penelit dan Pembelajaran Mat*. 2018;11(2).
- [18] Badjeber R, Mailili WH. Analisis Pengetahuan Prosedural Siswa Kelas Smp Pada Materi Sistem Persamaan Linear Dua Variabel Ditinjau Dari Gaya Kognitif. *J Penelit dan Pembelajaran Mat*. 2018;11(2):41–54.
- [19] Tupamahu PZ, Ratumanan TG, Laamena C. Students' mathematical representation and communication ability in mathematics problem solving. *J Didakt Mat*. 2023;10(1):111–30.
- [20] Laamena CM, Nusantara T, Irawan EB, Muksar M. How do the undergraduate students use an example in mathematical proof construction: A study based on argumentation and proving activity. *Int Electron J Math Educ*. 2018;13(3):185–98.
- [21] Amala MA. Profil Proses Matematisasi Horizontal dan Vertikal Siswa SMP dalam Menyelesaikan Masalah Kontekstual Pecahan Ditinjau dari Kemampuan Matematika. *MATHEdunesa J Ilm Pendidik Mat*. 2016;3(5):300–9.
- [22] Jediut M, Sabina Ndiung, Fransiska Jaiman Madu. Kemampuan Matematisasi Siswa SD dalam Menyelesaikan Soal Non Rutin. *J Elem Edukasia*. 2023;6(3):1510–8.

- [23] Chasanah IM. Proses Matematisasi Siswa Smp Dalam Menyelesaikan Masalah Kontekstual Ditinjau Dari Kemampuan Matematika. *MATHEdunesa*. 2021;10(1):69–78.
- [24] Hamidy A, Jailani J. Kemampuan proses matematis siswa Kalimantan Timur dalam menyelesaikan soal matematika model PISA. *J Ris Pendidik Mat*. 2019;6(2):133–49.
- [25] Jonsson B, Mossegård J, Lithner J, Karlsson Wirebring L. Creative Mathematical Reasoning: Does Need for Cognition Matter? *Front Psychol*. 2022 Jan;12(January):797807.
- [26] Norqvist M, Jonsson B, Lithner J, Qwillbard T, Holm L. Investigating algorithmic and creative reasoning strategies by eye tracking. *J Math Behav [Internet]*. 2019;55(April):0–1. Available from: <https://doi.org/10.1016/j.jmathb.2019.03.008>.
- [27] Sukirwan DD, Herman T. Analysis of students' mathematical reasoning. *J Phys Conf Ser*. 2018;948(1).
- [28] Agusti FA, Herman T, Zafirah A. Kemampuan Penalaran Imitatif Dan Kreatif Matematis Siswa Smp Pada Materi Persamaan Garis Lurus. *AKSIOMA J Progr Stud Pendidik Mat*. 2023;12(1):1447.