Identification of Mathematical Literacy Students Level 2, 3, 4 of Pisa Task

A. Nurutami, R. Riyadi and S. Subanti
Universitas Sebelas Maret, Jl. Ir. Sutami No. 36A, Surakarta 57126, Indonesia

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Abstract: This study aims to investigate the mathematical literacy ability of students. This research is a qualitative descriptive research. Its subjects of the study were 36 students grade 8th in Yogyakarta. The data collection was by test methods. The research's instruments were mathematical literacy test consisting of 3 PISA questions are used there are level 2, level 3, and level 4 PISA Task. The result got from the test of mathematical literacy which is analyzed to decide which indicator that is achieved by student. Then, some student will be interviewed to decide the level of student's mathematical literacy. Based on the result analyzed students task showed that students are still difficulties to accomplish all the question's test. The students are low capability in understanding the questions in short story form and reconstruct them into mathematics form. So, can be concluded that student's mathematical literacy ability is still categorized at the low level.

1 INTRODUCTION

Mathematics is as one of a science that exists in every aspect of human life. Even the development of modern technology does not escape from the role of mathematics. Therefore, mathematics is one of the basic sciences that must have by humans, especially by students in order to prepare to solve various daily faced problems. From some researcher, Mathematical literacy is defined as the ability of individual's capacity to formulate, apply and interpret mathematics in various contexts involving mathematical reasoning and the use of concepts, procedures, facts to describe, explain and predict phenomena and relate them to daily life (Dewantara (2015), Wardono (2015), and Oktiningrum (2016)). Mathematics used in all aspects of life is called mathematical literacy.

The literacy ability is one of the 21st century skills. The 21st century skills refer to content knowledge, literacy, and proficiency that prepare individuals to meet the challenges and opportunities of today's world (Ledward and Hirata, 2011). So, literacy skills need to grow up and mature over the course of every person's life, giving everyone the reading, writing and thinking skills needed for success in academic, workforce and personal situations.

Performance of Indonesian student's in mathematical literacy is measured by PISA. Indonesian student achievement in PISA survey shows an insignificant improvement during the period of 2000-2015. In PISA 2012 Indonesia was rank declined to rank 64 of 65 the participant countries, even based on the last PISA 2015 Indonesia was ranked 63 out of 69 countries (OECD, 2015). In 2018, Indonesia has been followed the PISA test for the sixth time and the result will be showed in 2019.

Table 1: Indonesian Students on PISA 2000-2015

Year	Indonesia Average Score	Indonesia Rank	Total of Countries Members
2000	367	39	41
2003	360	38	40
2006	391	50	57
2009	371	61	65
2012	375	64	65
2015	386	63	69

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Result of research conducted by PISA shows that mathematical literacy of Indonesian students is very low (OECD, 2015). Related to this, research by Mahdiansyah and Rahmawati (2014) shows that the mathematical literacy of Indonesian students is low. Results of research conducted by Andi, Zulkardi, & Darmawijoyo (2015) indicate that skill of student in solving mathematical literacy problems is not max yet. Also related to this, Nindya and Jailani (2015) that Indonesian students mathematics problem solving skill in PISA and TIMSS were not show good achievement. In specific area, Sari and Wijaya (2017) that mathematical literacy of students in Yogyakarta for understanding category and process belongs to very low category.

Proficiency in mathematical literacy according to PISA study is divided into the 6 level and the deep explanation about these levels could read in OECD. In Table 2, most Indonesian students in 2015 have not reached level 1 for mathematics (30.7%), which is of concern 37.9% of students have not even reached the lowest proficiency level (level 1) for mathematics (OECD, 2015).

Table 2: Percentage of students at each proficiency level in mathematics

	All Students						
	Below Level 1	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
	%	%	%	%	%	%	%
Indonesia	37.9	30.7	19.6	8.4	2.7	0.6	0.1
OECD total	10.9	17.5	23.4	22.9	16.2	7.1	2.0
OECD average	8.5	14.9	22.5	24.8	18.6	8.4	2.3

Based on the description above, it can be seen in general about the condition of literacy skills, especially mathematical literacy which is low, so the researchers try again whether the general situation in Indonesia represents the actual situation in each school, especially at MTs Muallimat Muhammadiyah Yogyakarta, then there is a need for research to find out how it really is about the state of mathematics literacy ability of students.

2 METHODS

The research methodology used in this research is a descriptive method with qualitative approach. However, also used quantitative data with numbers and basic statistics to support arguments and findings in the discussion.

The research had been done at class VIII-D MTs Muallimat Muhammadiyah Yogyakarta with the number of 36 students in the 2017/2018 academic year. The 36 students have various level of mathematics ability. Furthermore, to determine the value of students' mathematical literacy ability obtained by using the formula, as follows:

$$\text{The Acquisitio n Value of Students } (Y) = \frac{\text{Score Acquisitio n Students}}{\text{Ideal Maximum Score}} \times 100$$

Table 3: Describe of acquisition value of student mathematical literacy ability

The acquisition value of student	literacy ability of mathematics
$(Y \geq 80)$	high
$(60 \leq Y < 80)$	medium
$(Y < 60)$	low

(Kadir, 2010)

3 RESULTS AND DISCUSSION

Here are presented results of research on the mathematical literacy skill of students' in classroom VIII D MTs Muallimaat Muhammadiyah Yogyakarta with the discussion of the findings of this research was conducted on Tuesday, January 16, 2018. Description of mathematical literacy as follows Table 4.

Table 4: Description of Mathematical Literacy Ability of Students.

No	Subject	Percent of Mathematical Literacy Ability			Total
		2	4	3	
1	S1	50	0	25	75
2	S2	0	0	25	25
3	S3	50	0	20	70
4	S4	100	50	50	200
5	S5	25	25	25	75
6	S6	75	100	25	200
7	S7	50	50	50	150
8	S8	0	0	0	0
9	S9	50	100	20	170

10	S10	50	25	25	100
11	S11	50	25	25	100
12	S12	50	50	50	150
13	S13	50	50	25	125
14	S14	0	75	25	100
15	S15	100	25	25	150
16	S16	50	50	50	150
17	S17	50	50	50	150
18	S18	50	25	25	100
19	S19	50	75	0	125
20	S20	50	75	50	175
21	S21	50	50	25	125
22	S22	50	50	50	150
23	S23	75	0	0	75
24	S24	50	25	25	100
25	S25	50	25	25	100
26	S26	0	50	50	100
27	S27	75	75	0	150
28	S28	50	50	0	100
29	S29	75	75	0	150
30	S30	100	50	0	150
31	S31	75	75	50	200
32	S32	50	25	25	100
33	S33	50	25	25	100
34	S34	75	50	0	125
35	S35	75	25	25	125
36	S36	50	50	25	125
	Total	1900	1550	915	

Table 4 shows that the results of the mathematics literacy test skills of MTs Muallimaat Muhammadiyah Yogyakarta students were in the low category. Of the 36 students in class VIII D, there were 35 students who took the test and 1 student did not take the test namely student S8. Of the 35 students, only 10 students were able to score more than 60 or in the medium category on level 2 questions. In level 3 questions there were no students who were able to score more than 60. As for level 4 questions, there were only 8 students able to get a score of more than 60.

Description of the Mathematics Literacy Ability of MTs Muallimaat Muhammadiyah Yogyakarta students can be seen in the following figure 1. Figure 1 shows that on average students of MTs Muallimaat Muhammadiyah Yogyakarta at level 2 reached 53%, at level 3 it reached 25%, and level 4 reached 43%. If on average, the acquisition of students' mathematical literacy skills at the level tested reaches 30%. From the results of the achievement, the ability of students at level 2 to level 3 has decreased, this indicates that the higher the level of the question the lower the value obtained by students. But, at the level of 3 to level 4 has increased which means although levels matter more complicated, the student is able to interpret the problem questions well and able to resolve the problem appropriately.

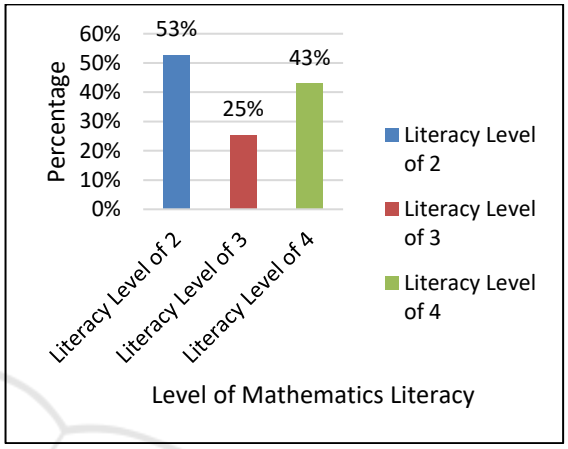

Figure 1: Percentage of Students' Mathematical Literacy Ability.

Based on students' answer in solving math problems level 2 PISA model, it can be concluded that students have difficulty in students can interpret and recognize situations in contexts that required no more than direct inference, and can't employ basic algorithms, formulas, procedures or conventions to solve the problems involving whole numbers. Based on students' answer in solving math problems level 3 PISA model, it can be concluded that students have difficulty in interpret and use representation based on different information source and reason directly from them and they can not to handle percentage, fractions and decimal numbers. Based on students' answer in solving math problems level 4 PISA model, it can be concluded that students have difficulty in (1) provide an explanation and communicate it based on their interpretation, (2) linking the representation they get with real world situations.

Based on the results of the research, each student has a different level of literacy ability. Although not all students meet the indicators given, but in solving the problems some students have been able to understand the purpose of the problems and formulate the problems stated in the problem. Some students have also been able to solve, interpret problems and present their answers quite well. This agrees with Kusumah that mathematical literacy is a

person's ability to formulate, solve, and interpret problems based on the existing context (Maryanti, 2012). The results of this research are in line with Edo, S. I, et al. (2013), the results obtained from the research which states that average of Indonesian students are only able to answer questions PISA level 1, 2, 3, and only some students who can solve level 4.

4 CONCLUSIONS

Based on the results of research and discussion that has been stated previously, it can be concluded that average of mathematical literacy ability students still low, it only reaches less than 60% for each level in the mathematics literacy test. The average of mathematics literacy abilities of VIII D Mts Muallimaat Muhammadiyah Yogyakarta is only 30%. So, can be concluded that the student's mathematical literacy ability at VIII-D in MTs Muallimaat Muhammadiyah Yogyakarta is still categorized at the low levels.

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REFERENCES

Dewantara, A., Zulkardi, and Darmawijoyo, 2015. Assessing seventh graders' mathematical literacy in solving Pisa-like tasks. *IndoMS-JME* Vol. 6(2), 39-49.

Edo, S. I, Hartono, Y., and Putri, R. I. I., 2013. Investigating Secondary School Students' Difficulties in Modelling Problems PISA-Model Level 5 and 6. *JIMS Journal* 4(1), 41-58.

Kadir, 2010. *Penerapan Pembelajaran Kontekstual Berbasis Potensi Pesisir sebagai Upaya Peningkatan Kemampuan Pemecahan Masalah Matematik, Komunikasi Matematik, dan Keterampilan Sosial Siswa SMP*. Dissertation, SPs UPI Bandung: Unpublished.

Ledward, B. C., and D. Hirata, 2011. An overview of 21st century skills. Summary of 21st Century Skills for Students and Teachers. *Pacific Policy Research Center. Honolulu: Kamehameha Schools–Research & Evaluation.*

Mahdiansyah and Rahmawati, 2014. Literasi Matematika Siswa Pendidikan Menengah: Analisis menggunakan Desain Tes Internasional dengan Konteks Indonesia. *Jurnal Pendidikan dan Kebudayaan* Vol. 20(4), 452-469, Badan Penelitian dan Pengembangan Kemdikbud. DOI: http://dx.doi.org/10.24832%2Fjpnk.v20i4.158.

Maryanti, E., 2012. *Peningkatan Literasi Matematis Siswa melalui Pendekatan Metacognitive Guidance*. Thesis, Bandung: Universitas Pendidikan Indonesia.

Nindya, F. W. and Jailani, 2015. Indonesian Student's Mathematics Problem Solving Skill in PISA and TIMSS. *Proceeding of International Conference on Research, Implementation and Education of Mathematics and Science* 2015 (ICRIEMS), Yogyakarta State University, May 17-19.

OECD, 2015. *PISA 2015 Assessment Framework Key Competencies in Reading, Mathematics and Science*. Paris: OECD Publishing.

Oktiningrum, W., Zulkardi, Hartono, Y., 2016. Developing PISA-like mathematics task with Indonesia natural and cultural heritage as context to assess students' mathematical literacy. *Journal on Mathematics Education* Vol. 7(1), 1-8. DOI: http://dx.doi.org/10.22342/jme.7.1.2812.1-8.

Sari, R. H. N. and Wijaya, A., 2017. Mathematical Literacy of Senior High School Students in Yogyakarta. *Jurnal Riset Pendidikan Matematika* Vol. 4 (1), 100-107. http://dx.doi.org/10.21831/jrpm.v4i1.10649.

Wardono, Waluya, B., Kartono, Sukestiyarno, and Mariani S., 2015. The realistic scientific humanist learning with character education to improve mathematics literacy based on PISA. *International Journal of Education and Research* 3(1), 349-362.