Gender differences in prospective teachers’ mathematical literacy: problem solving of occupational context on shipping company

N D S Lestari$^{1,2}$, D Juniati$^3$, St. Suwarsono$^4$

$^1$Mathematics Education Department, University of Jember, Indonesia
$^2$Department of Mathematics Education, Universitas Negeri Surabaya, Indonesia
$^3$Department of Mathematics, Universitas Negeri Surabaya, Indonesia
$^4$Mathematics Education Department, Faculty of Teacher Training and Education, Universitas Sanatha Dharma, Indonesia

E-mail: nurcholifllestari@mhs.unesa.ac.id

Abstract. The purpose of this paper is to describe to what extent the prospective teachers can be considered as mathematically literate and how they communicate their reasoning in solving the problem based on the sex differences. Data were collected through mathematics literacy test on occupational context by 157 of prospective teachers from three universities in East Java, Indonesia. Their written responses were collected, organized based on the sex differences, analyzed and categorized to one of three levels of mathematical literacy. The examples of interesting students’ response altogether with the scoring are discussed to describe their characteristic on mathematical literacy and their communication. The result showed that in general the mathematical literacy of female prospective teachers tend to be better than male prospective math teachers. Female prospective teachers are more capable of logical reasoning, using concepts, facts and procedures and algebraic operations to draw conclusions; make an interpretations and evaluations. This study has an implication that gender differences in mathematical literacy of prospective math teachers do exist, therefore this issue should be given a serious concern from the development programs of the faculty.

1. Introduction

Mathematical literacy differs from mathematics in general. Mathematical literacy is the knowledge to know and apply basic mathematics to everyday life [1]. Mathematical literacy is not about studying higher levels of formal mathematics, but about making mathematics relevant and empowering for everyone [2]. Mathematical literacy is an individual’s capacity to formulate, employ, and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts, and tools to describe, explain, and predict phenomena. It assists a person to recognize the role that mathematics play in the world and to make the well-founded judgement and decision needed [3].

The problems in mathematical literacy are categorized by the nature of the situation (the context category) and the major domain of mathematics involved (the content category). In solving the problem, three components of the nature of mathematical thought and action are needed [4]. The first
component is content mathematics classified as shape and space, change and relationships, quantity, and uncertainty and data. The second component is the process of solving problems classified as formulate, employ and interpret. The last component is fundamental mathematics capability classified as mathematisation, devising strategies, representation, reasoning, symbols and communication. While Personal, societal, occupational and scientific are labelled for the mathematical literacy context categories. Every problem are categorized based on to the one closest type of every components [3].

Prospective math teachers are specially prepared to become a qualified mathematics teachers. Teachers has an important role played in helping students to learn and affecting the educational outcomes-achievement, future participation, and attitudes of their students [5]. They should have to know deeply about what they teach, how they teach it [6], [7] and how the curriculum supported the teaching [7]. All of this knowledge are known as pedagogical content knowledge (PCK) which is stated as important element to be an effective mathematics teacher [8].

Prospective math teachers, especially in Indonesia, should have mathematical literacy and knowledge about mathematical literacy for at least of four reasons. Firstly, mathematical literacy become a hidden educational objectives of mathematics teaching and learning in Indonesia. The competence related to mathematical literacy has not yet stated clearly but implicitly seen from the standard of students graduated from elementary and secondary schools. It stated that graduated students should have the factual, conceptual, procedural and metacognitive knowledge relates to sciences, technology, art, and culture; and able to use it for their self, and society, as a citizen [9]. This standard is in line with the definition of mathematical literacy that to be mathematically literate one must have the ability to use the mathematical knowledge. However, based on previous study [10] many mathematics teachers are misinterpreted mathematical literacy and did not attempt to teach the lessons that led to the teaching of mathematical literacy mathematics teachers It implies that mathematics education students as prospective teachers have to know deeply about what they teach, i.e. mathematics and literacy mathematics. Secondly, to teach mathematical knowledge (conceptual and procedural knowledge), teachers should ensure that the concept of mathematics is firstly developed, and it requires an appropriate action of teachers to use correct mathematical language, symbols and notation in their teaching [11]. Thirdly, to teach students such that they able to use their mathematical knowledge and enhance their problem solving skills, then mathematics should be thought in context and bring a real-life situation into the classroom [11]. Since the teaching and learning should be meaningful then the usage of everyday context in the teaching mathematics should be used as a means to access mathematical knowledge. Therefore mathematical literacy can be an alternative to present problem with daily life context. Fourthly, the teacher’s ability to communicate their reasoning become important to teach mathematical knowledge [12]. This ability is one of mathematical ability needed for mathematical literacy [3]. Therefore, it also can be concluded that mathematical literacy is important for prospective math teachers as it is suitable to use in the teaching and learning mathematics.

The research about gender differences in mathematical literacy has investigated in many studies. A program assessment, PISA, aimed to evaluate the education system of countries in the world by testing 15-years-old students of their reading, mathematical, and science literacy, it also concerned to gender difference of it [3]. The result of PISA showed that in general, males performance in mathematical literacy are better than females[13] but it is contrary with Indonesian students’ performance [14]. Furthermore the study of Arora and Pawlowski [13] tried to find the why factors of this results. They claimed that females’ lack of self-confidence in their mathematics and science ability and their anxiety toward mathematics contribute to their under presentation among high performers in mathematics and science. Individuals with more self-confidence are more likely to allow themselves the freedom to engage in the trial-and-error processes that are essential to build these types of knowledge [15]. Another program assessment that study about literacy is PIAAC. Compared to PISA, PIAAC subject research were adult, around 16-65 years old and the focus were about proficiency in key information-processing skills-literacy, numeracy and problem solving in technology-rich environments and gathering information and data on how adults use their skills at home, at work and in the wider
community [16]. The survey result of PIAAC in 2012 showed that most countries that participated in PISA 2003, males were more engaged in and had more positive attitudes toward learning mathematics [13]. Both, PISA and PIAAC claimed that males were tends to be better than females in mathematical literacy, except for Indonesia (by PISA test). In other words in Indonesia females’ performance in mathematical literacy is better than males. However, Lailiyah [17] research about mathematical literacy skills of students’ in term of gender differences give a different results. In her research, she involved four prospective teachers to take a mathematical literacy test and used six indicators of mathematical literacy. Her research found that male students have well of each indicators in mathematical literacy. While, female students are categorized as good in almost each indicator, except for fifth indicator that is scored enough. This means that male students were slightly better than female students.

The mathematical literacy problem used in this paper are focused on occupational context especially on “shipping company”. The popularity of online shop in young people, including students, has made the shipping company much needed to facilitate the delivery of purchased goods. Based on the preliminary study, the users of shipping companies usually want the security of goods is guaranteed with a minimum cost. The calculation of the shipping cost depends on special terms of each shipping company. Commonly, the cost of sending goods depends on the volume, weight and choice of insurance used. Therefore, the ability of a person to perform spatial calculations, algebraic calculations, arguments and decision-making is necessary. They have gained these knowledge from their formal education before. However, many of them do not care how the costs are set and they will be so surprised to know the shipping cost from the shipping company officer. Therefore, the problem in occupational context about shipping company is interesting to use in this mathematical literacy test.

Table 1. Description of the questions on occupational context of shipping company

| No | Domain category of each questions | Description |
|----|----------------------------------|-------------|
| 1  | Content: Shape and Space         | Determining the weight of goods package to be used as a basis for determining the cost of delivery by first determining the type of package weight if the weight and volume of package of goods are known |
|    | Context: Occupational Process: Using concepts, facts, procedures and mathematical reasoning |  |
| 2  | Content: change and relationships | Deciding whether it is important or not a delivery service officer advises the use of package insurance that is sent in terms of the amount of compensation money if the goods are lost |
|    | Context: Occupational Process: Interpreting, applying and evaluating |  |
| 3  | Content: Quantity                | Counting the number of transactions that can be served by the delivery company every day if the hours of operation, the number of officers and the average service time are known. |
|    | Context: Occupational Process: Using concepts, facts, procedures and mathematical reasoning |  |

The purpose of this study is to describe to what extent male and female prospective teachers do are called mathematically literate and how they communicate their reasoning in solving the problem based on the gender differences.

2. Method.

In order to answer our research questions above, the mathematical literacy test with “shipping company” problem case are needed. On the test, they were asked to response/answer the question by giving brief explanation of reasoning and to erase the wrong response/answer is forbidden. They are only allowed to strike off the wrong answer and rewrite the correct ones at above or below it such that their way of thinking and reasoning can be traced. The test was conducted in three different time as
there were three different universities at East Java that participated. Mathematical literacy test was followed by 157 students of mathematics education at least on 5th semester. At this grade they had obtained more than 75% pure mathematics courses, and 80% mathematics education courses.

Furthermore, the prospective teachers written responses were collected, and organized based on the sex differences. A scoring rubric was used to assess their response on each question. The score represented their skill and characteristics of mathematical literacy on that question. The score on each question was varied depending on their difficulties level (see Table 3, 4 and 5). Then, their mathematical literacy was categorized into three categories of mathematical literacy (low, moderate, or good). Analysis of the data was done using the frequency of student on each categories of mathematical literacy and frequency of student performance on each question. The analysis were continued by the qualitative methods by presenting the examples of interesting prospective teachers responses altogether with the scoring.

3. Result and Discussion
Mathematical literacy test followed by 157 prospective teachers, consisted of 24 male and 133 female prospective math teachers. It is a custom condition in teacher training faculty at Indonesia that the number of male students are fewer than female students. Their responses on the mathematical literacy were collected and analyzed. The result of the data analysis were used to answer the question to what extent male and female prospective teachers do are called mathematically literate and how they communicate their reasoning in solving the problem based on the sex differences, Table 2 below shows the frequency of mathematical literacy category of prospective teachers on the theme of "shipping company".

Table 2. The mathematical literacy of prospective teachers

| Category  | Male | Female |
|-----------|------|--------|
|           | n    | %      | N    | (%) |
| Low       | 8    | 33.33  | 26   | 19.55 |
| Moderate  | 13   | 54.17  | 77   | 57.89 |
| Good      | 3    | 12.5   | 30   | 22.56 |
| Total     | 24   | 100    | 133  | 100  |

Table 2 above shows that the percentage of male prospective teachers in the category "low" mathematical literacy was 13.78% more than female prospective math teachers. While, for both "good" and “moderate” category the percentage of female prospective teachers was more than male prospective math teachers. It shows that in general the mathematical literacy of female prospective teachers tended to be better than male prospective math teachers. Again, this result are in line with the PISA results that Indonesian performance in mathematical literacy in PISA for female and male participants is not in line to the general trends of other country performance [12] [13].

The next following result will describe how the mathematical literacy performance of male and female prospective teachers on each question.

3.1. Performance of mathematical literacy and communication of reasoning for question 1.
Context for Question 1.
A shipping company charges the cost of package (goods to be shipped and the packaging) based on the weight of the package. There are two types of package weights that are actual weight and volumetric weight. Actual weight is weight by volume of package. The package should be weighed first to know the actual weight, then proceed to the volume. The following rules apply:

1. If the packet volume is less than 18,000 cm$^3$, the package weight is the actual weight and the cost of shipping is done by actual weight.
ii. When the package volume of goods $\geq 18,000 \text{ cm}^3$, then the weight of the package is the volumetric weight calculated by following formula, and the calculation of shipping cost is done by volumetric weight of package to be shipped ($B_v$)

$$B_v = \frac{p \times l \times t}{6000} \times 1 \text{ kg}$$

$B_v$ is volumetric weight, $p$ is length in cm, $l$ is width in cm, $t$ is height in cm

**Question 1**

If Budi want to send a package measuring $30 \text{ cm} \times 30 \text{ cm} \times 25 \text{ cm}$ with actual weight 1.50 kg. Determine the weight of the parcels and the calculation basis used to calculate the cost of sending the package!

As mentioned before that every question have a unique scoring system. There are 0-4 scale used as score for the first question. Students respond were compared to the description of the score and then determine the most corresponding one to describe the prospective math teacher performance. The highest score (4) is given to them that able to select and apply the rules of package weight calculation with the right reasoning. It mean that they should have some fundamental mathematics ability [9]. They able to devising a strategy to solve the problem, working with given information representation from the text and formula, develop and communicate their argument and reasoning to select appropriates rule, use a mathematisation and symbols to modify the given representation and calculate the weight of goods package. Question 1 only involve two terms of conditions. Table 3 bellow shows the frequency of Prospective Teachers’ Performance of mathematical literacy on question 1

**Table 3.** Prospective Teachers’ Performance of mathematical literacy on question 1

| Performance descriptions (score) | Percentage (%) |
|---------------------------------|----------------|
| Does not respond or respond without explanation (0) | 4.17 0 |
| Responding with reasoning explanation but does not lead to the right answer (1) | 16.67 12.78 |
| Choosing the right rules of package weight calculation with correct reasoning but do some misunderstanding to identify the statement or do some miscalculation(2) | 25.00 14.29 |
| Selecting and applying the rules for package weight calculation correctly but giving incomplete reasoning explanation (3) | 16.67 10.53 |
| Selecting and applying the rules of package weight calculation with the right reasoning (4) | 37.5 62.41 |

Table 3 above shows that the performance of male prospective teachers in question 1 was much better than female prospective math teachers. There was no female prospective teachers who did not respond or responded without explanation, while there were a small number of male prospective teachers who did not respond to anything or respond without any explanation. Moreover, 87.22% female prospective teachers were able to choose the rules for calculating the weight of package with correct reasoning, 72.94% female prospective teachers were able to select and applied the rules for package weight calculation and 62.41% of female prospective teachers who did it perfectly. In answering this question male prospective math often failed in communicate their arguments and reasoning. They tend to directly do the calculation without any argument or reason of choosing the rules. This characters is contrary to female prospective math teacher. They often show a brief explanation about their argument or reasoning before they took an action. It implies that for first question, female prospective teachers are more mathematically literate than male prospective math teachers.

Fig. 1 and Fig 2 bellow show about how the characteristics of mathematical literacy of male and female prospective math teachers, both are in low category of mathematical literacy, in reasoning and communicating.
Figure 1. Example of a male prospective teachers’ work in question 1

Figure 1 shows that he had poor written communication skill since there is only mentioned the calculation without explanation of his logical reasoning. There was a leap of reasoning in step 1 to step 2. He did not understand the meaning of the symbols used in the given formula. In the formula problem it was written $Bv = \frac{pxlt}{6000} \times 1kg$ with $p$ was the package length, $l$ was the package width, $t$ was the package height whereas $l$ was the constants given. However, he replaced the constant value 1 with the actual weight of the goods namely 1.5. Surprisingly, this mistake was not only occurred to some male prospective teachers but also for female perspective math teachers. Based on this analysis, it can be concluded that he was tended to only do computations according to the order of rules given to the problem. He did not present any reason or explanation at each step of understanding symbols contained within the given formula. Therefore the prospective teachers’ works shown in Figure 1 were given a score of 2.

Figure 2. Example of female prospective teacher’s respond for question 1

Figure 2 above is an example of female prospective teacher’s respond. It shows that the female student tried to use a written communication to explain her flow of thinking. She showed two part of independent solution (on the right and on the left) with a contradict statement. On the left side she stated that the volume is less than 18.000cm³ but on the other side are the contrary. It indicated that she did not understand the meaning of the given rules, she only made a calculation and unable to draw a connection between their work. She made a mistake in understanding the introduced concepts such as volumetric weight and actual weight. She compared two different magnitudes, volumetric weight and package volume as shown in Figure 2 on the right sides. This incorrect identification lead to a mistake in making conclusion that only found in female prospective math teachers. The prospective teachers’ performance as shown in Figure 2 was given a score of 1.
3.2 Performance of mathematical literacy and communication of reasoning for question 2.

Context for question 2
A shipping company has stipulated the provisions of the packaged delivery cost based on the weight and use of package insurance as follows:

i. If the weight of the package is not more than 1 kg then the delivery cost is a minimal cost of 25,000

ii. If the weight of the package is more than 1 kg then the excess weight of the goods package will be charged additional delivery costs of 5,000/Ounces.

iii. Electronic goods must be packed in a wooden box, and the packaging will be done by the shipping service provider with a packed fee charged as an adder of the cost of delivery the package.

iv. If there is an incident of package to be delivered missing then the shipping company will replace the lost item with a maximum of 10 times the delivery cost. If the shipped item is more than 10 times the delivery cost, it is advisable to insure the package at a cost of 0.2% of the item price and administrative fee of 5,000

Question 2
A customer intends to send electronic goods for 3,500,000 using this shipping company. The dispatcher informs us that the packing fee is 200,000 and the item weight is 3.2 kg. If you were the dispatcher, would you recommend using insurance or not? Explain your answer!

There are 0-5 scale used as score for the second question. The highest score (5) is given to them who able to select, apply the rules to calculate the delivery cost and drawn right reasoning. It mean that they should have some fundamental mathematics ability. They able to devise a strategy to solve the problem, working with given information representation from the text and formula, develop and communicate their argument and reasoning to select appropriates rule, use a mathematisation by constructing mathematical models for complex situation and use an appropriates symbols to modify the given representation and calculate the weight of goods package. Differs from question 1, question 2 is containing more complex term. It contains of five terms that need to be comprehend by the subjects.

Table 4. Percentage of prospective teachers’ performance in question 2

| Performance description [score]                                                                 | Percentage (%) |
|-----------------------------------------------------------------------------------|----------------|
| Does not respond or respond without explanation (0)                                  | 4.17 / 6.77    |
| Responding with reasoning explanation but it does not lead to the right answer (1)    | 33.33 / 30.08  |
| Only choosing the calculation rule of delivery cost but incorrect in applying the rule because she is wrong to understand the statement. (2) | 45.83 / 38.35  |
| Being able to select and apply rules to calculate delivery cost with correct reasoning but she does not conclude or explain them (3) | 0 / 3.76       |
| Being able to select and apply rules to calculate delivery cost with correct reasoning but incorrect in drawing conclusion (4) | 4.17 / 5.26    |
| Being able to select and apply rules to calculate delivery cost, as well as draw conclusion by providing correct reasoning (5) | 12.5 / 15.79   |

Table 4 above shows that in question 2 the performance of female prospective teachers was better than male prospective math teacher even though the difference is small. More than 82% for both male and female mathematics prospective teachers could not draw a conclusion correctly, most of them were failed in understanding the statement rule and reasoning thinking. It also shows that no more than 1/6 of the prospective teachers of both male and female were able to solve question 2 correctly and logically. This result also showed that question 2 was a more difficult question than question 1.
Figure 3 shows the student's mistake in understanding the statements of the calculation rule of the delivery cost causing a response error. On that problem, it was stated that: (i) If the weight of the package of goods was not more than 1 kg then the delivery cost was the minimal cost namely Rp. 25,000.00 and (ii) If the weight of the goods package was more than 1 kg then the excess weight of the goods package would be charged additional delivery fee of Rp5,000.00/Ounce. However, the student assumed that if the weight of the goods was more than 1 kg then rule 2 was applied regardless of rule 1. Therefore, the student's performance was given a score of 2 even though the student showed algebraic ability to make mathematics and mathematical representations.

3.3 Performance of mathematical literacy and communication of reasoning for question 3

Question 3 and the context:
A shipping company operates from 08.00 to 17.00 every day, closes on break from 5 pm to 6 pm and reopen at 6 pm to 9 pm. The working hours are divided into 2 shifts of the same length. The time required for a shift change is about 20 minutes. Each shift consists of 3 shipping operational officers who perform the package delivery transaction service. Standard time of service delivery officer is 7 minutes per transaction. How many transactions can this shipping company serviced on a daily basis?

Write down your reasons
As question 1 and 2, In question 3 prospective teacher also should show a good reasoning. They should have a good ability to represent the given text to their own representation using numbers or diagrams. They also should make a correct mathematisation to modelling the situation and in the same time they have to use their reasoning to make their model to be logic and acceptable. At this question, different ways of thinking will lead to a different correct answer. It is mean that this question is an open ended question. Finally, they have finished the answer by correct calculation.

Table 5. Percentage of frequency of prospective teacher responses to question 3

| Performance description [score] | Percentage |
|--------------------------------|------------|
| Not responding or responding without explanation [0] | 0.00 8.27 |
| Responding with explanation of reasoning but it does not lead to the right answer [1] | 20.83 16.54 |
| Calculating operational time correctly with logical reasoning but making a reasonable error to calculate the number of transactions [2] | 54.17 48.87 |
| Calculating the operational time correctly with logical reasoning but making an operation mistake to calculate the number of transactions [3] | 4.17 2.26 |
| Calculating operational time and the number of transactions correctly with logical reasoning [4] | 20.83 22.56 |

Table 5 above shows that female prospective teachers responded perfectly by 2.17% more than male students of mathematics education, but 8.27% of female students chose not to respond or responded without giving explanations/reasoning. In addition, Table 5 also shows that about half of
the prospective teachers participated on this test, both male and female, made a mistake in calculating the number of transactions. Figure 4 below shows an example of a correct but different way response.

![Figure 4](image)

**Figure 4.** The answer of male prospective teachers in calculating operational time

Figure 4 above shows they started to answer by calculating the total operational time. He was using a list of numbers from 8 to 21 to describe a time and shaded a space between number 17 and 18 to indicate the rest time. He also draw two segment under the list of number to identify the operational time in every shift for watch person. It brought him to a conclusion that the total time for each shift were 6 hours. Unfortunately, on his work there was no notes about this total time. It may lead him to a mistake in reasoning. He had used 12 hours or 720 minutes as total operational time as one shift total time, as instead of the total time for two shift. So he doubled the total time again and brought him to the incorrect answer. The figure also indicated that he did not use a good communication as there was no hand writing about his reasoning. Again he only wrote down the important point for him to make himself easier to answer but not to communicate to other. Therefore, the performance of this student was given a score of 2. This kind of performance was only done by 1 male prospective math teacher.

In addition to the responses in Figure 4, some male prospective teachers also showed different creativity to solve questions such as not dividing the shift into 2 equal lengths but the shift replacement time remained a reduction at the end of the operational hours. Then the prospective teachers should make a rounds to count the number of transactions.

4. Conclusion.
Based on the research finding and discussion that has been described above it can be concluded that in general the mathematical literacy of female prospective teachers tend to be better than male prospective math teachers. Female prospective teachers are more capable of logical reasoning, using concepts, facts and procedures and algebraic operations to draw conclusions, interpretations and evaluations. In addition, female prospective teachers also show a more communicative attitude in writing their way of thinking, while male students tend to only write important points for them. However, male prospective teachers have better creativity than female students by using unique methods. This study has an implication that gender differences in mathematical literacy of prospective math teachers do exist therefore this issue should be given a serious concern from the development programs of the faculty.

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References

[1] Ojose B 2011 Mathematics literacy: are we able to put the mathematics we learn into everyday use? *Journal of Mathematics Education* 4 89-100

[2] McCrone S S and Dossey J A 2007 Mathematical literacy--it's become fundamental *Principal Leadership* 7 32-37.

[3] OECD 2015 PISA 2015 *Draft mathematics framework* (Paris: OECD Publishing)

[4] Stacey K and Turnerr R 2015 *Assessing mathematical literacy: The PISA experiences* ed K stacey and R Turner (Switzerland: Springer International Publishing) chapter 1 pp 5-33

[5] Leder G C, Fargasz H J, Jackson G 2014 Mathematics, english and gender issues: do Teachers count? *Australian Journal of Teacher Education* 39

[6] Ma'rufi, I Ketut B and Dwi J 2017 The analysis of mathematics teachers’ leraning on algebra function limit material based on teaching experience difference *The 1st International Conference on Mathematics: Pure, Applied and Computation 2016* (AIP Publishing) p. 020056-1

[7] Shulman L S 1986 Those who understand: Knowledge growth in teaching. *American Educational Research Association* 15 p 4-14

[8] Ma'rufi, I Ketut B and Dwi J 2016 Pedagogical content knowledge: knowledge of pedagogy novice teachers in mathematics learning on limit algebraic function *The 1st International Conference on Mathematics, Science, and Computer Science (ICMSC) 2016* (AIP Publishing) p 050003-1

[9] Salinan Lampiran Permendikbud no 20 tahun 2016 tentang standart kompetensi lulusan pendidikan dasar dan menengah retrieved [20/01/2018] from [http://bsnp-indonesia.org/wp-content/uploads/2009/04/Permendikbud_Tahun2016_Nomor020_Lampiran.pdf]

[10] Lestari N D S, Juniati D and Suwarsono St 2017 Preliminary study: mathematics’ teacher conception in supporting the integration of mathematics’ literacy and mathematics teaching and learning *International Conference on Mathematics Education, Theory and Application (ICMETA) 2016* (Solo) (Solo: UNS) pp 76-83

[11] Machaba, F M 2017 Pedagogical demands in mathematics and mathematical literacy teachers and facilitators. *Open Access Eurasia Journal of Mathematics, Science and Technology Education* 4 95-108

[12] Pantaleon K V, Juniati D, Lukito A and Mandur K 2018 *J. Phys.: Conf. Ser* 947 012070

[13] Arora A and Pawlowskii E 2017 Examining gender differences in the mathematical literacy of 15-year-olds and the numeracy skills of the age cohorts as adults Retrieved [05/08/2017] from [https://static1.squarespace.com/static/51bb74b8e4b0139570ddf020/t/588a18c13a04118a0c68116e/1485445313820/Arora_Pawlowski_PIAAC_2017.pdf]

[14] Stacey K 2011 The PISA view of mathematical literacy in Indonesia *Journal of Indonesian Mathematics Society B* (Journal on Mathematics Education) 2 pp 95-126

[15] OECD 2015 *The ABC of gender equality in education: aptitude, behaviour, and confidence* (Paris: OECD Publishing)

[16] OECD 2016 *Survey of adult skills: reader’s companion, second edition, OECD skill studies* (Paris: OECD Publishing)

[17] Lailiyah S 2017 Mathematical literacy skills of students’ in term of gender differences *The 4th International conference on Research, Implementation, and education of Mathematics science (4th ICRIEMS) 2017* (AIP Publishing) p 050019-1