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# THE ERROR OF ELEMENTARY SCHOOL TEACHER EDUCATION STUDENTS IN SOLVING MATHEMATICS LITERACY PROBLEMS

**Ni Nyoman Parwati[*1] & I Gusti Putu Suharta[2]**

[*1]Doctor of Mathematics Education, Universitas Pendidikan Ganesha, Indonesia
[2]Professor of Mathematics Education, Universitas Pendidikan Ganesha, Indonesia

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## ABSTRACT

This study aims to describe errors in solving the problem of Mathematical Literacy using the Newman procedure. The subjects of this study were 12 students of Primary School Teacher Education of Universitas Pendidikan Ganesha. The instruments to collect data were tests and interview guidelines. The results of this study were: (1) the highest misunderstanding occurred in level 3 question problems with geometry content, algebra & functions, while the lowest understanding errors occurred in level 1 questions with geometry, probability & statistics content, and on level 2 questions with probability & statistics, and algebra & functions content; (2) the highest errors occurred on type 3, type 4, type 5 errors consistently on level 3 and level 4 questions on probability & statistics and algebra & functions content. Meanwhile, the lowest errors of type 3, type 4, and type 5 occured in level 2 questions on probability & statistics content; (3) men have lower type 2 and type 3 errors than women in level 3 questions with numbers content, and level 1 questions with geometry content; (4) men have higher than women errors in process skills and encoding in all content and competency levels.

**KEYWORDS**: Mathematical Literacy, Content, Context, Competence, Newman Procedure.

## 1. INTRODUCTION

Simply, Mathematical Literacy is the ability to know and apply mathematics in everyday life (Bobby Ojose, 2011). Another definition was stated by the Organization for Economic Corporation and Development (OECD, 2013). Mathematical Literacy is the ability of individuals to formulate, apply, and interpret mathematics in various contexts. This ability includes mathematical reasoning and the ability to use facts, concepts, and mathematical procedures to describe, explain and predict a phenomenon. According to Wagner, DA (2011) Literacy is the core of education for all. Based on that understanding, Mathematical Literacy is very important and needs to be used as the core in learning mathematics, so that children will know and apply mathematics in their daily lives.

The result of the study carried out by the Program for International Student Assessment (PISA) was the low Indonesian Mathematics Literacy students. In PISA 2012, the achievement of Mathematical Literacy of Indonesian students was ranked 64th out of 65 countries, while the 2015 PISA results in Indonesia ranked 62 out of 70 countries, with a mean of 386 far below the International mean of 490 (OECD, 2016). The PISA test was actually intended for children 15 years old or at the secondary school level, but some researchers also use it for children over the age of 15 or for prospective teachers. The results of the research by Necdet Taskin & Belma Tugrul (2014) for preschool teacher candidates in Turkey showed that there was a significantly difference between the mathematical literacy and self-sufficiency beliefs based on gender. The results of the study by Mahdiansyah & Rahmawati (2014) in high school students showed that Indonesia has a low student mathematical literacy. Similar research was carried out by Suharta & Suarjana (2018) in Prospective Primary School Teachers (PPST) whose ages ranged from 21-23 years that Mathematical Literacy was classified as low and PPST women had better mathematical literacy skills than men. These results indirectly indicated that there were differences in errors in solving mathematical literacy problems between men and women.

It is understandable that student learning outcome is influenced by student performance, student performance is influenced by teacher performance, and teacher performance is influenced by previous experience (including



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experience in college). A teacher will be able to develop students' Mathematical Literacy if the teacher has good Mathematical Literacy.

The low level of mathematical literacy raises questions about the quality of learning in the classroom. Students find it difficult to understand material, especially with regard to numbers, algebra and functions, geometry, and probability and statistics. Therefore, it is necessary to analyze errors whether systematic errors occur, so that these results can be used as feedback in the process of improving learning (Mariawan & Parwati, 2017). Error analysis can use the Newman procedure which consists of language, understanding, transformation, process skills, and encoding errors (Parakitipong, Natcha & Satoshi Nakamura, 2006). Newman procedure has the advantage of Polya's heuristic steps, which are more detailed so that errors can be known more deeply. In accordance with the 2010 PISA framework, the questions of Mathematical Literacy contain content, context, and competence. The context of the problem is generally close to life, so the analysis of errors in this case is focused on content and competence.

## 2. MATERIALS AND METHODS

**Materials**

***A. Mathematical Literacy***

According to the OECD (2013) Mathematical literacy was 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 individuals to recognize the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged and reflective citizens. According to this statement, Mathematical Literacy deals with: (1) the ability of someone to formulate, use, and interpret mathematics in various contexts, (2) use mathematical reasoning, concepts, procedures, facts, and tools to describe, explain, and predict phenomena, and (3) provide benefits about the role of mathematics in the real world.

According to the OECD (2010), the construction of Mathematical Literacy developed by PISA consists of (3C), they were content, context, and competence. Content consists of: Change and relationship, Space and Shape, Quantity, and Uncertainty and data. Context consists of: personal, occupational, societal, and scientific. Competencies consist of level 1 (knowledge), level 2 (applying routine procedures in a familiar context), level 3 (applying multistep procedures in various contexts), and level 4 (reasoning and reflection). According to Stacey, K (2010; 2011), the context was very important in learning mathematics, because students would face various challenges.

Mathematical literacy starts from a problem that contains content in context. Problem solving in the context must use mathematical knowledge and skills. Next, formulating the problem mathematically based on the concepts and relationships that are attached to the problem. After changing the contextual problem into a mathematical model, the next step is to apply mathematical procedures to obtain mathematical results. This stage usually involves activities such as manipulating, reasoning, and counting. The mathematical results obtained are then reinterpreted in the form of results related to the initial problem. Formulating, implementing, and interpreting are processes in Mathematical Literacy.

***B. Newman Procedure***

The Newman procedure is a method of analyzing errors in solving story problems (Parakitipong, Natcha & Satoshi Nakamura, 2006). In general, there are 2 types of errors made in problem solving, namely, (1) language errors and conceptual understanding related to reading and understanding the meaning of the problem, and (2) mathematical processes related to transformation, process skills, and encoding answers. According to this statement, the analysis of errors using the Newman procedure consists of language error (type 1), understanding error (type 2), transformation error (type 3), process skills error (type 4), and encoding error (type 5).


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This classification indicates that students must understand the meaning of the problem before proceeding to the mathematical process to obtain answers. To find out the type of errors in solving problems can be done by asking questions as follows.

a. A type of language error can be done by asking questions whether you can read symbols, mathematical sentences, or questions?
b. Type of misunderstanding error, can be done by asking a question whether you can understand the meaning of the question being asked?
c. The type of transformation error, can be done by asking questions related to whether you can choose the appropriate mathematical operations and procedures?
d. The type of process skill error, can be done by asking questions whether you can show the exact calculations and procedures used to find answers?
e. This type of encoding error can be done by asking a question whether you can represent the appropriate answer?

(Parakitipong, Natcha and Satoshi Nakamura, 2006; Effendi Zakaria, Ibrahim, & Siti Mistima Maat, 2010)

**Methods**

***A. Research design***

The design of this study was qualitative. The subjects or respondents of this study were 12 students of the Primary School Teacher Education of Universitas Pendidikan Ganesha consisting of 6 men and 6 women. The two student groups consisted of students who had good, sufficient, and lack of academic achievement. The ages of the study respondents were between 21 and 23 years.

***B. Instrument for research and data analysis***

The instruments used to obtain research data were tests and interviews. The test used in this study was a test modification developed by Widya Suryaprani (2017) which was considered valid and reliable, with a reliable index of 0.81. The test consists of 15 questions consisting of numbers, geometry, and algebra & functions consists of 4 questions with each question containing personal, general, occupational, and scientific contexts as well as level 1, level 2, level 3, and level 4. Meanwhile, the contents of probability & statistics consisted from 3 questions with each question containing personal, work, and scientific contexts as well as level 1, level 2, and level 3 competencies.

Examples of questions with contents of numbers, scientific contexts, and level 2 competencies are as follows.

> *Aldi visits the school library every 6 days. Sinta and Dinda visit the library each 10 days and 12 days. If on August 28 they visit the school library together, on what date do they visit the school library next at the same time?*

Furthermore, based on the answers given by the respondents, interviews were conducted. Interviews were used to determine errors that were classified into 5 types namely type 1 (language errors), type 2 (understanding error), type 3 (transformation error), type 4 (process skills error), and type 5 (encoding error). The guideline for the interview was related to the questions asked to find out the types of errors made in solving the problem. These questions are as follows.

a. Can you read symbols, mathematical sentences, or questions in problems?
b. Can you understand the meaning of the questions asked?
c. Can you choose the appropriate mathematical operations and procedures?
d. Can you show the exact calculations and procedures used to find answers?
e. Can you represent the appropriate answer?

(Parakitipong, Natcha and Satoshi Nakamura, 2006; Effendi Zakaria, Ibrahim, & Siti Mistima Maat, 2010; Mariawan & Parwati, 2017)

To classify type 1 are errors like reading symbols or questions was very easy, but not for other types of errors. The respondents experienced type 2 errors if they could not understand the intent of the problem, what was asked and known or revealed the intent of the problem with their own language. Type 3 errors if they could not remember or choose the appropriate concept or principle. Error type 4 if the respondents could not use concepts


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or principles to find answers, while type 5 errors if the respondents were unable to represent the appropriate answer.

Interviews focused on on questions with wrong asnwers or cannot be answered by the respondents. For example, the respondent does not answer a question. Researchers will ask questions starting from whether students have problems reading symbols or questions. Furthermore, respondents were also asked the purpose of the question, what concept or procedure was appropriate to use, how to use it, and how they were absolutely sure about the answer. If, the respondent could show or state the purpose of the question according to the direction or guidance of the researcher, then the respondent would not be classified into type 2 error. Likewise for other type of errors.

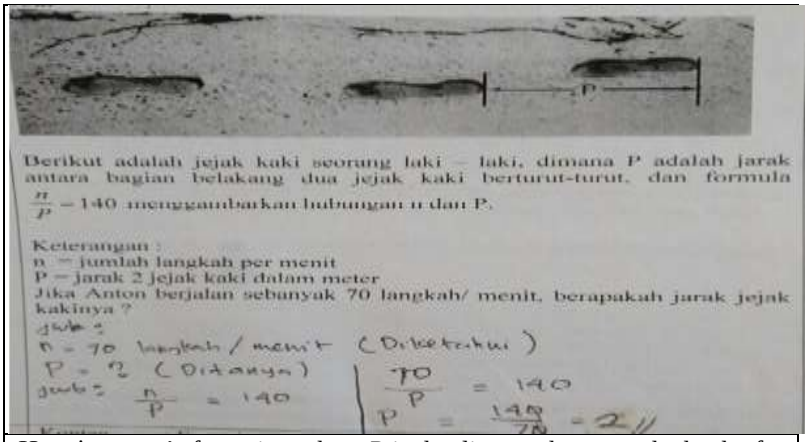
If there is a respondent showing a suitable answer, not based on the right process or procedure, the respondent does not belong to the type 5 errors, but it refers to the type 2, type 3, or type 4 errors. It is very likely that the respondent experiences the type 2 error but does not experience the type 3 errors. For example, after the respondent has been told the purpose of the problem, they can remember or choose the appropriate concept or principle. Likewise for other types of errors. Certain types of errors can affect other types of errors. For example, type 2 errors have implications for type 3 or type 4 errors. Data on errors obtained based on test answers and interviews are tabulated and then analyzed descriptively and qualitatively.

## 3. RESULTS AND DISCUSSION

Structured interviews were conducted for all respondents to find out errors according to Newman procedures. Interviews were conducted by referring to the solutions taken. The sequence of questions in the interview ware as follows.

a. The respondent was shown the answer key in the form of an assessment rubric.
b. The first question that was asked to all respondents is “is there a question that you cannot read?” (All respondents answered no).
c. The second question was the question which they could not finish or the wrong answers. (The attention of researchers and respondents to questions that could not be answered or wrong answers).
d. The third question was “what do you know and what is asked in the question or try to state briefly the intent of the question being asked”.
e. The fourth question was “Are the concepts, formulas, methods, or products appropriate for answering questions?”.
f. The fifth question was “how to calculate it or show the steps of your answer?”.
g. The sixth question was “how do you believe that your answer is correct?”.

This is an example of interview, male respondents who experienced process skills and encoding errors, but did not experience language, understanding, and transformation errors.




Here is a man’s footprint, where P is the distance between the back of two consecutive footprints, and the formula n / p = 140 describes n and P.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Note:
n = number of steps per minute
P = distance of 2 footprints in meters
If Anton runs 70 steps / minute, what is the distance of his footprint

Answer:
n = 70 steps / minute (known)
P =? (asked)
n/P = 140
70/P = 140
P = 140/70 = 2

***Figure 1. Sample Student's Answers***

R: Look at this one (pointing to the student's answer) ... now try checking the answer key ... what is your answer?
S: Wrong
R: What shoul the answer?
S: ½ sir
R: How can it be ½?
S: Sir, it is upside down, (p) should be equal to seventy per hundred and forty
R: try to explain why it's upside down
S: Silent...

The following is an example of an interview, for respondents who experienced type 3 errors.

Question:
The school will make a parking lot that has a length of 11.88 m and a width of 5.12 m. The parking lot is planned to be fitted with paving blocks as shown below.

If you need 60 paving blocks for every 1 square meter, how many paving blocks do you need to make the parking lot?

***Figure 2. Paving Blocks***

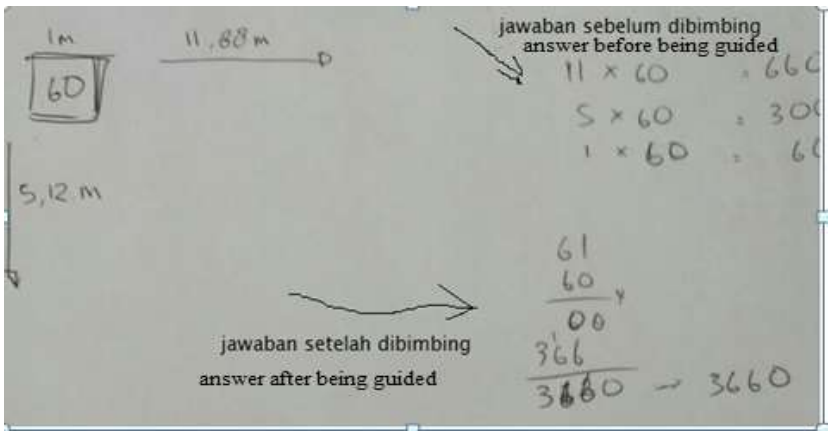


***Figure 3. Student's answer***


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Student answer is on the top right corner. But after being guided, respondents can determine the area by multiplying the length in width and continuing with rounding, as the following protocol.
R: Can you now answer the question number 5?
S: Not yet, while showing the sheet work.
R: How many square meters will be paved? How to calculate an area?
S: Length times width.
R: So, how wide is it?
S: Multiplying the length by width then the results are calculated as shown in the picture above.
R: So, how to round up the number?
S: Sixty One
R: Then, how many paving blocks needed?
S: Silent...
R: "If one square meter requires sixty paving blocks, so how many paving blocks for two square meters, three square meters, and so on?
S: Trying to count with multiplication and the results were three thousand six hundred and sixty thousand.
Note: R = Researcher, S= Respondent

The summary of errors according to the Newman procedure is presented in the following table.

***Table 1. Errors according to Newman Procedure***

| Content | Level | Gender | Errors | | | | |
|---|---|---|---|---|---|---|---|
| | | | Type 1 (%) | Type 2 (%) | Type 3 (%) | Type 4 (%) | Type 5 (%) |
| Numbers | | M | 0.00 | 25.00 | 16.67 | 25.00 | 25.00 |
| | | W | 0.00 | 16.67 | 8.33 | 16.67 | 16.67 |
| | 1 | T | 0.00 | 41.67 | 25.00 | 41.67 | 41.67 |
| | | M | 0.00 | 33.33 | 16.67 | 33.33 | 33.33 |
| | | W | 0.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| | 2 | T | 0.00 | 58.33 | 41.67 | 58.33 | 58.33 |
| | | M | 0.00 | 33.33 | 16.67 | 33.33 | 33.33 |
| | | W | 0.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| | 3 | T | 0.00 | 58.33 | 41.67 | 58.33 | 58.33 |
| | | M | 0.00 | 33.33 | 16.67 | 41.67 | 41.67 |
| | | W | 0.00 | 25.00 | 16.67 | 33.33 | 33.33 |
| | 4 | T | 0.00 | 58.33 | 33.34 | 75.00 | 75.00 |
| Geometry | | M | 0.00 | 0.00 | 8.33 | 8.33 | 8.33 |
| | | W | 0.00 | 8.33 | 0.00 | 8.33 | 8.33 |
| | 1 | T | 0.00 | 8.33 | 8.33 | 16.66 | 16.66 |
| | | M | 0.00 | 16.67 | 16.67 | 25.00 | 25.00 |
| | | W | 0.00 | 8.33 | 16.67 | 25.00 | 41.67 |
| | 2 | T | 0.00 | 25.00 | 33.34 | 50.00 | 66.67 |
| | | M | 0.00 | 41.67 | 41.67 | 41.67 | 41.67 |
| | | W | 0.00 | 33.33 | 33.33 | 41.67 | 41.67 |
| | 3 | T | 0.00 | 75.00 | 75.00 | 83.34 | 83.34 |
| | | M | 0.00 | 41.67 | 50.00 | 50.00 | 50.00 |
| | 4 | W | 0.00 | 33.33 | 33.33 | 50.00 | 50.00 |


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| Content | Level | Gender | Errors | | | | |
|---|---|---|---|---|---|---|---|
| | | | Type 1 (%) | Type 2 (%) | Type 3 (%) | Type 4 (%) | Type 5 (%) |
| | | T | 0.00 | 75.00 | 83.34 | 100.00 | 100.00 |
| Probability & Statistics | | M | 0.00 | 25.00 | 16.67 | 16.67 | 16.67 |
| | | W | 0.00 | 0.00 | 16.67 | 16.67 | 16.67 |
| | 1 | T | 0.00 | 25.00 | 33.34 | 33.34 | 33.34 |
| | | M | 0.00 | 8.33 | 8.33 | 8.33 | 8.33 |
| | | W | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2 | T | 0.00 | 8.33 | 8.33 | 8.33 | 8.33 |
| | | M | 0.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| | | W | 0.00 | 33.33 | 50.00 | 50.00 | 50.00 |
| | 3 | T | 0.00 | 83.33 | 100.00 | 100.00 | 100.00 |
| Algebra & Functions | | M | 0.00 | 8.33 | 8.33 | 16.67 | 16.67 |
| | | W | 0.00 | 0.00 | 16.67 | 33.33 | 33.33 |
| | 1 | T | 0.00 | 8.33 | 25.00 | 50.00 | 50.00 |
| | | M | 0.00 | 16.67 | 16.67 | 33.33 | 33.33 |
| | | W | 0.00 | 8.33 | 16.67 | 16.67 | 16.67 |
| | 2 | T | 0.00 | 25.00 | 33.33 | 50.00 | 50.00 |
| | | M | 0.00 | 33.33 | 33.33 | 41.67 | 41.67 |
| | | W | 0.00 | 41.67 | 41.67 | 41.67 | 41.67 |
| | 3 | T | 0.00 | 75.00 | 75.00 | 83.34 | 83.34 |
| | | M | 0.00 | 33.33 | 50.00 | 50.00 | 50.00 |
| | | W | 0.00 | 16.67 | 50.00 | 50.00 | 50.00 |
| | 4 | T | 0.00 | 50.00 | 100.00 | 100.00 | 100.00 |

*Note* : M = Man, W = Woman, T = Man and Woman

All respondents said that there were no difficulties in reading symbols, mathematical sentences or questions. The highest misunderstanding, as many as 75.00% occurred in level 3 question problems with geometry content, algebra & functions, while the lowest understanding errors, as many as 8.33% person occurred in level 1 questions with geometry, and probability & statistics content, and on level 2 questions with probability & statistics and algebra & functions content. The highest errors occurred on type 3, type 4, and type 5 errors consistently on level 3 and level 4 questions on probability & statistics and algebra & functions content. Meanwhile, the lowest errors of type 3, type 4, and type 5 occured in level 2 questions on probability & statistics content.

Based on gender differences, (1) men have lower type 2 and type 3 errors than women in level 3 questions with numbers content, and level 1 questions with geometry content, and (2) men have higher than women errors in process skills and encoding in all content and competency levels.

In general, there were no errors in solving level 1 question. They could: (1) calculate using the basic operations of addition, subtraction, multiplication, and division; find numbers; estimation; calculate the percentage of the amount given, and the measurement, (2) use the terms in an equation, formula, bar graph, pie chart, Cartesian


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Field, table of a value, mean, median and mode, (3) using the formula of square area, triangle, circle; or (4) read the information in the table.

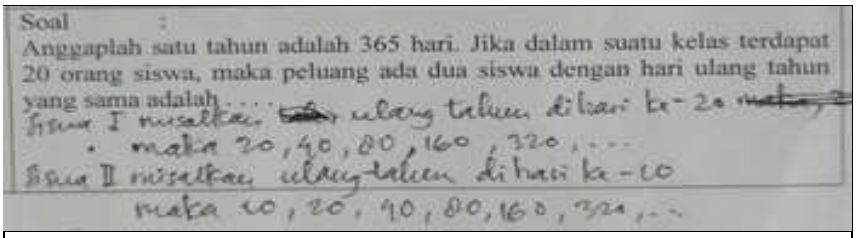
Respondents did not experience language errors so they could read mathematical symbols, images or problem statements because the content or symbols in the problem have been studied at the secondary school level and the context was also close to the students' life. Level 3 and level 4 problem solving errors with the highest geometry, algebra & functions content were caused because these questions were designed as non-routine mathematical problems, associated with contexts, and require high-level thinking. Understanding the problem is not enough yet, but the problem solvers must be able to see relevant concepts, procedures and implement them. They could understand what was being asked and the concept used. This was supported by student answers and interview results as follows.

Level 4 question (reasoning):

> *The taxi fare for the first kilometer is Rp. 8,000 and for the next kilometer is Rp. 4,000. The fee for waiting time is IDR 30,000.00 / hour. If the distance traveled is less than 2 km, the passenger must pay Rp 20,000.00. Make a mathematical model for the costs that a passenger needs, if he takes the taxi and asks the driver to wait.*

Some students could understand the intent of the problem, but they did not know the concept that should be used, and how to calculate it. The question requires reasoning and the ability to connect phenomena from the 2nd time onwards with the costs that must be incurred before the 2nd time and interpret the results to fit the context.

Likewise in the following level 4 (reasoning) questions, the answers of female respondents are shown as follows.




Question:
Suppose one year is 365 days. If in a class there are 20 students, then there are opportunities for two students with the same birthday as...
Student I, for example, is on the 20th day of 20, 40, 80,160, 320,
Student II, for example, birthday on the 10th day then 10, 20, 40, 80, 160, 320,

***Figure 4. Student's answer***

This is also confirmed by the results of interviews with female respondents as follows.

R: How is it? Can you finish all of them?
S: No, I forget a few things
R: Is it relevant with the given lecture
S: A little…it is just playing with cubes.
Note: R =Researcher and S= Respondent

This was supported by other respondents, who also said that the problem was difficult, and had forgotten, and was a little relevant to the course material. This statement was reinforced by the description of the mathematics course for students of Primary School Teacher Education of Universitas Pendidikan Ganesha. The course given was mathematics, Mathematics Education I, Mathematics Education II, Mathematics Education III. In accordance with the Undiksha (2013) study manual, the description of this course is as follows. Mathematics courses discuss the basic theoretical concepts of scientific mathematics as supporting mathematics learning in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elementary school that include: set theory; the concept of logic and its application; basic arithmetic concepts; the concept of equations, inequalities, and systems of equations; the concept of relations and functions; basic concepts of trigonometry; and the concept of opportunity theory.

The course of Mathematics Education discusses the substance and basic methodology Mathematical science that supports mathematics learning at elemtary schools which includes: understanding, types, and examples of the application of mathematical learning theories in mathematics learning at elementary schools; understanding, types, and examples of the application of mathematical learning methods in elementary school; concepts, principles, characteristics of Indonesian Realistic Mathematics Education and being able to develop mathematical problems in elementary school; the concept of numbers and symbols, numerical systems, and being able to use mathematics learning in elementary schools; the concept of relations and operations that apply to the enumeration number system and how to teach it in elementary school; concepts and operations that apply to integer systems and how to teach them in elementary schools; and the concept of clock numbers, operations and the properties of operations on hour numbers and being able to teach them in elementary school.

The Mathematics Education II course discusses substance and methodology the basic science of mathematics that supports mathematics learning at elementary schools that includes: material even number, odd number, prime number, composite number; biggest common factor, and least common multiple; fractions, comparisons, and scales; flat buildings, congruence and triangle congruence; symmetry, reflection/ reflection, and burial; and building spaces and learning at elementary school.

The course of Mathematics Education III discusses the substance and basic methodology of mathematical science that supports mathematics learning in elementary school including: conception the basis and structure of the 2013 curriculum, designing and implementing mathematics learning in accordance with the 2013 curriculum, rational and irrational teaching material and learning in elementary school, measuring length and breadth and understanding how to teach it in Elementary school, measurement of volume, capacity, weight and angle, and how to teach it in elementary school, mathematical problem solving approaches and applying them in elementary school, math games and applying them in mathematics learning in elementary school.

In general, the focus of mathematics or mathematics education for Primary School Teacher Education of Universitas Pendidikan Ganesha students is mathematics in elementary school and its learning. Some relevant materials such as probability theory and Geometry have been given in lectures, but it is not too deep. There is no material study that develops reasoning or mathematical thinking skills, so that prospective teachers are specifically strong in mathematics and elementary school mathematics learning, but it is not followed by reasoning, problem solving, or reflection. Judging from the development of science and technology and parenting, there is almost no difference in parenting for boys or girls. Parents tend to provide facilities, support, or equal opportunities for boys and girls. This parenting style will give the color of how they think with the balanced development of the two hemispheres of the brain (right or left).

## 4. CONCLUSION

Mathematical literacy was 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 individuals to recognize the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged and reflective citizens. According to this statement, Mathematical Literacy deals with: (1) the ability of someone to formulate, use, and interpret mathematics in various contexts, (2) use mathematical reasoning, concepts, procedures, facts, and tools to describe, explain, and predict phenomena, and (3) provide benefits about the role of mathematics in the real world.

Problems relating to mathematical literacy contain content, context, and competence. Errors in solving mathematical literacy problems are analyzed using the Newman procedure, consists of language error (type 1), understanding error (type 2), transformation error (type 3), process skills error (type 4), and encoding error (type 5).


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Based on the description above, there were a few things which can be summarized as follows.

a. The highest misunderstanding, as many as 75.00% occurred in level 3 question problems with geometry content, algebra & functions, while the lowest understanding errors, as many as 8.33% person occurred in level 1 questions with geometry, probability & statistics content, and on level 2 questions with probability & statistics, and algebra & functions content.
b. The highest errors occurred on type 3, type 4, and type 5 errors consistently on level 3 and level 4 questions on probability & statistics and algebra & functions content. Meanwhile, the lowest errors of type 3, type 4, and type 5 occured in level 2 questions on probability & statistics content.
c. Men have lower type 2 and type 3 errors than women in level 3 questions with numbers content, and level 1 questions with geometry content.
d. Men have higher than women errors in process skills and encoding in all content and competency levels.

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