

Reflective Thinking Ability of Teacher Candidate Students Based on Ability Level and Gender

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Abstract: The purpose of this study was to describe the reflective abilities of teacher candidate students based on their level of ability and gender. This research is a qualitative descriptive study. The subjects in this study were TMA students in the 7th semester of the 2018/2019 academic year, which amounted to 6 people selected by purposive sampling. Subjects are divided into several groups based on high, medium and low ability levels and by gender. The instruments used in this study were tests and interviews. To see the validity of the research data was carried out triangulation (reducing data, presenting data in narrative form and drawing conclusions). Based on the results of research and discussion it can be concluded that 1) male and female students at both high, medium and low ability levels have been able to interpret a case based on the mathematical concepts involved even though it is not yet complete, 2) on indicators identifying mathematical concepts or formulas that involved in the question is not simple, male and female students of high and medium level have been able to do it, but at a low level students are still unable to identify mathematical concepts or formulas but correct calculations, 3) students are generally able to solve mathematical problems even though they have not complete both at high, medium and low levels and 4) at high and medium ability students both male and female are incomplete and still wrong in generalizing and analyzing generalizations, while in low ability students have not been able to generalize and analyze generalizations.

Keywords: the thinking ability, reflective thinking, ability level, gender

Introduction

One of the thinking abilities that must be owned and important to be develop is reflective thinking. An educator should pay attention to these abilities. But the reality in the field, most of the learning outcomes evaluation process only assesses how students solve problems and the final results of the problems given. Several studies have discussed the importance of reflective thinking ability, including Zulmaulida (2012) who defines reflective thinking as an activity of thinking that can make students try to connect the knowledge gained to solve new problems related to their old knowledge (Zulmaulida, 2012). In addition, according to Chee (in Mentari et al., 2018), reflective ability is an awareness of what is known and what is needed, it is very important to bridge the gap in the learning situation (Mentari, Nindisar, & Pamungkas, 2018). Whereas according to Gurol (in Suharna, 2013) reflective thinking is a process of directed and precise activities in which individuals analyze, evaluate, motivate, get deep meaning and use appropriate learning strategies (Suharna, 2013). In line with this, Bruning, et al (in Jiuan, 2007) said that reflective thinking ability include interpreting problems, making conclusions, assessing, analyzing, creative and metacognitive activities (Jiuan, 2007). Dewey (in Song, 2005) states that reflective thinking is an active, persistent and careful consideration of a supposed belief or form of knowledge, about reasons that support that knowledge, and conclusions which are the estuary of that knowledge (Song, 2005).

Some experts say that reflective thinking is part of critical thinking. This is in accordance with the opinion of Phan (2006) who said that there are four stages in reflective thinking, they are: habitual actions, understanding, reflection and critical reflection (Phan, 2006). Whereas according to Nindiasari (2013) there are several indicators that can be used to measure reflective thinking ability, namely:

1. Can interpret a case based on the mathematical concepts involved
2. Can identify mathematical concepts or formulas involved in non-simple questions
3. Can distinguish between relevant data and not
4. Can draw an analogy from two similar cases



5. Can evaluate / check the truth of an argument based on the concept used
6. Can analyze and clarify questions and answers
7. Can identify and evaluate assumptions
8. Can solve math problems
9. Can generalize and analyze generalizations (Nindiasari, 2013)

In addition, according to Shermis (in Weast, 1996) reflective indicators consist of:

1. Identifying conclusions
2. Identifying reasons and evidence
3. Identify ambiguous and vague language
4. Identifying valuable assumptions and conflicts
5. Identifying descriptive assumptions
6. Evaluate logical reasoning
7. Evaluate sampling and measurement
8. Evaluate statistical reasoning
9. Identify omitted information
10. Recite the values they have in full understanding without prejudice (Weast, 1996)

Based on some expert opinions above, the indicators of reflective thinking ability used in this study are:

1. Can interpret a case based on the mathematical concepts involved
2. Can identify mathematical concepts or formulas involved in non-simple questions
3. Can solve mathematical problems
4. Can generalize and analyze generalizations

In solving a mathematical problem, a lecturer does not only have to pay attention to his students' thinking ability, but also pay attention to the initial abilities of each student. In early ability learning is one of the factors that can help students in the process of receiving and absorbing new information. In Piaget's theory (in Suherman, 2003), it is said that in constructing or constructing a mathematical concept, students experience the process of processing and incorporating information based on existing knowledge (assimilation), while existing knowledge is accommodated to accommodate new information (accommodation) (Suherman, 2003). Suharna (2012) said that each student has different mathematical abilities in solving mathematical problems. This is closely related to the readiness of students to begin learning (Suharna, 2012). When students already have initial knowledge about new material or information to be learned, then they are at least ready to receive new material based on the knowledge or experience they have had before. For that, in the learning process readiness of each student needs to be considered so that learning objectives can be achieved properly. This is supported by Thorndike's theory (in Slameto, 2003) which says that readiness is a prerequisite for further learning. Based on some of the opinions above, it can be concluded that initial ability is one of the factors that can also influence learning outcomes (Slameto, 2003).

In addition to the initial abilities, the ability to solve one's problems is also influenced by gender. According to Zhu (2007) there are many factors that cause gender differences in the process of solving mathematical problems, one of which is cognitive abilities. Zhu also said that there were differences between men and women in solving math problems in high school and college with varied problems (Zhu, 2007). This is supported by Santrock (2007) statement that boys are slightly better than women in mathematics and science. In general, the ability of male students is similar to that of women, but male students have better abstraction compared to women, enabling them to be better than women in the field of mathematics (Santrock, 2007). Lubinski (in John, 2002) also says that boys clearly seem to be able to work on very difficult categories better than girls (Van de Walle, 2002). Based on studies conducted by Bassey (2008) "Gender Different and Mathematics Senior Achievement of Rural Secondary Students in Cross River State, Nigeria", it can be concluded that in mathematics subjects men are superior to women (Bassey, Joshua, & Asim, 2008). If it is associated with reflective thinking ability, in his research Demirel, Derman & Karagedik (2015) showed that the mathematical problem-solving process using reflective thinking ability depends on gender differences (Demirel, Derman, & Karagedik, 2015).

Research Method

This research is a qualitative descriptive study with the aim of knowing the reflective thinking abilities of students based on their level of ability and gender. The subjects in this study were TMA students in the 7th semester of the 2018/2019 academic year, which amounted to 6 people selected by purposive sampling. Subjects are divided into several groups based on high, medium and low ability levels and by gender. The instruments used in this study were tests and interviews. The test consists of two parts are the initial ability test and the final test. The initial ability test is used to classify students based on their initial level of ability are high, medium and low initial abilities. Whereas for the final test is a reflective thinking ability test consists of 4 questions with indicators: 1) Can interpret a case based on the mathematical concepts involved, 2) Can identify mathematical concepts or formulas involved in non-simple questions, 3) Can solve mathematical problems and 4) Can generalize and analyze generalizations. Whereas interviews are conducted in depth and are semi-structured. To see the validity of the data triangulation is done, namely by way of: 1) reducing data, reducing unnecessary information, organizing data and verifying the answers of the subjects, 2) presenting data in the form of narratives that are well arranged and sequential so that they are easily seen, read, and understood, and 3) drawing conclusions or verifying data.

Result and Discussion

The research begins with the classification of students according to their level of ability, namely high, medium and low ability by giving a test. After the data was obtained, 6 subjects were selected by purposive sampling as representatives of students consisting of 1 female and 1 male each with high, medium and low abilities.

Table 1. The Results Data of Reflective Thinking Ability Test

Gender	Level Of Ability	Reflektif Thinking Ability Test				Total
		1	2	3	4	
Male	High	4	3	3	2	12
	Medium	4	2	3	2	11
	Low	3	1	3	0	7
Female	High	3	2	4	2	11
	Medium	3	3	2	2	10
	Low	2	1	3	0	6

After students are grouped based on their level of ability, they are given material and trained to work on questions that can improve their reflective thinking ability. At the end of learning, 4 students were given a written test in the form of an essay which aimed to see their reflective thinking ability. The tests given are designed based on indicators of reflective thinking ability, namely 1) Can interpret a case based on the mathematical concepts involved, 2) Can identify mathematical concepts or formulas involved in non-simple questions, 3) Can solve mathematical problems and 4) Can generalize and analyze generalizations. The range of assessment scores for reflective thinking ability is 0-4 with the maximum score of each student is 16. The results of test processing can be seen in table 1 above.

Based on table 1 above it is known that the reflective thinking ability of male students is higher than that of female students. For high level students, the total score of male students is 12 and female students are 11. At the medium level, male students have a total score of 11 and female students 10. Whereas at the low level male students have a total score of 7 and female students have a total score of 6. Data on the percentage value of the test of reflective thinking ability based on the level of ability and gender of students can be seen in table 2 below.

Table 2. Percentage of Value Test of Reflective Thinking Ability based on Level Ability and Gender

Gender	Level Ability	Score	Persentase (%)	Average
Male	High	12	75	63%
	Medium	11	69	
	Low	7	44	
Female	High	11	69	56%
	Medium	10	62	
	Low	6	37	

In table 2 above, it is found that the average percentage of reflective thinking abilities of male students is higher than female students, namely $63\% > 56\%$. This is in accordance with Santrock (2007) opinion that boys are slightly better than women in mathematics and science (Santrock, 2007). To deepen the data obtained, interviews were conducted with 6 subjects in this study. The interview was conducted after being given a test, by giving open questions. The results of test and interview analysis of students' reflective thinking ability based on their level of ability and gender, seen from each indicator of reflective thinking ability can be seen in the following explanation:

1. Analysis of student data with indicators can interpret a case based on the mathematical concepts involved.

After the research data is obtained from the results of tests and interviews conducted on the subject, then the next step is to compare these data to see the validity of the data obtained. The results of the data triangulation can be seen in table 3 below.

Based on table 3 below some conclusions are obtained, namely:

- a. Male students of high and medium ability level have been able to interpret a case based on mathematical concepts that are involved properly and correctly. Whereas female students in both high and medium ability levels are still miscalculated even though they have been able to interpret a case based on the mathematical concepts involved.
- b. Low ability male students have been able to interpret a case based on the mathematical concepts involved but the calculation is wrong. While female students of low ability level are still incomplete in interpreting a case based on the mathematical concepts involved and their calculations are still wrong.

Table 3. Triangulation of Answers and Student Interviews Based on Level Ability and Gender

Gender	Indicator of Reflective Thinking Ability	Level of ability	Test Results	Interview Result
Male	Can interpret a case based on the mathematical concepts involved	High	4	Already able to interpret a case based on the mathematical concepts that are involved properly and correctly
		Medium	4	Already able to interpret a case based on the mathematical concepts that are involved properly and correctly
		Low	3	Already able to interpret a case based on the mathematical concepts involved but wrong calculations
Female	Can interpret a case based on the mathematical concepts involved	High	3	Already able to interpret a case based on the mathematical concepts involved but wrong calculations
		Medium	3	Already able to interpret a case based on the mathematical concepts involved but wrong calculations
		Low	2	Already able to interpret a case based on the mathematical concepts involved but not complete and wrong calculations

2. Analysis of student data with indicators can identify mathematical concepts or formulas involved in non-simple questions

After the research data is obtained from the results of tests and interviews conducted on the subject, then the next step is to compare these data to see the validity of the data obtained. The results of the data triangulation can be seen in table 4 below.

Based on table 4 below some conclusions are obtained, namely:

- a. High-ability male students have been able to identify the mathematical concepts or formulas involved in the problem not simple but wrong calculations. While female students of high ability level are incomplete and are still wrong in identifying the mathematical concepts or formulas involved in non-simple questions.
- b. Medium level male students have been able to identify the mathematical concepts or formulas involved in the problem not simple but incomplete and wrong calculations. While female students of medium ability level have been able to identify the mathematical concepts or formulas involved in the problem not simple but wrong calculations.
- c. Male and female students at low ability levels are equally unable to identify the mathematical concepts or formulas involved in the problem not simple but correct calculations.

Table 4. Triangulation of Answers and Student Interviews Based on Level Ability and Gender

Gender	Indicator of Reflective Thinking Ability	Level of Ability	Test Results	Interview Result
Male	Can identify mathematical concepts or formulas involved in non-simple questions	High	3	Already able to identify the mathematical concepts or formulas involved in the problem are not simple but wrong calculations
		Medium	2	Already able to identify mathematical concepts or formulas involved in the problem are not simple but incomplete and wrong calculations
		Low	1	Not yet able to identify the mathematical concepts or formulas involved in the problem are not simple but correct calculations
female	Can identify mathematical concepts or formulas involved in non-simple questions	High	2	Already able to identify the mathematical concepts or formulas involved in the problem are not simple but incomplete and wrong calculations
		Medium	3	Already able to identify the mathematical concepts or formulas involved in the problem are not simple but wrong calculations
		Low	1	Not yet able to identify the mathematical concepts or formulas involved in the problem are not simple but correct calculations

3. Analysis of student data with indicators can solve mathematical problems

After the research data is obtained from the results of tests and interviews conducted on the subject, then the next step is to compare these data to see the validity of the data obtained. The results of the data triangulation can be seen in table 5 below

Based on table 5 above some conclusions are obtained, namely:

- a. Male students both high, medium and low ability levels have been able to solve mathematical problems but incorrect calculations.
- b. High-ability female students are able to solve math problems properly and correctly. At the level of medium ability, students have been able to solve mathematical problems but not yet complete and wrong calculations. While at the low ability level, they are able to solve mathematical problems but the calculation is wrong.

Table 5. Triangulation of Answers and Student Interviews Based on Level Ability and Gender

Gender	Indicator of Reflective Thinking Ability	Level of Ability	Test Result	Interview Result
Male	Can solve math problems	High	3	Already able to solve mathematical problems but wrong calculations
		Medium	3	Already able to solve mathematical problems but wrong calculations
		Low	3	Already able to solve mathematical problems but wrong calculations
Female	Can solve math problems	High	4	Already able to solve mathematical problems properly and correctly
		Medium	2	Already able to solve mathematical problems but not complete and wrong calculations
		Low	3	Already able to solve mathematical problems but wrong calculations

4. Analysis of student data with indicators can generalize and analyze generalizations
After the research data is obtained from the results of tests and interviews conducted on the subject, then the next step is to compare these data to see the validity of the data obtained. The results of the data triangulation can be seen in table 6 below

Table 6. Triangulation of Answers and Student Interviews Based on Level Ability and Gender

Gender	Indicator of Reflective Thinking Reflektif	Level of Ability	Test Results	Interview Result
Male	Can generalize and analyze generalizations	High	2	Already able to generalize and analyze generalizations but not complete and wrong calculations
		Medium	2	Already able to generalize and analyze generalizations but not complete and wrong calculations
		Low	0	Not yet able to generalize and analyze generalization
Female	Can generalize and analyze generalizations	High	2	Already able to generalize and analyze generalizations but not complete and wrong calculations
		Medium	2	Already able to generalize and analyze generalizations but not complete and wrong calculations
		Low	0	Not yet able to generalize and analyze generalizations

Based on table 6 above some conclusions are obtained, namely:

- a. Male and female students at both high and medium levels of ability have been able to generalize and analyze generalizations but have not yet completed and miscalculated.
- b. Male and female students of low ability level have not been able to generalize and analyze generalizations.

Conclusion

Based on data analysis and discussion obtained several conclusions, namely:

1. On indicators can interpret a case based on the mathematical concepts involved,
 - a. Male students of high and medium ability level have been able to interpret a case based on mathematical concepts that are involved properly and correctly. Whereas female students in both high and medium ability levels are still miscalculated even though they have been able to interpret a case based on the mathematical concepts involved.
 - b. Low ability male students have been able to interpret a case based on the mathematical concepts involved but the calculation is wrong. While female students of low ability level are still incomplete in interpreting a case based on the mathematical concepts involved and their calculations are still wrong.
2. In the indicator can identify the concept or mathematical formula involved in the problem is not simple,
 - a. High-ability male students have been able to identify mathematical concepts or formulas involved in the problem not simple but wrong calculations. While female students of high ability level are incomplete and are still wrong in identifying mathematical concepts or formulas involved in non-simple questions.
 - b. Medium level male students have been able to identify the concepts or mathematical formulas involved in the problem not simple but incomplete and wrong calculations. While female students of medium ability level have been able to identify mathematical concepts or formulas involved in the problem not simple but wrong calculations.
 - c. Male and female students at low ability levels are equally unable to identify mathematical concepts or formulas involved in the problem not simple but correct calculations.
3. In indicators can solve mathematical problems, male students both high, medium and low ability levels have been able to solve mathematical problems but wrong calculations. While high-level female students are able to solve math problems properly and correctly. At the level of medium ability, students have been able to solve mathematical problems but not yet complete and wrong calculations. While at the low ability level, they are able to solve mathematical problems but the calculation is wrong.

In indicators can generalize and analyze generalizations, male and female students both high and medium ability levels have been able to generalize and analyze generalizations but not yet complete and wrong calculations. While at the low ability level, they have not been able to generalize and analyze generalizations.

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