RESEARCH ARTICLE

Thinking Skills of Junior High School Students Related to Gender

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ABSTRACT

This study aims to determine the relationship between gender and students' thinking skills and compare their score between male and female based on their level of thinking skills. Moreover, the result of this study can also be used to evaluate the implementation of the 2013 Curriculum on mathematics junior high school especially Higher-Order Thinking Skills. The method used in this study is ex-post facto, with a population of all 7th grade public junior high schools students in Banjarmasin city. Sample taken were 391 students, divided into 6 schools that were selected randomly. The instrument used is 16 multiple choice test that is valid and reliable. This developed test respectively focused on measuring thinking skills, namely Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating. The result showed that female students were better than male students in almost all of the thinking skills, except Creating. However, there is no relationship between gender and thinking skills.

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1. INTRODUCTION

Education is aim to educate students to make them able to adapt in several situations, thinking flexibly, have high curiosity, creative, critical, can solve problems, respect each other, and tolerance of other people's idea (Aktamiş & Yenice, 2010; Zachariades, Christou, & Pitta-Pantazi, 2013). Well-educated students can apply their knowledge in other situations to solve the problem and have other skills that can make them using Higher-Order Thinking Skills (HOTS) (Krau, 2011; Miri, David, & Uri, 2007; Nuthall, 1999; Pappas, Pierrakos, & Nagel, 2013; Zohar & Dori, 2003). That is because HOTS encourage students to use their knowledge in a new situation (Gillies, Nichols, Burgh, & Haynes, 2014). In Indonesia, 2013 Curriculum that currently used focusing to develop HOTS. This statement can be found in Permendikbud Attachment Year 2016 Number 22. HOTS on that attachment is in accordance with the explanation of Anderson & Krathwohl (2001) that is Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating. However, the teachers assume that HOTS is not appropriate for lower achievement students (Zohar, Degani, & Vaaknin, 2001). Teachers believe that lower achievement students are unable to deal with HOTS tasks (Zohar, 1999). Whereas one of the important aspects of teaching and learning is HOTS (Heong et al., 2011). Perkins, Jay, & Tishman (1993) add that facilitation from the teacher to engage HOTS in the learning process helps students improve their learning outcomes. In line with that, Saido et al. (2015) state that students HOTS activated when they face the strange problems, uncertainties, questions, or dilemmas.

Bloom's Taxonomy according to Pappas, Pierrakos, & Nagel

(2013) is structured from the most concrete to the most abstract. Those students' thinking skills can be grouped into Lower-Order Thinking Skills (LOTS) and HOTS (Tanujaya, 2016). The first three levels in Bloom's Taxonomy that is remembering, understanding, and applying are included in LOTS, while the last three levels of Bloom's Taxonomy that is analyzing, evaluating, and creating categorized as HOTS.

Departing from the 2015 PISA (Program for International Students Assessment) result by the OECD (Organization for Economic Cooperation and Development) which is closely related to HOTS, the performance of students from Indonesia encountering an increase, especially in the field of mathematics, which is ranked 63 of 69 countries, rather than in 2012 that was ranked 64 of the 65 participating countries (Iswadi, 2016). Although this result is still relatively low, an analysis from the Ministry of Education and Culture's Communication and Public Service Bureau (2016) explains that there are at least three aspects that influence the 2015 PISA results in Indonesia. The first one is the role aspect of Principal who fulfills his responsibility for good school governance. The second one is the school status aspect where 6 out of 10 contributing students who answered PISA questions came from public schools. The last one is socio-economic background aspects where 3 out of 4 contributing students had parents with good socio-economic backgrounds.

A world that has changed and is very challenging requires students as prospective people in the future to become someone who can use his knowledge beyond capacity so students must

develop HOTS, such as critical thinking systems, decision making, and problem-solving (Miri et al., 2007). HOTS can be described as a complex and non-algorithmic thinking mode which usually produces various solutions (Miri et al., 2007). These thinking activities contain irregularities, application to various aspects, reflection, and self -regulation (Resnick, 1987).

Many research results link high-level thinking skills with gender. One of those is like the results of a study from Leach (2011) which found that gender significantly affected the average score of critical thinking. Other results were shown by Saido et al. (2015) which showed that although male students were more in low-level thinking skills than female students, this difference was not significant.

Research in Indonesia also provides mixed results. One of them is research conducted by Mulyani and Muhtadi (2019) which shows that there is a gender influence in solving HOTS type questions on trigonometric material. Other results were obtained by Ferita and Fitria (2019) which explained that there was no significant influence between gender and thinking skills of high school students. From some of the results of the research, both from Indonesia and outside Indonesia, researchers were attracted to conduct further research on the relationship between HOTS and gender. The difference in the focus of the research conducted compared to Leach (2011) is that what examine is not limited to critical thinking but rather analyzes, evaluates, and creates. This study is clearly different from Saido et al. (2015) because researchers did it in Indonesia. This research is different from what Mulyani and Muhtadi (2019) did because the material used was not trigonometry. This research is also different from Ferita and Fitria (2019) because the subjects used were junior high school students.

So, this study focuses on other aspects that might influence HOTS, namely gender. In addition, this study also aims to evaluate results of the implementation of 2013 Curriculum on mathematics subjects, especially in junior high schools related to thinking skills so that the suggestion to make a better education can be obtained.

2.   RESEARCH METHOD

The method used in this study is a quantitative descriptive method with ex Post facto approach, which is the study that conducted to find out a symptom or event and then looking for the factors that make it possible to happen. The symptoms in this study are students' thinking skills, while the factors that influence them are students' gender. Quantitative data comes from the results of students' answers against 16 valid and reliable multiple choice questions that the researcher has previously developed, under the condition that the answers are given a score of 1 if it is correct and given a score of 0 if wrong, no answers, or more than one answer. The multiple choice questions used each represent one of the levels of thinking skills according to Bloom's revised taxonomy, namely Remembering (C1), Understanding (C2), Applying (C3), Analyzing (C4), Evaluating (C5), and Creating (C6). Each question contains four answer choices in accordance with the provisions of the Government Regulation concerning MCQs for junior high school students. The population in this study were all students on 7th Grade State Junior High Schools in Banjarmasin City which is more than 20,000 people, so the sample taken was a minimum of 377 students based on 95% confidence level and 50% response distribution according to the provisions on the page http://www.raosoft.com/samplesize.html. The sample used in this study is 391 students, with 204 male students and 187 female students, divided into 6 randomly selected schools. Data collection is carried out at the end of even semester 2017/2018 school year.

Data from the answers of students who have been given a score and grouped by gender then analyzed for the description of students' thinking skills and find out if there is a relation with the gender. This analysis using version 23 SPSS software. To find out the description of students' thinking skills, descriptive statistics are used by calculating the mean, median, variance, and maximum as well as the minimum. As to determine whether there is a relation between the thinking skills of students and their gender, using the Chi-Square test.

3.   RESULT AND DISCUSSION

3.1   Results

The comparison between male and female students mean score based on the level of thinking skills can be seen in Figure 1.
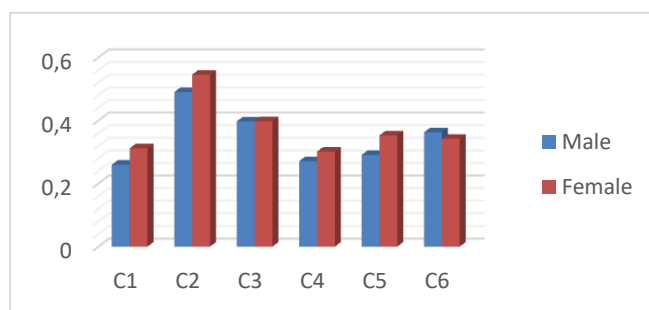

Figure 1. Comparison of Students' Mean Score

Based on Figure 1 it can be seen that male students only score higher than female by their thinking skills in the Creating level. Figure 1 also shows that the highest score is at the level of Understanding. To be clearer, this means data also needs to be supplemented by the distribution of data using variance as shown in Figure 2.
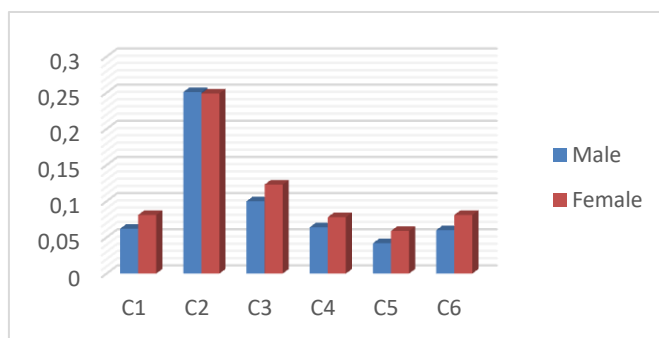

Figure 2. Comparison of Student Variance Scores

In Figure 2 it is seen that although female students are superior in 5 out of 6 levels of thinking skills, the variance scores of female students are also greater than male except for Understanding level. This shows that the score of female students is more varied. The results of more complete descriptive statistics regarding the scores of male and female students can be seen in Table 1.

Table 1. Median, Minimum, and Maximum Student Scores

Thinking Skills Level		Median	Min	Max	Skewness	Kurtosis
C1	M	0.33	0	1.00	0.455	-0.836
	F	0.33	0	1.00	0.544	-0.480
C2	M	0.00	0	1.00	0.040	-2.018
	F	1.00	0	1.00	-0.184	-1.987
C3	M	0.33	0	1.00	0.129	-1.100

Thinking Skills Level		Median	Min	Max	Skewness	Kurtosis
	F	0.33	0	1.00	0.339	-1.119
C4	M	0.33	0	1.00	0.599	-0.190
	F	0.33	0	1.00	0.684	-0.093
C5	M	0.33	0	0.67	0.080	-0.400
	F	0.33	0	1.00	0.249	-0.253
C6	M	0.33	0	1.00	0.082	-0.635
	F	0.33	0	1.00	0.371	-0.663

In Table 1 it can be seen that between male and female students have relatively similar median, minimum and maximum scores. A striking difference is in the median level of Understanding where median male students are 0.00 while female students are 1.00. The difference is also seen in the maximum score for the Evaluating thinking level, that is the male student's maximum score is 0.67 while the female student is 1.00. At the right side of the table are skewness and kurtosis scores to indicate data normality. According to Hair et al (2010), data is normally distributed if the skewness and kurtosis values are between ± 2.56 for a 0.01 degree of significance. Based on this opinion it was concluded that all scores were normally distributed. Furthermore, the comparison of male and female student scores based on HOTS and LOTS can be seen in Table 2.

Table 2. Descriptive Statistics for Students' LOTS and HOTS

Thinking Skills Level		Mean	Median	Var	Min	Max
LOTS	M	0.3824	0.44	0.062	0	0.78
	F	0.4183	0.44	0.071	0	1.00
HOTS	M	0.3081	0.33	0.021	0	0.78
	F	0.3321	0.33	0.029	0	0.78

Based on Table 2, it can be seen that female students have higher LOTS and HOTS scores, even though they have higher variance scores than male students. This result shows that female students are superior to the male in terms of thinking skills. However, is the level of thinking skills really related to gender? The answers to this question can be seen in Table 3.

Table 3. Students' Thinking Skills Level and Chi-Square Test Result

	Amount and Percentage		Total (%)	Sig.
	M	F		
LOTS	140 (68.6)	124 (66.3)	264 (67.5)	
HOTS	64 (31.4)	63 (33.7)	127 (32.5)	0.625
Total	204 (100)	187 (100)	391 (100)	

In Table 3, it can be seen that the percentage of female students who have HOTS is greater than male students. In the table can also be seen that because of the Pearson Chi-Square Significance is more than 0.05, it was concluded that there was no relationship between gender and students' thinking skills.

3.2 Discussion

The number of students who are still in LOTS in the amount of 67.5% where this result is two times higher than students who have HOTS, which is only 32.5% indicated that they lack from teaching facilitation to improve students' thinking skills, especially in the Remembering and Analyzing level. This is slightly different from the findings obtained by Saido et al (2015) that the lowest student thinking skills are in Synthesis and Evaluation. Those skills are required to improve students' creativity (Zohar, 2013). This difference shows that in Indonesia or especially in the Banjarmasin city for seventh-grade junior high school students, mathematics learning that leads to thinking skills is still very minimal. Students are even unable to just Remember what they have learned.

When observed carefully, female students that have LOTS, which is 66.3% from 187 students, is fewer than male students, which is 68.6% from 204 students. However, the lowest mean score for male students, that is equal to 0.2598 out of 1, is Remembering and this belongs to the LOTS group. Whereas the lowest mean score for female students, that is equal to 0.3012 out of 1, is Analyzing and this belongs to the HOTS group. This result illustrates that for male students, the level of thinking skills is heading towards HOTS even though it is still relatively lower than female. Conversely, female students still have to be more maximize their potential so that they don't just focus on LOTS.

In Figure 2, the variance scores of male and female students related to their thinking skills can be seen that the greatest variance is in Understanding level, although in Figure 1 it is seen that Understanding has the highest average score of both male and female students. This shows the inequality of students' skills, which students with high academic achievement will score much higher than students with low academic achievement. Most students who have high academic achievement focus only on the Understanding level without giving scaffolding to the classmate.

The results of this study which show that the absence of facilitation from various parties improves students' thinking skills clearly require solutions from various sides. In terms of learning, one solution that can be given is to apply problem-based learning (PBL). This is as stated by Riadi (2016) which shows that PBL can improve students' HOTS, especially in analyzing level. PBL-based learning kit can also increase students' HOTS compared to direct learning (Riadi & Retnawati, 2014), as well as research done by Rooney (2012) that the use of the Inquiry-Based Learning model can improve students' HOTS.

The low level of students' thinking skills which is not only at LOTS such as Remembering but also at HOTS such as Analyzing means that students with lower academic achievement are not along with higher academic achievement students (Zohar et al., 2001). Students who are in a homogeneous class for lower academic achievement will find it more difficult to develop HOTS. This means that one solution that can also be applied to improve students' HOTS is the heterogeneous grouping of students in class in terms of academic achievement. Although, equity in class is good in terms of the proportion of students who are distinguished by gender. This is shown by the results of the Chi-Square Test that there is no relationship between gender and the level of students' thinking skills.

4. CONCLUSION

The conclusion that can be drawn from this result is that male students have lower thinking skills than female, both HOTS and LOTS except Creating. Nevertheless, there is no significant relationship between students' gender and their thinking skills.

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