Profile of Students Metacognitive Skills in The Perspective of Gender

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Abstract- This study aims to investigate the potential gender differences regarding the metacognitive skills of biology education students. The subject of this research is student of class 2016 Departement of Biology Education of IKIP Budi Utomo Malang, Indonesia. This research is an ex post facto research with data analysis using descriptive and inferential approach. Descriptive approach is used to describe the level of metacognitive skills of male and female students, whereas the inferential approach is used to see the difference of metacognitive skills of male and female students. The result of this research are: (1) Level of metacognitive skills of male students in Department of Biology Education 43,71 while the level of metacognitive skills of female students in Department of Biology Education 42,67;(2) There is no significant difference between metacognitive skills of male students and female students in Department of Biology Education, and (3) metacognitive skills of male students better than metacognitive skills of female students in Department of Biology Education.

Index Terms- metacognitive, gender, genetic concept

I. INTRODUCTION

Livingston [1] states that metacognition is a high-level thinking that involves active control of the cognitive processes involved in learning activities. Furthermore, Howard [2] states that metacognition refers to one's knowledge of the processes and products of one's own cognition. Metacognitive skills is the ability to associate important information or messages with prior knowledge and monitor personal abilities in the reading process [3]. Based on this statement, it can be concluded that if students have sufficient metacognitive skills, students will be able to easily control the learning process. Metacognitive skills is very important in learning and are a determinant of academic success. Setiawan and Supiandi [4] research showed that metacognitive skills and reasoning skills are important predictors for making successful learning.

Metacognitive skills is necessary for successful learning. Peters [5] argues that metacognitive skills enable students to develop as independent learners, because they encourage them to become managers of themselves and become assessors of their own thinking and learning [6]. Metacognition, one of the dimensions of self-regulated learning, is defined as one's ability to use skills to understand and monitor one's cognitive processes [7]. Metacognition enables learners to evaluate and adapt their learning strategies based on awareness over how they learn most effectively. In order to effectively use metacognition, individuals must be aware of their own cognition in order to regulate and adapt in a way that is effective for learning [8].

Pintrich [9] states that metacognition involves the ability to actively control a variety of cognitive processes. Though, in order to be able to control one's own learning, students have to focus on several components of metacognition [10]. Flavell [11] states that the metacognitive components that underlie the ability to control cognitive processes during learning are: metacognitive knowledge, metacognitive experiences and metacognitive skills. Metacognitive knowledge encompasses knowledge or beliefs about tasks, strategies and goals. Metacognitive experiences comprise the affective experience that accompanies a cognitive process and metacognitive skills involve the voluntary use of specific strategies for controlling cognitive processes [10].

There are some factors that can affect students metacognitive skills, one of the factor is gender. Although there are many studies concerned with gender differences in metacognition and self-regulation skills, the findings are unsettled [10]. For example Niemivirta [12] reported that male students use more superficial learning strategies than females and on other hand Bidjerano [13] indicated that girls use much more often than boys on self-monitoring, goal setting and planning. Research indicates that the self-perception of academic ability in mathematics and science tend to be lower in the case of females, and this tendency appears to reach its highest point during adolescence [14]. Nonetheless, Zimermann and Martinez-Pons [15], and recently Zhu [16] reported that there are no significant differences between boys and girls regarding mathematics self-efficacy [10].

Ciascai *et al.* [10] states that previous research has shown inconsistent results regarding these differences rely on metacognitive skills between male and female. Some research showed that there were differences regarding boys and girls metacognitive skills, while others suggest that the difference is not significant. However, steady research is still needed since the findings of the study can

be used in educational practice. Considering the inconsistent findings on gender differences in metacognitive skills, this study was to describe the differences of metacognitive skills of male and female biology education students in understanding the genetic concept. In fact, the empowerment of metacognitive skills was still get very little attention in the learning process. In the learning process at IKIP Budi Utomo Malang, metacognitive skills have not yet been developed due to a lack of knowledge about these metacognitive skills. In the learning process students have not been able to monitor, evaluate and control the learning activities carried out. Students have not thought for themselves how to learn well so they can achieve the expected goals. So this research want to describe the differences of metacognitive skills of male and female biology education students in understanding the genetic concepts.

II. RESEARCH METHOD

The subject of this research is student of class of 2016 Department of Biology Education of IKIP Budi Utomo, Malang Indonesia. There are 64 students of biology education consisting of 39 women and 25 men. This research is an ex post facto research with data analysis using descriptive and inferential approach. A descriptive approach is used to describe the level of metacognitive skills of male and female students in the Department of Biology Education, whereas the inferential approach is used to see the difference of metacognition skills of male and female students in the Department of Biology Education.

Data on metacognitive skills are measured by giving written tests in the form of essays that integrated with tests of cognitive learning outcomes. Scoring of metacognitive skills was obtained from the special scoring rubric of metacognitive skills developed by Corebima [17].

Data that has been obtained before analyzed was carried out prerequisite test first. This test was conducted to see the distribution of the data that has been obtained which was normally distributed and homogeneous or not. The prerequisite tests used were the normality test and variance homogeneity test. Normality test used the Shapiro-Wilk Test. The Shapiro-Wilk Test was used to test the level of normal distribution and test the difference in mean values. Test variant homogeneity using Levene's Test of Equality of Error Variances.

The results of the research data were then analyzed using t-test analysis with the help of the SPSS program for windows 16.00. The significance of the data analyzed was based on the following.

1. If the significance value was> 0.05, the null hypothesis was accepted, and the research hypothesis was rejected
2. If the significance value was <0.05, the null hypothesis was rejected and the research hypothesis was accepted

III. RESULT AND DISCUSSION

The results of measuring the average score of metacognitive skills of male and female students showed different results. The average of metacognitive skills value of male student is 43.71. The average of metacognitive skills value of female is 42.67. The results of the study can be seen in Chart 1.

Chart 1
The Average of Metacognitive Skills Score

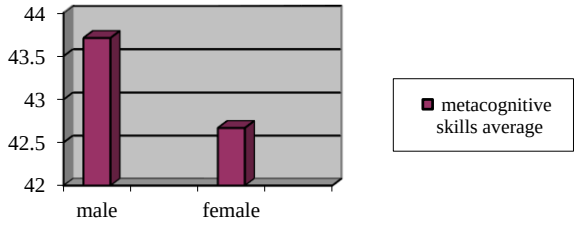

Table 1
Total Partisipants

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Metacognitive_Skills	male	25	43,7144	13,87232	2,77446
	female	39	42,6736	14,86646	2,38054

Table 2
The Result of Independent Samples Test

		Metacognitive Skills	
		Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances t-test for Equality of Means	F	,000	
	Sig.	,989	
	t	,280	,285
	df	62	53,896
	Sig. (2-tailed)	,780	,777
	Mean Difference	1,04081	1,04081
	Std. Error Difference	3,71234	3,65577
	95% Confidence Lower Interval	-6,38005	-6,28888
	Of the Difference Upper	8,46168	8,37050

The homogeneity of variance test for male and female metacognitive skills data result presented that metacognitive skills have a constant significance level by 0.989 at the 0.05 significance level. It means that the data of male and female metacognitive skills is homogeneous. Based on the results of data analysis, there is no difference in final metacognitive skills between male and female students. That is indicated by a significance value of 0.780 or more than 0.05 so that the null hypothesis was accepted and the research hypothesis was rejected. This means that there was no difference in metacognitive skills between male and female students. From Chart 1 known that the metacognitive skills better on male student than female student. This research was in line with previous research by Niemivirta [12] that reported boys use more superficial learning strategies than girls [8].

The results showed that there is no difference in metacognitive skills between male and female students in understanding the genetic concepts. This findings is in line with Özsoy and Günindi [18] research. Özsoy and Günindi explored the prospective preschool teachers' metacognitive awareness and its relation in terms of gender, grade, and the types of high school they have graduated. The results argued that there was no significant difference between females and males in their metacognitive awareness.

Yenilmez *et al*. [19] research on Biology achievement that study about the role of gender in the use of metacognitive awareness reading strategies among biology students. In that study most of the students apply problem-solving strategies compared to the other metacognitive reading strategies, but there was no significant difference between males and females. Furthermore, Kamid [20] stated that there was not any difference in metacognition ability between male and female students when completing a task [21].

Past research on gender differences in metacognition and self-regulation has been generally inconsistent, Bidjerano [13] and Zimmerman and Martinez-Pons [14] reported that girls use self-monitoring, goal setting, and planning more often than boys [8]. Gender and equity in science education have been reviewed since 1971. By 1990s, researchers interested to create a school environment in which girl-friendly instructional strategies, topics, and curriculum would be implemented. Researchers started to investigate the relationship among gender, race, ethnicity, economic status, and religion. After 2001 researchers started to investigate gender and urban issues. Historical understanding of gender studies indicated a very important issue for researchers. In this understanding, it was clear that gender issue had been investigated in relationship with other variables such as cognitive abilities, attitudinal variables, sociocultural variables, and home-family variables [22]. It was indicated that females and males develop their understanding about different aspects of science teaching and learning under the influence of those variables. That is to say, gender differences show heterogeneous findings across different variables [23].

Furthermore, another acceptable explanation for this finding is that the students' metacognitive skills tends to develop over time. The metacognitive skills developed over pre test to post test time. A bulk of research asserts that metacognitive growth is an ongoing developmental procedure. Kuhn maintains that metacognition should be conceptualized in a developmental framework [21].

La Misu and La Masi [24] said that experts have sought to explain the attributes that contribute to gender differences in learning and mathematical achievement. Leder [25] and Spencer et al.[26] stated that the difference was due to the socialization of gender roles and the threat of stereotypes of each sex. It was generally understood that the various factors that link gender differences in mathematics learning are enormous because they include: educational opportunities, teaching styles, influences and social values, the way men and women socialize places, social environments, student reactions to cultural contexts which was faster in learning.

In other hand, Anderson et al., [27] suggested that it is difficult to assess metacognition skills using simple paper measurements (paper and pencil measure). Preferably objectives related to metacognition knowledge can be tested in the context of classroom activities and discussions of varying strategies. One of the fundamental problems in learning the field of metacognition was to develop and use the right tasks to measure metacognition ability. This was because assessing metacognition ability means assessing metacognition

knowledge and experience or setting metacognition (control and evaluation). According to Panaoura [28], one common approach to measuring metacognition ability is to ask students directly about what they know or do. To assess students' metacognition control, they are asked to voice their thoughts (think aloud) about what to do and think about in solving problems. Some aspects of metacognition can be developed with metacognition strategies such as problem solving in pairs (pair problem solving). In learning process student talks about the problem by describing the thought process, the partner hears and asks to help clarify his thoughts. Therefore, metacognition is a dimension of knowledge that emphasizes the role of students in solving problems, where students are required to think systematically in solving problems independently [29].

IV. CONCLUSION

Based on the results of the research it can be concluded that: First, there is no differences in metacognitive skill between male and female students. Second, the metacognitive skills better on male student than female student

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