

Critical thinking skills differences of junior high school students based on the gender

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Abstract. One of the essential skills that must be approved in the era of the industrial revolution 4.0 is critical thinking skills. One way to equip students to face global challenges in the 21st century. The aim of the study is to know differences critical thinking of junior high school students based on the gender. The research method is descriptive research. The sampling technique by random sampling technique. The data collection method used a critical thinking skills test with 7 description questions that were tested for 92 students by VII grade in one of junior high schools in Yogyakarta, with details of 47 male students and 45 female students. Analysis of the test results was carried out in a descriptive qualitative manner. Based on the results of the study showed the average critical thinking of female students had an average value of 42.67% while male students had an average value of 41.94%. The conclusion is critical about students in general, both male and female students depend on very low categories. So there needs to be innovation in science learning, such as using learning models, media, supporting teaching materials that can improve students' critical thinking skills.

Keywords: *critical thinking skills, gender, junior high school*

1. Introduction

The presence of the 4.0 industrial revolution era in the 21st century has made the world is more competitive. Because of the phenomenon, there is a rule authentic in the education world to prepare generations survive challenges in the 21st century. One of them is through learning science in schools. In a science education workshop and 21st century skills development, it is recommended that students emphasize learning in 21st century skills such as: (1) adaptability or adaptation to their environment, (2) communication skills, (3) ability to solve problems that are not students routinely found, (4) self-management/ self-development, and 5) systems thinking [1]. These skills need to be learned to deal with current global demands.

One of the essential skills on this 21st century is critical thinking skills. According to Chiappetta, science is essentially as a body of knowledge, a way of thinking, and a way of investigating [2] which actually has facilitated or equipped to have these critical thinking skills. Through science learning, students can improve their thought processes. Thinking activities will bring up the abilities / strategies of thinking in students. There are three levels of thinking strategies, namely: (1) conceptualization which is a basic thinking strategy, in which humans make connections between the concepts they have learned, so learning always interconnects between initial knowledge and new knowledge; (2) making decisions, where humans are able to select solutions from various alternatives based on specific criteria for specific purposes; and (3) solving problems in which humans are able to find solutions to every challenge they



face in life [3]. Having these three thinking strategies should enable students to survive the problems they find in their daily lives.

There are many theories about critical thinking. Dewey says that critical thinking is basically an active process where we think, developing questions, finding answers, and finding relevant information [4]. Critical thinking is thinking based on the reasons that are believed or have been done [5], [6], [7]. According to Facione critical thinking means thinking well, almost the opposite of illogical or irrational thinking [8]. Critical thinking also means an attitude of to think deeply about a problem or things that are different in the range of one's experience by using methods of inquiry and logical reasoning [9]. Based on some of these opinions it can be concluded that critical thinking skills is a skill possessed by someone in analyzing ideas that are effective and productive in solving a problem to the stage of finding a solution in solving the problem. Between critical thinking and problem solving has a linear relationship [10]. Students who have low critical thinking skills will be very difficult in the process of finding ideas and solving problems [11].

Based on observations and interviews with science class VII teachers in one of Yogyakarta State Junior High Schools, it was revealed that students' critical thinking skills were still lacking. This is indicated by several things: (1) lack of student initiative about asking questions and about general students will answer questions posed by the teacher if the student is appointed by the teacher. (2) The tendency of students to only accept the material taught, without wanting to study more deeply and sustainably. This was found by the teacher in giving tests such as daily tests, for example being asked about the application of science in daily life, students would answer exactly what the teacher had said during the learning process. (3) when asked by the teacher, they want to answer themselves firmly and boldly, but they will answer simultaneously so that the voice is unclear. (4) There are still many students who are not careful in doing their tasks. (5) There are still many students who make homework by cheating without understanding what they are cheating.

Starting from this problem, one of the factors that does not directly affect critical thinking skills is gender differences. Gender in the same sense as the difference in sex, namely male and female. Men and women apart physically different, also differ emotionally and intelligence [11], [12]. Gender differences in critical thinking skills between men and women in EFL students however are not significant [13]. Biologically, differences in understanding can be related to differences in the structure of the brain parts of men and women involved in language regulation. In women brain regions are associated with more difficult language functions which require higher female language skills than men [14]. Language is a tool used to convey results or results [15]. According to Shaywitz stated during phonological tasks, male brain activity is focused on the left portion of the gyrus, whereas in women shows patterns of activity involving more nerves in both the left and right inferior frontal gyrus [16]. This information attests to variations in the level of language processing in men and women. Based on this data, we can think about the difference between men's and women's abilities.

Several other studies also revealed that boys generally showed that men were better at manipulating visual images and numerical abilities, while women were generally better at verbal tests [17], [18]. Based on the description, the purpose of this study is to determine the differences in critical thinking skills between male and female students. The results of this study are expected to provide benefits for schools and teachers in particular to be able to recognize the level of critical thinking skills of students according to gender. It is hoped that these results can be used as consideration in selecting alternative learning methods or approaches.

2. Research method

This research is a descriptive study. It is to determine differences of critical thinking skills students based on gender. The sampling technique is done by random sampling technique. The sample of this research was 92 students by VII grade in one of junior high school in Yogyakarta of 2019/2020 academic years, consisting of 47 male students and 45 female students. The instrument used to measure students' critical thinking skills is in the form of problem descriptions. The description items used consist of 7 questions related to the material classification of living things. Indicators of thinking skills used in this

study refer to indicators of critical thinking skills developed by Facione (1990) and the Ministry of Education Malaysia (2002), namely analyzing, grouping and classifying, explanation, comparing and contrasting, interpretation, evaluating, and making conclusion [3], [8]. Analysis of the test results was carried out in a descriptive qualitative manner. The result data from the students' critical thinking skills test, the scores are changed in the form of a percentage and categorized based on the criteria of the level of students' critical thinking skills as seen in Table 1.

Table 1. The level of critical thinking skills category [19]

Percentage (%)	Category
86-100	Very high
76-85	High
66-75	Sufficient
55-65	Low
≤ 54	Very Low

After being analyzed, it is seen the average difference of each indicator of critical thinking skills between male and female students.

3. Results and Discussion

Based on the results of the test analysis, the average data obtained from students' critical thinking skills. Between male and female students have a slight difference in critical thinking skills. The results of the average difference in critical thinking skills between male and female students can be seen in Figure 1.

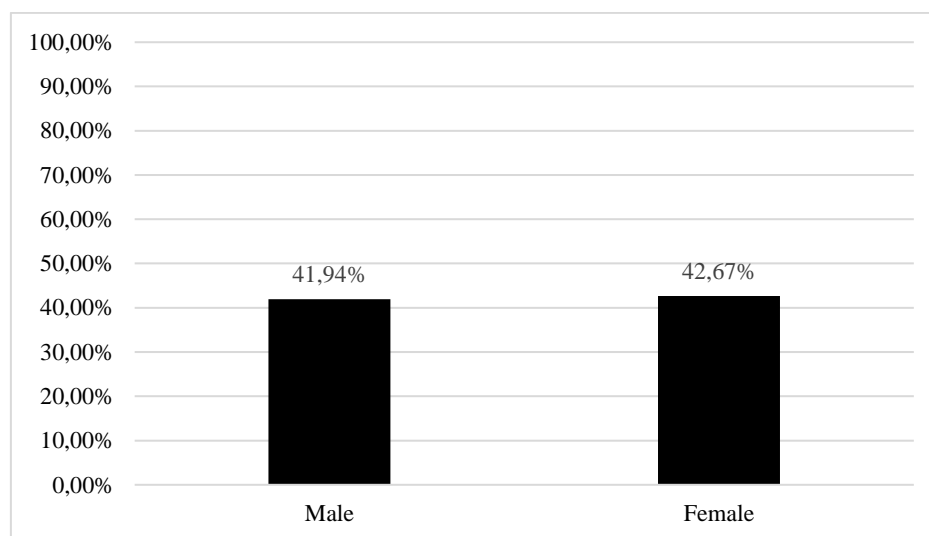


Figure 1. The results of the average difference in critical thinking skills between male and female students

Figure 1 shows average of critical thinking skills by female students is slightly higher than male students. Female students have an average of 42.67% while male students have an average of 41.94%. Both are in the very low category. This is consistent with the results of research conducted by previous researchers, who found that critical thinking skills of female students were better than male students [11], [13], [20], [21]. As for what affects the difference in the average of critical thinking skills of male and female students is the value of each indicator of critical thinking skills tested. The following is the average percentage of critical thinking skills indicators as seen in Table 2.

Table 2. Percentage of Average Skill Indicators Critical Thinking Male and Female Students

Indicators of Critical Thinking Skills	Percentage of Average Skill Indicators Critical Thinking Students (%)	
	Male	Female
Analysing	57.02	66.89
Comparing and contrasting	60.64	58.11
Grouping and classifying	24.00	23.00
Interpreting	43.83	46.22
Evaluating	54.89	55.41
Making conclusion	53.19	54.00
Explain	9.08	9.84

Based on Table 2 it can be seen that the average of critical thinking skills indicators between male and female students is different in each of the indicators. The difference in value is not too many differences. Critical thinking skills of male students are higher on several indicators namely indicators of comparing and contrasting and the indicators of grouping and classifying. While the indicators of analysing, interpreting, evaluating, concluding, and explaining, the percentage value of indicators of critical thinking skills of female students is higher than that of male students. Of the 7 indicators of critical thinking skills tested, overall students' critical thinking skills are in the very low category.

Some previous studies explain that these differences can be caused by differences in students' ability in terms of language. The difference in ability is related to differences in the structure of the brain parts of men and women involved in language processing. Men and women differ in terms of learning processes and language development [22]. Where women are superior in verbal ability compared to men.

Biologically, the differences in brain structures allow male and female students to differ in several ways such as the ability to process, respond to information, or store long-term information. Limbic system areas in men and women have different structures. It was further explained that women generally have a greater hippocampus than men, thus potentially increasing better long-term storage memory. In addition, other parts of the brain that have different structures between men and women are the cerebral cortex that controls thinking, decision making, and intellectual functioning. The female brain receives about 20% more blood flow and has more nerve connections. This allows women to process and respond to information more quickly [23]. From this it can be seen that gender can influence differences in critical thinking skills between male and female students on several aspects or indicators of critical thinking skills.

From the 7 indicators of critical thinking skills tested, there are 2 indicator values which are at the bottom of the very low category, which are explanation indicators and indicators grouping and classifying. In explain questions that are related to the material characteristics of groups of animals that are in the river that is not polluted (Figure 2), the answers of students who are given on average cannot answer according to the concept of the material and even some of the students do not answer the question. This is due to students not recognizing the characteristics of these animal groups, so students cannot explain them correctly.







7. Pada sungai yang belum mengalami pencemaran sering ditemukan siput air dan cacing *planaria*. Menurutmu, termasuk filum apakah kedua hewan tersebut! Kemudian jelaskan juga karakteristik dari masing-masing hewan tersebut!

Figure 2. Questions on the indicators explain

Then, on the problem of grouping and classifying (Figure 3), students generally give some answers that are not in classifying invertebrate animals in their class. However, a small number of students have

been able to classify groups of animals correctly, but in giving reasons for classifying students can't explain correctly and in accordance with the concept of related material.

3. Perhatikan gambar berikut.

		
Obelia	Euspongia	Cacing Hati
		
Bintang Laut	Siput	Kalajengking

Berdasarkan gambar tersebut, tentukanlah hewan manakah yang termasuk ke dalam kelompok hewan Porifera, Arthropoda, dan Echinodermata. Jelaskan dengan karakteristik masing-masing kelompok hewan tersebut (minimal 4) !

Figure 3. Question on the indicators grouping and classifying

Based on the explanation above, it is known that the indicator of students' critical thinking skills, especially in the classification of living things is still low. This shows that teachers do not empower science learning in practicing critical thinking skills. Based on interviews with teachers, students are poorly trained and are not accustomed to the form of questions that present the phenomena and materials of science learning are also rarely associated with problems that occur in everyday life. Whereas one way to develop students' critical thinking skills is to be done by always asking questions and questioning the phenomenon being studied [24]. This is important in order to create intensive interaction between students, teachers and learning materials and provide opportunities to involve students' critical thinking skills. Teachers must be able to create learning innovations such as using models, media or supporting teaching materials that can actively involve students in learning activities. This is important in order to create intensive interaction between students, teachers, and learning materials and provide opportunities to involve students' critical thinking skills.

Some previous studies also stated the critical thinking skills of seventh grade junior high school students in Sukoharjo district were in the low category. Of the 6 indicators of critical thinking skills tested namely interpretation, analysis, evaluation, inference, explaining, and self-regulation, all are in the low category [25]. Teachers must continue to develop critical thinking skills as early and as often as possible. The reason related to the need to develop critical thinking skills is the demand for the development of science and technology. Critical, logical, reflective, metacognitive and creative thinking are parts of 21st century thinking skills that must be empowered to be able to compete in various fields [26]. In the 21st century, which is the age of information, it is not the time to study science just to get to know concepts, but to provide critical thinking skills.

4. Conclusion

Based on the results of the study, it can be concluded that the average of critical thinking skills by female students is slightly higher than that of male students. Female students have an average of 42.67% while male students have an average of 41.94%. Both are in the very low category. On indicators comparing and contrasting, and indicators grouping and classifying, male students have a greater percentage than female students. While the five other indicators namely analysing, interpreting, evaluating, making conclusion and explain, female students have a greater percentage than male students. Of the 7 indicators of critical thinking skills, there are 2 indicators at the bottom of the very low category are the indicators explanation and indicators grouping and classifying.

There are differences in the results of tests of critical thinking skills between male and female students in the learning process of science, especially material classification of living things, so it is recommended: (1) Teachers pay attention to gender differences in learning, especially in training students' critical thinking. (2) Both male and female students can be helped by applying supportive learning methods to improve critical thinking skills and practice questions that are more challenging, so that they can develop their critical thinking skills. (3) Further research can be carried out using different student backgrounds, namely cognitive or affective abilities such as socio-cultural factors.

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