

# **Analysis of Students' Critical Thinking Skills, Scientific Literacy and Scientific Attitude in Ecosystem Materials**

**Ilham Hakiki Harahap<sup>1,\*</sup> Martina Restuati<sup>2</sup> Ashar Hasairin<sup>3</sup>**

<sup>1,2,3</sup>*Postgraduate Program School of Biology Education, Universitas Negeri Medan, Medan, Indonesia*

*\*Corresponding author. Email: [ilhambilogi90@gmail.com](mailto:ilhambilogi90@gmail.com)*

## **ABSTRACT**

This research was conducted at SMA Negeri 2 Kotapinang which aimed to determine the level of critical thinking skills of students (1) grade X at SMA Negeri 2 Kotapinang; (2) level of scientific literacy skills of grade X students in SMA Negeri 2 Kotapinang (3) scientific literacy of grade X students at SMA Negeri Kotapinang (4) level of critical thinking skills of students in male and female students (5) level of scientific literacy skills of male and female students (6) and scientific attitudes of male and female students. The research sample consisted of 107 students of grade X from a population of 107 students consisting of 3 classes in SMA Negeri 2 Kotapinang. Research instruments were in the form of tests of critical thinking skills and scientific literacy and non-test questionnaires on students' scientific attitudes. The results showed the level of students' critical thinking skills; (1) SMA Negeri 2 Kotapinang was classified as low (27.07); (2) the level of scientific literacy skills of grade X students at SMA Negeri 2 Kotapinang was quite good (50.76); (3) the scientific literacy of class X students at SMA Negeri 2 Kotapinang was quite good (73.63); (4) the level of critical thinking skills of male students was obtained by (25.31) and female students was obtained by (27.97) which were both classified as low; (5) the level of scientific literacy skills of male students was obtained (47.78) and female students was obtained (52.27) which was both quite good; (6) and the scientific attitude of male students was (70,62) and female students was (75,15). The results of this study indicated the low ability of students' critical thinking in the classroom so that the understanding of the material that has been explained by teachers has not been able to be mastered by students, besides, there were mistakes students in answering the instruments of critical thinking skills that have been done. It was seen that students did not fill in the reasons for the answers correctly, so there were still many students who find it difficult to understand Ecosystem material.

**Keywords:** *Analysis of Critical Thinking, Scientific Literacy, Scientific Attitude, Ecosystem*

## **1. INTRODUCTION**

Biology subjects in high school learn everything about life and the environment. One of the skills that must be possessed by students is to think critically, meaning that students must be able to solve problems scientifically with scientific arguments based on facts in the field. One of the biological material that requires critical thinking skills is the material of ecosystems, in the learning of ecosystems students will face several environmental problems, for example environmental pollution and the components of the ecosystem involved therein. To maximize the skill of critical thinking students are required to be able to think rationally, have arguments, be able to classify problems, interpret them and be able to communicate through scientific methods. A student's critical thinking skill determines how the

student thinks rationally, argues, classifies, interprets, so that critical thinking skills will make a student able to learn and communicate in discussions more easily. But the problems found in the field show students' critical thinking skills tend to be low [1]. This is reinforced from the results of field observations in SMA Negeri 2 Kotapinang 80% of students who live in the area of an oil palm plantation company ignore environmental pollution, for example pollution resulting from the production of the oil palm company, for example water in the area where students live has already polluted, thus reducing the quality of water content.

Differences in critical thinking skills can be seen by gender, research that shows differences in critical thinking skills between male and female students, the average pre-test of critical thinking skills in male

students is 45.9 and the average pre-test is 73.6 or experienced an increase in the critical thinking skills by 37.6%. The average pre-test for female students was 41.4 and the average post-test was 74.26 or an increase of 44.2%. Based on these results it can be seen that female students have a relatively higher percentage of critical thinking skills than male students [2].

Biology learning or integrated learning with critical thinking certainly cannot be separated from students' scientific literacy skills. The importance of mastering scientific literacy by students, relates to the way students solve problems faced by modern societies that depend heavily on technology and the advancement and development of science using scientific concepts [3].

Science learning is not only related to critical thinking skills, scientific literacy, but also affects the aspects of scientific attitude. Aspects of attitude include: curiosity about objects, natural phenomena, living things, and causal relationships that cause new problems that can be solved through correct procedures; science is open ended. This means that students are required to have a high curiosity about an object, natural phenomena, even environmental phenomena that occur around it [4-6]. This scientific attitude can be proven by providing a problem and how students respond in understanding the problems that occur around them and find solutions in solving problems that occur with scientific procedures and correct. The problem is students tend to be indifferent and not care about the problems that occur in their environment [7].

Based on the facts in the field from the initial observation results conducted in January to April 2019, many students did not understand the learning material so that the learning outcomes were low and did not meet the specified minimum graduation criteria of 70 so that they had to make remedial. In this study selected ecosystem material based on the still low average UAS score and the number of students who have to do remedial. The average UAS score obtained in the 2015/2016 academic year was 57.14 out of a population of 140 students with a class distribution of 35 students consisting of 15 male students and 20 female students, with an average number of students who completed 40 students. In the 2016/2017 school year the score of ecosystem material UAS had an average of 54.29 out of a population of 144 students with a class distribution of 16 students consisting of 16 male students and 20 female students, with an average total completion 38 students. Whereas in the academic year 2017/2018 the score of UAS for ecosystem material has an average of 60 out of a population of 144 students with a class distribution of class students consisting of 10-15 male students and 21-26 female students, with an average completed 42 students. Based on the problems described, this research is important to analyze and describe the ability to think critically, scientific literacy

and scientific attitudes of students based on gender (gender).

## **2. METHOD**

### ***2.1. Research Site, Population and Sample***

This research was carried out at SMA Negeri 2 Kotapinang. The study was conducted from April to August 2019. The population of this study was all students of grade X SMA Negeri 2 Kotapinang as many as 107 students. The research sample consisted of 107 students of grade X Science 1, X Science 2, and X Science 3. Sampling was done by total sampling technique.

### ***2.2. Research Type***

This research used a descriptive method with a quantitative approach. Descriptive method was used to investigate the level of critical thinking skills, scientific literacy and scientific attitudes of students on ecosystem material in the grade X Science of SMA Negeri 2 Kotapinang.

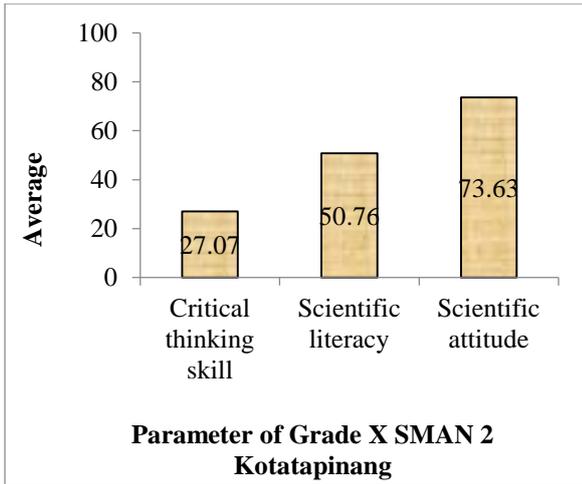
### ***2.3. Research Instrument and Data Analysis Technique***

In this study, the instruments used to test critical thinking skills and scientific literacy in the form of essay test questions, and non-test instruments, used a questionnaire on students' scientific attitudes. The data obtained in this study were analyzed descriptively quantitatively by describing the answers of respondents involved in this study regarding critical thinking skills, scientific literacy and scientific attitudes of students.

## **3. RESULT AND DISCUSSION**

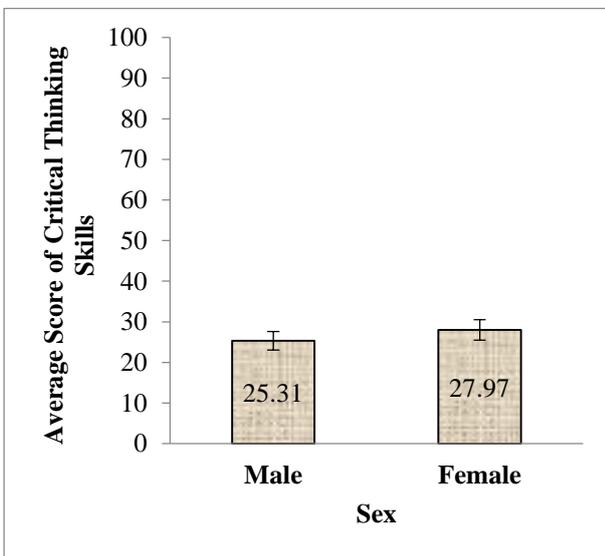
### ***3.1. Results***

1) *Level of Critical Thinking Skills, Scientific Literacy, and Scientific Attitudes of Students on Ecosystem Materials in Grade X SMA Negeri 2 Kotapinang.* Based on the results of research and analysis of data that have been obtained critical thinking skills of students in Ecosystem material in grade X SMA Negeri 2 Kotapinang classified as low with the acquisition of an average score of 27.07. The results of the research and analysis that have been carried out to determine the level of scientific literacy skill of students in grade X SMA Negeri 2 Kotapinang were quite good with an average score of 50.76. While the results of research and analysis that have been conducted to determine the scientific attitude of students in grade X SMA Negeri 2 Kotapinang classified as good with the acquisition of an average score of 73.63. This can be seen in Figure.1.



**Figure. 1.** Level of Critical Thinking Skills, Scientific Literacy, and Scientific Attitudes of Students on Ecosystem Materials in Grade X SMA Negeri 2 Kotapinang

2) *Level of Critical Thinking Skills of Male and Female Students in Ecosystem Materials in Grade X SMA Negeri 2 Kotapinang.* From the results data analysis that have been done, it was obtained that the level of critical thinking skills of male students was low (25.31) and female students have low critical thinking skills (27.97). Level of critical thinking skills of students by sex there was no significant difference between male and female in SMA Negeri 2 Kotapinang. The average score of critical thinking skills based on gender can be seen in Figure.2.



**Figure. 2.** Level of Critical Thinking Skills of Students on Ecosystem Materials in Grade X SMA Negeri 2 Kotapinang Based on Gender (P=0,135)

Based on the Figure above, it can be seen that the highest level of critical thinking skill can be found in female students. The average score of critical thinking skills in female obtained by 27.97 and male obtained by 25.31 which were categorized equally low.

### 3.2. Discussion

1) *Level of Critical Thinking Skills of Students on Ecosystem Materials in Grade X SMA Negeri 2 Kotapinang.* Based on the results of the study obtained that the level of critical thinking skills of students in grade X SMA Negeri 2 Kotapinang of 107 students was classified as low with an average score (27.07).

2) *Level of Critical Thinking Skills of Students on Ecosystem Materials in Grade X SMA Negeri 2 Kotapinang Based on Gender.* The critical thinking skills of grade X students of SMA Negeri 2 Kotapinang based on gender in 36 male students was low (25.31). While from 71 female students were classified as low (27.97). Students' critical thinking skills were strongly influenced by their learning experiences. That was, if during the learning process that has been experienced by students often stimulated to do critical thinking activities, it will experience an increase in good critical thinking. showed that there was no real difference in critical thinking skills between male and female students [8]. Showed that there was a significant relationship between critical thinking and reading comprehension [9]. Critical thinking was a reflective thought process that focuses on deciding what was believed to be done. Experience and evaluation were the main components in improving critical thinking skills. Experience, both events and knowledge, was a means of self-evaluation in reflective thinking. The ability to think critically between male and female varies. However, in this study it turns out that female have more daily experience in learning both at school and at home than male so that female's critical thinking skills were slightly superior [10].

### 4. CONCLUSION

Based on the results and discussion, it was concluded that the level of critical thinking skills of students in the Ecosystem material in grade X SMA Negeri 2 Kotapinang 2018/2019 Academic Year was in the low category with an average score of 27.07. While the male students included in the low category with the acquisition of an average score of 25.31 and female students included in the low category with the acquisition of an average score of 27.97. This was not included in a significant difference ( $0.135 > 0.05$ ).

### REFERENCES

- [1] W. Ardhi, "Pembelajaran Melalui Guided Inquiry Model Menggunakan Teknik Mind Map dan Teknik Modified Roundhouse Diagram Ditinjau dari Keterampilan Berpikir Kritis dan Keterampilan Proses Sains Mahasiswa", *Jurnal Pendidikan*, 6 (3):190- 197, 2012. from journal, with the title *Jurnal Pendidikan*.
- [2] Sulistiyawati., and C. Andriani, "Kemampuan Berpikir Kritis dan Hasil Belajar Biologi Berdasarkan Perbedaan Gender Siswa", *Jurnal Pendidikan*.

- Wacana Akademika, 1 (2): 127-142, 2017. From Journal, with the title Jurnal Wacana Akademika.
- [3] G. Anggriani, "Analisis Kemampuan Literasi Sains Siswa SMA Kelas X di Kota Solok", *Prosiding Mathematics and Sciences Forum*.2(1): 161-170. 2014. From *Prosiding Mathematics and Sciences Forum*.
- [4] Simamora, P., Manurung, S. R., & Rajagukguk, J. (2015). *Pengembangan Pembelajaran Fisika Umum I Berbasis Argumentasi Ilmiah Dalam Kelas Inkuiri Untuk Meningkatkan Pemahaman Konsep*.
- [5] Simamora, P., Manurung, S. R., & Rajagukguk, J. (2014). Sikap dan Pandangan Mahasiswa terhadap Pembelajaran Fisika Umum I Berbasis Argumentasi Ilmiah dalam Meningkatkan Pemahaman Konsep.
- [6] Kartika, Y., Wahyuni, R., Sinaga, B., & Rajagukguk, J. (2019, July). Improving Math Creative Thinking Ability by using Math Adventure Educational Game as an Interactive Media. In *Journal of Physics: Conference Series* (Vol. 1179, No. 1, p. 012078). IOP Publishing.
- [7] S. Zubaidah, "Keterampilan Abad ke-21: Keterampilan yang Diajarkan melalui Pembelajaran", *Prosiding Seminar Pendidikan Biologi*. pp : 1-17. 2016. From *Prosiding Seminar Pendidikan Biologi*.
- [8] B.E. Myers, and J.E. Dyer, "The Influence of Student Learning Style on Critical Thinking Skill", In *Journal of Agricultural Education*, 2(1): 47-58. 2006. From Journal with title In journal of Agricultural Education.
- [9] S. Yousefi, and M. Mohammadi, "Critical Thinking and Reading Comprehension among Postgraduate Students: The Case of Gender and Language Proficiency Level". From Journal, with title *Journal of Language Teaching and Research*, 7(4): 802-807. 2016.
- [10] R.H. Ennis, 2013: "The Nature of Critical Thinking: an Outline of Critical Thinking Dispositions and Abilities", UniversitasIllionis. 2013.