



Effect of *Reciprocal Teaching* on Human Reproductive System Material on Critical Thinking Ability of Class XI SMA

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ABSTRACT

Students' critical thinking ability is still low in biology learning due to the lack of student activity in the teaching and learning process so that it is necessary to apply a reciprocal teaching-learning model. This model can make students become active during the learning process. This study aims to determine the effect of the reciprocal teaching-learning model on the critical thinking skills of SMA Negeri 4 Madiun students. The research design used is quantitative research with hypothesis testing using t-test. The research data was taken from the population of class XI MIPA at SMAN 4 Madiun which amounted to 120 students. The sampling technique was stratified random sampling, with class XI MIPA 3 as the control class and XI MIPA 4 as the experimental class. The results of the study by calculating the value hypothesis test obtained that t count (2.101) > t -table (2.0017), where H_1 is accepted and H_0 is rejected. This study concludes that there is an effect of the reciprocal teaching-learning model on the critical thinking skills of SMA Negeri 4 Madiun students.

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INTRODUCTION

Education is a planned process for creating a comfortable and safe learning atmosphere in creating a smart young generation (Rahmat, 2016). Education has the challenge to produce the best graduates who have creative abilities, critical abilities, and intellectual intelligence. To answer these challenges in its implementation can be through the learning process in schools.

Schools are places for teaching and learning activities and learning processes to realize learning objectives (Djamaluddin & Wardana, 2019). The implementation of this learning refers to the applicable curriculum, namely the 2013 curriculum. In this curriculum, students are required to be active during the teaching and learning process in schools, one of which is at SMA Negeri 4 Madiun. However, in its implementation in biology learning, not all students are active. Students are still not confident in their answers

when the teacher is asking questions. Students are afraid if the answer is wrong and do not dare to ask about things they do not know. This condition occurs on SMAN 4 Madiun.

Students have different characteristics in learning, some are passive, and active. Students must be active in expressing opinions through a student-centered learning process (Ramadani & Qibtiyah, 2021). So that students play an active role during the learning process. This student has an obligation to actively argue about the focus of the discussion so that the learning process runs smoothly. Based on previous research, active learning is a superior approach compared to traditional approaches that focus more on delivering material content, such as lectures (Hartikainen, *et al.*, 2019). The benefits that can be given are that it can improve students' thinking and critical thinking skills and student learning outcomes can also have an effect.

One way that can be done to activate student learning in the biology teaching and learning process is to apply a reciprocal teaching-learning model. The reciprocal teaching-learning model is a reverse learning model that is used to realize student-centered teaching and learning activities (Sartono, *et al.*, 2016) in overcoming problems found by teachers to activate students. In applying the reciprocal teaching model, four strategies can be used, namely summarizing, question generating, clarifying, and predicting (Anggraeni, *et al.*, 2018). The goal is to help students focus on what they are reading and make students focus on understanding the reading. Students have their respective abilities in solving a problem, one of which is in the teaching and learning process (Pane & Dasopang, 2018). The expected teaching and learning process is the existence of critical thinking.

Critical thinking is very important in learning biology. Critical thinking is the cognitive ability in determine a decision or conclusion based on logical reasons and accompanied by empirical evidence (Agnafia,

2019). Critical thinking is a student's ability to determine careful judgments in making decisions and solving problems. Critical thinking is a way of thinking of students about responding to a problem logically, having an explanation of the problem clearly, and not causing much meaning to a problem. Critical thinking skills are the ability to analyze, make comparisons, draw conclusions, evaluate arguments and solve problems. Critical students have high curiosity to be able to analyze problems wisely, can develop their ideas independently, are open-minded, and appreciate new ideas from other parties (Safitri, 2020). Students who have high thinking skills can affect student learning outcomes.

Critical thinking ability can be influenced by several factors including: (1) a person's perspective on understanding and assessing something; (2) a person's level of intelligence/intelligence; (3) own motivation; (4) a person's background and cultural factors; (5) the experiences that have been obtained; (6) emotional/anxiety states; and (7) physical condition (Khasanah & Ayu, 2017). In addition to influencing factors, there are several indicators for assessing critical thinking skills according to including elementary clarification; basic support; inference; advanced clarification; and strategies and tactics (Ennis, 2018).

Based on the description of the background, the problem is formulated, namely how to implement reciprocal teaching and learning. Second, what is the effect of a reciprocal teaching-learning model on thinking ability. The purpose of this study was to determine the implementation of the reciprocal teaching-learning model in teaching and learning activities, in addition to knowing the effect of the reciprocal teaching-learning model on the critical thinking skills of SMAN 4 Madiun students.

METHOD

The research was conducted at SMA Negeri 4 Madiun on Jl. Serayu No.80, Pandean, Taman District, Madiun City. The time of the study was conducted from April until May 2022.

This type of research is quantitative research experimental methods. The population in this study were students of class XI MIPA at SMA Negeri 4 Madiun, as many as 120 students. The technique or method of taking the sample in this research is using stratified random sampling. Class XI MIPA 3 as the control class and XI MIPA 4 as the experimental class were given the reciprocal teaching model treatment. Each class consists of 30 students.

Data collection techniques were carried out by means of observation and giving test questions. The test is in the form of a

description question consisting of 5 questions containing indicators of critical thinking skills. Data analysis was tested including validity test, reliability test, normality test, homogeneity test, and hypothesis testing.

RESULT AND DISCUSSION

The Result

Both classes are applied with different learning models. Based on the test of learning outcomes for the experimental class and the control class in the pre-test and post-test, as can be seen in Figure 1. Based on the learning outcomes of the experimental and control class students, the increase in the pretest to posttest scores for the experimental class was 20 while the control class was 16.17. These data indicate that there is an increase in student learning outcomes in the before and after tests.

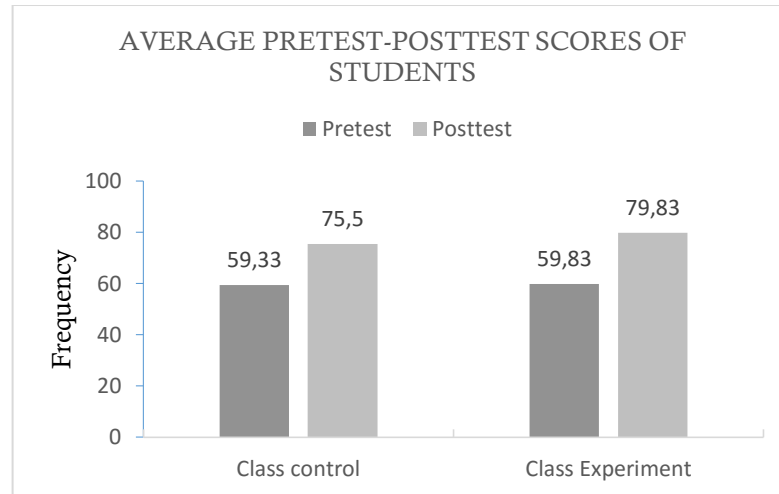


Figure 1. Graph of comparison of the results of pretest-posttest experimental and control classes

The results of the average pretest value of the control class were 59.33 and the pretest value of the experimental class was 59.83. Both classes are included in the criteria for having low critical thinking skills. Then the posttest control class obtained an average value

of 75.5 and the experimental class an average value of 79.83. Both posttest scores are included in the criteria for having high critical thinking skills. There is an increase in students' pretest-posttest scores as shown in Table 1.

Table 1. Criteria for Critical Thinking Ability

Interval	Criteria
$81,25 \leq x \leq 100$	Very High
$71,5 \leq x \leq 81,25$	High
$62,5 \leq x \leq 71,5$	Middle
$43,75 \leq x \leq 62,5$	Low
$0 \leq x \leq 43,75$	Very Low

(Supriyati, et al., 2018)

The data that has been collected is then analyzed using the normality test. The goal is to find out if the data is normally distributed or not. The normality of the data has a significant degree of = 0.05 or 5%. If the data has a significant value of more than 0.05, then the data is normally distributed and vice versa. From Table 2 below, it can be seen that the p-

value (Sig.) $0.147 > 0.05$, meaning that H0 is accepted, then the data is said to be normally distributed. The experimental class has a p value (Sig.) = 0.2. So it can be concluded that the p-value (Sig.) $0.2 > 0.05$, meaning that H0 is accepted, then the data is normally distributed.

Table 2. Data Normality Test

No	Sample Group	Number of Samples	Kolmogorov-Smirnov	Conclusion
1	Control Class	30	0,147	Normal
2	Experimental Class	30	0,200	Normal

Data that is normally distributed is tested for homogeneity. The purpose of the homogeneity test is to determine whether the

distribution of the data is homogeneous or not. The data can be seen in Table 3.

Table 3. Data Homogeneity Test

Levene Statistic	df	Sig.
.084	58	.773

The results of the homogeneity test obtained a significant value of $0.773 > 0.05$, meaning that H0 is accepted, then the research population obtained has the same variance or

the data is homogeneous. Furthermore, hypothesis testing. This can be seen in Table 4.

Table 4. t-Test Results

t	Sig.
2,062	0,044

The calculated t-value of the results of the t-test data analysis is 2.101 It can be compared with the t-table value of df 58, which is 2.0017. The value of t count (2.101) > t table (2.0017) then H0 is rejected so that it can be concluded that there is an effect of the Reciprocal Teaching learning model on the critical

thinking skills of SMA Negeri 4 Madiun students.

Discussion

There are two classes of data retrieval, namely the control class and the experimental class. The samples taken were 60 students, including 30 students in the control class and

30 students in the experimental class. The material used for both classes is the human reproductive system.

In this case, the researcher uses the material of the human reproductive system which has the characteristics of high concept understanding (Pratama, *et al.*, 2020). In accordance with the research variable which is an indicator of critical thinking ability in understanding the concept of material for the human reproductive system. Students are required to understand what they are learning so that understanding does not occur misconceptions about the truth of the material concept.

When reciprocal teaching is applied, students pay attention to the steps in carrying out learning well. The atmosphere in the classroom is also conducive. This can help to learn to use reciprocal teaching smoothly, so that there is an influence on students' critical thinking skills. This is in line with the results of research by (Mustofa & Suciarti, 2019) which concludes that critical thinking skills increase due to the influence of reciprocal teaching. Another study which states that the reciprocal teaching learning model has a significant effect on science knowledge competence is stated by (Dewi, *et al.*, 2020). Reciprocal teaching has a high impact on increasing students' reading achievement (Oo, *et al.*, 2021) to understand the material being studied.

There is a reciprocal teaching-learning model strategy, namely summarizing, generating questions, predicting, and clarifying. In the summarizing stage, initially, what students do is read the material on the human reproductive system that has been given by the teacher paragraph by paragraph, and understand according to their understanding as evidenced by supporting facts (Muslimin, *et al.*, 2017). Students do not just read but summarize the important points of the content of the material they have read which will later be discussed during the discussion. At this stage, it provides opportunities for students to identify, paraphrase, and help

review important information in the text. Student activities at this stage during the learning process are checking the understanding of the text by summarizing what has been read and studied previously. As research conducted by Ashegh (2018), that reciprocal teaching is a successful technique in improving students' reading comprehension skills. In summary, students will certainly have good reading skills.

In the questioning-generating stage, at this stage students ask questions about the results that have previously summarized the material (Prasetyo, 2021). The process of raising this question through the minds of students who initially did not know at all and eventually became aware, it is necessary to know. Previously, students identified the types of information that were quite important, so that they could provide the substance of the question. Then they turn this information into self-questioning questions to ensure that they can also answer their own questions. Questions can also be asked to other students by raising a finger as a sign that he wants to ask a question. Questions through book sources or the internet.

To clarify, students review and clarify difficult vocabulary, or structures that they have not understood in the text on the material on the reproductive system (Agustiniingsih, 2019). In order to be successful, students must dig deeper into relevant knowledge through books and internet sources. The teacher also talks about the correct concepts according to biology so that at the end of the lesson there are no misconceptions about understanding the materials of the human reproductive system. The teacher takes over the students who were previously objects for attention. The teacher clarifies the students' answers after a joint discussion.

Predicting, students' initial knowledge is combined with new knowledge that has been learned and has been discussed with the teacher (Ramadani & Qibtiyah, 2021). Teachers and students during the learning

process associate their initial knowledge with the new knowledge they receive. This activity encourages students to actively think ahead, and predict and also serves the purpose of the reader, to confirm or find strong reasons for making hypotheses. In this activity, students activate the class by asking and answering other students so that the class that was previously only centered in one direction can now all active class content convey their predictions.

Students are required to play an active role in this reciprocal teaching and learning model. This learning can be done by forming discussion groups. Discussing studying biology lessons, we must understand the concept first so as not to cause a double meaning. Biological materials have the characteristics of understanding concepts that are interconnected (Tenzer, *et al.*, 2022). In learning biology, you must be able to understand the content of biological material which is very complex and cannot be sensed. Biological materials that have a high level of understanding must be absorbed by students, especially those relating to physiological concepts that cannot be sensed.

Understanding the concept of the process or mechanism of the reproductive system involves students' critical thinking skills. This is due to studying a process in the body that must be in order and cannot be arbitrary. In understanding the concept, there are many mistakes that hinder the initial concept of thinking. Reproductive system materials have a close relationship with students' critical thinking skills. Critical thinking is all or part of the process of questioning, analysis, synthesis, interpretation, inference, inductive and deductive reasoning, intuition, application, and creativity (Seibert, 2021). Critical thinking involves identifying elements of thinking, clarifying concepts, discovering assumptions, and considering other points of view.

The results of the data analysis research resulted in the average posttest score for the control class, an average value of 75.5, and the

experimental class an average value of 79.83. Both posttest scores are included in the criteria for having high critical thinking skills. The effect is caused by the posttest average score of students who use reciprocal teaching having a higher score than conventional. Learning before the reciprocal teaching model was carried out, some students were still not active because they did not have the courage to convey their ideas, so the ability to express opinions was still lacking.

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The data was analyzed by a prerequisite test which showed that the data was normally distributed and homogeneous, followed by data analysis using the t-test. Based on the results of the t-test calculation, it shows that the t-count value is 2.101 and then compared with the t-table for 5% db 58, the t-table is 2.0017. The basis for decision making counts $2.101 > t\text{-table } 2.0017$, then H_0 is rejected, so that it can be concluded that there is an effect of the Reciprocal Teaching learning model on the critical thinking skills of SMA Negeri 4 Madiun students.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the implementation of the teaching and learning

process with the reciprocal teaching learning model with the materials of the human reproductive system can be carried out smoothly. Students feel happy with the implementation of learning. Four reciprocal teaching strategies, namely summarizing, generating questions, clarifying and predicting.

The results of the control class study obtained an average posttest value of 75.5 and the experimental class with an average value of 79.83. Included in the criteria for having high critical thinking skills. The results of hypothesis testing with the t-test indicate that the value of t count (2.101) > t table (2.0017) then the decision making H_0 is rejected, so that there is an effect of the *Reciprocal Teaching* learning model on the critical thinking skills of SMA Negeri 4 Madiun students.

REFERENCES

- Agnaifa, D. N. (2019). Analisis Kemampuan Berpikir Kritis Siswa Dalam Pembelajaran Biologi. *Jurnal Florea*, 2(1), 45–53.
- Agustiningih, N. (2019). Melatih Keterampilan Komunikasi dan Kemandirian Belajar Siswa MA Melalui Model Pengajaran Terbalik (Reciprocal Teaching) pada Topik Pertumbuhan dan Perkembangan Tumbuhan. *Jurnal Program Studi Pendidikan Biologi*, 9(1), 30–42.
- Anggraeni, H., Rahayu, S., Rusdi, R., & Ichsan, I. Z. (2018). Pengaruh Reciprocal Teaching dan Problem Based Learning terhadap Kemampuan Berpikir Kritis Peserta Didik SMA pada Materi Sistem Reproduksi. *Biota*, 11(1), 77–95. <https://doi.org/10.20414/jb.v11i1.84>
- Ashegh Navaie, L. (2018). The Effects of Reciprocal Teaching on Reading Comprehension of Iranian EFL Learners. *Advances in Language and Literary Studies*, 9(4), 26. <https://doi.org/10.7575/aiac.all.v.9n.4p.26>
- Dewi, Putu Krisna Sandra Dewi, I Ketut Ardana, dan N. N. G. (2020). Model Reciprocal Teaching Berbasis Reinforcement Terhadap Kompetensi Pengetahuan IPA. *Journal for Lesson and Learning Studies*, 3(2), 183–190.
- Djamaluddin, A., & Wardana. (2019). Belajar Dan Pembelajaran. In A. Syaddad (Ed.), *CV Kaaffah Learning Center* (Cetakan 1). CV. Kaaffah Learning Center Selawesi Selatan.
- Ennis, R. H. (2018). Critical thinking across the curriculum: A vision. *Topoi*, 1(37), 165–184.
- Hartikainen, S., Rintala, H., Pylväs, L., & Nokelainen, P. (2019). The Concept of Active Learning and the Measurement of Learning Outcomes: A Review of Research in Engineering Higher Education. *Education Sciences*, 9(4), 9–12. <https://doi.org/10.3390/educsci9040276>
- Khasanah, B. A., & Ayu, I. D. (2017). Kemampuan Berpikir Kritis Siswa melalui Penerapan Model Pembelajaran Brain Based Learning. *Jurnal Ekspone*, 7(2), 8.
- Muslimin., Indaryanti., & Susanti, E. (2017). Pembelajaran Matematika dengan Model Reciprocal Teaching untuk Melatih Kecakapan. *Jurnal Pendidikan Matematika*, 11(1), 1–13.
- Mustofa, R. F., & Suciati, F. (2019). Pengaruh Pembelajaran Resiprocal Teaching terhadap Kemampuan Berpikir Kritis. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, 9(2), 131–140. <https://doi.org/10.30998/formatif.v9i2.3118>
- Oo, T. Z., Magyar, A., & Habók, A. (2021). Effectiveness of The Reflection-Based Reciprocal Teaching Approach for Reading Comprehension Achievement in Upper Secondary School in Myanmar. *Asia Pacific Education Review*, 22(4), 675–698. <https://doi.org/10.1007/s12564-021-09707-8>
- Pane, A., & Dasopang, M. D. (2018). Belajar Dan Pembelajaran. *FITRAH: Jurnal Kajian Ilmu-Ilmu Keislaman*, 3(2), 333. <https://doi.org/10.24952/fitrah.v3i2.945>
- Prasetyo, T. H. (2021). Penerapan Strategi Reciprocal Teaching untuk Meningkatkan Hasil belajar Mata Pelajaran Biologi pada Siswa Kelas XI IPA 1 MAN Banyuwangi Semester Ganjil Tahun Pelajaran 2020-2021. *Nusantara Hasana Journal*, 1(4), 95–101.
- Pratama, S., Idrus, A. Al, Kusmiyati, & Setiadi, D. (2020). Analisis Miskonsepsi pada Materi Sistem Reproduksi Siswa Kelas XI MAN 1 Lombok Barat Tahun Ajaran 2019/2020. *Jurnal Inovasi Pendidikan Dan Sains*, 1(3), 59–65. <http://ejournal.unwmataram.ac.id/JIPS/article/view/429>
- Rahmat, P. S. (2016). Peran Pendidikan dalam Membentuk Generasi Berkarakter Pancasila. *Jurnal Penelitian Pendidikan*, 03(02), 2. <https://www.journal.uniku.ac.id/index.php/pedagogi/article/view/1161/863>
- Ramadani, S. D., & Qibtiyah, M. (2021). Apakah Model Pembelajaran Reciprocal Teaching dapat Meningkatkan Minat Belajar dan Hasil Belajar Biologi Siswa SMA? *Jurnal Ilmiah Pendidikan Biologi*, 07(03), 123–132. <https://doi.org/https://doi.org/10.22437/bi>

o.v7i3.13369

- Safitri, A. (2020). Kemampuan Berpikir Siswa dalam Pembelajaran Matematika dengan Pendekatan Saintifik. *JPM: Jurnal Pendidikan Matematika*, 6(2), 117. <https://doi.org/10.33474/jpm.v6i2.5577>
- Sartono, N., Komala, R., & Dumayanti, H. (2016). Pengaruh Penerapan Model Reciprocal Teaching Terintegrasi Mind Mapping Terhadap Pemahaman Konsep Siswa Pada Materi Filum Arthropoda. *Biosfer: Jurnal Pendidikan Biologi*, 9(1), 20–27. <https://doi.org/10.21009/biosferjpb.9-1.4>
- Seibert, S. A. (2021). Problem-Based Learning: A Strategy to Foster Generation Z's Critical Thinking and Perseverance. *Teaching and Learning in Nursing*, 16(1), 85–88. <https://doi.org/10.1016/j.teln.2020.09.002>
- Supriyati, E., Setyawati, O. I., Purwanti, D. Y., Salsabila, L. S., & Prayitno, B. A. (2018). Profil Keterampilan Berpikir Kritis Siswa SMA Swasta di Sragen pada Materi Sistem Reproduksi. *Bioedukasi: Jurnal Pendidikan Biologi*, 11(2), 72–78. <https://jurnal.uns.ac.id/prosbi/article/view/32610>
- Tenzer, A., Handayani, N., & Daniarsih, A. (2022). Identifikais Miskonsepsi Materi Sistem Reproduksi pada Buku Teks SMA Kelas XI di Kota Malang. *Jurnal Pendidikan Biologi*, 13(1), 11–23. <https://doi.org/10.17977/10.17977/um052v13i1p11-23>