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The Use of Think-Read-Group-Share-Reflect (TRGSR) Strategy On Reproductive System Material Towards Improving Student's Critical Thinking

Dinda Nurul Aini[1]*, Ading Pramadi[2], Asrianty Mas'ud[3]
[1,2,3]UIN Sunan Gunung Djati, Indonesia
*Corresponding Author: dindaaini791@gmail.com

ABSTRACT

Students tend to be unconfident in asking questions about a problem, unable to understand and express the meaning of data, unable to assess the credibility of a source, unable to justify a reason with strong evidence, and unable to overcome thoughts that is only based on prejudice. This research aims to see the effect of the TRGSR strategy on improving critical thinking skills on reproductive system material. The research method used was quasi-experimental with a non-equivalent control group design. The results of research in classes using the TRGSR strategy show that the implementation of teacher and student activities is 82.5% (good). Improving critical thinking skills is high with an N-Gain value of 0.71 or 71%, while in the control class it is 0.57 or 57% (medium). The instrument used to measure the improvement of critical thinking skills using teacher and student activity observation sheets, learning response questionnaires, and multiple-choice questions based on Facione (2011) critical thinking indicators. The population of this study was all class XI MIPA of the 2023/2024 academic year with a total of 177 students in five classes. The sample used was two classes, experimental class and the control class of 71 students. Results of the hypothesis test obtained a Sig. value. (2-tailed) 0.046 (< 0.05) which means H_0 is rejected and H_1 is accepted, so the TRGSR strategy has a positive and significant effect on improving student's critical thinking skills on reproductive system material. The student's response to the reproductive system in the class with the TRGSR strategy was 74.06% (good).

Keywords: critical thinking, reproductive system, think-read-group-share-reflect

INTRODUCTION

Critical thinking is one of the most important 21st century skills that must be possessed. According to Facione (2011), critical thinking is thinking that has a purpose (proving something, interpreting the meaning of something, solving a problem). For students, this critical thinking can facilitate the absorption of material presented by the teacher, be sensitive to the problems faced, and be a tool for solving problems (problem solving). Critical thinking can make students critical and able to solve all problems so that later students are able to make the right decisions. This will certainly have a positive influence on learning outcomes (Dewi et al., 2023)

Based on an interview with a Biology teacher at one of the Madrasah 'Aliyyah in Bandung City, the critical thinking skills of grade XI MIPA students are still lacking overall. Students tend to be unconfident in asking questions about a problem, lacking in understanding and expressing the meaning of data, lacking in assessing the credibility of a source, lacking in justifying a reason with strong evidence, and lacking in being able to overcome thoughts that are only based on prejudice. In addition to student factors, the learning process in the classroom is still centered on the teacher, where the process of delivering material is carried out verbally by the teacher to students. This kind of learning tends to make students dependent on the teacher so that they are less able to explore and search for information, thus making students' critical thinking skills less honed.

Biology is a subject that is rich in content. Grade XI Biology material focuses on material related to organ systems that are quite complex and complicated, such as the movement system, circulation (cardiovascular), digestion, respiration, excretion, coordination system, reproductive system, and immune system. This organ system material is considered difficult by students, especially the Reproductive System chapter. Based on interviews with Biology teachers, students lack understanding of concepts in the reproductive system, including gametogenesis and the menstrual cycle. This is reinforced by research by Hairy, M. R., Kusmiyati, Yamin (2018) whose results showed that the percentage of mastery of the concept of reproductive system material for grade XI MIPA students in all State Senior High Schools in Mataram City in the category of not understanding the concept was 51%, misconceptions 38% and understanding the concept 11%. The difficulty in the Reproductive System chapter is the reason for the need for critical thinking because more reasoning is needed to understand the material.

In addition to the difficulty in understanding the concept of reproductive system material, there are other reasons why improving critical thinking skills in reproductive material needs to be done. The reasons are the increasing cases of unplanned pregnancies, sexual deviations, the proliferation of sexually transmitted infections, and a free sex lifestyle among teenagers. Facione (2011) in his writing stated, "Failure to think critically contributes to patient deaths, loss of income, ineffective law enforcement, loss of jobs,..., bad decisions, unplanned pregnancies,...". If students are invited to think critically about the potential dangers that arise from unplanned and unhealthy sexual activities, then cases that threaten the lives of this nation's generation will not occur.

Numerous researchers in science education (Driver et al., 2000; Duschl & Osborne, 2002) advocate for a transformation in pedagogical approaches, shifting from a teacher-centered framework to one that is learner-centered, with a focus on collaborative and constructivist learning. As a result, several instructional strategies have been introduced in recent years, including the 5E model—Engage-Explore-Explain-Extend-Evaluate (Bybee et al., 2006), the Science Writing Heuristic (Wallace & Hand, 2004), and the Argument Driven Inquiry model (Sampson et al., 2011), to support the construction of explanations regarding natural phenomena and to facilitate sharing them in small groups or during full-class discussions. One of the collaborative and constructivist learning strategies that can be a solution to this problem is the

TRGSR strategy. The TRGSR (Think-Read-Group-Share-Reflect) strategy is a strategy developed by Giri & Paily (2020). This strategy is similar to the TWPS (Think-Write-Pair-Share) strategy which is a result of improvements to the TPS (Think-Pair-Share) developed by Frank Lyman in 1981. Research conducted by Giri & Paily (2020) concluded that students who were exposed to the TRGSR strategy were proven to improve critical thinking skills compared to traditional teaching approaches. The TRGSR steps are teacher-friendly to implement. The steps of the TRGSR strategy are (1) Think: students think about the problems given. (2) Read: students read the handouts given individually related to the problem (3) Group: forming groups; explore concepts via the internet, (4) Share: groups present their arguments, and (5) Reflect: groups reflect (Giri & Paily, 2020). Based on the statement above, it is very appropriate if the TRGSR strategy is used in learning to help improve critical thinking skills in Biology subjects, especially reproductive system material.

Previous studies related to the TRGSR strategy, such as those conducted by (Isnaeni, 2021), (Zahra, 2021), and (Angelina, 2022), produced positive conclusions regarding the use of the TRGSR strategy with classroom learning. The dependent variables of these previous studies are sequentially the ability to collaborate and understand concepts, literacy skills, and creative thinking skills. The novelty and purpose of this study is that this study examines the effect of the TRGSR strategy on improving critical thinking skills in organ system material, namely the reproductive system, which has not been studied before.

METHOD

This research was conducted on May 3 to May 17, 2024 at one of the Madrasah 'Aliyyah in Bandung city. The population of this study was all class XI MIPA of the 2023/2024 academic year with a total of 177 students in five classes. The sample used was two classes, namely the experimental class and the control class of 71 people taken using the purposive sampling method.

The research method used in this study is a quasi-experimental method with a non-equivalent control group design described in table 1, where both groups are given a pretest, then experimental class was given learning with the TRGSR strategy, while the control class was given learning without the TRGSR strategy (Djaali, 2020). Learning in the control class used strategies that are usually used by biology teachers that are centered on students. The focus of the study is to see the effect of increasing critical thinking skills of class XI MIPA students using the TRGSR strategy.

Table 1. Non-Equivalent Control Group Research Design

Class	Pretest	Treatment	Posttest
Experiment	O_1	X	O_2
Control	O_3	-	O_4

(Rukminingsih et al., 2020)

Information :

O_1 : The average value of initial critical thinking skills in the experimental class

O_2 : The average value of critical thinking skills in the experimental class
O_3 : The average value of initial critical thinking skills in the control class
O_4 : The average value of critical thinking skills in the control class
X : Learning with TRGSR strategy
- : Learning without TRGSR strategy

The instrument used to measure the improvement of critical thinking skills using teacher and student activity observation sheets, learning response questionnaires, and multiple-choice questions based on Facione (2011) critical thinking indicators as many as 40 questions were created with expert guidance which were then tested and 25 questions were obtained with significant validity, good reliability, sufficient distinguishability, good distractor levels, and varying levels of difficulty (six easy questions, eighteen medium, one hard). The data obtained were tested for normality and homogeneity and then the hypothesis was tested using an independent sample T-test (Kusuma & Fridayani, 2023) using SPSS version 26.

RESULT AND DISCUSSION

The results of observations of the implementation of teacher and student activities can be seen in table 2. Based on table 2, the average percentage value of teacher and student activities during two meetings in the experimental class was 82.5%, which indicates very good learning implementation. According to (Basam, 2022), the implementation of learning activities shows the percentage of the teacher's ability to implement each learning syntax and shows the percentage of student activity and participation when participating in learning (T. Dewi et al., 2022). If the TRGSR strategy syntax is implemented well, it will have a positive effect on learning.

Table 2. Results of Observations of Teacher and Student Activities in Experimental and Control Classes

Class	Object of Observation	Meeting	Mark	Category	Average	Category
Experiment	Teacher	1st	85%	Very good	85%	Very good
		2nd	85%	Very good		
	Learners	1st	85%	Very good	80%	Good
		2nd	75%	Good		
Control	Teacher	1st	73%	Good	80%	Good
		2nd	87%	Very good		
	Learners	1st	73%	Good	80%	Good
		2nd	87%	Very good		

Student response data in learning was obtained from filling out student response questionnaires in classes with and without the TRGSR strategy. The results of the recapitulation of student responses in the experimental and control classes can be seen in table 3. Student responses to learning reproductive system material with the TRGSR strategy were 74.06% with a good category. According to Ani (2019), good student responses are useful in increasing

student motivation, self-confidence, and academic skills. Student motivation to learn is one factor that can encourage students to achieve learning goals. High learning motivation can increase mastery of learning materials and develop students' critical thinking skills to find solutions to solve the problems they face (Dayanti et al., 2024). Self-confidence is also related to critical thinking. Critical thinking skills can be developed by students having to have a sense of trust or confidence in their abilities without anxiety and doubt (Shandy, 2023), especially confidence in expressing the meaning of data, identifying reasons and claims, drawing conclusions, and assessing the credibility of sources which are indicators of critical thinking according to Facione (2011). The increase in each indicator of critical thinking occurs because each TRGSR strategy syntax can improve critical thinking skills.

In the control class, the percentage of learning implementation was lower than the experimental class and the results of the student response questionnaire showed that students in the control class felt uninterested in teacher-centered strategies because learning dominated by the teacher made students feel bored and fed up (Umamah et al., 2019).

Data on the increase in student's critical thinking skills on the reproductive system material in the experimental and control classes were obtained from the N-Gain calculation. The increase in critical thinking skills on the reproductive system material in the experimental and control classes can be seen in table 4. There was an increase in student's critical thinking in learning the reproductive system material in each indicator of critical thinking skills in the class using the TRGSR strategy as evidenced by the N-Gain value of 0.71 with a high category. This positive and significant influence is supported by the implementation factors of teacher and student activities during learning, student responses to learning, and an increase in KBKr. This means that the TRGSR strategy can be a solution to increase student KBKr. This strategy facilitates collaborative learning in which there is collaboration and interaction between each individual to work together in groups to achieve common goals (Susanti, 2021). Ramdani, et al. (2022) stated that collaborative learning provides 70 major criteria influences on critical thinking, creative thinking, and major criteria influences on metacognitive skills. Research by Nisa et al. (2023)also stated that there is an influence of the application of collaborative learning in improving critical thinking and creativity of students.

Table 3. Student Responses in Experimental and Control Classes

No.	Indicator	Experimental Class		Control Class	
		Average Percentage of Indicator (%)	Category	Average Percentage of Indicator (%)	Category
1.	Shows motivation to learn more about reproductive system material	77	Good	73.5	Good

No.	Indicator	Experimental Class		Control Class	
		Average Percentage of Indicator (%)	**Category**	**Average Percentage of Indicator (%)**	**Category**
2.	Demonstrate positive feelings towards learning in class	70.3	Good	65.3	Good
3.	Demonstrate increased understanding after implementing learning	74	Good	74.5	Good
4.	Shows a sense of ease when answering questions after completing learning in class	68	Good	70.5	Good
5.	Demonstrate a desire to apply the knowledge learned in everyday life	81	Very good	85.25	Very good
	Average	74.06	Good	73.81	Good

In the first indicator, interpretation, students are able to categorize which are male sex hormones and which are female sex hormones. In the code-breaking sub-indicator, students are able to break a code to answer the problem of contraceptive methods through the keywords mechanical barrier and contraceptive method for Mr. Fulan. Mechanical barrier means a contraceptive method that prevents sperm from entering the Fallopian tubes and contraceptive method for Mr. Fulan means a contraceptive method for men. Many students answered correctly with the answer vasectomy, although some students answered tubectomy. In the sub-indicator clarifying the intent, students are able to clarify the intent of the translation of Surah al-Hajj verse 5 about the process of human creation. Interpretation skills can be improved at the thinking and group stages because at this stage students are asked to understand and express the intent of the reproductive system problem through group discussions. Interpretation skills are useful for students to interpret and conclude data acquisition in order to obtain information or an overview of the existing problems to gain an understanding of a concept, so that it will be easy to learn the material being taught (Sa'adah et al., 2020).

In the second indicator, analysis, students are able to consider what ideas will be taken if there is a case of premature rupture of membranes. In the argument identification sub-indicator, students are able to identify whose argument is correct in describing the gametogenesis process. In the reason and claim identification sub-indicator, students are able to identify whose reasons and claims are correct regarding the relationship between hormones and the condition of follicles and endometrium in the menstrual cycle graph. During learning, a student asked "If semen and

urine come out of the same channel (ureter), why is semen pure while urine is impure?" This shows that students are able to analyze problems related to two types of fluids that come out of one channel but have different properties. Analytical skills can be improved at the group and presentation stages because at this stage students are asked to consider ideas, identify arguments, reasons, and claims through group discussions and consider arguments, reasons, and claims from the questioning group. According to research by Setiawaty et al. (2019), analytical skills can enable students to apply logical thinking to analyze information, identify problems, find solutions to these problems and find ways to solve problems in everyday life.

Table 4. N-Gain Calculation in Experimental Class and Control Class

Critical Thinking Indicators	**Experiment**		**Control**	
	N-Gain	**Category**	***N-Gain***	**Category**
Interpretation	0.67	Medium	0.62	Medium
Analysis (Analysis)	0.68	Medium	0.43	Medium
Inference (Inference)	0.65	Medium	0.55	Medium
Evaluation	0.67	Medium	0.61	Medium
Explanation	0.69	Medium	0.58	Medium
Self Regulation (Self-Regulation)	0.88	High	0.84	High
Average	0.71	High	0.57	Medium

In the third indicator, inference, students are able to question the implied evidence regarding sexually transmitted infections. In the alternative assumption sub-indicator, students are able to provide a hypothesis regarding what menstrual disorders occur in a woman. In the sub-indicator of drawing valid or logically justified conclusions, students are able to provide conclusions regarding the differences between monozygotic and dizygotic twins from the picture. Inference skills can be improved at the reflection stage because at this stage students are asked to perfect their arguments by drawing conclusions. Inference skills or drawing conclusions have the advantage of making a conclusion about a phenomenon (Zahro & Pertiwi, 2021), especially phenomena related to the reproductive system in everyday life, such as the phenomenon of the proliferation of sexually transmitted infections (STIs) due to promiscuity.

In the fourth indicator, evaluation, students are able to assess the credibility of claims by assessing whether someone's claim that drinking ice water during menstruation can inhibit menstrual blood flow is credible or not. In the sub-indicator assessing the quality of arguments made using inductive and deductive reasoning, students are able to assess someone's claim whether their statement is very acceptable, quite acceptable, or unacceptable regarding whether twins in their mother's womb are monozygotic or dizygotic twins based on ultrasound results. Evaluation skills can be improved at the presentation stage (share) because at this stage students are asked to assess the quality of the arguments and the credibility of the sources used by the group that is presenting. The skill of assessing the credibility of sources is important for students

to choose which sources they can use to help them solve problems. Therefore, this skill is important for students to have (Warsita et al., 2018).

In the fifth indicator, explanation, students are able to state the results of laboratory tests regarding the infertility conditions of men A, B, C, and D based on the sperm phenotype table. In the sub-indicator justifying the spermatogenesis procedure in men. In the sub-indicator providing arguments, students are able to provide arguments about whether a woman can get pregnant if one of her ovaries is removed. Explanation skills can be improved at the presentation stage (share) because at this stage students are asked to state the results and arguments obtained from the results of group discussions. Argumentation skills are one of the most important skills to have in science learning because students must be able to provide scientific explanations of phenomena and use them to solve problems (Hardini & Alberida, 2022).

In the sixth indicator, self-regulation, students are able to monitor themselves if they find a lump in the breast or armpit area, they must immediately check it with a doctor. In the self-correction sub-indicator, students are able to reflect on the Surah al-Isra' verse 32 regarding adultery which can lead to self-destruction. Self-regulation skills can be improved at the reflection stage because at this stage students and teachers are asked to monitor and correct together. Self-regulation skills are very important for students to plan, organize, and direct behavior to achieve certain goals that involve physical, cognitive, and motivational elements (Nugraha & Suyadi, 2019).

In the control class, there was an increase in critical thinking skills in each indicator after using a teacher-centered strategy. However, the increase was not as high as in the class using the TRGSR strategy. This happened because the teacher-centered strategy made students feel bored and fed up. Data to see the effect of TRGSR strategy on improving critical thinking skills in reproductive system material were obtained from normality test, homogeneity test, and hypothesis test from the results of pretest and posttest analysis. Based on the results of the normality test, the data in the experimental class and in the control class were normally distributed with homogeneous posttest value variance. The results of the hypothesis test with the t-test in the class using the TRGSR strategy had a Sig. (2-tailed) value of 0.046 or H_0 rejected and H_1 accepted, which means that the TRGSR strategy in learning reproductive system material has a positive and significant effect on improving students' critical thinking skills.

The positive and significant influence is supported by the excellent implementation of the TRGSR strategy, good student responses, and increased critical thinking skills in each indicator in classes using the TRGSR strategy. According to Basam (2022), the implementation of learning activities shows the percentage of teachers' ability to implement each learning syntax and shows the percentage of student activity and participation when participating in learning (F. A. Dewi et al., 2021). If the TRGSR strategy syntax is implemented well, it will have a positive influence on learning. According to Ani (2019), good student responses are useful in increasing students' motivation, self-confidence, and academic skills, which will have a positive effect on their critical thinking skills. The increase in each critical thinking indicator occurs because each TRGSR strategy syntax can improve critical thinking skills.

In addition, previous studies have stated that the TRGSR strategy facilitates collaborative and constructivist learning that can improve critical thinking skills (Giri & Paily, 2020). Collaborative learning has a large category influence on critical thinking, creative thinking, and a large category influence on metacognitive skills (Ramdani et al., 2022). Tuysuz & Tuzun (2020) stated that the TRGSR strategy makes a positive contribution to the development of students' critical thinking in forensic chemistry activities. Zahra's research (2021) shows that the TRGSR strategy also has a positive effect on improving creative thinking skills. According to Wati & Sari (2023), creative thinking skills are related to critical thinking skills (with a perfect correlation and a regression coefficient of 99%) because when students think creatively, especially when writing or conveying their ideas, in line with that their critical thinking skills will be the basic thing that will lead them to think logically to consider answers that are in accordance with the problems they want to solve. Research by Diana et al. (2021) and Angelina, (2022) stated that the TRGSR strategy also has a positive effect on improving literacy skills. According to Rohman (2022), the higher the literacy skills of students, the higher the level of criticality of students in receiving, processing, and responding to the information received. Isnaeni's (2021) research states that the use of TRGSR learning strategies can improve students' mastery of material concepts. According to Istiqamah et al. (2019), if students' conceptual understanding is high, then students' critical thinking skills will also be high because to understand a concept, students must be able to interpret (interpretation) and also conclude (inference) according to the concept of the material being taught.

Meanwhile, in the class without TRGSR strategy, there was no influence of TRGSR strategy on improving students' critical thinking skills in learning reproductive system material with a Sig. value of 0.298 or H_0 accepted and H_1 rejected. This is supported by the percentage of learning implementation which is lower than the experimental class, the results of student responses indicating that students in the control class feel uninterested in teacher-centered strategies, and the N-Gain value of 0.57 with a moderate category.

CONCLUSION

The TRGSR strategy in learning reproductive system material has a positive and significant effect on improving students' critical thinking skills. Based on the findings of the research results, there are several suggestions to complete the research and for further research, namely 1) students are expected to read the handouts that have been given so that during learning they are ready to carry out two-way discussions with groups, 2) educators are expected to condition students to be ready to carry out learning with the TRGSR strategy, and 3) further researchers can examine this TRGSR strategy with other dependent variables, such as high-level thinking skills, creative thinking skills, argumentation skills, and others.

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