



## **The effect of the make a match model on critical thinking skills and student motivation in reproductive system material**

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**Abstract.** The critical thinking skills and motivation to learn of grade XI students at State High School in Yogyakarta need improvement, as 21st-century biology learning requires students to develop these skills. Therefore, Critical Thinking Skills can be achieved by applying appropriate learning models. The purpose of this study is to determine the effect of applying the Make a Match learning model on the Critical Thinking Skills and learning motivation of high school grade XI students in the material on the human reproductive system. The research design was a quasi-experimental study using a Non-Equivalent Pretest Posttest Control Group Design. The research was conducted at a State High School in Yogyakarta, involving all grade XI science students. The research sample was determined through purposive sampling, with class XI Science 2 as the experimental class and class XI Science 5 as the control class. The data collection technique in this study uses observation, tests, and the distribution of questionnaires. The data analysis technique used a nonparametric statistical analysis. The results showed that the Make a Match learning model had an effect on critical thinking skills and students' learning motivation in the experimental class, with a significance value of 0.001 ( $p < 0.05$ ). The results of this study can serve as an innovative alternative learning strategy in biology to improve critical thinking skills and students' motivation to learn. The application of this model encourages active engagement, social interaction, and collaborative concept analysis processes.

**Keywords:** *Critical thinking skills, Human reproductive system, Learning motivation, Make a match*

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## **INTRODUCTION**

Education is currently in the 21st century, an era known as the Industrial Revolution 4.0, characterized by rapid development in science and technology (Sutrisna, 2021). Education in the 21st century requires students to master several essential skills. The skills in question are 21st-century skills. The National Education Association has identified 21st-century skills as "The 4Cs" skills (Redhana, 2019). The US-based Partnership for 21st Century Skills identifies competencies needed in the 21st century, namely "The 4Cs," including communication, collaboration, critical thinking, and creativity (Khoirunnisa & Habibah, 2020).

Critical Thinking Skills help in cognitive, social, mental, moral, and scientific development (Herlinawati et al., 2024). With Critical Thinking Skills taught in schools, students can gain an in-depth understanding of the meaning of an event, process information, draw conclusions, and build their own knowledge (Diniyyah et al., 2022). Based on the competencies of 21st-century learning, education is expected to develop students with strong critical thinking, creativity, communication, and collaboration, enabling them to play an active role in solving existing problems and thereby improving their thinking skills (Fahrudin et al., 2025).

Based on interviews with biology teachers at SMA Negeri in Yogyakarta, one problem in the classroom is that students' learning motivation is relatively low because the teaching methods used by teachers are conventional, namely lectures and assignments. In addition, it is also caused by the use of mobile phones during learning, which disrupts students' concentration. Research by Inapi (2018) shows that students' low motivation and learning

outcomes are influenced by teachers who still use the lecture method, which is teacher-centered, so learning is not optimal. In general, students' motivation to learn is very lacking, this can be seen from the attitude of students who are not enthusiastic, and are not ready to participate in learning, so that the learning atmosphere is less active, the interaction between teachers and students or students with students is very lacking, students tend to be passive, only accept what the teacher gives, as a result the learning outcomes of students are low (Zaharah & Susilowati, 2020). This is in line with research by Utomo et al. (2020), that critical thinking skills in schools are still relatively low, one of which is because students tend to be passive and only accept the material given by the teacher, do not take the initiative to ask questions, and seem to pay less attention to the learning that is carried out.

The implementation of learning can take place more actively if the learning model used can actively and effectively involve students to achieve the expected goals (Nuraeni & Syihabuddin, 2020). However, in its implementation, the learning model remains conventional, so it is considered less varied and monotonous (Makrifah, 2020). This condition causes students to feel bored and uninterested because they are not interested in the learning that takes place. This is in line with Makrifah's (2020) research, which found that the use of monotonous conventional methods actually makes students bored and less enthusiastic about learning, as evidenced by students' lack of focus when the teacher delivers instruction.

One suitable learning model is the Make a Match model, which is used to train students to be more careful and better understand the material. The Make a Match model can foster cooperation when answering questions by matching cards, making learning more interesting and enthusiastic, and increasing students' activity as they look for card pairs (Kurniasih & Berlin, 2015). According to Huda (2013), in the Make a Match model, students work through five stages, namely (1) group and card division, (2) finding card pairs, (3) presenting answers, (4) giving sanctions and awards, and (5) confirmation.

Grade XI high school students in Yogyakarta have critical thinking skills but low learning motivation, so appropriate learning strategies and models are needed to improve their learning. The Make a Match model has never been used in high school, so this research will examine the effects of its implementation on critical thinking skills and students' motivation to learn. This research can serve as an innovative learning strategy in biology to enhance critical thinking skills and increase students' motivation to learn. Its implementation facilitates active participation, strengthens social interaction, and encourages collaborative concept analysis. Appropriately, educators can integrate this model into learning planning and implementation, especially for materials with conceptual characteristics and high complexity.

## **METHODS**

The research design was a quasi-experimental study using a Non-Equivalent Pretest Posttest Control Group Design. The research was conducted at a high school in Yogyakarta from May 6-15, 2024. The study population consists of all students in grade XI majoring in science. The sample determination was based on class considerations, with an average score in the previous semester that was nearly the same. The Mid-Semester Assessment Score in class XI Science 2 is 57.94, while class XI Science 5 is 55.54. Based on interviews with biology teachers at SMA Negeri in Yogyakarta, it is evident that grades XI Science 2 and XI Science 5 are treated as equal classes in the implementation of the learning process. Thus, class XI Science 2 was designated as an experimental class using the Make a Match model, and class XI Science 5 as a control class using a direct learning model.

The data collection technique in this study uses observation, tests, and the distribution of questionnaires. The instruments used consist of Learning Implementation Plans, Student Worksheets, learning media, observation sheets for learning implementation, and pretest and posttest questions to measure Critical Thinking Skills. The instrument is validated by lecturers

as material experts and learning experts, so that research instruments suitable for use are obtained through revision.

The data analysis of the research results involved descriptive and inferential statistical analyses using SPSS version 25.0 for Windows. Descriptive statistical analysis was conducted to examine average grades, class intervals, maximum grades, and minimum scores for Critical Thinking Skills and learning motivation data. Meanwhile, inferential statistical analyses were conducted using the Kolmogorov-Smirnov test for normality and the Kruskal-Wallis test for homogeneity. The data were not normally distributed, so nonparametric tests were used: the Mann-Whitney U test and the Wilcoxon test.

## RESULTS AND DISCUSSION

### Results

#### *Observation of learning implementation*

The results of the comparison of the percentage of implementation of the learning model syntax and the Learning Implementation Plan (RPP) based on observations of learning implementation in the experimental class and the control class are shown in Table 1.

**Table 1. Results of Learning Observation in the Classroom**

No.	Meetings	Percentage of Learning Implementation	
		Experimental Classes	Control Class
1.	First	100%	93%
2.	Second	100%	93%
3.	Third	100%	93%
4.	Fourth	100%	93%

Based on the observational results, learning in the experimental and control classes was in accordance with the learning design. However, the implementation of learning activities in each meeting in the control class did not reach 100% because one learning stage was not carried out: presenting the results of the discussion.

#### *Critical Thinking Skills*

##### *Descriptive Statistical Analysis*

The results of the descriptive statistical analysis of the pretest and posttest scores for Critical Thinking Skills of students in the experimental and control classes are shown in Table 2.

**Table 2. Results of descriptive statistical analysis of critical thinking skills**

Aspects/Components	Experimental Classes		Control Class	
	Pretest	Posttest	Pretest	Posttest
N	36	36	36	36
NMin	40	65	10	55
NMax	70	95	70	85
Mean	55.14	79.86	45.14	73.33

Based on the results of the descriptive statistical analysis, the average level of Critical Thinking Skills of students in the experimental class pretest is higher, at 55.14, than that of the control class pretest, at 45.14. Then, on average, the level of Critical Thinking Skills of students in the experimental class on the posttest was also higher, with a score of 79.86, than that of the control class, with a score of 73.33.

## *Inferential Statistical Analysis*

### Normality Test

The results of the normality test of *pretest* and *posttest* scores of Critical Thinking Skills of students in the experimental class and control class are shown in Table 3.

**Table 3. Normality test results**

No.	Classes	Sig.	Results	Interpretation
1.	<i>Experimental Class</i> Pretest	0.051	$p > 0.05$	Normally Distributed Data
2.	<i>Posttest</i> Experiment Class	0.078	$p > 0.05$	
3.	<i>Control Class</i> Pretest	0.065	$p > 0.05$	
4.	<i>Control Class</i> Posttest	0.086	$p > 0.05$	

Based on the results of the normality test, the overall results of the data were obtained sequentially with a Sig. value of  $> 0.05$ . Therefore, it can be concluded that the research data are normally distributed.

### Homogeneity test

The results of the homogeneity test of *pretest* and *posttest* scores of Critical Thinking Skills for students in the experimental class and control class are shown in Table 4.

**Table 4. Homogeneity test results**

	Sig.	Result	Interpretation
<i>Pretest</i>	0.001	$p < 0.05$	Inhomogeneous Data
<i>Posttest</i>	0.324	$p > 0.05$	Data Homogen

Based on the results of the homogeneity test, the Sig. value of the experimental class was 0.001 ( $p < 0.05$ ), while the control class was 0.324 ( $p > 0.05$ ). Because one of the results has a Sig. A p-value  $< 0.05$  indicates that the data is heterogeneous.

The data on the pretest and posttest results in the experimental and control classes were found to be normally distributed but not homogeneous. Thus, the analyses carried out were the Mann-Whitney U nonparametric test and the Wilcoxon test.

### Mann-Whitney U test

The results of the Mann-Whitney U test on the posttest scores of Critical Thinking Skills for students in the experimental and control classes are shown in Table 5.

**Table 5. Mann-Whitney test result**

	Sig.	Result	Interpretation
Mann-Whitney U test	0.001	$p < 0.05$	$H_0$ Rejected

Based on the results of the Mann-Whitney U test, a Sig. (2-tailed) value of 0.001 ( $p < 0.05$ ) was obtained, which could be concluded that the hypothesis was accepted. Thus, there is a difference in the average Critical Thinking Skills between the experimental and control classes in the students' final scores.

### Wilcoxon test

The results of the Wilcoxon test on the Critical Thinking Skills of the experimental and control class students are shown in Table 6.

**Table 6. Wilcoxon test result**

	Sig.	Result	Interpretation
Eksperimen	0.000	$p < 0.05$	$H_0$ Rejected
Kontrol	0.000	$p < 0.05$	

Based on the results of the Wilcoxon test, all data with a Sig. (2-tailed) value of 0.000 ( $p < 0.05$ ) was obtained, which could be concluded that the hypothesis was accepted. Thus, it can be said that there is a difference in Critical Thinking Skills between the experimental class and the control class from the pretest and posttest results.

### ***Learning motivation***

The results of filling out the learning motivation questionnaire for each indicator are shown in Tables 7 and 8.

**Table 7. Results of the experimental class learning motivation questionnaire**

No.	Learning Motivation Indicators	Answer				Total
		Score 1	Score 2	Score 3	Score 4	
1.	Desire and the desire to succeed	7	118	459	132	716
2.	Drive and need to learn	1	78	357	84	520
3.	Future hopes and aspirations	3	72	384	196	655
4.	Rewards in learning	2	58	96	36	192
5.	Interesting learning activities	1	6	165	52	224
6.	Conducive learning environment	1	22	231	76	330

Based on Table 7, the highest indicators of learning motivation in the experimental class are desire and desire to succeed, while the lowest indicator is appreciation of learning.

**Table 8. Results of the control class learning motivation questionnaire**

No.	Learning Motivation Indicators	Answer				Total
		Score 1	Score 2	Score 3	Score 4	
1.	Desire and the desire to succeed	24	126	324	228	702
2.	Drive and need to learn	10	84	282	136	512
3.	Future hopes and aspirations	9	76	324	244	653
4.	Rewards in learning	11	46	63	68	188
5.	Interesting learning activities	0	4	141	92	237
6.	Conducive learning environment	3	26	186	120	335

Based on Table 8, it can be found that the highest indicators of learning motivation in the control class are desire and the desire to succeed. In contrast, the lowest indicator of learning motivation is appreciation of learning.

### ***Descriptive statistical analysis results***

The results of the descriptive statistical analysis of learning motivation data for students in the experimental and control classes are shown in Table 9.

**Table 9. Descriptive Statistical Analysis of Learning Motivation**

Aspect	Experimental Classes	Control Class
N	36	36
NMin	66	55
NMax	90	74
Mean	73.25	63.83

Based on the results above, the average learning motivation of students in the experimental class was higher, at 73.25, than that of students in the control class, at 63.83.

### *Inferential statistical analysis*

#### Normality test result

The results of the normality test of learning motivation data for students in the experimental and control classes are shown in Table 10.

**Table 10. Normality test result**

	<b>Sig.</b>	<b>Result</b>	<b>Interpretation</b>
Experiment	0.004	$p < 0.05$	Abnormally Distributed Data
Control	0.200	$p > 0.05$	Normally Distributed Data

Based on the results of the normality test, the Sig. value of the experimental class was 0.004 ( $p < 0.05$ ), while the control class was 0.200 ( $p > 0.05$ ). Because one of the results has a Sig. A  $p$ -value  $< 0.05$  indicates that the data is abnormally distributed.

#### Homogeneity test result

The results of the homogeneity test for learning motivation data for students in the experimental and control classes are shown in Table 11.

**Table 11. Homogeneity test result**

	<b>Sig.</b>	<b>Result</b>	<b>Interpretation</b>
Learning Motivation Questionnaire	0,332	$p > 0,05$	Data Homogen

Based on the results of the homogeneity test, a Sig value of 0.332 ( $p > 0.05$ ) was obtained. So it can be concluded that the data is homogeneous. The data from the learning motivation questionnaire in the experimental and control classes were declared abnormal and homogeneous. Thus, the analyses carried out were the Mann-Whitney U nonparametric test and the Wilcoxon test.

#### Mann-Whitney U test result

The results of the Mann-Whitney U test on the learning motivation data for students in the experimental and control classes are shown in Table 12.

**Table 12. Mann-Whitney U test result**

	<b>Sig.</b>	<b>Result</b>	<b>Interpretation</b>
Uji Mann-Whitney U	0.000	$p < 0.05$	$H_0$ Rejected

Based on the results of the Mann-Whitney U test, a Sig. (2-tailed) value of 0.000 ( $p < 0.05$ ) was obtained, which could be concluded that the hypothesis was accepted. Thus, there is a difference in average learning motivation between the experimental and control classes.

#### Wilcoxon test result

The results of the Wilcoxon test on the learning motivation data of students in the experimental and control classes are shown in Table 13.

**Table 13. Wilcoxon test result**

	<b>Sig.</b>	<b>Result</b>	<b>Interpretation</b>
Wilcoxon test	0.000	$p < 0.05$	$H_0$ Rejected

Based on the results of *the Wilcoxon test*, a Sig. (2-tailed) value of 0.000 ( $p < 0.05$ ) was obtained, which could be concluded that the hypothesis was accepted. Thus, there is a difference in learning motivation between the experimental and control classes.

## Discussion

### *Critical thinking skills*

Based on the observation results, the implementation of learning in both classes is in accordance with the prepared learning implementation plan. However, the implementation of learning activities in each meeting in the control class did not reach 100% because the stage of presenting the discussion results was not carried out. Teachers' learning implementation should align with the learning implementation plan prepared beforehand. This is because the learning implementation design serves as a benchmark for classroom learning. Teachers must be able to implement the learning plan to achieve the set learning goals (Aprilia et al., 2022).

The aspects of critical thinking indicators according to Nitko & Brookhart (2014) are: (1) providing simple explanations (*elementary clarification*), including: focusing on questions, analyzing arguments, and asking clarification questions; (2) building basic support skills, including: assessing whether sources are reliable and assessing observation reports; (3) *inferences*, including: assessing conclusions deductively, making conclusions inductively, and making judgments; (4) provide *advanced clarification*, including: explaining definitions and identifying assumptions; and (5) developing strategies and *tactics*, including determining an action, interacting with others, and identifying rhetorical and tactical mechanisms. The results of implementing the Make a Match learning model are based on students' final test scores, which reflect their performance on questions aligned with the Critical Thinking Skills indicator.

The application of the Make a Match learning model is a good effort in learning biology, especially for the material on the human reproductive system. This is because the learning model involves many students working together to find card pairs. In addition, selecting material on the human reproductive system for students is quite difficult because many scientific terms must be understood. The number of Latin terms that are difficult to remember and the number of organs in the reproductive system are factors that hinder students' understanding of the material (Achmad & Pea, 2020). Thus, the Make a Match learning model is considered suitable for classroom use with material on the human reproductive system.

Based on observations of student learning activities, there is a difference in the learning activities of students in the experimental class using the Make a Match model and the control class using direct learning. Learning activities in the experimental class are conducted using the Make a Match syntax to create an active and fun learning atmosphere. When the treatment was delivered in the experimental classroom using the Make A Match model, the students became more active and enthusiastic in learning, thereby increasing their ability to think critically (Rahmasari & Nuriadin, 2022). This condition can support the achievement of students' Critical Thinking Skills, according to the measured indicators.

Critical Thinking Skills on indicators provide simple explanations, namely focusing questions, analyzing arguments, and asking clarification questions. Students are expected to focus on the questions by determining the main problem, formulating a problem statement from the presented discourse, and providing a simple explanation based on the information. The aspect of providing a simple explanation is being able to resolve, analyze and provide explanations based on information in the form of clear and relevant facts (Utari & Muttaqin, 2021). This is in line with Hardianti's (2014) research that the aspect of providing basic explanations can be shown that in solving chemistry problems, students have focused on what the problem is, what is known, what is the core of the problem before deciding to choose the right or appropriate strategy or procedure.

The Critical Thinking Skills Indicator focuses on building basic skills, namely being able to assess whether sources are trustworthy and evaluate observational reports. Students are expected to provide reasons based on the statements presented. To determine the appropriate reason, students must read the entire statement. By using this Make a Match learning model,

students will be more active in solving problems assigned by the teacher, thereby strengthening their ability to think critically (Utari & Muttaqin, 2021).

The next indicator in concluding is to assess conclusions deductively, make conclusions inductively, and make judgments. Students are expected to be able to draw a conclusion based on a statement, drawing, schema, and so on. Conclusions are drawn from the information or data that has been collected. This is in line with Hardianti's (2014) research, which shows that the correct drawing of conclusions must be based on the step from reason to a reasonable and logical conclusion.

The next indicator in developing strategies and tactics is determining what action to take and interacting with others. This indicator emphasizes how a person interacts with others and takes concrete steps to deal with the problem. Therefore, students are expected to be able to formulate alternative solutions to a problem presented. In accordance with the indicator aspect, namely managing strategies and tactics, students should be able to help students make the right decisions and consider the information around them from various perspectives (Utari & Muttaqin, 2021).

The five indicators of Critical Thinking Skills have been demonstrated well in the experimental class through activities such as finding card pairs, discussing with friends, and presenting answers in front of the class. Through the Make a Match learning model, students not only learn from teachers but also exchange ideas with peers, helping them build their own knowledge. This is in line with the research of Novita et al. (2021), which found that the Make A Match learning model affects students' critical thinking skills on circular motion materials, as the learning process emphasizes students playing an active role in solving the problems they face.

This differs from the control class, which uses the direct learning model in its learning activities. During the learning process, students listen to the teacher's explanation of the material, then record it, and then work on the student worksheet. This activity is less effective at improving students' Critical Thinking Skills because learning is one-way and teacher-centered, so students are not supported in carrying out learning activities related to Critical Thinking Skills. Likewise, the stage of presenting the results of the discussion was not carried out because the students worked on the student worksheet for too long.

### ***Learning Motivation***

The application of the Make a Match learning model is also supported by the level of student learning motivation. Student learning motivation data were obtained from the questionnaire sheets administered after the learning model treatment in each class. The six indicators of learning motivation are the desire to succeed, the presence of encouragement and need for learning, the presence of future hopes and ideals, the presence of appreciation in learning, the presence of interesting activities in learning, and the presence of a conducive learning situation.

Students' motivation to learn, in terms of passion and the desire to succeed, can be increased through the use of interesting and varied learning models. This can encourage students' interest and motivation to work hard, thereby improving their learning outcomes. The use of varied teaching styles, in addition to avoiding boredom in learning, can also motivate and increase student motivation (Atma et al., 2021). Teachers should be able to develop various strategies and approaches to make learning fun and engaging for students.

During the study, observations of students' learning activities revealed differences between the experimental and control classes. In the experiment class, the activity of achieving indicators of learning motivation can be seen, namely, the desire to succeed when doing something. This can be seen in students' activities, matching cards by deftly looking for their

card pairs. Students try to find the right pair of cards in a short period of time. Almost all students managed to find their partners.

The success of the card pair discovery stage is due to each student's desire to succeed, enabling common goals to be achieved through the contribution of their respective efforts. This is in line with [Aqil's \(2018\)](#) opinion that the Make A Match model can train students to actively participate in learning equally and requires them to cooperate with their group members so that responsibilities are fulfilled, ensuring all students are active in the learning process. Coupled with awards and sanctions, students will compete to avoid sanctions. This will motivate students to become literate and learn before using the Make a Match model.

In addition, students' activities in finding card pairs are also related to indicators of learning motivation for future hopes and ideals ([Situmorang et al., 2025](#)). During learning activities, students seem serious and try to find their card pairs without engaging in other activities outside the activity, focusing on finding their card pairs in their own way. This is in line with the opinion of [Fitriani et al. \(2016\)](#) that the cooperative learning model of the Make a Match type also gives responsibility to each student because, in this model, there is a process of finding a partner who matches the cards they get, so that each student must think and find answers correctly.

Likewise, the indicator of learning motivation in interesting learning activities is the use of the Make a Match learning model with cards. The use of learning media in the form of cards can attract interest and motivation to learn because students are required to actively play the cards. In addition, students feel challenged to find their card pairs quickly. This is in line with the opinion of [Riyanti & Abdullah \(2018\)](#) that the Make a Match learning model keeps students actively involved in learning, so they feel happy, engrossed, and interested in the subject matter.

The activities of students with the Make a Match model also appear to reflect achievements in the indicators of learning motivation, namely, encouragement and the need to learn. This can be seen in students' attention to the teacher's confirmation of the material. The students seemed to listen attentively and respond to the questions. In addition, students actively ask questions when they do not understand the material being explained. This is in line with the opinion of [Riyanti & Abdullah \(2018\)](#) that students become interested in exploring the material provided to solve problems presented in the form of group games.

Through the Make a Match learning model, providing sanctions and rewards for students can increase their motivation to learn. This is in line with [Lestari's \(2019\)](#) research, which found that awards and sanctions have a positive and significant impact on students' motivation to learn. Awarding praise, points, or items can boost students' motivation and enthusiasm for learning. Awards are given to students who correctly match a pair of cards with their partner. Students who do not get their partners will get sanctions from teachers. Giving awards by teachers can be one of the strategies used to attract students' interest and motivation to learn.

The use of the Make a Match learning model demonstrates achievement in the learning motivation indicator, namely, a conducive learning situation. This can be seen in students' activities, such as doing a worksheet in pairs and presenting answers. Students can exchange ideas to answer questions in the student worksheet. This is in line with the opinion of [Artini et al \(2019\)](#) that the average learning motivation and learning outcomes of students are greater in the class learned with the Make A Match model because with the help of couple card media, they can form small groups, do assignments together, exchange ideas with groups, and train students' accuracy in finding questions and answers from the couple card.

The learning activities of students in the control class with direct learning showed low learning motivation, such as not being active in answering questions from the teacher, shown by only a few children who responded, not paying attention to the teacher's explanations by

doing other activities outside of the lesson, such as playing with gadgets, and not being dexterous in working on worksheet. This is because learning occurs only one way and is teacher-centered. Teachers seem to dominate learning activities, so students only listen to the teacher's explanation of the material and then record it (Apriani & Sudrajat, 2025). Such learning results in students not receiving an optimal learning experience and in students being less challenged or motivated to learn (Artini et al., 2019).

## CONCLUSION

Based on this study, it can be concluded that the Make a Match learning model influences the Critical Thinking Skills and learning motivation of grade XI students at SMA Negeri in Yogyakarta on the topic of the human reproductive system. This is shown by the experimental class's average posttest score, which is higher than that of the control class. The results of the hypothesis test on the students' Critical Thinking Skills showed that, after the Mann-Whitney U test on the posttest score, a significance value of 0.001 ( $p < 0.05$ ) was obtained. Based on the Wilcoxon test, a significance value of 0.000 ( $p < 0.05$ ) was obtained in both classes. Furthermore, the results of the students' learning motivation showed that, after the Mann-Whitney U test, a significance value of 0.000 ( $p < 0.05$ ) was obtained, and after the Wilcoxon test, a significance value of 0.000 ( $p < 0.05$ ) was obtained. This shows that the use of the Make a Match learning model affects critical thinking skills and students' learning motivation in the human reproductive system. Based on these findings, further research can test the effectiveness of this model in other biology materials or at different levels of education by involving a wider sample to improve the generalization of the findings. The next researcher is also advised to combine the Make a Match model with other learning approaches or media to obtain a more comprehensive picture of its influence on students' higher-level thinking skills and affective aspects.

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