



Think talk write with pictured cards on human digestive system: impact of critical thinking skills

Yakobus Bustami*, Yance Riyati, Hendrikus Julung.

Biology Education, STKIP Persada Khatulistiwa, Sintang, Indonesia.

*Corresponding author: ybustami07@gmail.com.

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ABSTRACT

The critical thinking skill is one of the high-level thinking skills needed by students in the teaching and learning process. This research aimed to determine the effect of Think Talk Write (TTW) based pictured cards on students' critical thinking skills of class VIII on human digestive system material in SMP Negeri 6 Ketungau Tengah. The research was a quantitative approach using the quasi-experimental design. The populations were all eighth-grade students of SMP Negeri 6 Ketungau Tengah consisting of 41 students. The samples were VIII A class total of 22 students for the experimental class and VIII B class total of 19 students for the control class. Instruments used essay questions to measure critical thinking skills. The data obtained were analyzed using descriptive and inferential analysis using the t-test. The descriptive analysis results in the TTW learning model showed that there was an increase in the mean value of students' critical thinking skills from pre-test to post-test by 66,34% and the conventional learning by 33,30%. The results of the inferential analysis show that there is a significant learning effect on students' critical thinking skills ($p: 0,000 < 0,05$). The mean value of the TTW learning model is better than the conventional learning. It is recommended that teachers be able to implement the TTW learning model based on picture cards in science learning to improve students' critical thinking skills.



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INTRODUCTION

Education has an essential role in improving the critical thinking skills of biology students' (Noviyanti, Rusdi & Ristanto, 2019; Mahanal, Zubaidah, Sumiati, Sari & Ismirawati, 2019) especially the conceptual of human digestive system (Mahmudah, Tindangen, & Lumowa, 2018; Mardiah, Putra, & Winarti, 2018). It is material that the abstract and universal character so it requires a variety of skills, especially critical thinking skills. The research results by Hidayah et al., (2019) &



Bingham et al., (2016), showed that the implementation of learning models to the material of the human digestive system has impact students' critical thinking skills. Therefore, critical thinking skills must be instilled early on in students, especially in the learning process (Ahmatika, 2016). It is essential for the learning process so students can give the right decisions on a problem presented so that it will produce optimal learning outcomes (Rusdi, Evriyani, & Praharsih, 2016). Students' critical thinking skills enable students to take advantage of their potential to seem problems, solving problems, creating and realizing themselves (Muhfahroyin, 2009; Sari, Nilawarni, & Heryanti, 2014).

According to Jatmiko et al., (2018), Karakoç, (2016) and Anggraini, Rahayu, Rusdi & Ichsani (2018), critical thinking skills is a cognitive process which is carried out as a thinking guide by using reason judgments against evidence, context, standard, method, and conceptual structure by performing concepts, application, synthesis and information. obtained from observation, experience, reflection, thinking, or communication as a basis for believing and doing an action and focusing on what to do. Furthermore, Bustami & Corebima (2017) reveals critical thinking can be used as a basis for the analysis of arguments and insights into each meaning and interpretation to develop logical reasoning. Diharjo et al., (2017); Tawil (2013), and Djamahar, Sartono, & Hasanah (2016), stated that the link between critical thinking and the learning process took place including the teacher must be able to prepare students to be able to solve problems in the learning process. Teachers are the main factor in the success of science learning (Handayani, Adisyahputra, & Indrayanti, 2018; Ismirawati, Corebima, Zubaidah, & Syamsuri, 2018; Rosamsi, Miarsyah, & Ristanto, 2019). Teachers must be able to choose and use various strategies, models, methods, media, and learning techniques (Bustami et al., 2018; Supriyatin, Miarsyah, & Melia, 2018). The use of learning strategies by teachers is crucial so students are interested and not bored following the learning process (Purba, D., Supriyatin, S., & Sigit, D, 2018). Students' boredom in following the learning process can affect the low skill, especially the critical thinking skills of biology students.

The research results conducted by Gunawan et al., (2016) showed the average students critical thinking skills were 67,00% and categorized as enough. The research by Nuryanti et al., (2018) also showed the conventional critical thinking of students was 40,46%. Students are still lacking in terms of thinking about a problem that is presented critically, and students are not thinking about the issues that are presented thoughtfully so that the achievement of learning outcomes is not optimal. On the other hand, teachers are still lacking in empowering the ability to the argument in the process of learning (Sartono, Rusdi, & Handayani, 2017). The method of learning tends to be one way, the learning process dominated by teachers and the teacher less used innovative learning models such as the TTW learning model (Handayani et al., 2018).

The pre-observation results in SMP Negeri 6 Ketungau Tengah showed that there were still students whose grades did not achieve the minimum completion criteria. The average student learning outcomes, especially in the material of the human digestive system only reaches 60 and categorized as enough. The content of the human digestive system is one of the materials taught at junior middle school. The human digestive system includes the digestive organs and their functions. The understanding the digestive system material students must be shown the digestive organs either through pictures or videos. However, so far the teacher is still very lacking in using media images to explain the digestive organs, thus making students less able to understand the material of the human digestive system.

The pre-observation results also showed that students were less courageous in giving arguments, asking questions, and giving conclusions. This is because the learning process is still conventional in that it is only listening, taking notes, working on exercises in the textbook or provided by the teacher and there is no interaction between the teacher and students and students, and not using media to help convey the material lesson. The schools have implemented a curriculum of 13 (K-13), but teachers have not been able to implement it maximally because it has only been implemented for a year. On the other hand, students are also lazier to think and only limited to memorizing without understanding the concept well. Therefore, there are no activities that can encourage students to think critically to cause the critical thinking skills of biology students' to be low.

Fatmawati et al., (2014) also expressed the students critical thinking skills low. The low students critical thinking skills are caused by several factors including (1) lazy thinking, 2) lack of focus, (3) students are only memorizing without understanding the concept well, (4) students have not been able to process reasoning skills, ask questions and analyze them and (5) are not trained because learning is teacher-centered. This is in line with Luzyawati (2017) revealed that the low students critical thinking skills are because the learning process carried out is mostly still teacher-centered, so students only receive information from the teacher, students passive, bored and lacking in enthusiasm. Siphiwelas (2013), and Masturi et al., (2014) revealed that teachers cannot think, talk, and write as in the TTW learning model.

Therefore, teachers are required to be able to apply various appropriate learning strategies to be able to increase students' critical thinking skills. According to Siphiwelas (2014); Masturi et al. (2014) to increase students' critical thinking skills, teachers must be able to use or apply various learning models that can engage students actively, collaboratively and student-centered, and students can construct their knowledge. Constructivist activities can easily be done if students can work together with other students (Rukmini & Saputri, 2017; Djamahar, Ristanto, Sartono, Ichsan, & Muhlisin, 2018; Ristanto, Zubaidah, Amin, & Rohman, 2018). The learning model is appropriate when using cooperative learning (Ristanto, 2017). According to Suparmi (2012), Purnawan (2014), Darmawan, et al., (2018), cooperative learning is a form of learning based on constructivism, with several students as members of small groups who have different levels of ability from one another. Group formation aims to provide opportunities for students to be actively involved in the process of critical thinking. This is following the statement of Bustami & Corebima (2017) that to train students' critical thinking skills could be done to use constructivist learning.

One of the constructivist-based cooperative learning models is the Think Talk Write (TTW) learning model. According to Wirda (2017), TTW learning is developed and built through the activities of thinking, talking and writing involves a problem-solving in small groups. The results of the researches in middle school by Gunawan et al., (2016), and Lukman (2017) showed that the implemented of TTW learning model was able to improve critical thinking skills.

The TTW learning model is also one of the learning models that can encourage students to be actively and creatively involved in the learning process. Siphiwelas (2013), and Masturi et al., (2014) revealed that actively and creatively student involvement in the learning process will afford to improve the quality of learning. The TTW learning model provides to force students to think through reading activities. The reading results will be communicated through presentations and assisted with learning media in the form of picture card.

Picture cards are beneficial in use in learning because they have advantages that are concrete, realistic, and show the subject matter. Picture cards can overcome the boundaries of space and time because particular objects or events cannot be brought to class and children cannot always be brought to the object or event. Also, picture cards can overcome the limitations of our observations and can clarify a problem. On the other hand, picture cards are also easily obtained at low prices and do not require special care (Umayah et al., 2013). Picture cards can improve students' critical thinking skills because picture cards make it easier for students to analyze images critically (Sari et al., 2015).

Based on the problems it is necessary to conduct research related to students' critical thinking skills improvement in junior high school through the TTW learning model based picture cards on the material of the human digestive system. This research is expected to be able to contribute to the school to be able to implement active learning, including the use of TTW learning model based picture cards on human digestive system material.

METHOD

Research Design

The used in this research was a quantitative approach based on the quasi-experimental method. This research used the pretest-posttest nonequivalent group design which consisted of two class group namely the experimental class group and the control class group. The experimental class group used

TTW learning model based picture cards while the control class group used conventional learning such as behavioristic approach, lecture method, and textbook. The pretest-posttest nonequivalent group design can be seen in [Table 1](#).

Table 1.

The Pretest-Posttest Nonequivalent Group Design

Pretest	Treatment	Posttest
P ₁	T	P ₂
P ₃	C	P ₄

Note:

- P₁ = pre-test of experimental class
- P₃ = pre-test of control class
- P₂ = posttest of experimental class
- P₄ = posttest of control class
- T = TTW learning model with picture cards
- C = Conventional learning

Population and Samples

This research population was all students of class VIII A and VIII B consisting of 41 students. The samples in this research for the experimental class were VIII A class consisting of 22 students, and the control class was VIIIB class consisting of 19 students. Determination of the samples is done by simple random sampling. The samples in this research were taken based on the value of even semester report cards which showed the same average academic ability. The average value of VIII A class academic ability was 65,30, and VIIIB class was 65,70.

Instrument

The data collection instrument aims to collect data in the field needed in research activities. The data collection instrument used was essay test questions used to determine the critical thinking skills of biology students' in the material of the human digestive system with the indicators are formulating a problem, making deduction and induction, giving arguments, evaluating, deciding and implementing (Ennis, 2009). The number of test questions consists of 5 items which related the organs and processes of the human digestive system, as well as diseases of the human digestive system. The essay test has been validated by the expert and tested to determine reliability and validity. The results of the analysis showed that each item was reliable and valid. The values of Cronbach alpha to all items ranged from 0,785 to 0,890 and the value of Product moment ranged from 0,402 to 0,520.

Procedure of Research

The procedures in this research consist of three stages. The first stage is the stage of giving pretest, giving a pretest to seem the students' initial ability before the implementation of TTW learning model based on picture cards and conventional learning. The second stage is the learning process with the TTW learning model based picture card in the experiment class and conventional learning in the control class, each of which was for two meetings on human digestive system material. Implementation using the TTW learning model based picture cards includes several stages, namely the stages of preliminary, think, talk, write, presentation using picture cards, and closing stage, while the conventional learning stages include preliminary, presentation, exploration, recitation, drawing a conclusion and closing stage. Then the third stage is the stage of giving the posttest, giving posttest to seem the students' final abilities after the implementation of TTW learning model based picture cards. Flowcharts procedure of research can be seen in [Figure 1](#).

Data Analysis

The data analysis used in the form of the descriptive analysis and the inferential statistical. The descriptive study to determine the average value the critical thinking skills of biology students' while inferential statistical is used to seem the learning model effect on the critical thinking skills using the t-test. Before the t-test, a prerequisite test was carried out, namely the normality test and homogeneity test. All data related to the critical thinking skills value were analyzed using the SPSS version 22 program.

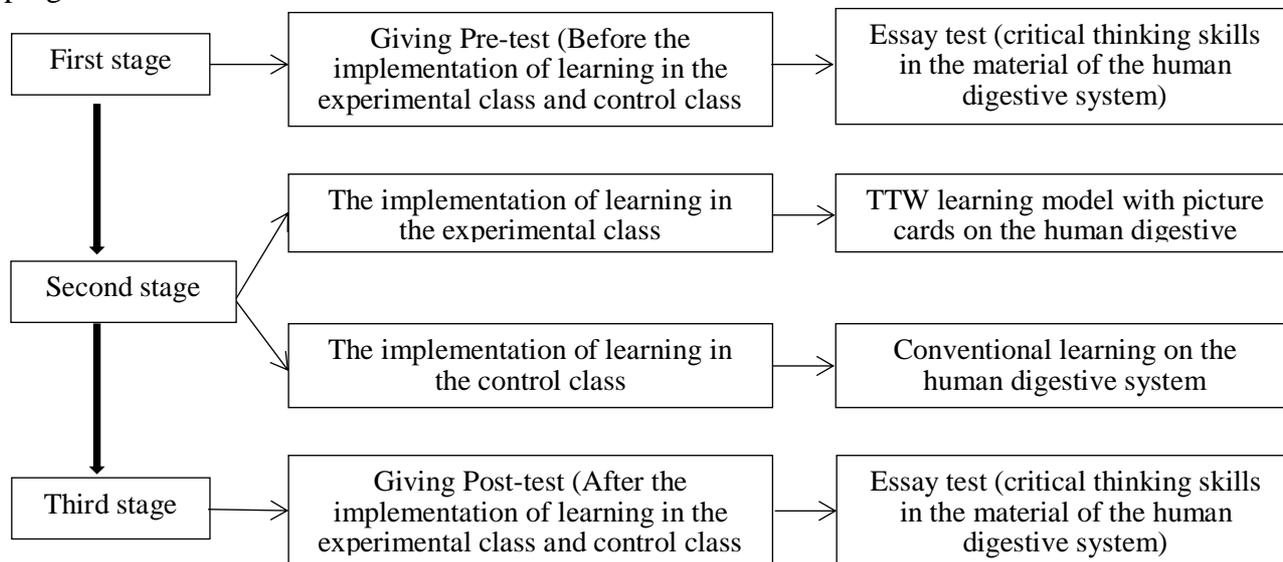


Figure 1. Research Procedure

RESULTS AND DISCUSSION

The critical thinking skills are obtained from the pretest, and posttest average. The pretest and posttest were followed the experimental class students were 22, and the control class students were 19. The results of the descriptive analysis related to the critical thinking skills mean value of biology students' can be seen in [Table 2](#).

Table 2.

The critical thinking skills value of biology students.

Value	Experimental Class		Control Class	
	Pretest	Posttest	Pretest	Posttest
Highest value	65,00	92,00	65,00	70,00
Lowest value	35,00	75,00	35,00	50,00
Average	48,72	81,04	45,05	60,05
Category	low	very good	low	fair
Increase (%)	66,34%		33,30%	

Based on [Table 2](#), it can seem that the pretest mean value biology students critical thinking skills of the experimental class is 48,72 with 65 the highest value and 35 the lowest value, while the posttest the critical thinking skills average value of biology students' is 81,04 with 92 the highest value and 75 the lowest value. In the control class, the mean value pretest critical thinking skills were obtained at 45,05 with 65 the highest value and 35 the lowest value. In the posttest, the mean of critical thinking skills is 60,05 with 70 the highest value and 50 the lowest value. The critical thinking skill of biology students in the experimental class increased by 66,34% while for the control class was increased by 33,30%. The results of the research provide meaning that learning using TTW learning model based picture cards can improve the critical thinking skills of biology students'. The

results of this research are in line with the research of Lukman (2017); Sari et al., (2015); and Yanuarta et al., (2016) which showed that there was an increase in the critical thinking skills of biology students' after the application of the TTW learning model.

The prerequisite test results, namely the critical thinking skills normality test of biology students' can be seen in Table 3. The results of the normality test analysis in Table 3 show that the pretest and posttest classes have a probability value more significant than the alpha value (0.05) so that all data are normally distributed.

Table 3.

The results of the normality test

Class	Test	Mean	Standard deviation	Sig.	Alpha (α)	Conclusion
Experimental	Pretest	48,72	9,26	0,740	0,05	Normally
	Posttest	81,04	5,61	0,589	0,05	Normally
Control	Pretest	45,05	7,60	0,225	0,05	Normally
	Posttest	60,05	6,56	0,994	0,05	Normally

The results of critical thinking skills homogeneity test of biology students' showed the probability values the experimental and control classes pretest are 0,242 and posttest are 0,358. The probability values of both the pretest and posttest have a higher value than the alpha of 0,05 so that the two data are declared homogeneous (Table 4).

Table 4.

The results of the homogeneity test

Test	Sig.	Alpha (α)	Sig. > α	Conclusion
Pretest	0,242	0,05	0,242 > 0,05	Homogeneity
Posttest	0,358	0,05	0,358 > 0,05	Homogeneity

The results of a hypothesis test in Table 5 show that the pretest probability value of the experimental and the control classes is 0,177 and higher than the alpha 0.05 so that there is no difference in the critical thinking skills of biology students' between the experimental and the control classes at the pretest. The posttest results of the experimental and the control classes showed a probability value of 0,000 and smaller than alpha 0,05, so there were differences in the critical thinking skills of biology students' between the experimental and the control classes at the measurement posttest. The percentage of the average value increased in the experimental class was higher than the control class. Thus, the TTW learning model with picture cards has more impact on the critical thinking skills of biology students.

Table 5.

The results of the hypothesis test related to critical thinking skills

Test	Sig.	Alpha (α)	Conclusion
Pretest	0,177	0,05	There were no differences in critical thinking skills
Posttest	0,000	0,05	There were differences in critical thinking skills

These research results are in line with the research of Lukman (2017), Sari et al., (2015), and Gunawan et al., (2016) which state that the research model learning has a significant influence on critical thinking skills. TTW learning groups are better able to improve critical thinking skills when compared to conventional learning. The low biology students' critical thinking skills in conventional learning were caused the learning process still teacher-center. The results of the observation showed that conventional learning only focuses on delivering material verbally from the teacher. Most students do not explore their potential to the fullest, and there is no independence in finding and

processing their material besides receiving from the teacher so that the critical thinking skills of biology students in the control class have not been maximized.

Improving the critical thinking skills of biology students' in the experimental class are better because the TTW learning model involves students actively and enthusiastically in thinking, speaking, and writing. This is following the statement of Gunawan et al., (2016) which active state activities always accompanied active learning and students ever the ability to critical thinking skills about the material taught the teacher.

The stages in the TTW learning model are also able to increase critical thinking skills. The step of think in the TTW learning model will afford to process students 'thinking so that will affords to increase students' critical thinking skills. Furthermore, the stage of the talk will encourage students to express their opinions or arguments. The stage of talk is a stage that requires students to communicate with words and languages that they understand in their groups to convey their thinking results at the stage of think. The stage of talk allows students to be skill at speak and communicate, also allows for the exchange of opinions which raises questions that will stimulate thinking processes (Yanuarda et al., 2016; Nasrudin & Azizah, 2010). Finally, the stage of TTW learning model in write is also able to improve critical thinking skills. Inggriyani & Fazriyah (2017), revealed that write activities would require someone to have good reasoning in thinking about the things he would write so that writing activities would affect students' critical thinking skills.

On the other hand, picture cards can make students happier and motivated to take part in learning, and by looking at pictures, students are easier to remember and analyze learning material. According to Masturi et al., (2014), picture cards can attract students' interest, and attention to learning and Sari et al., (2015) stated that picture cards could help students understand the relationship between material concepts and everyday life phenomena to minimize the possibility for students to cause misconceptions.

CONCLUSION

Based on research results, it can be concluded that: (1) the mean value of the experimental class posttest critical thinking skills is 81,04 with a high category while the control class is 60,05 with a moderate grade. (2) The results of the hypothesis test in the post showed a probability value smaller than the alpha value ($0,000 < 0,05$) so that there was a significant difference in the critical thinking skills of biology students' between the experimental class and the control class on the human digestive system material. The critical thinking skills average value of the experimental class is better than the control class. Thus, the TTW learning model-based picture cards are better affords to improve critical thinking skills when compared to conventional learning. It is recommended that teachers be able to implement the TTW learning model based on picture cards in science learning to improve students' critical thinking skills.

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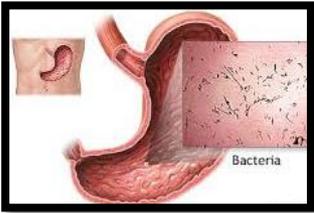
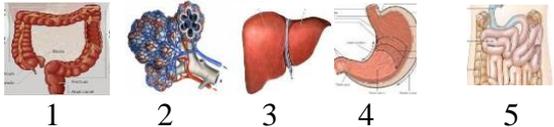
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Appendix:

Assessment of critical thinking on the material human digestive system

No	Indicator of critical thinking	Item test
1a	Formulating a problem	1. Mr. Gilang eats the rambutan fruit and is immediately swallowed with the seeds. A few days later it was difficult to defecate because the stool was hard so it was difficult to remove.
1b	Deciding and implementing	a. Make 3 questions based on the case experienced by Mr. Gilang! b. Based on the events experienced by Mr. Gilang, give your ideas so you don't have trouble defecating!
2	Evaluating	2. Look at the following picture!  <p>According to your assessment, what causes things like pictures can occur in our digestive organs!</p>
3	Evaluating	3. The consequence of irregular eating patterns will cause Maag disease, constipation, and gastric wounds. According to your evaluating, what do you think about the characteristics of someone affected by Maag, constipation, and gastric wounds!
4	Making deduction and induction	4. Look at the following picture!  <p>a. Based on the picture, what conclusions include the organs in the digestive system? b. Give your reason why peristalsis also occurs in organ item 4, which is the stomach?</p>
5	Giving arguments	5. Every day humans need food. Foods that are eaten can make a person become full. a. Explain according to your arguments why when you're hungry your body becomes weak and not powerful! b. Explain according to your arguments why when full the body becomes energized and has energy!