

Application of the Student Team Achievement Division (STAD) Learning Model Assisted by Video Media to Improve Critical Thinking Skills and Student Learning Outcomes in Coordination System Topic

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Abstract:

Critical thinking skill is cognitive aspect that need to be considered and achieved in learning. Critical thinking skills can be achieved by teachers who can apply learning models and media in accordance with the material taught in learning. The application of the Student Team Achievement Division (STAD) learning model assisted by video media is a combination model and learning media that can be applied in learning to improve students' critical thinking skills. This study aims to see the application of the STAD learning model assisted by video media on the critical thinking skills of students, especially in the coordination system topic. This study used an experimental method with a pretest-posttest control group design. The research subjects were 112 high school student of XI Grade who were divided into two groups, namely the experimental group and the control group. Each group consist of 56 students was randomly selected. The experimental group used the STAD learning model assisted by video media, while the control group used the conventional learning model. The parameter measured in this study is critical thinking skills. Data on critical thinking skills were analyzed using parametric statistics, namely the independent sample t-test. The two-difference test of the mean N-Gain critical thinking skills between the control and experimental groups showed t-value (4.64) > t-table (1.98). The results of data analysis showed that there was a significant mean difference in students' critical thinking skills between the experimental group and the control group. It can be concluded that the application of the Student Team Achievement Division (STAD) learning model assisted by video media can improve students' critical thinking skills in the coordination system topic.

Keywords: Critical Thinking, STAD, Media Video.

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I. Introduction

Critical thinking is a person's way of improving the quality of the results of thinking systematically, logically, and producing solutions to problems in accordance with scientific truth¹³. Critical thinking skills are the life skills that need to be developed in the educational process through the learning process in schools. Students who have critical thinking skills will be able to solve problems and find appropriate solutions in learning. Based on research by experts, it shows that critical thinking skills in Indonesia are still low¹⁷. The survey results showed 46% of respondents answered that the education system in Indonesia has not been able to produce students who have critical thinking skills⁷. Based on the results of observations in several high schools in the city of Sigli regarding Biology material, especially in coordination system topic, it was also found that the students' ability to solve types of questions that required analysis was still low. Observations were made by giving a test consisting of 40 items to 50 students. In the questions that required analysis, the ability to solve problems or find solutions, on average only 34% of students answered questions correctly, the remaining 66% of students answered questions with wrong answers. This shows that the thinking skills of students are still low so that they had not been able to think critically according to the actual concept.

One of the way to train students for critical thinking skills is by changing the teacher centered learning method to student centered, which is a student-centered learning method, in accordance with the demands of the 2013 curriculum in Indonesia. This student-centered learning can be actualized by using the cooperative learning model Student Team Achievement Division (STAD). STAD is one of the cooperative learning that makes students to be active in learning. In this learning model students are given the opportunity to collaborate

and elaborate with peers in the form of group discussions to solve problems related to the material that being taught²¹.

Several studies regarding the application of the cooperative learning model STAD assisted by learning media have been carried out in many science subjects. The results of the study reveal that the application of the cooperative learning model STAD has an effect on critical thinking skills, activeness, attitude competence, motivation and problem solving abilities^{2,3,4,9,10,11,12,14,15,17,24}.

In addition in applying the appropriate learning model, learning objectives will also be achieved if it is supported by the use of appropriate learning media, such as the use of video learning media. This learning media is very much needed, especially for science subjects such as Biology⁸. Video learning media is a tool used to convey learning material through a moving image display that is projected to form the same character as the original object. The use of video learning media is able to provide positive responses from students. Students are motivated to learn and are able to improve their understanding of the subject material presented¹⁹.

Biology material contains many abstract concepts such as the concept of coordination systems²³. For example, the process of transmission of nerve impulses and the mechanism for regulating body's systems by hormones is a concept that is difficult to study in detail if there is no direct object to study or to see. The use of instructional media is needed to concretize these concepts so that there are no misunderstandings of concepts. Based on the results of preliminary observations at Senior High School 1 Sigli (SMAN 1) and Senior High School 2 Sigli (SMAN 2) in the odd semester of the 2020/2021 school year on Biology learning, especially in the coordination system material, it shows that teachers still rarely use learning media, especially video-based ones. Even though this material really needs the help of learning media to increase student interest in learning, given the characteristics of the material which are mostly theoretical and abstract. This is thought to be one of the reasons for the low interest of students in learning Biology which results in low learning outcomes, so that there are still 80% of students who are generally still below the minimum mastery criteria with an average score below 70.

One of the effort that can be use to overcome this problem is to train students' critical thinking skills through appropriate learning models and supporting learning media, such as the cooperative learning model STAD assisted by video learning media. In this learning model, critical thinking skills are trained by providing worksheet which consists of questions that must be completed by each group. The giving of worksheet will be assisted by the presentation of video media which will make it easier for students to solve and answer these questions. The questions given are a type of question that can explore the critical thinking skills of students. The application of the STAD cooperative learning model combined with learning media has been widely used in Biology learning, but its application is rarely found in coordination system topic. Therefore this research was conducted to examine the application of the STAD cooperative learning model assisted by video learning media on the coordination system topic, especially on the critical thinking skills of students.

II. Material And Methods

This study uses a quantitative approach with the type of applied research which is based on the problem of low critical thinking skills in students. This research conducted in senior high school in Sigli especially eleventh grade student in odd semester of the 2020/2021 academic year.

Study Design: Pretest posttest control group design

Study Location: Senior High School 1 Sigli (SMAN 1) and Senior High School 2 Sigli (SMAN 2). This research conducted specifically on government Senior High School.

Study Duration: November 5th to 28th 2020.

Sample Size: 112 students

Subject & selection method: The population in this study were all students of 11th Grade of government Senior High School Sigli in 2020/2021 academic year, totaling 167 students. The school was taken based on the A accreditation score, so that two high schools in Sigli were selected which were used as research locations, namely Senior High School 1 Sigli and Senior High School 2 Sigli. The sampling technique was carried out by random (*random sampling*) from a homogeneous population. The total sample size in this study was 112 students including the control class and the experimental class.

Procedur Methodology: The method used in this research is an experimental method. The data collection technique used in this study was to use a test instrument. The test instrument used was in the form of essay questions that were given in the form of a pretest and post-test. The essay questions given have been adjusted to the criteria and indicators of critical thinking skills which consist of *Focus, Reason, Inference, Situation, Clarity*, and *Overview* or shortly the indicators we call as FRISCO⁶.

Statistical analysis: The data obtained in the form of the results of the initial ability test (pretest) and the final ability test (posttest) were tabulated for analysis by calculating the average score of the pretest and posttest critical thinking skills in the experimental class and control class students.

The score is then calculated and normalized (N-Gain) by using the formula from Meltzer as follows¹⁶:

$$N_Gain = \frac{Posttest\ Score - Pretest\ Score}{Maximum\ Possible\ Score - Pretest\ Score} \times 100$$

Information :

High: N-Gain > 70

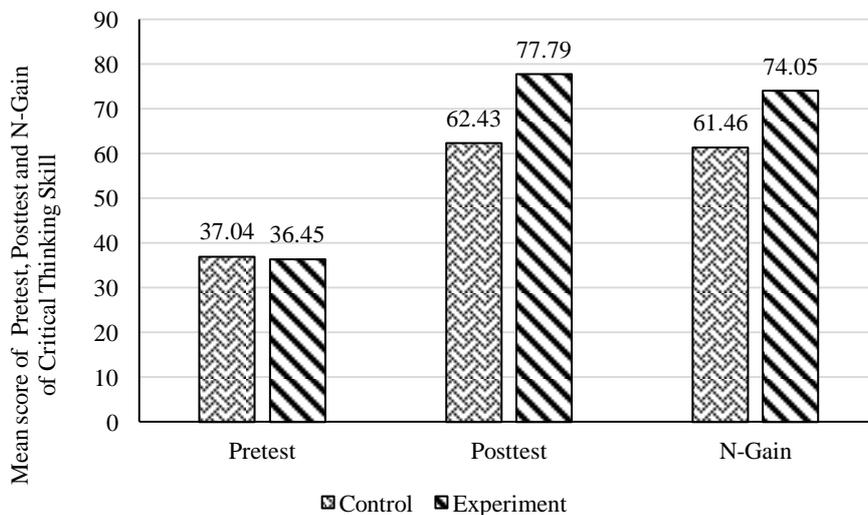
Medium: 30 ≤ N-Gain ≤ 70

Low: N-Gain < 30

The average pretest score and normalized N-Gain were taken as data to compare students' critical thinking skills between the control class and the experimental class. The average pretest score and N-gain critical thinking skills of students if the distribution is normal and homogeneous, then the two-difference test is continued with the difference mean test (t test). The type of the difference mean test (t test) that is used is independent sample t-test. If the data is not normally distributed or not homogeneous, then the average or mean difference test is performed using a non-parametric test using the Mann-Whitney test.

III. Result and Discussion

Critical thinking skills are measured through test given to students after the application of learning about coordination system topic using the Student Team Achievement Division (STAD) learning model assisted by video in the experimental class and conventional learning models in the control class, the test consist of 10 essay questions. Based on the data obtained, there are differences in students' critical thinking skills between the control class and the experimental class. The results showed the critical thinking skills of students in the experimental class were better than the critical thinking skills of students in the control class. The data recapitulation of the average score of critical thinking skills in the pretest, posttest, and N-Gain of the control class and experimental class students as a whole is presented in Figure 1.



Figur 1. Mean Score of Pretest, Posttest and N-Gain of Critical Thinking Skills

The mean or average score of pretest for the control class was 37,04 and the mean score of pretest for the experimental class was 36,45. The results of the pretest mean difference between the control class and the experimental class that showed in Figure 1. there was no significant difference. After receiving treatment of the application of the video-assisted STAD learning model in the experimental class and the conventional learning model in the control class, the mastery of material regarding the coordination system in students increased compared to the pretest score. We can see this from the posttest data and N-Gain. The mean N-Gain score for the experimental class was 74,05 and the control class was 61,46. The results of the difference in the mean N-Gain score between the experimental class and the control class show a significant difference, it can be seen in Table 1.

Table 1. Recapitulation of the Mean Difference Test (t test) for Pretest and N-Gain Score of Students' Critical Thinking Skills in the Experimental Class and the Control Class

Critical Thinking Skill	Mean Score	Normality	Homogeneity**	Mean Difference	Evidence
Pretest	Exp (36,45)	$X^2_{\text{value}} (4,35) < X^2_{\text{table}} (9,49)$ (Normality)	$F_{\text{value}} (1,47) < F_{\text{table}} (1,89)$ Homogen	$t_{\text{value}}(0,37) \leq t_{\text{table}} (1,98)$	There is no significant difference
	Control (37,04)	$X^2_{\text{valu}} (5,72) < X^2_{\text{table}} (9,49)$ (Normality)			
N-Gain	Ekp (74,05)	$X^2_{\text{value}} (5,26) < X^2_{\text{table}} (9,49)$ (Normality)	$F_{\text{value}} (1,46) < F_{\text{table}} (1,89)$ Homogen	$t_{\text{value}} (4,64) > t_{\text{table}} (1,98)$	There is significant difference
	Control (61,46)	$X^2_{\text{value}} (4,22) < X^2_{\text{table}} (9,49)$ (Normality)			

* Chi-Square test (Normal: $X^2_{\text{value}} < X^2_{\text{table}}$; $\alpha = 0,05$)

** F-test (Homogeneity: $F_{\text{value}} < F_{\text{table}}$; $\alpha = 0,01$)

Based on the N-Gain criteria, the mean N-Gain score of the experimental class was included in the high criteria, while the average N-Gain score of the control class was included in the medium criteria. The difference in N-Gain scores between the experimental class and the control class shows that the increase in critical thinking skills of students on the coordination system topic in the experimental class is better than the control class. The application of the multimedia or video-based STAD learning model consisting of a collection of animated videos, pictures and text can make students interested and motivated so that they are actively involved in the learning process. Students in groups are actively involved in finding the main idea of a material, solving problems or conveying what they have just learned back to others so that it will improve higher-order thinking skills in students such as critical thinking skills²².

In the STAD learning model, students are led to be actively involved in learning. As for the activities of students, namely solving a problem related to the material being taught, each member of group free to expresses his opinion and they together trying to understand the concept in depth to build their own knowledge which further helps students to improve critical thinking skills, such as logical reasoning, inference, analysis and the ability to solve a problem¹².

The worksheet used in the experimental group also contains a number of essay questions that train students' critical thinking skills. When answering the worksheet in their group, each student is assisted by displaying a learning video related to the question that being asked. In this case, students in their respective groups are directed to find their own answers to the questions or problems they are facing. This allows students to form and find their own knowledge based on what is seen from videos and other sources.

The use of video media is very necessary in mastering Biology material. In particular, the material contains the concept of abstract physiological mechanisms such as coordination systems. One way that can be done to make the students can understand the material well is by visualizing it. Video media is an effective way that can be used to visualize a concept¹⁸. Video media contains moving films or images so that they can visualize the actual process and can describe a process accurately.

The video media displayed in the experimental class can visualize the processes that cannot be seen with the naked eye that occur in this coordination system. The discussion of the coordination system consists of the nervous system, the hormonal system, and the sensory system, all of which contain physiological processes such as the nerve impulse transmission mechanism, how a stimulus can arrive and be processed in central nervous system, the feedback regulatory mechanism for hormone secretion, mechanism of vision, mechanism of hearing, mechanism of smelling, mechanism of touching, mechanism of tasting and so on. Some of these concepts are abstract concepts in the coordination system material that require visualization so that students can see directly.

Visualization displayed from video media can make students interesting to pay attention to learning, so that all students can have the same knowledge about a concept according to scientific truth and can avoid misunderstandings. A good understanding of a concept will guide students to skillfully solve a problem regarding the concept. Students' skills in solving a problem have a positive impact on students' critical thinking skills²¹.

The combination of the STAD learning model and video media is a very good combination to improve students' critical thinking skills. The STAD learning model and video media both have a role in improving the cognitive skills of students, one of which is critical thinking skills. This is also supported by research which

states that the application of the STAD-based Biology learning model can improve critical thinking skills of students participating in the General Biology course of IKIP Budi Utomo²⁰. Another research also stated that combination of the STAD type cooperative learning model with Biology learning videos can improve student learning outcomes and critical thinking skills¹¹.

Critical thinking skill are also analyzed for each indicator. In this study, the indicators used are Focus, Reason, Inference, Situation, Clarity, and Overview⁶. The results of the recapitulation of critical thinking skills for each indicator show that there is a difference in the average of the experimental class and the control class. The description of the difference in the mean posttest score for each indicator of critical thinking skills in the experimental class and the control class can be seen in Figure 2.

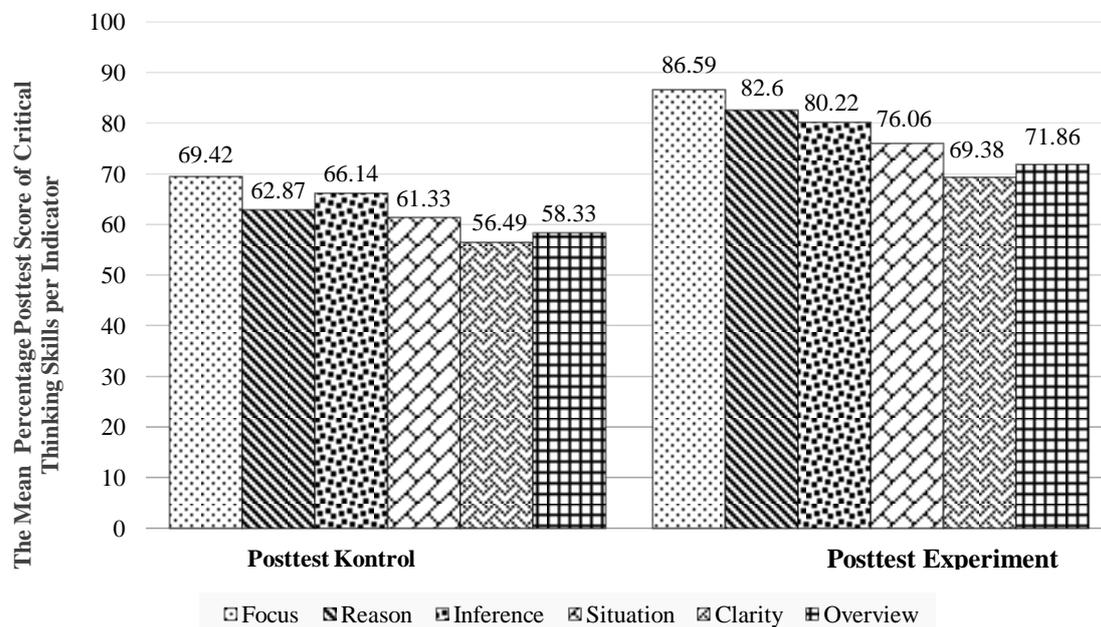


Figure 2. Percentage of Critical Thinking Skills per Indicator

In the experimental class whose learning uses the video-assisted STAD learning model, the mean percentage of posttest scores is higher than the control class on each indicator of critical thinking skills. Based on Figure 2, the *Focus* indicator gets the highest average score percentage compared to other indicators. *Focus* is an indicator of critical thinking skills to find out what the question is asking and can find the right answer to the problem or question given¹.

Students can achieve the highest average on the *Focus* indicator because students in the experimental class are accustomed to identifying a problem because they are trained to complete the worksheet in their respective groups during learning. The division of study groups in the STAD learning model is based on heterogeneous group members, where students who have high abilities will work with students who have the ability below them to solve problems contained in the worksheet and are responsible for making each member of the group understand the material they are learning through the completion of questions at the worksheet. The given worksheet contains questions or problems related to the coordination system topic. The use of worksheet to train critical thinking skills in the experimental class is also supported by video media which contains abstract processes or mechanisms contained in the coordination system topic. The use of video media helps students to see firsthand how the mechanism in the coordination system actually occurs, so that students can understand the material better and their understanding makes students take the right steps in solving problems or questions given related to the coordination system topic/material. The combination of the STAD model and video media has a positive effect on improving critical thinking skills, especially on the *Focus* indicator.

Based on Figure 2, we can also see that other indicators such as *Reason*, *Inference*, *Situation*, *Clarity*, and *Overview* get the mean percentage of posttest scores in the experimental class higher than the mean percentage of posttest scores in the control class. This is not separated from the role of the STAD learning model assisted by video media too which can make it easier for students to understand the material of the coordination system and develop their thinking skills, especially critical thinking skills and their indicators. In the experimental class, each worksheet question given contains indicators of critical thinking skills, besides that, in its completion, students are also supported by video media related to the questions and problems that are in the worksheet. The video display really helps students to concretize the concepts they are learning so that

students can better understand abstract material concepts such as coordination system material and can find the right steps on each question or problem they face regarding this material. Exercising in answering questions that have indicators of critical thinking skills during learning makes students familiar with solving problems that require them to provide the right reasons as solutions to problems such as in the *Reason* indicator, providing appropriate conclusions in supporting problem solving such as in the *Inference* indicator, providing appropriate information to solve problems such as in the *Situation* indicator, explaining the terms used in the argument correctly as in the *Clarity* indicator, and checking the suitability of information and steps in solving a problem such as the *Overview* indicator. The flexibility in answering this type of question makes students able to achieve higher posttest score achievement on each indicator than the control class.

Critical thinking skills are skills that must be trained because critical thinking is not innate and does not develop naturally⁵. Related to this, the use of the STAD learning model, the habituation of completing worksheet which contains indicators of critical thinking skills and the use of video media is one of the right strategies that can be used to train students' critical thinking skills.

IV. Conclusion

Based on the results of the study, it can be concluded that the application of the Student Team Achievement Division (STAD) learning model assisted by video media can improve students' critical thinking skills in the coordination system topic. The STAD learning model assisted by video media also give contribution for each indicator of critical thinking skills of students in coordination system topic.

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