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The Effect of STAD-Type Cooperative Learning Based on a Learning Tool on Critical Thinking Ability in Writing Materials

Syamsul Ghufron
Universitas Nahdlatul Ulama Surabaya, Indonesia,*syamsulghufron@unusa.ac.id*

Nafiah
Universitas Nahdlatul Ulama Surabaya, Indonesia, *nefi_23@unusa.ac.id*

Syahruddin
Universitas Muhammadiyah Makasar, Indonesia, *syahruddin@unismuh.ac.id*

Kaswadi
Universitas Wijaya Kusuma Surabaya, Indonesia, *kaswadi_fbs@uwks.ac.id*

Mustofa
Universitas Islam Darul Ulum Lamongan, Indonesia, *tofa09@unisda.ac.id*

The purpose of this study is to determine the influence of STAD-type cooperative learning based on a learning tool on critical thinking skills in the students' learning outcomes. This study is a 2x3 factor design quasi-experimental one. The data were collected through multiple-choice tests, descriptions, observations, and documents. Multiple-choice tests, explanations, observations, and documents were implemented to collect the data. Using the SPSS16 application, the hypothesis test by two-way ANOVA had a significance level of 5. In relation to the impact of STAD-type co-operatives learning based on learning tools for critical thinking skills in students' outcomes has shown significant values in the areas of cognition, psychomotor, and affective. The cognitive domain score was 0.314, the psychomotor domain score was 0.032, and the affective domain score was 0.038. The results of the test decide that the significance is less than 0.05, namely 0.00 < 0.05. The conclusions of this research are: 1) STAD-type cooperative learning based on a learning tool has a significant effect on critical thinking skills on student psychomotor and affective learning outcomes, 2) students' academic abilities do not affect student learning outcomes.

Keywords: STAD-type, cooperative learning, learning tool, critical thinking, writing

INTRODUCTION

Learning online during the Covid-19 pandemic has become an issue in Indonesia (Supena et.al., 2021). The issue of online learning has also developed into an international issue that is a must and necessity during the Covid-19 pandemic era

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(Fernandez, 2021; Thapa et.al., 2020; Murphy, 2020; Demuyakor (2020; Affandi et al., 2022). The teaching and learning process online, based on the policy of the Minister of Education and Culture of the Republic of Indonesia in Circular 2020 on the Implementation of Education Policy in the Emergency of the Coronavirus Infection (Covid-19) Epidemic, was implemented. In the process of adopting new learning habits during the Covid-19 pandemic, one of the things that are necessary for the adaptation process in learning is the existence of teaching materials and online learning tools which use attractive and easily accessible media for students. As a solution to the impact of the Covid-19 pandemic, educators are required to design learning devices and media as innovations by utilizing online learning tools and media.

In teaching, learning tools also determine the quality of learning and the success of achieving goals (Nugroho & Fitri, 2018; Marianita & Artati, 2018). Therefore, learning tools must be able to direct students to be creative, collaborative, and critical thinking activities (Noermanzah & Friantary, 2019). Students' understanding of the subject matter at school is influenced by the quality of teaching materials among the others. One of the teaching materials used is the learning tool. Learning tool are a means of learning activities that can help facilitate understanding of the material being studied. The printed materials in the form of sheets containing materials, summaries, and instructions were the main tools for implementing learning tasks related to the basic abilities and indicators that students perform and achieve. Learning tools are necessary for the learning process due to the fact that they can inspire students to actively participate in the learning process.

The teacher in the 2013 student-cantered curriculum teaching (student-centered learning) acts as a facilitator and mediator who must be able to arouse students' interest in learning material and provide various models of learning approaches so that students obtain the most appropriate learning model. In this case, the learning model that can be implemented is STAD which stands for Student Team Achievement Division. According to Darmuki, et al. (2019), STAD is a method that presents academic information using verbal or text presentations, and divides students heterogeneously into 4-5 people and uses quiz procedures. In addition, STAD learning method is a learning that involves the recognition of teams where students are divided into several heterogeneous groups based on the level of achievement or level of learning ability (Romaida et al., 2020). The STAD that belongs to the cooperative learning model that prioritizes cooperation in groups can improve the character of group cooperation (Darmuki et al., 2018; Hidayati et al., 2019). Each student in the group has a different level of ability (Darmuki & Hidayati, 2019; Hidayati & Darmuki, 2021). The cooperative learning model prioritizes cooperation in solving problems in the learning process. Slavin (2019) states that cooperative learning is learning that places students in study groups consisting of four to five people who are a mixture of different academic abilities, so that in each group there are high, medium, and low achievers. Kagan (2017) states that cooperative learning is learning in the form of sharing information and experiences, responding to each other, and communicating with each other. This form of learning not only helps students learn about the material but also forms the character of

cooperation with other students where they communicate with each other and help each other in completing assignments (Noviana, 2016: 222).

The Research on the development of this learning tool has been carried out by many other researchers. Some have developed student worksheet for high school students such as Latifah (2016), Sari & Lepiyanto (2016), Anggraini, Anwar & Madang (2016), Fitriani, Gunawan and Sutrio (2017), and Astuti, Danial & Anwar (2018). Some researchers develop student worksheet for junior high school students as done by Zulfah (2017), Firdaus and Wilujeng, (2018), Apertha & Zulkardi (2018), Ernawati (2019), Pratama and Saregar (2019). There are also development researchers who have developed student worksheet for elementary students such as Rofiah's research (2014), Sasmito & Mustadi's research (2015), Pradita & Wangid's research (2017), Sulistyorini & Harmanto's research (2018), and Hasanah's research (2019). Researches on the development of the electronic learning tool were carried out by several researchers including Istikhomah, Sesanti, and Yulianti (2020), Istiqomah and Suparman (2019), Khotimah, Yasa, and Nita (2020), Purnama and Suparman (2020), Puspita and Dewi (2021) , and Wulandari and Suparman (2020).

Among these studies, very few are focused on writing material. In addition, the steps of the learning model in the student worksheet are not clear and do not present questions based on observations and questions that can train students' social skills. Three studies focus on writing material, namely the Puspitoningrum research (2011) which developed Student Worksheet for junior high school students with fairy tale writing material. Purwati (2020) developed an integrative model in the learning of junior high school students based on discourse aspects. Ernawati (2019) researched the development of Student Worksheet for junior high school students with fable material. Thus, all Student Worksheet development researches that focus on writing material are only for junior high school students, while elementary school students generally focus on an integrative thematic approach.

Learning to write for elementary school students still needs to be improved. This is based on the reality that the students' writing skills are still relatively low (Purwati, 2020; Marianita & Artati, 2018). This might happen as a result of learning that takes place in schools that do not fully apply the communicative approach. For teachers, this communicative approach is not well understood (Kurniawan, 2016; Hartati, 2013). All of these results show the low writing skills of students in elementary schools (Budiyono, 2012), students in secondary schools (Purwati, 2020), and students in universities Marianita & Artati, 2018).

Based on this thought, the researcher is very interested in the electronic learning tool research for 5th-grade elementary school students based on STAD type of cooperative learning on writing material. The selected writing material is writing material that emphasizes the existence of effective sentence requirements. The material chosen is based on the basic competencies of the Emergency Curriculum during the pandemic. Two basic competencies meet these criteria, namely the KD "4.2 Presenting a summary of explanatory texts (explanations) from printed or electronic media using standard vocabulary and effective sentences orally, in writing, and visually" and "4.5 Making

invitation letters (birthdays, activities school, grade promotion, etc.) with effective sentences and pay attention to the use of spelling."

The aims of this study were to test the results of STAD-type cooperative learning based on a Electronic Learning Tool validation on writing materials. This research article focuses on the stage of testing the effect of the results of STAD-type cooperative learning based on a Electronic Learning Tool on critical thinking skills in writing material. This research is very important to do considering that, so far, elementary school teachers have paid less attention to errors, especially sentence errors in the work of their students in the form of writing. With the development of Electronic Learning Tool writing material with the emphasis on effective sentences, it is hoped that there will be an increase in the writing skills of elementary school students.

Critical thinking skills of the main domains of 21st century are important for students to find the source of the problem and how to find and get the right solution to the problems at hand. The learning process in Indonesia has many weaknesses one of which is the lack of students' critical thinking skills. Zubaidah (2018) states, writing learning is said to be of quality if learning is challenging, fun, and encourages exploration, provide successful experiences, and develops thinking skills. This opinion is in line with Sutiman et.al (2014) who claimes that the learning process, especially learning to write, must prepare quality students who are aware of science (scientific literacy), have values, attitudes, and higher-order thinking skills, so that there will be human resources who can think critically.

One of the thinking skills expected to appear in learning to write is critical thinking which can stimulate students to write what is being studied (Ewie, 2010). According to Beyer (1995), critical thinking skills enabling the students to have a clear meaning consist of aspects of interpretation including the students' ability to classify the problems received; aspects of analysis including the students' ability to test ideas and recognize reasons and statement; aspects of inference including the students' ability to make a conclusion in solving problems through writing; aspects of evaluation including the students' ability to assess statements or opinions received both from themselves and others; aspects of explanation including the students' ability to explain statements and opinions that have been expressed to become a strong opinion; and aspects of self-regulation including the students' ability to regulate their existence in the face of problem-solving. It stands to reason that the ability development manifested in the integration of observation, analysis, reasoning, assessment, and decision-making shows the development of critical thinking skills. In line with this, critical thinking consists of the ability to generate and process information and beliefs together with the habit of using skills to guide behavior based on intellectual commitment, Ennis (2011). In fact, critical thinking includes aspects of self-protection (self-guided), self-disciplined, self-directed, self-monitoring, and self-corrective thinking, which is an attempt to higher-order thinking. Fulfilling all of these aspects, critical thinking people will be consistent, try to live rationally, and be quite empathy.

The Electronic Learning Tool Cooperative Learning-Based of STAD-Type

The constructivist-collaborative-based learning includes several concepts which consist of opening concept, assimilation, accommodation, cognitive imbalance, Zone of Proximal Development (ZPD), and scaffolding. Based on these concepts, it is known that knowledge is created from the formation of active individual and social interaction. In line with these concepts, Electronic Learning Tools with the belief that knowledge is self-constructed by students who work actively in collaborative groups are the base of the Electronic Learning tool cooperlearning-based of STAD-type.

Electronic learning tool are learning tool that can attract students' attention in completing their assignments because in them there are elements of sound and images. The Electronic Learning tool is a student worksheet in which there is a summary of the material, questions and instructions for carrying out tasks that contain text, audio and audiovisual elements that must be done by students referring to the basic competencies that must be achieved, to help students learn in a focused way. Electronic learning tool are learning tool in which there is a summary of the material, questions and instructions for the implementation of tasks carried out by students in the learning process packaged in interactive multimedia. The role of the Electronic Learning Tool in the learning process is as a tool to provide knowledge, attitudes and skills to students. Learning tool are needed in the learning process because they can provoke them to involve in the teaching and learning process actively. The Electronic Learning tool is one of the teaching materials that help students to add information about the material being studied in the learning process.

Theoretical Review

The Electronic Learning Tool is a learning tool as a complementary tool to support the Learning Implementation Plan (Puspita and Dewi, 2021). Electronic Learning Tool is one of the teaching materials that help students to add information about the material studied in the learning process (Wulandari and Suparman, 2020). Learning tool are a means of learning activities that can help facilitate understanding of the material being studied. Furthermore, learning tools are needed to provoke students to be actively involved in the learning process. These tools, according to Pratama and Saregar (2019), can be printed teaching materials in the form of the student worksheet containing material, summaries, and instructions for implementing learning tasks with the basic competencies and indicators that must be done by students.

Critical thinking comprises testing, relating, and evaluating all aspects of a situation or problem, focusing on part of a situation or problem, collecting and organizing information, validating and analysing information, remembering and analyzing information, and determining reasonableness (whether or not an answer is reasonable), drawing valid conclusions, having analytical and reflexive properties (Ennisi, 2011). This is a stage of higher-order thinking which aims to make reasonable decisions about what we believe and what we do. According to Jenicek (2006), there are four groups of higher-order thinking which include problem-solving, decision making, critical thinking,

and creative thinking. Meanwhile, reasoning includes basic thinking, critical thinking, and creative thinking, Ewie (2010).

It is clear that critical thinking consists of the ability to understand problems, select the information that is important to solve problems, understand assumptions, formulate and select relevant hypotheses, draw valid conclusions, determine the validity of conclusions, and to finds analogies and kinds of relationships between pieces of information, to determine the relevance and validity of the information that can be used for problem formation and resolution, and to finds and evaluates solutions or other ways of solving problems (Klimoviene, 2006 and Lang, 2000),

Furthermore, critical thinking skills include attitudes, the ability to acknowledge the existence of problems and accept them, and the general need for evidence that supports problems, Leen et. al. (2014; in addition, it also includes the ability to show the truth, knowledge of correct conclusions, abstractions, and accurate generalizations from some accompanying evidence, as well as the ability to apply attitudes and knowledge. It also implies that knowledge is the most basic aspect and measure of intelligence in the thinking process. Obviously, although all opinions are different, in essence, they have similarities in the aspects of collecting, evaluating, and using information effectively. It stands to reason that critical thinking skills are needed by students so that they are good at making decisions in their life. The main key to generating critical thinking is to restructure thinking as a result of analyzing and evaluating it effectively.

Moreover, it can also be understood that the ability to make observations, ask relevant questions and look for needed sources, test and check beliefs, assumptions, and opinions, use facts, identify and define problems, and assess the validity of statements and arguments, to make wise decisions and valid solutions, and to understand the logic and logical argumentation comprises the critical thinking skills, Piaw (2010).

Critical thinking with the elements of 1) focus, 2) reason, 3) conclusion (inference), 4) situation, 5) clarity, and 6) review, (Ennis, 2013), is a way of thinking that is directed, planned, and follows a logical flow following known facts. Ruber stated that, in critical thinking, students are required to use certain appropriate cognitive strategies to test the reliability of problem-solving ideas and overcome problems and shortcomings. It is certain that critical thinking begins with how to respond to a problem that is in front of him so that the focus of the problem can be seen from the conclusions of the arguments presented. Students will respond in the form of underlying and logical reasons but do not come to conclusions. If the reasons given are appropriate and sufficient, conclusions can be drawn. They must match the actual situation. There must be clarity when there are terms used in the argument so that there are no mistakes in making conclusions. There must be reviewing or checking or re-examining of what has been found, decided, noticed, studied, and concluded.

According to Piaw (2010), the indicators to assess critical thinking skills through tests are assumptions, making inferences, deductions, interpretations, and evaluating arguments. This is in line with Prayitno, et al. (2012) who states that the construct of thinking ability consists of 1) Formulating a problem that can be measured by the ability

of students to formulate questions that lead to investigations. 2) Arguing can be measured by students' ability to formulate arguments as needed and can show differences and similarities between the aspects given in the assignments. 3) Performing deductions can be measured by the ability of students to deduce logically and interpret data appropriately. 4) Conducting induction can be measured by students' ability to analyze data, make generalizations, and draw conclusions appropriately. 5) Evaluating can be measured by the ability of students to be able to evaluate based on facts alone by providing a variety of alternative problems. 6) Deciding and taking action can be measured by the ability of students to determine a way out and choose possible alternatives to be chosen.

The STAD type cooperative learning model theory from Slavin (2019) was implemented as the learning model in this study. This learning model is the simplest and most appropriate learning model used by teachers who are just starting to use a cooperative learning approach. Slavin (2019: 143) argues that this learning model creates students' group works which consists of four students with various gender, skill, and background of ethnic. The learning materials are presented by the teacher while the students study in groups. They are asked to answer the quiz individually and they cannot cheat their friends. Moreover, the results of quiz are compared to the students' previous scores and the group who can increase their progress will get additional score. These scores are added up to get group's achievement. The group who can fulfil the learning criteria will get a bonus as their appreciation (Affandi et.al., 2022).

METHOD

Research Design

The design of the study was a Quasi-Experimental Research one using the control group of conventional learning with varied lectures and the experimental group of constructivist-critical-collaborative learning. As stated by Sugiono (2011), the post-test was given to the experimental group and control group. The primarily collected data were then processed and analyzed to determine whether there is an effect of the Electronic Learning Tool cooperative learning-based of STAD-type on critical thinking skills.

The procedure in this study includes planning stage is the preparation of learning devices used in the treatment stage. The planning stage includes the preparation of research proposals, preparing learning tools in the form of syllabus preparation, Learning Implementation Plans using a collaborative-constructivist learning model, and finally preparing research instruments in the form of data collection tools. where the researcher takes as much data as possible from the research subject. This stage includes the preparation of research proposals, preparing research instruments (syllabus and lesson plans), the implementation of teaching and learning activities in the control class with various learning treatments using the lecture method, and in the experimental class, the treatment is in the form of the application of the collaborative-constructivist learning model. The learning process was observed by three people to monitor the implementation of the constructivist-critical-collaborative learning model syntax using

an observation sheet, after which a post-test was held, and the data analysis was carried out using version 16 of the SPSS.

Participants

Sukmadinata (2007) says that the representative samples come from the population to take conclusion which can be implemented for it. The population of this study was all 5th graders in the southern Surabaya area for the 2020/2021 academic year, totalling approximately one hundred schools, and the samples in this study were selected using random sampling from two schools based on the accreditation of schools that obtained superior accreditation (level A), namely SDN Sidosermo 1 Surabaya as a control class in which there were 36 students, and SDN Margorejo 3 Surabaya as an experimental class in which there were 38 students.

Data Collection Techniques

The techniques to collect the data in this study were observations, documentations, and tests. According to Budiyono (2017), test technique is a series of questions or exercises which can be utilized to assess someone's intelligence, skill, knowledge, or even talent. This is a systematic procedure in which the individual being tested is exposed to a set of response stimuli that can be shown in numbers. In this study, a test method in the form of a written essay question was used to measure students' critical thinking skills.

The data in form of notes and reviews about the school documents were collected using documentation technique. The school documents had to be related to the research object. The data collected with this technique is the value of writing practice data as a reference material used to determine the balance of students' initial abilities in the research population.

Furthermore, Budiyono (2004) explains that observation is carried out by observing the research object directly to investigate all activities happened in it. In this study, an observation sheet was used to see the Electronic Learning Tool cooperative learning-based of STAD-type which is applied in the classroom supervised by an observer. The objects of the observation cover the entire process of teaching and learning activities in the classroom including the teacher' and students' activities as well as the classroom conditions during the learning process.

Data Analysis

This research implemented the data analysis of descriptive statistical and inferential statistical. Descriptive statistical data analysis was used to describe the collected data, namely, the critical thinking ability profile of the 5th-grade elementary school students of the 2020/2021 academic year in the southern Surabaya area, while inferential statistical data analysis assisted by the SPSS version 16 program was used to test the hypotheses. A two-sample t-test which is stated to be independent at significant level (α) of 0.050 is utilized in hypothesis testing. The prerequisite tests were carried out before t-test. In this study, it consisted of normality test and homogeneity test. The normality test was carried out using the Kolmogorov Smirnov test. While the homogeneity test was

carried out using Levene's test. To draw the hypothesis decision the criteria is as follows. H_0 is rejected when the probability significance (Sig.) < (0.05). On the other hand, H_0 is accepted when the probability significance (Sig.) > (0.05) (Budiyono, 2004).

Data Accuracy Validation

The critical thinking is assessed using test in the form of descriptive questions, and the instrument used to collect data was tested first to determine the level of quality of the questions. The feasibility test of the research instruments was done using validity and reliability tests. Validity, which is the accuracy of an instrument in carrying out its measuring function, is an important quality of any test (Sugiono, 2011). The validity test in question is to test whether the instrument (measurement instrument) is really by the writing material given in the learning process. Accordingly, a valid test means that the instrument can be used to measure what it is supposed to measure. The validity test is divided into two types, namely internal and external validity.

Content validity relates to the ability of the test to measure the content that is supposed to be measured. In accordance, this shows whether the test includes a representative sample of the behavioral domain being measured. The content validity is maintained by identifying the concepts on the subject matter to be tested, compiling a grid of the material to be tested, compiling test questions based on the grid and then making an answer key along with an assessment rubric, and re-examining the questions, answer keys and assessment rubrics before the questions are printed (Budiyono, 2004).

Construct validity is a form of validation regarding whether the instrument (measuring instrument) is under what it wants to measure, namely the indicator (elaboration) of the concepts in the material being measured. Indicators are needed to describe the abstract concept and they play a role in overseeing the preparation of measuring tools to fit the concept.

Measuring indicators means measuring the building (construct) of a concept, so it can be concluded that if the measuring instrument is right in measuring indicators, it is also appropriate in measuring concepts in the material (Sukmadinata, 2007). Due to the fact that construct validity can be measured through expert review or by being tested on several individuals outside the sample but still in the population, the construct validity of the instrument in this study was tested through an expert review.

Sugiyono (2011) says that the external validity can be tested by equalizing the criteria of research instruments with the empirical facts in the field. External validity is done by testing the instrument on a sample of the research population and can be found by connecting the overall score of students in one item (X) with the overall score obtained by all students (Y) through Pearson's product-moment correlation technique.

The value of rXY is then used in the calculations on the t-test. The t-test is used because the respondents used in testing the instrument are samples, so generalization is needed into the population so that it can be considered to represent all the characteristics in it (Budiyono, 2004). The next step is to look at the distribution (Table t) for the

significance level (α) = 0.05 and the degree of freedom (dk = N-2). The comparison results in a test decision are as follows. When the value of tcount < ttable, the item can be stated to be invalid. On the other hand, when the value of tcount > ttable, the item is stated to be valid. This stays true with a repeated test (Arikunto, 2009). Therefore, test questions are reliable when it provides the same results in the different times. To measure the reliability of test instruments and questionnaire items, the Cronbach Alpha test was utilized.

FINDINGS

The Results of Research

The results of the critical thinking ability test (posttest) from the two groups with different the Electronic Learning Tool treatments were compared so that it could be seen whether there was an effect of implementing the Electronic Learning Tool cooperative learning-based of STAD-type on students' critical thinking skills.

Data on students' critical thinking skills in learning to write were obtained from the results of a written test in the form of writing essay questions after the learning process (posttest) on the material for Scientific Thinking with Basic Competencies, namely explaining writing effective and logical sentences in gaining knowledge. The essay question consists of 6 items that cover critical thinking aspects according to Facione (2013) which include: interpretation, analysis, inference (conclusion), evaluation, explanation, and self-regulation. The results of the distribution of students' critical thinking skills through the Electronic Learning Tool cooperative learning-based of STAD-type in the experimental group and the Electronic Learning Tool with various lecture methods, presentations in the control group briefly can be seen in the table below.

Table 1
Distribution of Critical Thinking Ability

Interval Level	Control Class Frecuency	Experiment Class Frecuency
45-52	9	0
53-60	4	2
61-68	10	7
69-76	5	6
77-84	5	16
85-92	3	5
93-100	0	2
Total	36	38

The table above shows the frequency of each value interval in the control group and the experimental group. The largest frequency of the control class is located at a value of 61 to 68 with a frequency number of 11. The largest frequency of the experimental group lies in the interval value of 77 to 84 with a frequency number of 16 indicating that the level of critical thinking ability of the experimental group students is higher than that of the control group students as can be seen in the table below.

Table 2
Description of students' critical thinking ability results

Statistical Result	Control Group	Experimental Group
Average	64,92	76,84
Standard Deviation	12,13	8,87
Variance	147,164	78,731
Minimum	45	58
Maximum	87	93
Median	64,60	78,25
N	36	38

In table 2, it can be viewed that the average value of students' critical thinking results in experimental group was higher than the average value of students' critical thinking results in control group. The average value in experimental group was 76,84. The average value in control group was 64,92. The larger the standard deviation, the more heterogeneous the data, conversely, the smaller the standard deviation, the more homogeneous the data. The value of standard deviation in experimental group was 8,87. The value of standard deviation in control group was 12,13. Furthermore, the value of variance in experimental group was 78,731. While the value of variance in control group was 147,164. This situation shows that the standard deviation and variance in the control class are higher than in the experimental class; it means that the diversity level of control group was higher than the diversity level of experimental group (Budiyono, 2017). The maximum and minimum values in the experimental group were higher than the control group, and the median or median value in the experimental group was higher than the median of the control group. Based on these results, it can be said that the critical thinking ability test of the experimental group is better than the control group. It can be seen in Table 2 that the average value of the critical thinking ability of the experimental class with the STAD-based cooperative learning is higher than the control class with the lecture method of various presentations.

It can be seen in Table 2 that the average value of critical thinking skills in the experimental class with the STAD-based Electronic Learning is higher than in the control class with various lecture presentations. In table 3, it presents the comparison of average value for each aspect of critical thinking skills in both groups.

Table 3
Comparison of average value of critical thinking ability in each aspect

Group	Interpretation	Analysis	Evaluation	Inference	Explanation	Self-regulation
Experimental	83,026	83,026	77,368	75,789	83,158	58,947
Control	91,250	49,444	68,889	63,333	61,667	54,444

Table 3 shows that the experimental group tends to be higher than the control group. It can be seen that the experimental group excels in aspects of analysis, inference (conclusion), evaluation, explanation, and self-regulation, while the control group excels in only one aspect of critical thinking, namely, the interpretation aspect (interpretation).

The interpretation aspect of critical thinking in control group can be said to be higher than in experimental group. In control group, it shows the value of 91.250, while in experimental group, it shows the value of 83.026. The value of the analysis aspect in the control group with 49.444 is much lower than in the experimental group with 83.026. The value of the evaluation aspect in the control group with 68,889 is higher than the value in the experimental group with 77.36. The aspect of inference in the control group with 63,333 is also lower than in the experimental group with 75.789. The value of the explanation aspect of the control group with 61,667 is lower than the experimental group with 83,158. The value of the self-regulation aspect in the control group with 54,444 is lower than the value in the experimental group with 58,947. The average aspect of the highest critical thinking ability in the experimental group lies in the explanation aspect, while for the control group lies in the interpretation aspect. The lowest average critical thinking ability aspect in the experimental group lies in the self-regulation aspect, while for the control group lies in the analysis aspect. Based on the average difference in critical thinking skills between the experimental group and the control group for each aspect, the range from the largest to the smallest is as follows: the analysis aspect of 33,582, explanation of 21,491, inference of 12,456, evaluation of 8,480, interpretation of 8,224, and self-efficacy. regulation of 4,503. Based on Figure 4.1, Figure 4.2, and Figure 4.3 show that the application of the Electronic Learning Tool cooperative learning-based of STAD-type improves the students' critical thinking skills.

Normality Test

To test the hypothesis, it needs a prerequisite test before carrying out t-test. The tests are normality test and homogeneity test. The first condition for the data to be t-tested is that the data must be normally distributed. This normality test has a purpose to investigate that both groups are derived from population which is normally distributed. H_0 shows that the sample comes from a normally distributed population and H_1 shows that the sample does not come from a normally distributed population. The normality test of students' critical thinking skills in the control group and the experimental group was found using the Kolmogorov-Smirnov test assisted by the SPSS 16 program set to = 0.050. The decision of the accepted normality is that if the value of Sig. from the normality test is greater than the value of the level that is set, namely 0.050 (Sig. > 0.050). In other words, if the data value Sig. from the normality test is greater than 0.050 (sig > 0.050) then, H0 is accepted, and it can be said that the data is normally distributed. Table 4 shows the normality test of critical thinking ability.

Table 4
Normality test of critical thinking ability

Class	Kolmogorov Smirnov	KS_{Table}	Sig	Results	
				Explanation	Decition
Control	0,107	0,227	0,809	Sig > 0,05	Normal
Experiment	0,077	0,221	0,455	Sig > 0,05	Normal

In table 4, the value of sig. is > 0.05. In this case, H_0 is accepted which means that the data in both groups has normal distribution.

Homogeneity Test

The second condition that must be met before conducting a t-test is that the data must be homogeneously distributed. The homogeneity test was carried out to investigate that variance of both groups. It could be stated to be heterogeneous or homogeneous. It is stated to be homogeneous when it has the same variance. The homogeneity test of critical thinking skills was carried out using Levene's test with = 0.05 and assisted by the SPSS 16 program. The variance between the control class and the experimental class is homogeneous if the significance value indicated is more than 0.05 (sig> 0.05) and heterogeneous if the indicated significance value is less than 0.05 (sig < 0.05). H_0 shows that each class has the same variance (homogeneous), while H_1 shows that each class does not have the same variance. Table 5 shows the result of homogeneity test of students' critical thinking ability.

Table 5
The result of homogeneity test of critical thinking ability

Homogeneity Test	df1	df2	F_{Count}	T_{able}	Sig	Decision of $H_{o\ Test}$
Critical Thinking Ability	74	72	3,883	3,974	0,053	Accepted

The table above shows that the value of F-count is 3.883 and the price of F-table(0.05)(1)(72) is 3.974. The results of these calculations indicate that F-count < F-table(0.05)(1)(72) and the significance value for the homogeneity test is more than 0.05. The results of these calculations indicate that H0 is accepted so that the value of critical thinking skills in the control class and the experimental class is homogeneous. Also, the hypothesis testing on students' critical thinking ability shows that the data comes from a population that is normally distributed and has a homogeneous variance so that parametric testing of the hypotheses through a t-test can be carried out.

Hypothesis test

In this study, t-test is utilized to test the hypothesis. T-test is carried out by using the SPSS 16 program. The purpose of the two-sample t-test is to compare whether the two data (variables) are the same or different (Sugiono, 2011). The prerequisite tests which consist of normality test and homogeneity test provide the results that the critical thinking ability test are normal and homogeneous, so the prerequisites for conducting the t-test are met. The criteria used in making the hypothesis decision is the level of significance (α) = 0.05. H_0 is rejected if the significance of probability (sig) < (0.05). This means that if the probability significance (sig) < 0.05, then the null hypothesis (H_0) is rejected and vice versa if the probability significance (sig) > 0.05, then the null hypothesis is accepted. H_0 in this study shows that the implementation of the Electronic Learning method of cooperative learning-based of STAD-type and the application of the learning method using various presentations on critical thinking skills have no difference. H_1 states that there is a difference between the application of the Electronic Learning method of cooperative learning-based of STAD-type with the application of learning tool with various lecture methods presentations on students' critical thinking skills. The results of the analysis of the effect of the implementation of the Electronic

Learning cooperative learning-based of STAD-type on students' critical thinking skills through the t-test can be seen briefly in Table 6.

Table 6
T-Test results the effect of STAD-based the electronic learning tool cooperative learning on critical thinking ability

Variable	N	df	F_{Count}	T_{able}	Sig	Explanation	Decision of $H_{o\ Test}$
Critical Thinking Ability	74	72	4,485	1,993	0,00	Sig > 0,01	Rejected

In table 6, it can be viewed that the significance value was less than 0,05. Thus, it can be concluded that H0 is rejected and H1 is accepted. H1 shows that there are differences between the implementation of the Electronic Learning method of cooperative learning-based of STAD-type and the application of the learning method with various presentations of students' critical thinking skills. It indicates that the Electronic Learning method of cooperative learning-based of STAD-type has an impact on critical thinking ability. It is in line with the significance value which shows less than 0,01. Based on the statistical data above, the finding of this research is The Electronic Learning Method of cooperative learning-based STAD-type has a significant effect on the students' psychomotor and affective learning outcomes, and students' critical thinking skills do not affect student learning outcomes.

DISCUSSION

The results of data analysis using t-test showed that the Electronic Learning Tool cooperative learning-based of STAD-type affected students' critical thinking skills. The results of the test decisions are shown by the sig value of 0.00 so that sig <0.05 and the t-count value of 4.845 and the t-table value of 1.993 so that t-count> t-table. The average value of students' critical thinking skills obtained by the experimental class with the Electronic Learning Tool cooperative learning-based of STAD-type is higher than the control class using conventional learning, there is a relatively large difference in the average value of critical thinking skills, which is 76.84 in the experimental group and 64.92 for the control group. This is because in the Electronic Learning Tool cooperative learning-based of STAD-type students are required to be able to formulate problems, formulate hypotheses, and test tentative answers through group discussions and experiments, resulting in an inquiry process that results in students' critical thinking about the material. This is in line with the research conducted by Kaddoura (2011) which reveals that there are differences in critical thinking skills in aspects of analysis, evaluation, conclusion, deduction, and induction, between classes that are given case-based learning rather than traditional learning. The learning process runs smoothly and creates effective interaction between teachers and students.

The Electronic Learning Method of cooperative learning-based of STAD-type is a combination of Constructivism and Collaborative views that complement each other. The constructivist character requires students to construct their knowledge, while the collaborative character emphasizes social practice and working together in collaborative groups. This is in line with Srikote (2013) which states that in the learning process

students are required to be active to build lesson concepts and solve problems that arise in lessons. Not all students can be actively involved in the learning process because of the different academic abilities among the students. Accordingly, it needs to create heterogeneous collaborative groups so that students with high academics can help the middle and low academic students to be actively involved in learning. This is supported by Darmuki et.al (2019 who states that, in collaborative learning, students must be placed in study groups to work together, be able to interact or discuss with other friends, have a strong will to teach friends in groups, and take benefit from student interaction in such collaborative groups.

Learning by using the Electronic Learning Tool cooperative learning-based of STAD-type in the experimental group was running effectively, which was shown by the enthusiasm of students during the learning activities At this beginning stage, students are formed into teams with approximately 5 members with heterogeneous academic abilities. The heterogeneous abilities of students in this group are intended to facilitate the scaffolding process through peer tutorials. . The scaffolding process through peer tutorials is intended so that students with high academics can help develop concepts or knowledge of students with medium and low academics, to minimize the gap in students' thinking abilities.

This stage aims to direct students to share the initial ideas or concepts they have in their minds regarding the learning material. So, at this stage, they can develop critical thinking skills in the interpretation aspect. This is in line with Piaget's constructivist learning theory which states that an active process in learning will make students build systems of meaning and understanding of facts through their experiences and interactions both with sources and with their learning partners (Piaget, 1986). In this study, the interpretation aspect in both groups has an average difference of 8,224. The average value of the control group is 91.250, which is higher than the experimental group with 83.026. This was due to fact that the control group started the lesson with the presentation of materials by the teacher before the practice, which was in contrast with the control group who started the lesson by practicing the inquiry process first.

The next stage is the creation of cognitive conflicts to create cognitive conflicts in the minds of students provoking cognitive imbalances. In this phase, students display slides in the form of pictures of activities using deductive thinking and inductive thinking through video presentations of the phenomenon of using deductive thinking and inductive thinking to solve problems. The role of the teacher in this phase is to help students describe their ideas by asking questions that allow them to refute students' ideas. The cognitive imbalance makes students feel dissatisfied with the phenomena they face. This urges them to manage and find the right answer to imbalance their cognitive. So, throughout this stage, the students develop critical thinking skills in aspects of analysis and explanation. The analysis aspect is seen when students test ideas and analyze the causes of problems. Aspects of analysis in the control group and the experimental group have an average difference of 33,582. The average value of the analytical aspect of the experimental group is 83,026, much higher than the average value of the control group of 49,444. This happened because the constructivist process

in students' minds went well in the experimental group compared to the control group which only got material from the lecturer. The explanation aspect is developed as the students express and explain their opinions to find the right answer to the phenomena they face. The explanation aspect between the control group and the experimental group has an average difference of 21.491. The average value of the experimental group is 83,158, which is greater than the average value of the control group of 61,667. This happens because the opportunity and time given to express opinions when discussing in the experimental group are more than the control group.

The next stage is collaborative concept formation. Concept formation is carried out in a constructivist manner through a process of assimilation and accommodation. This stage requires students to conduct inquiry activities by designing, conducting and discussing experiments through collaborative group work. The discussion and experiment activities require students to be able to formulate problems and hypotheses and test tentative answers. This is in line with the statement of Gokhale (1995) who states that through collaborative groups, students gain the basis of critical thinking freely and interdependently with each other during the expression of opinions discussions, decision-making, and problem-solving.

Critical thinking helps students to create and apply new knowledge to real-life so that students are more creative, responsible, thoughtful and creative. The process of formulating problems is done by training students to group existing data, this enables the practice of critical thinking skills in the interpretation aspect. The process of formulating hypotheses trains students to test data, formulate relationships logically, and formulate hypotheses so that they can practice critical thinking skills in analytical aspects (analysis). In testing tentative answers, the students are fostered to arrange ideas, collect the data needed, interpret it, and make decisions. To improve the explanation and evaluation aspects of students' critical thinking ability can be carried out by arranging ideas and setting the activities in sequences. In this phase, students have to be able to clarify and judge the ideas by giving strong opinions. The evaluation aspect between the control group and the experimental group has an average difference of 8.48. The average value of the experimental group is 77.789 which is higher than the average value of the control group is 68,889. This happens because the Electronic Learning Tool cooperative learning-based of STAD-type encourages students to assess a reliable statement from an experimental report. Students can also assess opinions made either inductively or deductively after conducting experiments designed independently (Facione, 2013) so that ideally the Electronic Learning Tool cooperative learning-based of STAD-type can affect students' abilities.

The next activity after obtaining the experimental data is making inferences. The conclusion aspect (inference) has a different average of 12.456. The average value of the experimental group, which is 75.789, is greater than the average value of the control group of 63,333. The average value of the experimental class is higher than the control class. This is due to the fact that, in the experimental class, students formulate problems, propose hypotheses, and design and conduct activities themselves. These help the students in identifying the facts, uncovering the hypotheses, and making inferences of

deductive and inductive judgments. In line with Beyer (1995) and Bers (2005) who argued that the critical thinking ability can be increased by the students. It can be carried out by providing and identifying the elements which are utilized to make conclusion. Moreover, it can be used to accomplish the assumptions and examine the evidences. Furthermore, it is utilized to minimize the results of opinions, data, information, principles, beliefs, etc.

The results of discussion activities and experiments that have been carried out through collaborative group work are then presented in front of the class. The class performances have an objective to enable teachers to monitor students' concept acquisition, and improve as well as strengthen the students' concepts that have been built during group discussions. Accordingly, it supports students in achieving the constructivist knowledge. Students will know which materials have been understood and which have not been understood, here aspects of critical thinking self-regulation (self-regulation) can be trained and the teacher becomes only a facilitator. Aspects of self-regulation of the control group and the experimental group have an average difference of 4.503. The average value of the self-regulation aspect of the control group is 54,444 which is lower than the experimental group of 58,947.

The following step is to implement quiz which is done in the end of learning process. One KD quiz is given to students in the form of descriptive questions. In this step, the students' understanding level about the materials can be measured. The last stage is providing team recognition for collaborative teams or groups that are active and experience an increase in both individual scores in groups and group progress scores. The purpose of presenting students' achievement individually and in groups is to drive students to think that the success in learning can be obtained when they study hard and provide better presentation.

The Implementation of learning using the Electronic Learning Method cooperative learning-based of STAD-type can train the students' thinking skills, especially the students' critical thinking skills. Guo (2016) states that the Electronic Learning Tool cooperative learning-based of STAD-type carries out initial conceptions (schemata), assimilation, accommodation, cognitive imbalance, and scaffolding which requires students to learn to construct concepts or knowledge by discussing or working together in collaborative groups so that the Electronic Learning Tool cooperative learning-based of STAD-type can train students' critical thinking skills (Romaida et al., 2020).

The results of this study indicate that the application of the Electronic Learning Tool cooperative learning-based of STAD-type has a significant effect on critical thinking skills on student psychomotor and affective learning outcomes. This study is in line with research conducted by Darmuki et al. (2018) which states that cooperative learning-based of STAD-type can create students active. According to Klimoviene et al (2006) and Zivkovil (2016), there is an indicative impact of critical thinking ability on learners' learning outcomes in psychomotor and affective domains by implementing collaborative constructivist learning. Another research that supports this research was the research conducted by Gokhale (1995) which found out that collaborative learning-critical thinking can improve learning outcomes, including thinking skills.

CONCLUSION

The conclusions of this research are: 1) The Electronic Learning Tool cooperative learning-based of STAD-type has a significant effect on the students' psychomotor and affective learning outcomes, and 2) students' critical thinking skills do not affect student learning outcomes Future research to test the practicality and the effectiveness of the Electronic Learning Method cooperative learning-based of STAD-type and find out the impact of academic skill on students' achievement and their abilities to think. The limitations of this study were that this study has not covered all other independent variables due to certain methodological or procedural difficulties and beyond the control of the researcher.

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