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M6 LEARNING MODEL: THE FRAMEWORK TO DESIGN A LEARNING MODEL THAT IMPROVES STUDENTS' CRITICAL THINKING SKILL

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ABSTRACT

This article introduces the M6 learning model as a conceptual framework that can improve students' critical thinking skills. This study employed a qualitative method. The conceptual framework focuses on two main theories, they are the previous learning models that can improve students' critical thinking skills and theories of critical thinking skills. The result of this study is a syntax of learning model consisting of six steps, they are (1) initial skill focus; (2) concept justification; (3) problem identification; (4) idea presentation; (5) evaluation; and (6) conclusion.

Keywords: Framework, M6 Learning Model, Critical Thinking Skills

INTRODUCTION

Reversible Critical thinking skill is one of the highly required skills in the 21st century (Kharbach, 2012; Abed et al, 2015; Swart, 2017; Changwong, 2018; Saputra et al., 2019; Sa'dijah et al., 2019). Additionally, this critical thinking skill is also essential for many aspects (Marcut, 2005; Yacoubian, 2015; Alcantara & Bacsa, 2017). Therefore, the development of this skill is strived for in the mathematics education curriculum (NCTM, 2000; Radulovic & Stancic, 2017; As'ari, Mahmudi, & Nuerlaelah, 2017). The Indonesian government also expects for the development of this skill in each subject learned in the classroom to create successful students in the future (Kemendikbud, 2013). The expectation comes from several excellent attributes owned by people with critical thinking skills. Critical thinking skill helps a person to make a valid decision resulting in rapid new knowledge mastery (Ku, 2009; Lau, 2011; Ananiadou & Claro, 2009). This skill also helps students to face complex challenges when they solve a problem (Hendricson et al, 2006; Carter et al, 2016). Lastly, this skill also helps students to analyze, judge, and draw a conclusion from the problem they face (Pithers & Soden, 2000; Huang, Ricci, & Mnatsakanian, 2016). Thus, critical thinking skill needs to be developed in the classroom learning.

However, the critical thinking skill of many students is less developed because classroom learning rarely focuses on that skill development. According to the result of previous studies, teacher-made lesson plans and assessment instruments are not specifically made to improve students' critical thinking skills. Besides, the students' initial thinking skill is also low. That comes from students' inability to solve critical thinking skill related questions. The observation result shows that there are only 25% of students who can solve those questions. Consequently, that shows the low critical thinking skill of the students. The other results of the observation on students' answers show their inability to write the information required by the questions; inability to mention the proper reason; inability to evaluate the provided choices of answers; and inability to draw the correct conclusion (Susandi et al., 2018). This evidence shows the importance of learning quality improvement in Indonesia, especially the one that focuses on critical thinking skill development.The development of students' critical thinking skills requires the right learning models.

There isa various learning model that can improve students' critical thinking skills. Yeh (2009), develops a direct-instruction learning model consisting of introduction (review on previous materials, present the learning objectives, and focus students' attention on the topic that will be discussed), presentation, and teacher guides students to conclude. Also, Wannapiroon (2013), develops the Research-Based Blended Learning (RBBL) model consists of arranging and analyzing problem; designing and planning investigation; interpreting and evaluating problems; and presenting the result of the investigation. In addition, Buhaerah (2016) develops the PMBK model with several steps, they are concept identification and justification; problem-solving; algorithm generalization and analysis. Muhlisin (2016), designs the RMS learning model with the syntax of reading; creating a map concept; and sharing. Other than those, Damianus, Darhim, & Kartasasmita (2017), designs the contextual thinking learning model with the syntax of presenting contextual problem; proposing critical questions and analysis; group and individual investigation; presentation and discussion; reflection; and test.

However, the development of those learning models are lacking in a few aspects. In the learning model developed by Yeh (2009), the teacher still delivers the materials during the presentation and dominate the students during the making of the conclusion. The learning model developed by Wannapiroon (2013) is also lacking in the long duration in the investigation process since students do it individually and no teacher's role in the presentation process. The lack of the model developed by Buhaerah (2016) is the teacher only divides the groups without considering their ability; students still used the already existed concept on the main problem they are going to learn; students only draw a conclusion from

the materials without any evaluation. The learning model developed by Muhlisin (2016) is also lacking in the direct ways of delivering feedback for students' presentations that reduces students' participation in giving their opinion. In the last model, the model developed by Damianus, Darhim, & Kartasasmita (2017) makes the teacher dominate the questions session, thus the students have a lesser chance to ask questions and deliver their idea. During the presentation, the teacher gives direct feedback and direct explanation as the conclusion for the problem-solving. According to the previous studies on these learning models, there should be an improvement in these learning model to maximally achieve the learning objectives. Therefore, we need a more valid, practical, and effective learning model to enhance students' critical thinking skills.

Learning process that improves students' critical thinking skill are identifying problem, analyzing problem, group discussion, giving questions that stimulate critical thinking skill, drawing conclusion, from various sources, evaluating finding, diving feedback, and scoring that stimulate critical thinking skill (Duron *et al*., 2006; Qatipi, 2011; Lee et al., 2012; Peter, 2012; Aktas & Unlu, 2013; Zhao *et al*., 2016; Vong & Kaewurai, 2017). Students can develop mathematical critical thinking skills when they face mathematics problems, identify the probable solution, and justify the reason for their finding (Marin & Halpern, 2011; Thomas, 2011; Fahim & Pazesk, 2012). The activities that stimulate critical thinking, problem identification, problem investigation, finding discussion, finding evaluation, solution creation, and solution presentation can improve students' critical thinking skill (Vong & Kaewurai, 2017; Hadi, et al., 2018; Prayogi, et al., 2018). The activities, such as giving problems, collecting sufficient evidence, creating hypothesis, commenting on presentation of the result train students to identify problems, analyze problem, concluding problem, and evaluating problem that also increase students' critical thinking skill (Duron et al., 2006; Peter, 2012; Zhao et al., 2016; Duran & Dokme, 2016).

Based on the explanation and evidence presented above, the researchers want to design a new learning model based on the previous learning model and theories about critical thinking indicators that improve students' critical thinking skills. This model is named the M6 learning model. It calls M6 because of the models consisting of six learning syntaxes that support the development of students' critical thinking skills.

METHODOLOGY

The initial data collection was done through a preliminary study that seen the level of students' mathematics critical thinking skills. The test on students' critical thinking skills involved 32 seventh grade students from SMP N 1 Weru Cirebon. Besides, the researchers also conducted a review on the learning condition of the school, various mathematic critical thinking related theories, and learning models that improve students' critical thinking skills. There are five learning models being reviewed in this study, they are direct-instruction learning model (Yeh, 2009); Research-Based Blended Learning (RBBL) learning model (Wannapiroon, 2013); PMBK learning model (Buhaerah, 2016); RMS learning model (Muhlisin, 2016); and contextual thinking learning model (Damianus, Darhim, & Kartasasmita, 2017). Additionally, the researchers also studied critical thinking skill indicators. There are four indicators being studied in this reviewed, namely critical thinking skill indicator based on Ennis (1996); Jacob & Sam (2008); Sale & Cheah (2011); and Facione (in Peter, 2012). Based on the result of this study, the researchers create an appropriate contextual framework to develop the learning model that can be implemented in mathematics learning in the classroom. Below is the explanation about the review on the learning models that improve students' critical thinking skill, in Table 1; Table 2; Table 3; Table 4; and Table 5.

RESULT AND DISCUSSION

1. The result from the Evaluation of Students' Initial Critical Thinking Skill

Before we make the framework of the M6 conceptual learning model, the researchers conducted a primary study, first. Therefore, the researchers conducted a test on students' initial critical thinking skills in SMPN 1 Weru Cirebon, involving 32 students from VIII A, the academic year of 2017/2018. The critical thinking questions given to students were related to analysis, evaluation, and drawing conclusion skills. The materials being tested were to evaluate those three skills in a linear equation in two variables. The percentage of results from a test on students' initial critical thinking skills is presented in Table 7.

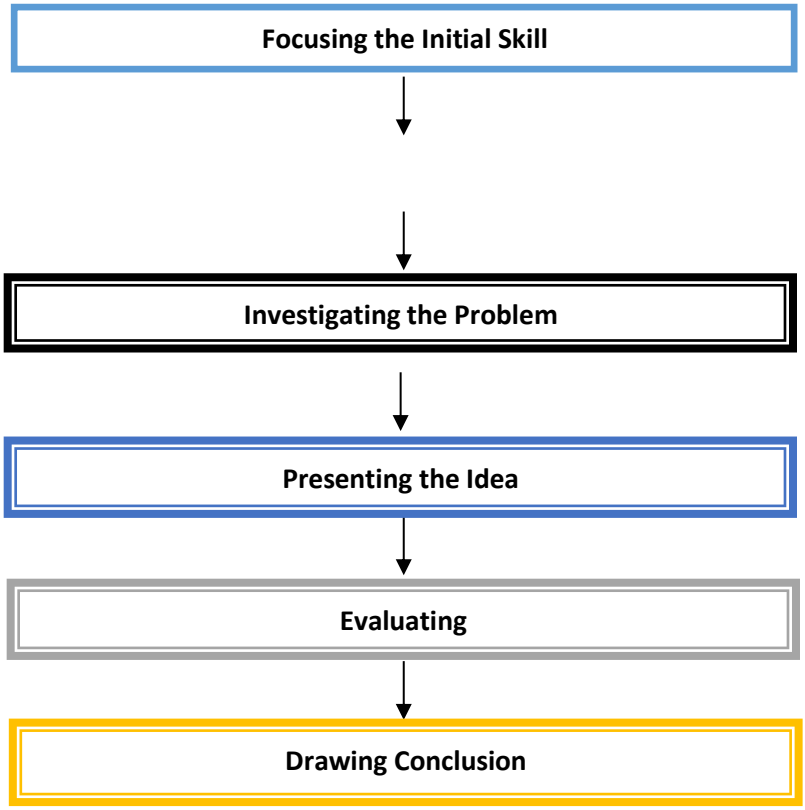
2. Review on the Current Learning Environment

According to the researchers evaluation on teachers of in VIII grade of SMPN 1 Waru on academic year of 2017/2018 during the mathematics learning with scientific approach, the researchers found that: (1) teachers rarely ask the students to do observation and experiments in their classroom learning; (2) teachers rarely give HOTS questions to the students; (3) teachers routinely give questions with a single answer to the students during the learning process, thus teacher cannot stimulate other ideas from students; (4) many teachers still rely on the textbook, thus it becomes their only learning source; (5) teachers tend to develop questions and exercises for students based on the textbook they got from the school even when there are various learning sources other than that textbook; (6) teachers still use a regular type of questions, thus they have the tendency for not teach the students to improve their critical thinking skill; and (7) the exercise given to the students only have one single answer.

Based on the evaluation conducted on the students during the mathematics learning in the classroom, the researchers conclude that: (1) students are still lacking on the confidence during the mathematics learning because they are not habituated with open-ended questions; (2) students still have difficulties to understand the textbook's content, examples, and language; (3) students are not responsive toward teachers' explanation because they feel bored; (4) from the report of students work, their critical thinking skill is still low; and (5) students tend to copy or follow the answer of other students that they perceived as smart students.

3. Result of Conceptual Framework of M6 Learning Model Development

The M6 learning model is a new design of learning models that modified the syntaxes of previous learning models that can improve critical thinking skills. M6 learning model has 6 steps, they are (1) the initial skill focus; (2) concept justification; (3) problem identification; (4) idea presentation; (5) Evaluation; and drawing a conclusion. The design of the conceptual framework is presented in Picture 1 and the



supporting ideas are discussed in the next part.

Picture 1. Design of M6 Learning Model

Below is the explanation for each of the M6 learning model syntaxes as well as the theories.

Step I: Focusing the Initial Skill

On step I, the teacher does the introduction activity. After that, the teacher group students into a group of 3-5 students. The groups' formation aims to create social interaction in the classroom. This corresponds to a learning social nature according to Vygotsky's theory that says good learning facilitates students to learn from their peers. Furthermore, Douglas & Chiu (2013) says students can earn various things from group work such as develop critical thinking skill, learn a collaborative skill, get different perspectives, and maintain the knowledge. The formation of heterogenic groups gives students the opportunities to deliver their personal idea to solve the problem together (Douglas & Chiu, 2013). A collaboration can be in the form of formal small group or classroom discussion on a work presented by students with other students giving improvements, critics, or alternative solution that develop communication skill, encourage peer reliance and positive environment, and deliver the idea that there are various ways to solve mathematics problem, aside from the one presented by the group (Laursen, 2014). Besides, looking for information on a specific topic, collaboration, and rewriting the already discussed topic can improve critical thinking skills (Alsharadgah, 2014; Yen Ju, et al., 2014).

In addition to the group formation, the teacher conducts an answer and question section to explore students' initial skills. This helps the teacher to understand students' initial knowledge before they move to the next material. Besides, that prerequisite knowledge also helps to develop students' critical thinking skills (Yeh, 2009). From that initial understanding, students move forward to develop new knowledge that focuses on them and encourage as well as stimulate their thinking to solve problems presented by teachers and draw a conclusion (Radzi, et al, 2017). Other than that, Safdar, et al, (2012) mention that to have meaningful learning, students should link their new knowledge (concept, proportion, rules, and principle) to what they have known before. Furthermore, according to Clements (2013), mathematics initial knowledge is essential to predict the achievement of the next materials, thus teachers need to do it in the right ways on the first step. Additionally, students can also learn to respond to the questions that are given by teachers through problem identification to answer the question. This is done since the involvement of feedbacks and drawing conclusions are the effective tools to develop critical thinking in synthesis, evaluation, reasoning, and concluding domain (Tsui, 2002).

Step 2: Justifying Concept

In this step, the teacher assigns students to understand the materials from the textbook and find the concepts related to the topic being discussed. After that, the teacher appoints a representative from each group to explain the concept they got from the textbook. The students, then, question the concept that they have not understood. This allows students to give the right concept and question the concept they have not understood, thus, they get the new knowledge to solve the problem (Paul & Elder, 2008; Innabi, 2003). Furthermore,

according to Bajracharya (2010), justifying a concept is an initial step to build the knowledge of critical thinking. Besides, Bajracharya (2010) & Ennis (2008), explain that reading and explaining concepts is the activities for self-development. In this step, students can ask question about the concepts that they have not understood. According to Duron, et al, (2006), questioning is an essential part of teaching learning. This helps teachers to know the parts that students have understood, develop ideas, and new understanding, thus, the questions can stimulate teacher and student's interaction in critical thinking.

Step 3: Investigating Problem

In this step, the teacher gives problems by assigning students to work on students' worksheets consisting of analysis, evaluation, and drawing conclusion related questions. This is done due to several learning activities, such as classroom team project, worksheet assignment, have been implemented to apply and promote critical thinking skill among students (Almubaid, 2014). In the next step, students identify the problem, formulate hypotheses made by students within the group, do and make a note on the evaluation and ideas, and test the hypothesis through group discussion. The same participation as the one in the group discussion is done to make students solve the problem and improve their learning result (Chen, 2012; Hsueh, 2014; Raes et al, 2012). Furthermore, according to Valdez, et al (2015), the collaboration in the group work can improve students' critical thinking and decrease the number of duration students need to develop their thinking process. According to Vygotsky (1978), students can get to a higher intellectual level if they are asked to work in a collaborative situation rather than working individually. The usage of students' worksheets can improve the level of students' understanding of the materials and students' communication (Douglas & Chiu, 2013). According to Hadi, et al, (2018), the procedures on the students working sheet to improve critical thinking involve students' activities on problem orientation, problem formulation, hypothesis formulation, variable identification and definition, working procedure development, data analysis, list the possible conclusion, evaluation, and drawing the conclusion. The process of identifying the problem, understanding, and looking for information can improve critical thinking skills (Facione, 2013).

In this step, the teacher also gives scaffolding procedures to the students who face problems during the investigation. The aim of this scaffolding activity is to help students to think and find the answer to the difficulties they faced during the investigation. According to Shabani, Khatib, & Ebadi (2010), the main purpose of scaffolding activity in a learning process shows ZPD characteristic to shift students' responsibility for the task. Scaffolding emphasizes collaboration between students and teachers in building skills and knowledge. In this step, students also draft and test hypothesize, that can help them to train their cognitive, a process that students need to do to learn step by step to gain the mastery in the interaction with an expert (the teacher or other students with higher mastery on the problem they face). This step is also expected to develop students' mathematics critical thinking skill that becomes the purpose of this study. According to Duran & Dokme (2016), the discussion can improve students' critical thinking, help students to improve their ability to create a relation between claim and evidence.

Step 4: Presenting Idea

In this step, the teacher asks students to present their ideas they have got from the group discussion in front of the class. During the presentation, students explain their ideas from the investigation. This is supported by Nezami, et al (2013), the sharing activity on the result of group discussion can improve critical thinking skills. In this step, there will be different opinions on the presented ideas that can stimulate the social interaction between the learners that create a better zone of proximal development and cognitive training. Garret, et al, (1996) mentions that the debate will improve critical thinking skill. According to McDonald (2012), when students learn to accept and give critics, it helps students to become great people who can face the working world. Besides, students who are not presenting can also attain a score from evaluating the idea delivered by other groups and find a new idea based on the right reason. This is supported by Webb, et al (20140, when students explain essential mathematics ideas in the group, there is a greater achievement if they relate to each of their personal idea (like challenging partners, clarifying contradicting ideas, delivering the alternative idea, and build other people idea).

Teachers give scaffolding to help students to get back to the problem being discussed and find the right answer if the debate has gone out of the context. Consequently, that creates indicators of critical thinking skills that improve their critical thinking skill. That corresponds to the idea from Wartono (2018), that critical thinking skills can be empowered by teachers by giving challenging questions or problems for students. Asking the right critical question can stimulate and guide students' critical thinking and their continuous exploration from opinion, knowledge, and evaluation (Browne & Keeley, 2007; Duran & Dokme, 2016). However, Good (2004), suggests hold their opinion on the suggestion given by students and let them get comments and critics from their peers.

Step 5: Evaluating

In this step, the teacher asks students to check the answers they got during the presentation. This aims to let the student learn how to judge the wrong answer to improve their critical thinking skill. This corresponds to Stacey (2012) and Geng (2014), that say critical thinking aims to clarify the mathematics ideas and evaluate with clear evidence. After students find the wrong answer, then the teacher gives them a chance to explain their reason in evaluating the work of other students. This is to make students learn to develop their idea and train their responsibility for the decision they have made. This is because critical thinking skill involves the willingness to evaluate various perspectives through looking for the clear reason (Duron, et al, 2006; Lai, 2011; Ruggiero, 2012; Facione, 2013; Murawski, 2014). Several evaluation activities in critical thinking are testing the relevant proof and create logical reason (Mason, 2008; Pagano & Roselle, 2009; Fahim & Ghamari, 2011).

Step 6: Drawing Conclusion

In this step, the teacher asks students to formulate the conclusion they have got from the evaluation step. The teacher also appoints several students to deliver their conclusion from the evaluation process. This is done to make students learn to draw a conclusion with their own language. The evaluation from other students has been proven to be an effective tool to know the contribution of each group member (Weimer, 2008). After that, the teacher checks the conclusion from those appointed students' and gives the general conclusion from the students' answers. After that process, students draw a conclusion with their own language so they can understand it easily. This is done to make students think and act to develop the assumption about a particular problem

with strong evidence to draw a conclusion for that assumption (Lotter, et al, 2014)

CONCLUSION

The conceptual framework of the M6 learning model aims to improve student's critical thinking. This conceptual framework considers coherent theoretical studies. In designing the conceptual framework of the M6 learning model, the researchers modified the syntaxes from five existing learning models that improve students' critical thinking skills and theories on critical thinking indicators. The researchers have not developed the learning media that support the M6 learning model. Therefore, the researchers suggest future researchers develop the right learning media that is useful to develop students' critical thinking skills in classroom learning.

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Table 1. Steps of Direct-Instruction Learning Model According to Yeh

Steps of Direct-Instruction Learning Model	**Classroom Activities**
Step I: introduction and review	a. The teacher reviews the critical thinking skill and explores its relation to the students' initial knowledge. b. Teacher attracts students' attention and motivation to learn through explaining the learning objectives and the importance of critical thinking skill.
Steps II: presentation	a. The teacher presents information to be effectively processed and encoded by the students. b. Teachers interactively demonstrate critical thinking skills.
Step III: guided practice	a. Teachers provide opportunities for students to practice critical thinking skills. b. The teacher boosts student interaction and implementation of scaffolding to help students encode the information they have gotten.
Step IV: individual practice	a. The teacher divides students into several working groups to solve critical thinking related problems.

Table 2. Steps of Research-Based Blended Learning Model According to Wannapiroon

Steps of Research-Based Blended Learning Model	Classroom Activities
Step I: Arranging and analyzing the problem	a. Students develop a strategy for their chosen topic. b. Students formulate questions and create a hypothesis. c. The teacher creates an appropriate investigation model that can be used.
Step II: designing and planning an investigation	a. The teacher gives suggestions for students in choosing the topic. b. Students choose a topic and begin the investigation. c. Students identify a case study and competence in getting the information. d. Students finish the planned design investigation.
Step III: interpreting	a. Students interpret the data. b. Students report the finding. c. Students individually deliver their report on the study case. d. Students integrate and analyze the study cases.
Step IV: presenting the investigation result	a. Students develop a presentation strategy b. Students present the result of their investigation. c. Each student does the cross-study case.

Table 3. Steps of PMBK Learning Model According to Buhaerah

Steps of PMBK Learning Model	Teacher Activities	Students Activities
Phase I: identifying and justifying a concept	a. The teacher divides students into small groups. b. The teacher assigns students to read the materials and find the concepts related to the main problem. c. The teacher assigns students to arrange relevant reasons to explain the concept. d. Ask students to explain the concept, question unclear things, in turn.	a. Each student goes to the groups. b. Looking and understanding the explanation of activities about the problems related concept. c. Students create argumentation supported by evidence to strengthen the explanation. d. Students clearly explain the concept of the materials and question unclear things.
Phase II: problem-solving	a. The teacher assign students to solve the problem on the activity paper together with their group. b. The teacher assigns students in each group to correctly score the answer. c. The teacher asks the students doing the presentation to gives feedback to the questions given to them.	a. Students respond to the teacher by deciding (known and questioned) the mathematics model and the solution. b. Students give suggestions or comments and evaluate their answers. c. Students choose one answer and give it to the teacher.
Phase III: generalize and analyze the algorithm	a. The teacher assigns the students to present in front of the class. b. The teacher gives a chance for students or other groups to give feedback or questions. c. The teacher guides the presenting groups to give feedback to the question.	a. Students present their work in front of the classroom (the chosen group only). b. Students check, compare the answer they got, respect, and question the correctness of the answer. c. Students comment back through completing the supportive data and giving the complete explanation on the way to get the data. d. Revise the result that they consider wrong.
Phase IV: Conclusion	a. The teacher assigns the students to draw the final conclusion.	a. Students draw a conclusion on the materials they have learned.

Table 4. Steps on RMS Learning Model According to Muhlisin

Steps of RMS Learning Model	Classroom Activities
Step I: reading	a. The teacher guides the students in the learning of a specific topic or material. b. Students discuss the activities related to the specific topic or material.
Step II: creating a map concept	a. The teacher assigns students to individually make a map concept related to the information they have read.

	b. The teacher arranges students into heterogenic groups. c. The teacher asks a question to and facilitates the students to make a map concept in their group based on their individual map concept and information they have read. d. Students make a map concept related to the material that has been discussed. e. Students communicate their idea and map concept in the group.
Step III: sharing	a. Students present their group's map concept in-class discussion b. The teacher gives feedback, reinforcement, and confirmation on the topic they have learned through various learning materials.

Table 5. Steps of Contextual Thinking Learning Model According to Damianus, Darhim, & Kartasasmita

Steps of Contextual Thinking Learning Model	**Classroom Activities**
Step I: presenting contextual problem	a. The teacher presents the learning objectives. b. The teacher presents a contextual problem. c. Students listen to the teacher's explanation. d. Students observe the contextual problem presented by the teacher.
Step II: asking analytical and critical questions	a. The teacher presents several questions that attract and stimulate students' critical thinking. b. The teacher asks students to formulate questions about the presented problem. c. Students listen to the teacher's questions and give answers, ideas, or opinions about the presented problem.
Step III: individual and group investigation	a. The teacher gives a working sheet to the students. b. The teacher asks students to individually solve the problem. c. The teacher asks students to make groups and discuss the solution in the groups. d. The teacher acts as a facilitator to support students to do scaffolding to change their idea. e. Students solve the problem individually. f. Students discuss and solve the task in the group.
Step IV: presentation and discussion	a. The teacher asks several representative students from several groups to present their solution in front of the classroom. b. The teacher responds and gives an explanation of the conclusion on the students' problem-solving. c. Students present the result of their group discussion. d. Students give feedback or questions toward the presenting group.
Step V: reflection	a. The teacher guides students to draw a conclusion or short summary of the concept or idea from the discussed problem. b. Students draw a conclusion on the materials they have learned.
Step VI: test	a. Teachers give tests to the students. b. Students work on the test given by the teacher.

Critical thinking skill indicator based on Ennis (1996) consist of focus, reason, inference, situation, clarity, and, overview. Critical thinking skill indicator based on Jacob & Sam (2008) consist of clarification, assessment, inference, and strategies. Critical thinking skill indicator based on Sale & Cheah (2011) consist of compare & contrast, Analysis, inference & interpretation, and Evaluation. Critical thinking skill indicator based on Facione (in Peter, 2012) consist of identify, define, enumerate, analyze, list, and self-correct. According to those critical thinking skill components from the experts, we can conclude that critical thinking skill improvement can be done through learning processes that actively involve students to analyze, evaluate, and draw a conclusion. The summary of the study on critical thinking skill components and its mathematics learning process is presented in Table 6.

Table 6. Components of Critical Thinking Skill and Mathematics Learning Activities

Components of Critical Thinking	**Mathematics Learning Activities**
Analyze	➢ Students can identify the information they need to formulate the research question and to get the right answer
Evaluate	➢ Students can evaluate the correct answer and give the right reason for the evaluation they have done to the answer
Draw Conclusion	➢ Students can draw a conclusion and give the reasons for the information they have got from the question

Table 7. Percentage of Result from Test on Students' Initial Critical Thinking Skill

Question Number	**Cognitive Process of Critical Thinking Skill**	**Percentage of Students who Fulfilled the Criteria**
1	Analyze	8 students (25%)
2	Evaluate	6 students (18,75%)
3	Draw Conclusion	3 students (9,375%)

According to data presented in Table 7, it can be seen that not even half of the total number of students can correctly do the critical thinking skill process. This shows that the students' critical thinking skill is low level. this is reinforced by research susandi et al (2019a) and susandi (2019b), that students' critical thinking skills are still relatively low. Thus, students' critical thinking skill needs to be improved and developed.