Formosa Journal of Science and Technology (FJST)
Vol. 1, No. 8, 2022: 1185-1200

Application of Mathematics Learning Model Creative Problem Solving that Assisted with Desmos to Improve Students' Critical Thinking Skills of SMKN 14 Medan

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A R T I C L E I N F O

Keywords: Applying, Creative Problem Solving, Desmos, Students' Critical Thinking Skills

Received : 10, November
Revised : 30, November
Accepted: 24, December

A B S T R A C T

The object of this research is students' critical thinking skills by applying the Creative Problem Solving (CPS) learning model and is assisted with to material Linear Equation System of Two Variables in class X TPBO of SMK Negeri 14 Medan. The result analysis revealed that: there is improvement of students' critical thinking skill after applying those action, such as, the observation for students' critical activities increased from 37,27% in cycle I to 80% in cycle II, with gain index 0,70 (medium), there are 19 out of 31 students (61,29%) have attained the standard of critical thinking skills with mean score 62,60, improved after the execution in cycle II became 27 out of 31 students (87,10%) and mean 81,45, with gain index 0,67 (medium) and the responses of students for interview in cycle II show students' critical thinking skills in solving the problems.

DOI: https://doi.org/10.55927/fjst.v1i8.2136
ISSN-E: 2964-6804
https://journal.formosapublisher.org/index.php/fjst

INTRODUCTION

Education is a key to achieve better advancement and development in all aspects of human life. Education, in essence, is a process of human empowerment that is expected to allow students to become brilliant, educated, and knowledgeable beings (Hamzah, 2007). One of the subjects that is important in formal education is mathematics learning. Mathematics has great contributions in solving problems in human's life, for example, solving problems in our daily life, working world, and supporting the development of science and technology. Based on the vision of mathematics education, learning mathematics has two (2) aims of development, namely, fulfilling today's needs and for the future one (Sumarmo, 2002).

One of the skills that are expected to be mastered by students is critical thinking. Talking about critical thinking, Soeprapto (2001) said, "Critical thinking skill is an essential skill in our life, work-life, and offer many advantages in all aspects of life". Critical thinking skill has been one of the main goals in the education world since 1942. Facione (1990) identified that critical thinking skills allow students to analyze and unify information to solve problems. The sharper their critical thinking skills, the better students can solve problems and formulate arguments by drawing on a base of knowledge (Huang,2016). That means improving critical skills can help students improve their ability in solving problems, especially mathematics problems, which leads them to improve their results in learning.

Ironically, these days, critical thinking skills in learning mathematics are still low. Based on interpretation from OECD (Schleicher, 2019), in the study of PISA 2018, Indonesia's rank is 72nd of 78 countries in the mathematics section and is still on level 1. This study explains that students have no skills to elaborate their high thinking skill and apply it to solve the questions. This situation can be caused by how low their ability to critical thinking is. The researcher also conducted an observation on 30 students to check their critical thinking skill. Students' answers to the question on first question show that there are students who still didn't understand the basic concept of how to draw a triangle, especially the right triangle. There are still 52,94% of students that make the wrong figure. Some students didn't even know the concept of circumference, and some of them could not explain the reason and steps of how they got their answers. They found it hard to write down the conclusion of the whole calculation. For the second question, about 54% of students are able to sketch figures based on the problem, based on that, we can see that most of them already know how to interpret a problem into a figure and understand facts and problem in the question. But even when they can interpret the problem into figure, they still can't use the information from the question to solve the solution, they are not able to clarify the concept that will be used to solve that. This observation tells us that students can not apply their high order skills to solve the problem, which means their critical thinking skills are still low, with the highest score of students in this essay being 20.

Besides the test, the researcher also interviewed a mathematics teacher of SMKN 14 Medan. In that interview, the teacher told that because students have

to learn from home for almost two years, the interest of students to learn is decreasing. It is shown with how many students join the online class and how many students do their assignments and send them to their teacher. For the online learning, they stated that they just send the material's summary and assignments to the students. And for the face-to-face learning, they said that they still use the traditional model, namely the teacher-centered model.

A learning model is a learning design illustrated from the beginning until the end of the learning process, which is presented specifically by the teacher (Helmiati,2012). Designing a learning process by choosing the suitable learning model is an essential task for teachers since the model they choose will affect students' way of receiving the material. Novitasari (2015) stated that to improve critical thinking skills, we can apply a learning model called Creative Problem Solving (CPS). She claimed in her research that there is a difference between students' critical thinking skills when they learn with and without the Creative Problem Solving method.

Based on Isrok'atun (2018), the Creative Problem Solving learning model is a learning model that emphasizes the creativity of students in problem-solving through divergent and convergent thinking. Retnawati (2017) said that Creative Problem Solving is a learning model that actively involves students in solving problems to make them capable develop their thinking skills.

On the other side, the world's reality this day is pandemic Covid-19. The education sector is one sector that gets major effects from this pandemic. Based on Surat Mendikbud No. 46962/MPK.A/HK/2020 and Surat Edaran Mendikbud No. 4 2020, Covid-19 pandemic forces us to do physical distancing, so we can't make the learning process by meeting directly. This condition makes it harder to conduct all of the procedures of Creative Problem. To make the learning process easier and more beneficial, technology plays a big part. Choosing the right media-based technology will significantly help apply this model in the online learning process. Media-based technology that can help in this problem is Desmos. Desmos is a web-based graphing utility that requires no special hardware. It works on any computer, tablet, or phone (Ebert,2015).

Based on that background, the researcher wants to do research that will focus on improving students' critical thinking skills by applying the Creative Problem Solving learning model and using Desmos as media in learning mathematics. The researcher wishes that this research will be helpful as a consideration to repair and improve the quality of education in Indonesia, especially in mathematics.

LITERATURE REVIEW

Critical Thinking Skills

Critical thinking skill is one aspect of high-order thinking skills. Flora (2015) defines critical thinking means holding valuable and advantageous knowledge with beliefs, having independent opinions and accepting that it is subject to evaluation (critique), submitting their own ideas and the ideas of others, build arguments that provide consistency of their views, to exhibit tolerance, flexibility, and respect, learn how to think effectively evaluating and

testing solutions. Critical thinking skill is one aspect of high-order thinking skills. Flora (2015) defines critical thinking means holding valuable and advantageous knowledge with beliefs, having independent opinions and accepting that it is subject to evaluation (critique), submitting their own ideas and the ideas of others, build arguments that provide consistency of their views, to exhibit tolerance, flexibility, and respect, learn how to think effectively evaluating and testing solutions. Brenda (2009:4) said in their book that critical thinking is the ability to think about your thinking in such a way that you recognize its strengths and weaknesses and, as a result, reconsider your viewpoint and reconstruct your thinking in an improved form.

Ennis (1996) identified five criteria of critical thinking skill that called FRISCO, namely,

1. Focus. This criterion means that students understand the statements in a question with the main problem and can determine the concept that will be used to solve the problem.
2. Reason. This criterion means that students can explain the reason for the answers they give.
3. Inference. This criterion means that students can write down their conclusion from the pieces of information they get and write down their answers step-by-step.
4. Situation. This criterion means that students can answer according to the context of the problem.
5. Clarity. This criterion means that students can explain more clarities in using the concept and linkages of each concept.
6. Overview. This criterion means that students can re-check what that have been found, decide, considered, learnt, and concluded.

Cottrell (2005:2) stated that improving critical thinking brings numerous benefits. One of the benefits is that it helps you make better and more informed decisions about whether something is likely to be accurate, effective, or productive. Another benefit is that by improving critical thinking skills, other ancillary skills such as observation, reasoning, decision-making, analysis, judgment, and persuasion skills are also improved.

Creative Problem Solving

Creative Problem Solving (CPS) is an expansion of the Problem Solving learning model. Creative Problem Solving is Problem Solving that encompasses analytic and creative thinking of students. Lumsdaine (1994) said that, "Problem solving, as commonly taught in schools, is an analytical or procedural approach. This approach almost exclusively employs left-brain thinking modes, is competitive, and relies on individual effort. However, creative problem solving is a framework that encourages whole-brain, iterative thinking in the most effective sequence; it is cooperative in nature and is most productive when done as a team effort".

Pepkin (2004) states that there are four (4) procedures in applying Creative Problem Solving learning model in mathematics class namely,

1. Clarification of Problem. In this step, teacher explain the about the problem and make sure students understand the main problem.
2. Brainstorming. In this step, students are asked to submit their ideas and opinions to solve the problem.
3. Evaluation and Selection. In this step, students discuss with their teammates about their ideas and then evaluate them.
4. Implementation. After they decide which ideas that more suitable, students implement those ideas in solving the given problem.

Website Desmos

Website Desmos is free web-based graphing that contains in-class calculators, digital math activities, and a curriculum for online classrooms. Desmos is a web-based graphing utility that requires no special hardware. It works on any computer, tablet, or phone (Ebert,2015). Desmos can help learn specific material such as geometry, algebra, and calculus (Nisyak, 2018).

There are two mainstays products of Desmos, namely graphing calculator and classroom activities. The first mainstay is a complex calculator which can help students solve mathematical calculation and interpret it into graphs. As for classroom activity, Desmos provide a website-based classroom. This website-based classroom is called Desmos Activity Builder. This website is made to fulfill Desmos' vision to support students in studying mathematics and liking it (Desyarti, 2020). This website-based classroom provides teachers make interactive and meaningful digital mathematical activities. This research will use the classroom activities mainstay.

The link to access Desmos classroom activities is https://www.desmos.com. After that, log in or sign-up so we can use it easily. There are two sub-sites in Desmos, one for students and another for teachers. There are two ways for students to access the Desmos classroom. The first is by typing https://www.desmos.com on the browser and then typing the classroom code on the "Students" table. The other way is by directly clicking a shared link by the teacher.

RESEARCH METHODS

The research was conducted in SMKN 14 Medan and on the odd semester of 2022/2023. The subject of this research was 31 students of class X TPBO of SMKN 14 Medan, with object was students' critical thinking skills by applying Creative Problem Solving (CPS) learning that assisted with Desmos. The type of the research that used is Classroom Action Research (CAR). In applying Classroom Action Research (CAR), the research procedure has to use cycles. This research use at least two (2) cycles. If the result of the first cycle is not satisfied yet, research will be proceed to the second cycle until the cycle success. The data of the research results are collected by using research instruments, namely, tests, observation, and interview. Procedures of each cycle in this research are modified with Kemmis and Taggart (1982) procedures, such as.

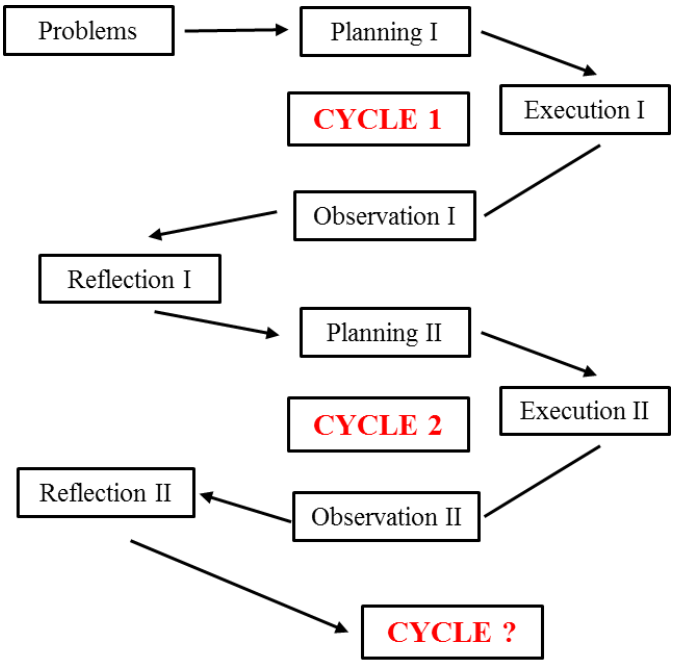

Figure 1. The Procedure of Research

Instrument that used in learning process is pre-test, Desmos, teaching modules, students' worksheet, observation sheet, and post-test. The data is analyzed with data reduction and then analyzing students' critical thinking with the mean of score for each indicator, score of the whole test for each student, mean of class' score, classical score, and gain index interpretation. As for the observation sheet, the researcher analyzes with count observation percentages. The indicators of success for each cycle are,

1. Classically, there are 85% or above of students that involved in the critical thinking skills test have scored over 70 on the test.
2. There is an improvement in students' critical thinking skills, which is shown by gain index (over 0,3).
3. Observation Percentages of students' activity in the class have to be over 70% to show students' critical activities during the learning process.

RESULT

The cycle I began with the first problem, such as Based on the result of the answered pre-test, the number of students whose skills to understand statements and facts in a problem is 24 students (77,42%). Students whose skills to formulate information or facts into mathematics models are 21 students (67,74%). There are nine (9) students (29,3%) whose skills to solve the problem with their idea and explain the reason. Students whose skills to write down their conclusion based on their solution are 14 students (45,16%). Students whose skills to answer according to addition asked problem are six (6) students (19,54%). And students whose skills to overview and their final answer is 12 students (38,71%).

Based on the first problem, the researcher, as the teacher conducted a planning by arranging Teaching Module containing steps of the learning process using Creative Problem Solving (CPS) (attach to appendix 1) and

teaching materials, preparing supporting facilities in the learning process, such as students' worksheets, website Desmos, and material references book, and preparing research instruments, such as a test to analyze students' critical thinking skills and an observation sheet to observe students' activities. Then the researcher executed the planning by conducting the learning process based on the arranged Teaching Module.

After conducted the learning process in cycle I, the researcher determined the result. The first result is from observation sheet. The researcher determined that the score for students' activities in the first meeting is 1,54 (very low) and for the second meeting is 2,18 (low), out of five (5). As for observation percentages, we received 37,27%, classified as very fail for the entire cycle I process. This score means that students' activity in the learning process is very low, and the teacher failed to encourage students to be more active and critical in class. This condition has to be improved in the following cycle. As for the critical thinking skills, the result is explained below:

Table 1. Level of Students' Abilities based on Indicator Focus

Nb	Score Interval	Category	Number of Students	Percentages	Means
1.	$90 \leq IS < 100$	Very Critical	5	16,13%	69,76 Not Critical
2.	$80 \leq IS < 90$	Critical	3	9,68%	
3.	$70 \leq IS < 80$	Quite Critical	9	29,03%	
4.	$0 \leq IS < 70$	Not critical	14	45,16%	

This indicator represents students' skills in understanding and identifying information, facts, and problem in the given contextual problem. We also assess students' skills in modifying the information into mathematical models. The result shows us that there are 5 students (16,13%) categorized as very critical, 3 students (9,68%) as critical, 9 students (29,03%) as quite critical, and 14 students (45,16%) are not critical. In terms of means, the researcher determined 69,76, implying that students are still not critical in understanding, identifying, and modifying information in contextual problems.

Table 2. Level of Students' Abilities based on Indicator Reason

Nb	Score Interval	Category	Number of Students	Percentages	Means
1.	$90 \leq IS < 100$	Very Critical	6	19,35%	67,74 Not Critical
2.	$80 \leq IS < 90$	Critical	8	25,81%	
3.	$70 \leq IS < 80$	Quite Critical	-	0%	
4.	$0 \leq IS < 70$	Not critical	17	54,84%	

This indicator represents students' skills in solving, writing down and explaining the reasons behind their problem-solving techniques. The result shows us that there are 6 students (19,35%) categorized as very critical, 8 students (9,68%) as critical, none of the students (0%) as quite critical, and 17 students (54,84%) as not critical. In terms of means, the researcher determined 67,74, implying that students are still not critical in solving, writing down and explaining the reasons behind their problem-solving techniques.

Table 3. Level of Students' Abilities based on Indicator Inference

Nb	Score Interval	Category	Number of Students	Percentages	Means
1.	$90 \leq IS < 100$	Very Critical	4	12,90%	60,48 Not Critical
2.	$80 \leq IS < 90$	Critical	-	0%	
3.	$70 \leq IS < 80$	Quite Critical	10	32,26%	
4.	$0 \leq IS < 70$	Not critical	17	54,84%	

This indicator represents students' skills in writing down their conclusion after solving the problem. The result shows us that there are 4 students (12,90%) categorized as very critical, none of the students (0%) as critical, 10 students (32,36%) as quite critical, and 17 students (54,84%) as not critical. In terms of means, the researcher determined 60,48, implying that students are still not critical in writing down their conclusion based on the solution they get.

Table 4. Level of Students' Abilities based on Indicator Situation and Clarity

Nb	Score Interval	Category	Number of Students	Percentages	Means
1.	$90 \leq IS < 100$	Very Critical	5	16,13%	45,16 Not Critical
2.	$80 \leq IS < 90$	Critical	-	0%	
3.	$70 \leq IS < 80$	Quite Critical	-	0%	
4.	$0 \leq IS < 70$	Not critical	26	83,82%	

This indicator represents students' skills in adjusting the solution to the new problem and clarifying their final solution for the given contextual problem. The result shows us that there are 5 students (16,13%) categorized as very critical, none of the students (0%) as critical and quite critical, and 26 students (83,87%) as not critical. In terms of means, the researcher determined 45,16, implying that students are still not critical in adjusting the solution to the new problem and clarifying their final solution for the given contextual problem.

Table 5. Level of Students' Abilities based on Indicator Overview

Nb	Score Interval	Category	Number of Students	Percentages	Means
1.	$90 \leq IS < 100$	Very Critical	3	9,68%	58,06 Not Critical
2.	$80 \leq IS < 90$	Critical	9	29,03%	
3.	$70 \leq IS < 80$	Quite Critical	-	0%	
4.	$0 \leq IS < 70$	Not critical	19	61,29%	

This indicator represents students' skills in reviewing or re-checking their solutions, making decisions, and drawing conclusions based on the correction. The result shows us that there are 3 students (9,68%) categorized as very critical, 9 students (29,03%) as critical, none of the students (0%) as quite critical, and 19 students (61,29%) as not critical. In terms of means, the researcher determined 58,06, implying that students are still not critical in reviewing or re-checking their solutions, making decisions, and drawing conclusions based on the correction.

Based on each student' score, there are 4 students (12,90%) have very critical skills, 2 students (6,45%) have critical skills, 13 students (41,94%) has quite critical skills, and 12 students (38,71%) are not critical. Based on the result, the researcher determined that 19 out of 31 students (61,29%) have attained the standard of critical thinking skills. The means of students' critical thinking skills is 62,60. And according to the gain index calculation, the gain index is 0,24, indicating there is development, but it is still low. Despite the development, this is still a failure. It is because the classical score is still 61,29%, which has not achieved the standard of the classical score (≥85%).

Based on the result, the researcher, as the teacher reflected on their errors, students' activity, and students' incapable of critical thinking skills. The result of the reflection such as, the researcher as a teacher was less capable in attract students' attention to listen to the introduction, the researcher as a teacher was less capable of involving all students to be more active in learning activities, and several students felt bored and boisterous. The result of students' critical thinking skills after the reflection is.

Table 6. Research Result in Cycle I

Aspects	Indicator of Successful	Result	Description
Classical Percentages	There are 85% or above of students that involved in the critical thinking skills test have scored over 70 on the test.	There are 61,29% students had achieved at least 70 on the test result	The result has not met the successful standard, so proceed to the next cycle.
Gain Index	There is an improvement in students' critical thinking skills, which is shown by gain index.	The gain index is 0,24 which show that there is improvement.	The result has met the standard but still low, has to be improved in next cycle.
Observation Percentages	Observation Percentages have to be over 70%	Observation Percentages is 37,27%	Continue to the next cycle while reflecting on the mistakes made in cycle I.

As a result of not achieving the indicators of success in cycle I, the researcher proceeded to the following cycle, cycle II. During cycle II, the researcher was expected to correct previous mistakes and improve learning quality. During cycle II, the researcher paid attention to some things as the problems based on the reflection of the cycle I, such as, students were not focus enough on the learning process, several students are incapable of using Desmos since they were first-time users, several students were not active in responding, asking, and having group discussions during the learning process, students were incapable of writing down and analyzing information in the contextual problem, students were incapable of solving a new challenging problem, careless, and imprecise in calculating.

The researcher, as the teacher, prepared the modified teaching module, desmos, and student's worksheet based on the errors in previous cycle. And then executed the plan the learning process. The result of this cycle is the researcher determined that the score for students' activities in the first meeting is 3,72 (sufficient) and for the second meeting is 4,37 (good), out of five (5). In terms of observation percentages, we earned 80% for the entire cycle II process. In this research, the researcher used the gain index to interpret the development of students' activities. According to the calculation, the gain index is 0,70, indicating there is development, categorized as medium. This score indicates that students' activities are improving and are categorized as good. As for the critical thinking skills, the result is,

Table 7. Level of Students' Abilities based on Indicator Focus

Nb	Score Interval	Category	Number of Students	Percentages	Means
1.	$90 \leq IS < 100$	Very Critical	9	29,03%	85,66 Critical
2.	$80 \leq IS < 90$	Critical	11	35,48%	
3.	$70 \leq IS < 80$	Quite Critical	7	22,58%	
4.	$0 \leq IS < 70$	Not critical	4	12,90%	

The result shows us that there are 9 students (29,03%) categorized as very critical, 11 students (35,48%) as critical, 7 students (22,58%) as quite critical, and 4 students (12,90%) as not critical. In terms of means, the researcher determined 85,66, implying that students are capable in understanding, identifying, and modifying information in contextual problems.

Table 8. Level of Students' Abilities based on Indicator Reason

Nb	Score Interval	Category	Number of Students	Percentages	Means
1.	$90 \leq IS < 100$	Very Critical	8	25,81%	81,18 Critical
2.	$80 \leq IS < 90$	Critical	14	45,16%	
3.	$70 \leq IS < 80$	Quite Critical	-	0%	
4.	$0 \leq IS < 70$	Not critical	9	29,03%	

The result shows us that there are 8 students (25,81%) categorized as very critical, 14 students (45,16%) as critical, none of the students (0%) as quite critical, and 9 students (29,03%) as not critical. In terms of means, the researcher determined 81,18, implying that students are critical in solving, writing down and explaining the reasons behind their problem-solving techniques

Table 9. Level of Students' Abilities based on Indicator Inference

Nb	Score Interval	Category	Number of Students	Percentages	Means
1.	$90 \leq IS < 100$	Very Critical	6	19,35%	74,19 Quite Critical
2.	$80 \leq IS < 90$	Critical	-	0%	
3.	$70 \leq IS < 80$	Quite Critical	18	58,06%	
4.	$0 \leq IS < 70$	Not critical	7	22,58%	

The result shows us that there are 6 students (19,35,%) categorized as very critical, none of the students (0%) as critical, 18 students (58,06%) as quite critical, and 7 students (22,58%) as not critical. In terms of means, the researcher determined 74,19, implying that students are quite critical in writing down their conclusion based on the solution they get.

Table 10. Level of Students' Abilities based on Indicator Situation and Clarity

Nb	Score Interval	Category	Number of Students	Percentages	Means
1.	$90 \leq IS < 100$	Very Critical	11	35,48%	74,19 Quite Critical
2.	$80 \leq IS < 90$	Critical	-	0%	
3.	$70 \leq IS < 80$	Quite Critical	-	0%	
4.	$0 \leq IS < 70$	Not critical	20	64,52%	

The result shows us that there are 11 students (35,48%) categorized as very critical, none of the students (0%) as critical and quite critical, and 20 students (64,52%) as not critical. In terms of means, the researcher determined 74.19, implying that students are quite critical in adjusting the solution to the new problem and clarifying their final solution for the given contextual problem.

Table 11. Level of Students' Abilities based on Indicator Overview

Nb	Score Interval	Category	Number of Students	Percentages	Means
1.	$90 \leq IS < 100$	Very Critical	24	77,42%	88,71 Critical
2.	$80 \leq IS < 90$	Critical	-	0%	
3.	$70 \leq IS < 80$	Quite Critical	-	0%	
4.	$0 \leq IS < 70$	Not critical	7	22,50%	

The result shows us that there are 24 students (77,42%) categorized as very critical, none of the students (0%) is critical and quite critical, and seven (7) students (22,50%) as not critical. In terms of means, the researcher determined 88,71, implying that students are still not critical in reviewing or re-checking their solutions, making decisions, and drawing conclusions based on the correction.

Figure 2 below depicts the means for each indicator of critical thinking skills in cycle I and cycle II, if represented by a bar diagram.

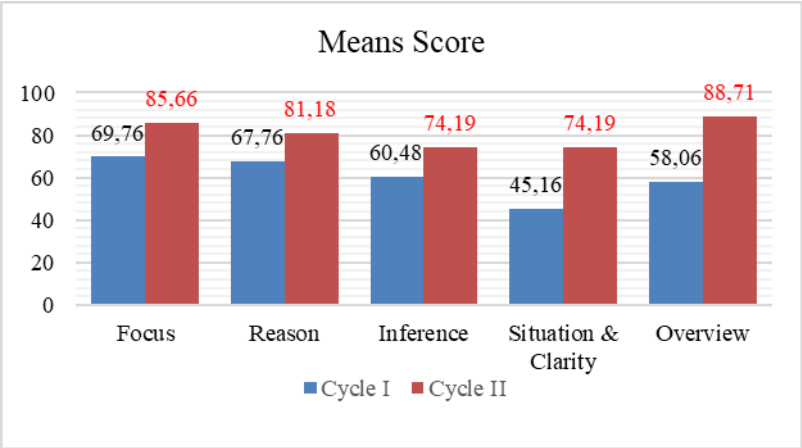

Figure 2. Graphic for Means of Each Indicator in Cycle I and II

Based on each student' score, where there are nine (9) students (29,03%) have very critical skills, eight (8) students (25,81%) have critical skills, ten (10) students (32,26%) has quite critical skills, and four (4) students (12,90%) are not critical. Based on the result, the researcher determined that 27 out of 31 students (87,10%) have attained the standard of critical thinking skills. The means of students' critical thinking skills is 81,45. In this research, the researcher used the gain index to interpret the development of critical thinking skills score. According to the calculation, the gain index is 0,53, indicating there is development, categorized as medium.

Table 12. The Development of Critical Thinking Skills Score

Aspect	Cycle I	Cycle II	Gain	Category
Observation Percentages	**32,27%**	**80%**	**0,70**	**Medium**
Focus	69,76	85,66	0,53	Medium
Reason	67,74	81,18	0,42	Medium
Inference	60,48	74,19	0,35	Medium
Situation & Clarity	45,16	74,19	0,53	Medium
Overview	58,06	88,71	0,73	Medium
Means	**60,45**	**81,45**	**0,53**	**Medium**
Classical Score	**61,29%**	**87,10%**	**0,67**	**Medium**

In addition to observation and test results, the researcher conducted an interview. According to the interview, the majority of the students were capable of explaining the reason for the information written on their solution and how to modify them into the mathematical model. They were also capable of explaining the steps that they took to solve the contextual problem. They did not know how to solve the addition problem at first, but after a brief explanation, they began to solve it using their knowledge. Most of them are also capable of explaining the meaning behind the overview. Table 13 displays the result of the research in cycle II.

Table 13. Research Result in Cycle I

Aspects	Indicator of Successful	Result	Description
Classical Percentages	There are 85% or above of students that involved in the critical thinking skills test have scored over 70 on the test.	There are 87,10% students had achieved at least 70 on the test result	Since the indicator was achieved, the researcher did not continue to the next cycle.
Gain Index	There is an improvement in students' critical thinking skills, which is shown by gain index.	The gain index is 0,53 which show that there is improvement.	Since the indicator was achieved, the researcher did not continue to the next cycle.
Observation Percentages	Observation Percentages have to be over 70%	Observation Percentages is 80%	Since the indicator was achieved, the researcher did not continue to the next cycle.

Based on table 13, all of the indicators of each aspect have achieved successful criteria. The researcher did not extend this study to the next cycle because the indicator of success, as well as the research objective, had been achieved.

DISCUSSION

Cycle I was divided into two (2) meetings of 80 minutes each. The learning process in this cycle was conducted based on arranged Teacher Module that was validated by three (3) mathematics education experts. The teacher Module was arranged according to Creative Problem Solving (CPS) learning model's syntaxes. The researcher used Desmos to aid the learning process and validated students' worksheets as group discussion aids. The result determines students' activities in the learning process as very fail. Students' participation in answering, asking, expressing ideas, exploring, deciding, and evaluating was lacking. The cause might be students' lack of confidence, nescience, ignorance, and disinterest in the learning process. The other reason cause might be teachers' lacking skills to encourage students' interest. According to each indicator means, students are not critical. The highest score is 69,76 (not critical) for focus (understanding, identifying, and modifying information on problems), and the lowest is 45,16 (not critical) for situation & clarity (solving challenging and new problems and clarifying their decision). The test has a mean of 62,60 (not critical), a gain index of 0,24 as low improvement, and a classical score of 61,29%. Despite the low improvement, this cycle cannot be called successful because it failed to meet the indication of success.

Because cycle I was a failure, the researcher proceeded to cycle II. However, before moving on to cycle II, the researcher reflected on the errors in cycle I. The taken actions to solve the error in cycle II were, the teacher had to be more firm and reduce the lectures while making the Desmos website more engaging and engaging; the researcher, as the teacher, shared link to students a day before the class begins, so that they can prepare and practice to use that; the researcher prepared rewards to encourage students to be more active; and the teacher presented another challenging contextual problem to be discussed in the group and assisted them if there was a mistake.

Cycle II, like cycle I, was performed in two meetings, based on Teaching Module, and using Desmos and students' worksheets as the aid. This cycle is conducted by reflecting on issues in cycle I. The observation result increased to 80%, with a gain index of 0,70 (medium improvement), indicating that students' critical activities in the class had improved. Students became more engaged in exploring, problem-solving, evaluating, and expressing their ideas. The result of the initial critical thinking skills following cycle II execution increased to 27 out of 31 students (87,70%) exceeding the minimum score (quite critical) with means is 81,45. The gain index of the cycle II test is 0,67 (medium improvement), indicating students' critical thinking skills improvement.

To strengthen the result of this research, the researcher compared it with other relevant research. Based on research conducted by Ridha, M. R. (2016), implementing Creative Problem Solving improves students' critical thinking skills. The improvements are 1) observation percentages improved from 65% to 93,3%. 2) Based on the test, 32 students (96,77%) experienced an improvement in their critical thinking skills, as well as each indicator of critical thinking skills. The score improved by 14,68%. And 3) the questionnaire score indicates that each sign of critical thinking skills has improved. Other research (Maftukhin, 2014) demonstrated the effectiveness of implementing Creative Problem Solving in improving students' critical thinking skills. They reported that 85,71% of students exceed critical thinking tests, with a mean of 75,029.

CONCLUSION

1. In improving students' critical thinking skills, the researcher conducted a learning process with applied Creative Problem Solving (CPS) assisted by Desmos in the material Linear Equation System of Two Variables. The results of cycle I didn't meet the indicator of success, categorized as fail. Because of that, the researcher proceeded this study to the second cycle. The taken actions after reflected on the first cycle errors were: a) the researcher became more assertive, minimized lecturers, and made Desmos more interesting, b) shared the link with students a day before the class begins, upgraded and changed some parts of Desmos to make it easier to use, c) prepared rewards to encourage students' liveliness during the learning process, d) improved the problem in Desmos and worksheets to assist students in understanding, analyzing, and solving the contextual problem, and e) prepared the new challenging problem to be discussed in the group.

2. The implementation of Creative Problem Solving (CPS) assisted by Desmos in the material Linear Equation System of Two Variables can improve students' critical thinking skills. The researcher determined that, based on the observation result, students' critical activities increased from 32,37% to 80%. During cycle II, students became more active in asking, responding, sharing, comparing, deciding, and evaluating their ideas, their teamwork also improved, and determined gain index 0,70 (medium improvement). The mean score improved from 62,60 (not critical) to 81,45% (critical), with classical score improved from 61,29% to 87,10%, with gain index 0,67 (medium improvement). The responses to the interview also indicate an improvement in students' critical thinking. The responses for the first interview revealed that most of the students still copied their classmates' solutions, answered the problem hastily, and couldn't explain the reasons behind that. Furthermore, in the second interview, several students confidently explained the techniques of their solution and the proof.

FURTHER STUDY

This research still has limitations. So, it is necessary to carry out further research on the topic Application of Mathematics Learning Model Creative Problem Solving that Assisted with Desmos to Improve Students' Critical Thinking Skills.

REFERENCES

Facione. (1990). *Critical thinking: A Statement of Expert Consensus for Purposes of Educational Assessment and Instruction*. California: Academic Press.

Flora, N. M. and Elena Hurjui. (2015). *Critical Thinking in Elementary School Children, Procedia-Social and Behavioral Sciences*.

Helmiati. (2012). *Model Pembelajaran*. Yogyakarta: Aswaja Pressindo.

Huang, Hui F. et al. (2016). Mathematical Teaching Strategies: Pathways to Critical Thinking and Metacognition. *International Journal of Research in Education and Sciences*. Vol. 2(1): 190-200.

Isrok'atun, R. A. (2018). *Model-Model Pembelajaran Matematika*. Jakarta: PT Bumi Aksara.

Jon, Orr. (2017). Function Transformation and the Desmos Activity Builder. *The Mathematics Teacher Journal*. Vol. 110(7) : 549.

Maftukhin, Mohammad et al. (2014). Keefektifan Model Pembelajaran Creative Problem Solving (CPS) berbantuan CD Pembelajaran terhadap Kemampuan Berpikir Kritis. *Unnes Journal of Mathematics*. Vol. 3(1): 29–34.

Novitasari, Dian. (2015). Penerapan Pendekatan Pembelajaran Creative Problem Solving (CPS) sebagai Upaya Meningkatkan Kemampuan Berpikir Kritis Matematis Siswa. *Jurnal Pendidikan Matematika & Matematika*. Vol. 1(1): 43–56.

Pepkin. (2004). *Creative Problem Solving in Math.*

Retnawati, H. (2017). *Desain Pembelajaran Matematika untuk Melatihkan High Order Thinking Skills*. Yogyakarta: UNY Press.

Ridha, M. R. and M. Syaban. (2016). Peningkatan Kemampuan Berpikir Kritis Matematis Siswa dalam Pembelajaran Matematika melalui Pendekatan Creative Problem Solving (CPS). *Sosiohumanitas*. Vol. 18(1).

Schleicher, Andreas. (2019). *PISA 2018: Insights and Interpretation*. OECD.

Soeprapto. (2001). *Membuat Manusia Berpikir Kreatif dan Inovatif*. Bandung: Nusamedia.