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RESEARCH ARTICLE

**STUDENTS' CREATIVE THINKING SKILLS USING CONSTRUCTIVE CONTROVERSY
 APPROACH AND CONFLICT RESOLUTION BASED LEARNING.**

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Abstract

This research began with the development of learning instrument. The purpose of this study was to describe students' creative thinking skills on exponential and logarithmic material at the first grade of Science class in East Java. This research was Classroom Action Research in nature. The learning instruments used were lesson plan, students' work sheet, and learning achievement test with the validity coefficients of 3.84; 3.86; and 3.89 respectively. Learning instruments were developed by fulfilling in the practical category based on the results of analysis of teacher's activity with a good category in managing classroom learning, marked by 80% success. The percentages of teacher's success in classroom management in the first and second meeting were 91.18% and 94.12%. Percentage of students' activities in the first and second meeting was 81.48% and 86.11%. Therefore, the study has included the class activity in the practical category. The instructional instruments were developed with the effective category, based on the results of questionnaires filled by the students, compared to the student work sheet and learning achievement test, achieved validity value of 86.37%, with good categories to be used in learning. In addition, the minimum passing criteria determined by the school was ≥ 71 .

Based on the results obtained by the students in the student work sheet, creative thinking skills in the first controversy obtained variant extents, 16.67% in flexible thinking, 16.67% in elaborative thinking, 0% in smooth thinking, and 23.44% in original thinking. In the second controversy, the students obtained 31.25% in flexible thinking, 16.67% in elaborative thinking, 5.73% in smooth thinking, and 33.33% in original thinking. As such, the students obtained 71.88% creative thinking skills upon focusing on the first and second controversy, which meant that the students were categorized as creative. In the first controversy, they obtained 56.77% and in the second one they achieved 86.98%, so it can be concluded that the percentage of creative thinking of the students increased by 30.21%. In the first test result, they obtained creative thinking skills profiled as 16.67% flexible thinking, 16.67% thinking elaborative, 0.52% smooth thinking, and 29.69% original thinking, and in second student test results indicated the percentage of creative thinking skills

31.25% flexible thinking, 16.67% elaborative thinking, 7.81% smooth thinking, and 33.33% original thinking. The creative thinking skill evaluated in the tests in the first and second meeting were 76.3%, marked as creative category. Percentage of creative skills obtained by the students in the first meeting was 63.54% and in second meeting was equal to 89.06%, marking an increase of creative thinking skills by 25.52%.

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Introduction:-

Indonesia is a country addressed in the free-trade area in the Asian or known as the Asian Economic Community. As such, Indonesians must be ready to confront the global economy. The impact of the global economy is happening at some sectors, resulting in impacts not only in economic sector but also in education. The education sector is required to produce high-quality human resources, not only in terms of their students but also skilled and professional teachers.

Science is very important in the development of knowledge and a universal body of knowledge, which form the basis of the development of modern technology. According to Akhmad (2015: 40) Mathematics is one of the subjects required to train reasoning on mathematical concept of, a method of thinking logically, and systematic and consistent mechanism. According to Russefendi (2006:94), Mathematics is important as the tool for scaffolding the patterns of thought and forming the attitude.

Mathematics is also a lesson that can be trained to students in developing critical, logical, and creative thinking. Creative thinking and the ideas would emerge and be developed further during the students' academic endeavour if supported by learning created by teachers. In learning Mathematics, the creativity of students is very essential especially in resolving questions have been involving students for creative thinking. It is expected that students can find creative and new ideas in the following analysis of and resolve mathematical problems. But, in fact students express ideas in varied ways according to their creative thinking because every student has different capacity.

Creative thinking skills for students is crucial in competition in the era of globalization, because in the problem of modern life is on the rise. Given the importance of creative thinking for students, it is important that teacher start teaching embark on creative thinking instruction at early stage of students' education. This will lead to higher creative think skills. However, in fact most teachers still keep doing their instruction conventionally dominated by lectures and teachers-centred activities. Students just listen, review, and note what teacher explains. Teacher's inattentiveness to learning activity students experience will lead to the lack of interest in learning Mathematics.

Teacher's role in learning is to facilitate activities and design of students in learning to foster the learning of new knowledge (Sanjaya, 2008: 75-80). Increased capacity of creative thinking students achieve can be escalated through the learning activities applied in Mathematics instruction, because learning method is directly related to learning. Preparation done by teacher when will appear in lesson plans, and activities done by students can be written in students worksheets. The success of students in learning can be seen in the learning achievement test results. Instructional media is used by teachers and students to reach the purpose of learning, but the implementation done in the field still has not led the students to improve creative thinking. A common set of teaching is unable to improve students' creative thinking skills. In this regard, this problem becomes a reference to construct learning plan aimed to increase students' creative thinking skills.

During this developments of instructional instruments, the researchers applied particular instructional methods and approach. There are many methods and approach to learning considered powerful to develop creative thinking. One learning model, which can accommodate the very goal, is learning model conflict resolution and constructive approach controversy. Hopefully, the implementation of these instructional methods can help teachers to optimize Mathematics instruction, so that it can change students' perspective assuming that learning Mathematics is uninteresting and boring, into a lesson which is interesting to students. Instructional model of conflict resolution and constructive approach controversy is commonly applied for Social studies, such as civic, history, etc. Because Social instruction can easily accrue students' togetherness and help them to learn from ideas based on previous knowledge,

so students are encouraged to solve problems based on facts. While in Mathematics, in overcoming of conflict students should be base their reasoning on the fact or theorem.

The advantages of developing instructional instruments in the study deal with the absence of instructional instruments which build on conflict resolution and constructive controversy approach to enhance the capacity of creative thinking skills. An instructional instrument under development were lesson plans, student worksheets, and learning achievement. Lesson plans developed contained students' activities based on conflict resolution and constructive controversy approach. Student worksheet and the test result developed contained problems and conflicts aimed to increase the students' capacity in creative thinking.

Munandar (1999) suggests that the characteristics of creative thinking skills, including (1) thinking smoothly, (2) thinking flexible, (3) thinking originally, and (4) detailing skills. Four the characteristics of critical thinking skills are described as follows.

Table 1:- Elements Creative Thinking

Number	Understanding	Students' Behaviour
1.	<ul style="list-style-type: none"> Thinking smoothly (fluency) Attempting many initiatives , the answer , a settlement or answers Attempting more than one answer 	Ask a lot of questions
		Answering with a number of answers if you have any questions
		has some ideas of a problem
		Fluent in using his ideas
		Work faster and do more than other students
2.	<ul style="list-style-type: none"> Flexible thinking Producing varying ideas, answers or questions Seeing problem from different angles Being able to change approach or thinking 	Quickly spot errors and weaknesses of an object or situation
		Gives a variety of unusual usage of an object
		Gives a variety of interpretations of a picture, story or problem
		Apply a concept or principle in different ways
		Giving a consideration or discussing something in a way which is different to the majority of the group
		If given a problem, they usually think of different ways to solve it
		Categorize things according to different parts or categories
Being able to change the direction of thinking spontaneously		
3.	<ul style="list-style-type: none"> Thinking originally Being able to create a new and unique phrase Thinking of unorthodox ways to express themselves Being able to make unusual combinations of parts or elements 	Thinking about issues or things other people never thought about
		Questioning old ways and trying to think of new ways
		Choosing asymmetry in drawing or design
		Looking for a new approach from stereotype
		After hearing or reading ideas, working to propose new solution
4.	<ul style="list-style-type: none"> Spelling out elaboration 	Looking for meaning deeper and answering or solving problems in a detailed procedure
		Developing/enriching the ideas of others
		Trying to test details
		Always looking for more results
		Adding lines, colours, or parts to a figure he creates

Anwar et al (in Mursidik, 2014) note that creative thinking is a new way to see and do something, which is divided into 4 aspects, encompassing fluency, flexibility, originality, elaboration.

a. Aspects of fluency

Aspects of eloquence are related to how students build ideas. Fluency in creative thinking refers to the variety of correct answers given to students. In this aspect, different answers are not necessarily considered diverse.

b. Aspect of flexibility

Aspects of flexibility in creative thinking lead to the skill empowering the students to solve problems with different problem solving.

c. Aspect of originality (authenticity)

The authenticity of the students' problem solving is related to come up with original ideas or solutions. The less likely students give the same answer or the same way of resolving, the higher the authenticity of the answer is. However, this aspect must still consider the appropriateness and use of answers.

d. Elaboration aspects (details)

Aspects of hatred associated with the skills of students to explain in a coherent, detailed and interconnected fashion between one step and another. The use of appropriate concepts, terms, and notations is also taken into account in this aspect.

Conflict Resolution

In Mathematics learning, learning conflict resolution and learning lessons are two things that complement each other, providing teachers with the means for their instruction. Therefore, teacher can give students lessons, and students can learn and share lessons with their peers. Within this learning context, teacher not only acts as the centre of learning, but also as learning partners. NCSS (2000:12-22) describe the steps of Conflict Resolution as follows.

Table 2:- Table Steps of the Conflict Resolution

Steps	Teacher's Activity	Students' Activities
Identification	<ul style="list-style-type: none"> • Explaining the purpose of learning • Raising questions and answers to explore the concepts that students have • Giving examples of conflicts/issues/issues • Frequently asking questions about the conflicts presented 	<ul style="list-style-type: none"> • Listening to the teacher's explanation • Answering questions provided by teachers • Asking the unknown
Exploration	<ul style="list-style-type: none"> • Presenting - matter of basic learning • Providing the sources of reading to support problem solving 	<ul style="list-style-type: none"> • Listening to the material that was delivered teacher • Recalling previous material through textbooks, notebooks, and so on • Linking the concept of the problem faced
Explanation	<ul style="list-style-type: none"> • Formulating hypotheses about conflicts that have given • Clarifying the concept of participants to primary school students in the life settlement problems • Making the task team and group 	<ul style="list-style-type: none"> • Solving problems based on their own concept • Working in a group and discussing
Negotiation conflict	<ul style="list-style-type: none"> • Overseeing discussions • Guiding students sparked ideas • Helping students gather information needed • Summarizing discussion 	<ul style="list-style-type: none"> • Conveying the idea of • Gathering information • Concluding the result of the discussion
Conflict resolution	<ul style="list-style-type: none"> • Checking the decision taken school tuition 	<ul style="list-style-type: none"> • Judging problem

Constructive Controversy Approaches:-

This approach is commonly used in learning social-related contents because accruing discussions and problem solving on social controversy is relatively easy. On learning Mathematics, teacher bears role as guide in this approach. Teacher encourages the students to think critically by exposing them to controversial issues. The controversy can be about judging whether things are right and wrong, in an open-ended discussion. Hosnan (2014) explains the advantages and disadvantages of constructive approach controversy approaches. The advantages include (1) students learn consulting, (2) students appreciate the opinions of others, (3) students learn to develop ways think critically and rational, (4) to cultivate of engagement, (5) the competition. While the rest include: (1) opinion and questions students can evolve from issue, (2) the amount of time required, (3) the presence of personal qualities that want to stand out, or otherwise the weak become inferior and always dependent on others, (4) the occasional hardships to reach conclusion.

Syntax Constructive Controversy Approaches (CCA) and Conflict Resolution (CR) obtained conformity steps.

Table 3:- The Coding in Constructive Controversy Approaches (CCA) and Conflict Resolution (CR)

Conflict Resolution (CR)	Constructive Controversy Approaches (CCA)	Code
Identification	1. Teacher raises questions pertaining to matter discussed, while the students investigate learning resources for information	CRCCA 1
Exploration	2. Students work in several groups	CRCCA 2
Explanation	3. Students use evidence and logic to present arguments against opposition, and the rest of the class also follow in presenting their ideas	CRCCA 3
Negotiation conflict	4. Students debate on certain issue by presenting ideas to each other and support their perspectives using evidence and logic 5. Students propose their group perspectives against others' to gain shared understanding	CRCCA 4
Conflict Resolution	6. Students re-conceptualize problems and identify the similarities between the two perspectives then make a conclusion.	CRCCA 5

Research Methods:-

This research-and-development study was oriented toward product development, followed by product evaluation prior to implementing it in instructional context. The product, which was developed in the form of instructional instrument, was meant to aid Mathematics instruction based on constructive controversy approach and conflict resolution aimed to increase students' creative thinking. The instructional instruments under development included (1) lesson plans, (2) students worksheets, and (3) learning achievement test. The product was put into classroom action research for evaluation purposes. This research was done in the odd semester of 2017/2018 academic year. The subjects of the research were the students in the first-grade Science class at high school in East Java, including 35 students. There were 3 students who were absent during the first meeting, so 32 students were under observation. Model of learning media that used in this research was 4-d model, which had been modified by Thiagarajan, Semmel & Semmel be 3-d model. The research procedures performed in this study were defining, designing, and developmental stage, meanwhile dissemination was not done. Education design was still too general for this study. Nieveen's 3 product quality aspects were operative to assess the final product, which dealt with validity, practicality, and effectiveness.

The instructional instruments under development included lesson plans, worksheets, and learning achievement test were evaluated for validity, resulting in validity scores of 3.84, 3.86, and 3.89 respectively. The instructional instrument was evaluated for its practicality on the ground of teaching activity, which was marked by good category at 80%. The teacher's success in managing the classroom activities in the first and second meeting were 91.18 % and 94.12 %. The success of students' activities in the first and second meeting reached 81.48 % and 86.11 %. As a result, the instruments were proven practical. Instructional media developed were also proven effective as students' performance evaluated using the worksheets and the test reached 86.37 %, marked at good category. This clearly indicated that the instructional instruments were ready for classroom use as the students gained the passing grade set by the school, which was ≥ 71 .

Scoring criteria and indicators to observe the capacity of student creative thinking are explained as follows:

Table 4:- Scoring Categories and Indicators the Capacity of Student Creative Thinking

Steps	Indicator	Score
Thinking smoothly	Giving reasons based on concept and fact to support answers given	1
Thinking flexibly	Formulating the main issues	1
	Writing the required details to solve the problems	1
Thinking originally	Writing down alternative answers for different reasons to one problem solving	1
	Provide a summary about problems given	1
Thinking elaboratively	Analysing problems	1

Detail:

Table 5:- Description of the Students’ Creative Thinking Skills

Value	Information
0	When indicator is not met
	When indicator is met incorrectly
1	When indicator is met correctly

Critical thinking skills were said to increase providing that the students’ scores in the second meeting were higher than those in the first one. This increase is formulated in the following patter.

$$S_1 < S_2 < S_3$$

Information:

S_1 Is the score in controversy 1

S_2 Is the score in controversy 2

S_3 Is the score in controversy 3

Research Result:-

The data used in this research was the results of validation, observation sheets of teacher’s activity, and the results of observation on students’ creative thinking skills. Before these instruments were piloted, the instructional instrument was validated by the validator. Subsequent to the validation, data and suggestion thereof were analysed in order to determine the quality of the instruments. To facilitate analytical working, the validation results of the instruments were analyzed. The analysis results generated the following data.

Table 6:- Instructional instrument Development Results

Number	Instructional Instruments	The validity	Interpretation
1	Lesson plans	3,84	Valid
2	Students Worksheets	3,86	Valid
3	Learning Achievement Test	3.89	Valid

Based on the validity coefficient, the instructional instruments are proven valid.

After analysing the creative thinking skills of each group on the matter of controversy 1, data concerning thinking smoothly, thinking flexibly, thinking originally, and thinking elaborative were amassed.

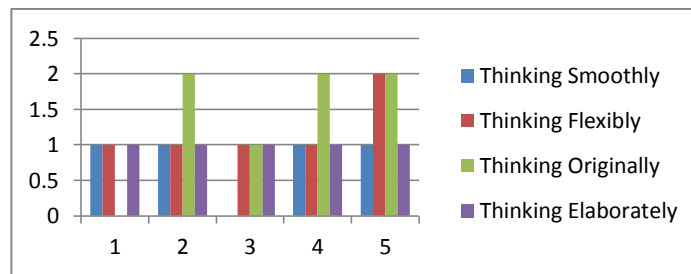


Figure 1:- The Creative Thinking Skills of Students on the 1st Controversy

Figure 1 points out the results of the analysis obtained from the 5 groups on the matter of controversy 1 conducted in Science class X1. In the aspect of thinking smoothly, the average group got a score of 1, which means the group is able to provide appropriate reason supported with concepts and facts about the answers given, but 1 group has not been able to meet the aspect of thinking smoothly. On the average of thinking aspects, all groups gain 1, which means that all groups are able to formulate the solution to the controversy. However, they were still not able to write down the facts needed to solve the problem. In the original thinking aspect, the groups get a score of 2, which means that all groups are able to write additional alternative answers for different reasons and able to give a conclusion to the problems given. In the elaborative thinking aspect, the groups commonly get a score of 1, which means that all groups are able to analyse the problem. Of the five groups, group 5 gains the highest score, because they can solve the problems contained in the students work sheet correctly, thus evincing that all aspects of creative thinking indicators are met. Group 1 and 3 get the lowest score, as there are less precise answers, so not all aspects of creative thinking are met.

The ability to think creatively in each group concerning controversy 2 was also put under analysis. The results also profile the ability to think smoothly, think flexible, original think, think elaborative as follows.

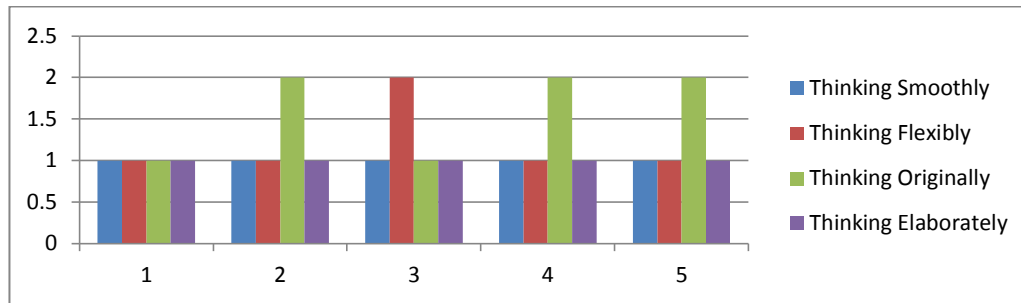


Figure 2:- The Creative Thinking Skills of Students on the 2nd Controversy

The above diagram portrays the results of the analysis obtained from 5 groups on the matter of controversy 2, conducted in science class XI. On the aspect of thinking smoothly, generally the groups get a score of 1, which means the groups are able to provide the reason according to concepts and facts to the answers given. On the average thinking aspects, the groups gain score 1, which means that all groups are able to formulate solution to the problem, and there are still not yet able to write down the facts needed to solve the problem. In the aspect of original thinking, the groups get a score of 2, which means that all groups are able to write alternative answers to the solution in different ways for different reasons and able to give a conclusion to the problems given. In the elaborative thinking aspect, generally the groups get a score of 1, which means that all groups are able to analyse the problem. Of the five groups, group 1 achieve the lowest score, because there is an inappropriate answer, so not all aspects of creative thinking are met.

Based on the results obtained by students in student work sheet, creative thinking skills in the first controversy are characterized by the following achievements; 16.67% flexible thinking, 16.67% elaborative thinking, 0% smooth thinking, and 23.44% original thinking. In the second controversy, the students' creative thinking skills are characterized by 31.25% flexible thinking, 16.67% elaborative thinking, 5.73% smooth thinking, and 33.33% original thinking. These findings indicate that the students' creative thinking skills on the first and second controversy are 71.88%, which means that students in the Science class are categorized as creative. In the first controversy, they obtain 56.77% and 86.98% in the second one, so it can be said the percentage of creative thinking students on student work sheet has increased by 30.21%. In the first learning achievement test, the percentage of creative thinking skills are characterized by 16.67% flexible thinking, 16.67% thinking elaborative, 0.52% smooth thinking, and 29.69% original thinking. By contrast, on the second controversy, the students' test result obtain the percentage of creative thinking skills at 31.25%, which is are atomized into 16.67% elaborative thinking, 7.81% smooth thinking, and 33.33% original thinking. The students' creative thinking skills on the first and second test are marked by 76.3% achievement, categorized at creative category. The percentage of students' creative thinking skills in the first and second meeting are equal to 63.54% and 89.06%, respectively, indicating an increase of creative thinking skills equal to 25.52%.

Discussion:-

Based on the result of the research, the development of Mathematics instructional instruments based on constructive controversy approach and conflict resolution, all lesson plans, student worksheets, and learning achievement tests have fulfilled the criteria of validity, practicality, and effectiveness so that they can be used in the learning process. All three instruments have been validated by 3 validators namely 2 lecturers of Mathematics education and 1 Mathematics teacher at the research site. The results obtained are 3.84, 3.86, and 3.89 for the validity of lesson plans, worksheets, and achievement tests, respectively. These all indicate very valid category. The teachers' instructional activities in the first and second meeting are marked at 91.18% and 94.12%. So, it can be said percentage of teachers' success in terms of classroom management is $\geq 80\%$. On the observation of students' activity, they achieve 81.48% and 86.11% in the first and second meeting respectively, indicating that the instruments are categorized in the practical category. In the category of effectiveness of instructional instruments, the percentage of student worksheets and achievement tests is 86.37%, with good category for learning purposes. While the value obtained by students obtained from the worksheets is ≥ 71 , so that the value obtained by the

students has met passing grade determined by school. On the observation sheet, the students obtained the percentage of creative thinking skill sat 71.88%, meaning that the students are categorized as creative. The lesson was conducted 2 times. At the first meeting, the material presented was the form of rank, while at the second meeting it focused on root. The previous teachers guided the students by using student worksheets so that students were not confused in doing student work sheet. There are five stages in student worksheet that must be done, including identification, exploration, explanation, conflict negotiation, and conflict resolution. In the first stage, identification, on the average, the students were able to write down the problems contained in the controversy, because students have already known issues to be discussed so that students directly wrote down the problems to be discussed in the identification column. This stage trained the students to think flexibly. In the second stage, exploration, students were trained to think flexibly. In the first meeting, the students generally still felt confused to look for the facts contained in the controversy, but on the second meeting they were not confused anymore to determine the facts contained in the controversy. The third stage was explanation, where students were trained to think smoothly. On the first meeting the students were still confused in writing down the reasons for their answers, but on the second meeting the average students were able to write down the steps along with the reason even if there was an incomplete writing. In the fourth stage of conflict negotiation, the students were trained to think originally and elaboratively. Students debated with other groups. All the groups participated in this activity to get the right answers and the underlying reasons. Opinions from other groups were written in the conflict negotiation column. This debate was done so that students were encouraged to discuss and accept opinions from other students to obtain mutual agreement and get conclusions written on conflict resolution. The 5 stages performed were devoted to training their creative thinking skills.

From the results of research that has been done, the score of creative thinking skills of students has increased from the first meeting to the second meeting. The average score of students at the first meeting was 3.41 and at the second meeting was 5.22. This indicates an increase in learning outcomes of students from the first meeting to the second meeting.

Figure 3 explains the improvement of creative thinking skills score obtained by students on each controversy.

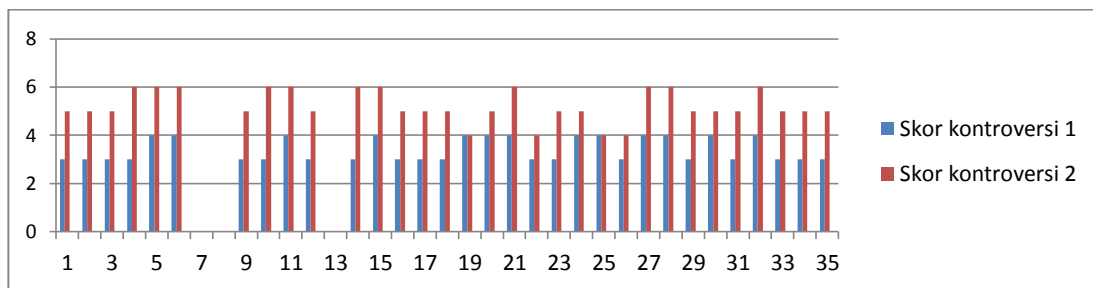


Figure 3:- The Final Score Diagram of the Creative Thinking Skills of Students

Figure 3 describes the improvement of creative thinking skills of students on every controversy. The average score obtained by students in the first controversy is a score of 3 out of a maximum score of 6, whereas in the second controversy the average score obtained by students is 5 of the maximum score 6. On the first controversy, there were 19 students who got the lowest score, namely score 3, and on the second controversy there were 4 students who got the lowest score of 4. Factors that caused these low scores were related to the fact that the students were still not able to write facts contained in the problem and had not been able to write the appropriate reasons with the concept and the facts about the answers given. This clearly implied that students who got a low score were because they were not able to think flexibly and think smoothly, as require in the category of creative thinking.

Based on the results obtained by students in student worksheets, creative thinking skills in the first controversy obtained percentage of 16.67% flexible thinking, 16.67% elaborative thinking, 0% smooth thinking, and 23.44% original thinking. In the second controversy, they obtained 31.25% flexible thinking, 16.67% elaborative thinking, 5.73% smooth thinking, and 33.33% original thinking. So that obtained the percentage of creative thinking skills of controversy first and second equal to 71.88% which mean student in science class X1 categorized creative. In the first controversy obtained 56.77% percentage and second percentage 86.98%, so it can be said the percentage of creative thinking students on student worksheet had increased by 30.21%. In the first test, they obtained the percentage of creative thinking skills profiled by 16.67% flexible thinking, 16.67% thinking elaborative, 0.52%

smooth thinking, and 29.69% original thinking, and on second test they obtained the percentage of creative thinking skills characterized by 31.25% flexible thinking, 16.67%elaborative thinking, 7.81%smooth thinking, and 33.33%original thinking. The students’ test results indicating their creative thinking skills on the first and second meeting were 76.3% with creative category. Based on the first and second test, they students scored 63.54% and 89.06%, which implied an increase by 25.52%.

Suggestion:-

- a. For other researchers who will conduct similar research, it is recommended that when making students worksheet space to fill the answers further widened so that students can freely write the answer, and not write on the back sheet.
- b. Teachers are expected to develop instructional instruments that can bring creative thinking to students and can train students to think creatively, especially thinking smoothly so that creative thinking skills students increase.

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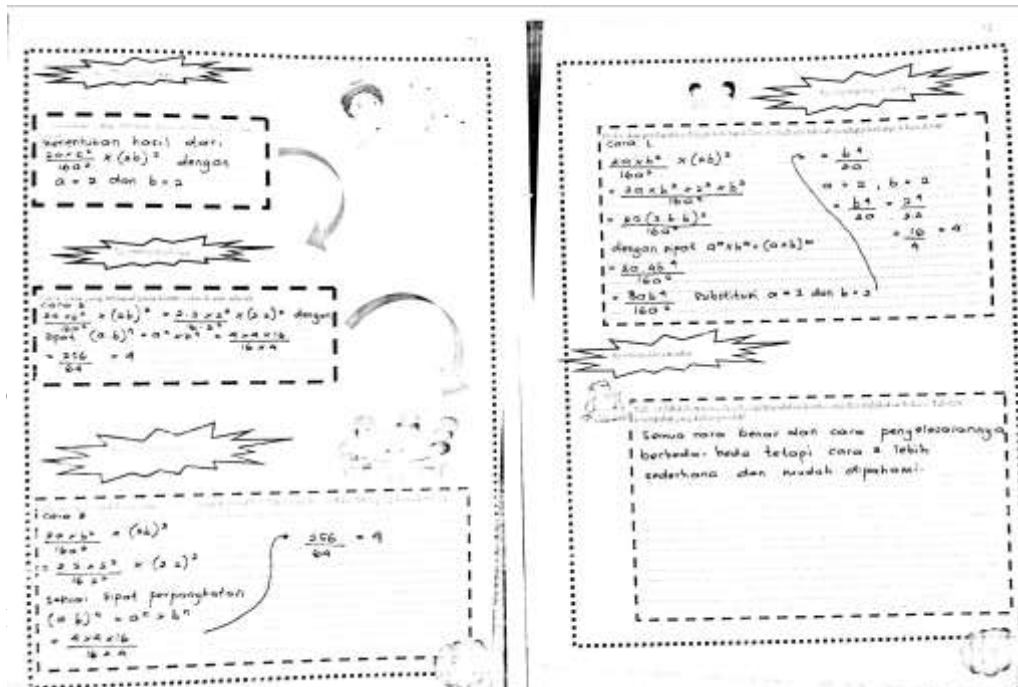
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Appendix:-

Example of students’ answer on students’ worksheet.



Mencari nilai persamaan yang ada pada nilai x dan y

Menerikan nilai y jika diketahui

$$x + 4y - 9 = x + 4 + 9$$

hasilnya $-\frac{3}{2} = y$

Tuliskan langkah lain yang dapat digunakan untuk menyelesaikan permasalahan di atas?

$$x + 4y - 9 = x + 4 + 9$$

$$4y - 9 = 8y + 4$$

$$-2 - 4 = 8y - 4y$$

$$-6 = 4y$$

$$-\frac{3}{2} = y$$

Sifat $x + ay - b = x + ay + c$ jika sama $a - ay =$ sama maka yang dioperasikan pengalihan

kemudian dipindah ruas untuk mencari nilai y

Mencari nilai persamaan yang ada pada Cara 1

Kerangka

$$x + 4y - 9 = x + 4 + 9$$

$$4y - 9 = 8y + 4$$

$$-2 - 4 = 8y - 4y$$

$$-6 = 4y$$

$$-\frac{3}{2} = y$$

lupa $x + a - b = x + ay - c$
 $ay - b = ay - c$

kemudian dipindah ruas dengan konsep yang sama untuk mencari nilai y

ide sama x ay maka yang dioperasikan pengalihan

Tuliskan kesimpulan yang anda peroleh dari permasalahan di atas ..

Tidak ada cara yang salah, semua cara benar. tapi cara satu lebih mudah karena kita sudah diajari tepat Perbandingan.

Ada dua pendapat yang ada untuk hasil pemrosesan ini.
 Tidak ada cara yang baik, semua cara
 benar. Tapi cara yang lebih mudah karena
 kita sudah diajari ingat Peringkatannya.

Solusi 2
 Tentukanlah nilai dari $\sqrt[3]{\sqrt[3]{a^3 \cdot b^3}}$

Diketahui:
 Cara 1

$$\sqrt[3]{\sqrt[3]{a^3 \cdot b^3}} = \sqrt[3]{\sqrt[3]{a^3} \cdot \sqrt[3]{b^3}}$$

$$= \sqrt[3]{a \cdot b}$$

$$= \sqrt[3]{a^1 \cdot b^1}$$

$$= \sqrt[3]{a^1 \cdot b^1}$$

$$= (a^1 \cdot b^1)^{\frac{1}{3}}$$

$$= (ab)^{\frac{1}{3}} = \sqrt[3]{ab}$$

Dik

$$\sqrt[3]{\sqrt[3]{a^3 \cdot b^3}} = \sqrt[3]{\sqrt[3]{a^3} \cdot \sqrt[3]{b^3}}$$

$$= \sqrt[3]{a \cdot b}$$

$$= \sqrt[3]{a^1 \cdot b^1}$$

$$= \sqrt[3]{a^1 \cdot b^1}$$

$$= (a^1 \cdot b^1)^{\frac{1}{3}}$$

$$= (ab)^{\frac{1}{3}} = \sqrt[3]{ab}$$

Diketahui: tentukanlah nilai dari $\sqrt[3]{\sqrt[3]{a^3 \cdot b^3}}$
 pemrosesan di atas?

$$\sqrt[3]{\sqrt[3]{a^3 \cdot b^3}} = \sqrt[3]{\sqrt[3]{a^3} \cdot \sqrt[3]{b^3}}$$

$$= \sqrt[3]{a \cdot b}$$

$$= \sqrt[3]{a^1 \cdot b^1}$$

$$= \sqrt[3]{a^1 \cdot b^1}$$

$$= (a^1 \cdot b^1)^{\frac{1}{3}}$$

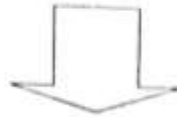
$$= (ab)^{\frac{1}{3}} = \sqrt[3]{ab}$$

Menurut anda pemrosesan yang benar adalah Cara 1
 karena sesuai dengan sifat Peringkatannya.

$$\sqrt[3]{a^3} = a^1$$

$$a^m \cdot x a^n = a^{m+n}$$

$$(a^x)^y = a^{x \cdot y}$$



Tuliskan kesimpulan yang anda peroleh dari permasalahan di atas ..

Pada persamaan diatas cara untuk menentukan sebuah jawaban yang paling tepat adalah cara 1 karena untuk menyelesaikan soal diatas menggunakan sifat-sifat

$$\sqrt[m]{a^m} = a^{\frac{m}{n}}$$

$$a^m \times a^n = a^{m+n}$$

$$(a^x)^y = a^{x \cdot y}$$