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Creative and Innovative Abilities of Tenth Grade Senior High School Student In Solving SPLTV Tasks

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Abstract

This research investigates the proficiency of students' creative and innovative thinking abilities within the framework of 21st-century learning, employing indicators aligned with the Partnership for 21st Century Learning (P21) goals. The primary objective is to ascertain the impact of the Treffinger learning model, integrating principles of realistic mathematics education, on the enhancement of students' creative and innovative thinking skills. Employing a mixed-methods approach, the research utilizes a quantitative methodology employing a one-group pretest-posttest design, complemented by qualitative research in the form of descriptive analysis of the levels of creative and innovative thinking skills. The statistical analysis, conducted through hypothesis testing, revealed a significant influence, as evidenced by Assymp Sig (0.000) < 0.05. This indicates that the Treffinger learning model, incorporating realistic mathematics education principles, effectively contributed to the improvement of students' creative and innovative thinking skills. Furthermore, the data analysis identified distinct levels of creative and innovative thinking skills among the participants: 3 students exhibited a baseline level (level 0), 17 students demonstrated proficiency at level 1, 7 students exhibited competence at level 2, while only 1 student attained an advanced level of proficiency at level 3. Based on this data, there is a significant increase, especially at the level 2 from 4 to 7 students.

Key words: Creative and Innovative ability, RME, SPLTV

INTRODUCTION

The 21st century education emphasizes the need for mastery of critical skills, such as creative and innovative thinking, critical thinking, communication skills, and collaboration skills, which are often referred to as the 4Cs (Yudha, et al., 2018). This research focuses on exploring students' creative and innovative thinking skills in solving problems related to the System of Linear Equations of Three Variables (SLETV). Students' creativity and innovation levels can be enhanced by providing opportunities for them to think divergently or openly. This involves training students to think outside the box, adopt new approaches to thinking, communicate new ideas and solutions, identify unusual problems, and seek to create new responses and conjectures. The success of individual students is associated with their creative abilities (Septikasari, 2018).

The development of students' creative and innovative thinking skills needs extrinsic support, teachers also need to adopt innovations in the learning process. One form of innovation that can be used is the Indonesian realistic mathematics learning model. In the context of this research, realistic

mathematics learning is specifically designed by combining the stages of Realistic Mathematics Education (RME) learning. The integration of the three stages of RME, namely the basic tools stage, the practice and process stage, and the problem solving stage, is directed to produce integration that supports the development of students' creative and innovative thinking skills in various aspects, such as thinking creatively, working creatively with others, and applying innovation (Yudha, et al., 2017).

Previous research, such as that conducted by Zanuar Triwibowo (2017), showed that the application of the Treffinger learning model with an open-ended approach can improve students' mathematical creative thinking skills. Similar findings were also supported by Firma Yudha, et al (2018), who found that students showed an increase in creative and innovative thinking skills in solving certain problems. In addition, the results of research by Sabina Ndiung (2019) showed that students who learned through the Treffinger creative learning model with RME principles had higher creative thinking abilities and numerical skills compared to students who learned through conventional models.

Based on the research conducted, the ability of students' creative and innovative thinking through the concept of integration between realistic mathematics learning has not been done by previous researchers. Due to the abstract nature of mathematics, alternative mathematics learning in secondary schools must be implemented using a realistic approach, but supported by creative strategies. Therefore, the integration between realistic mathematics learning, especially using the treffinger principle, is one of the alternative solutions to improve mathematical creative and innovative thinking skills. This is the basis for researchers to carry out research with the title creative and innovative skills in solving SPLTV problems in class X MAN 1 Banyuwangi.

METODE

This research uses quantitative and qualitative methods or commonly called mixed methods. To obtain the research objectives, the researcher used triangulation. John W. Creswell (Creswell: 2019) and Morse, J.M (Morse: 1991) have supported the combination of quantitative and qualitative data collection techniques in conducting research, and noted that they can complement each other. To obtain the research objectives, the research was conducted in two parts, namely: (1) a quantitative research method with a one group pretest - postest design, and (2) a descriptive qualitative research method that analyzes the level of creative and innovative thinking ability of selected subjects and is reinforced by the results of interviews.

The subjects in this study were class X students at MAN 1 Banyuwangi. To decide on the determination of the research subject, namely through purposive sampling technique, because the subject is chosen according to the criteria needed by the researcher. In determining the research subject, the researcher gave a pre-test then after implementing the treffinger learning process with RME principles, the researcher gave a post-test to find out

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whether the learning model and principles had an influence on students' thinking skills. From the test results, the researchers leveled the students' creative and innovative thinking abilities and then the researchers took 4 students at each level to conduct interviews.

Data analysis used in this study used two stages, in the first stage hypothesis testing was carried out through the Wilcoxon test to determine the effect of realistic mathematics learning applied. Then in the second stage to describe the level of students' creative and innovative thinking abilities, the analysis is carried out according to the stages of miles and huberman, namely in the form of data collection, data presentation, data reduction, and conclusion drawing. The Triangulation Model can be seen from the following figure 1.

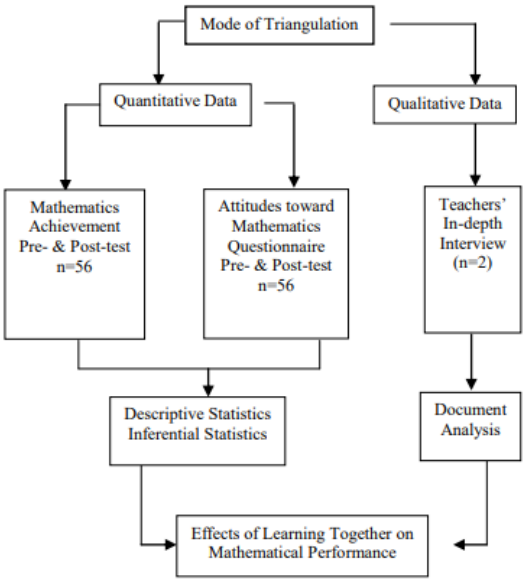

Figure 1. Mode of Triangulation

RESULT AND DISCUSSION

In order to find the first research objective, a hypothesis test was conducted, namely the Wilcoxon test to determine the effect of RME learning. The hypothesis used is:

H_0: There is no difference in the value of students' creative and innovative thinking skills before and after the application of Indonesian realistic mathematics learning.

H_1: There is a difference in the value of students' creative and innovative thinking skills after the application of Indonesian realistic mathematics learning.

The test criteria is to reject Ho if the Asymp.Sig value <0.05. by Wilcoxon test showed in table 1

Table 1. Wilcoxon Test

Parameters	Posttest Creative And Innovative Ability Pretest Creative and Innovative Ability
Z	-4.104[b]
Asymp. Sig. (2-tailed)	.000

Based on this output, the value of Asymp.Sig. (2-tailed) is 0.000 which means it is smaller than <0.05. then it can be concluded that Ho is rejected and H1 is accepted. Thus, based on the Wilcoxon test, there is a difference between the pretest and posttest, which means it can be concluded that there is an effect of the application of RME learning on the ability to think creatively and innovatively.

The results of the inventory scale of creative and innovative thinking abilities show that as many as 3 students have level 0 creative and innovative thinking abilities, 17 students have level 1 creative and innovative abilities, 17 students have level 2 creative and innovative abilities, and 1 student has level 3 creative and innovative abilities (figure 2).

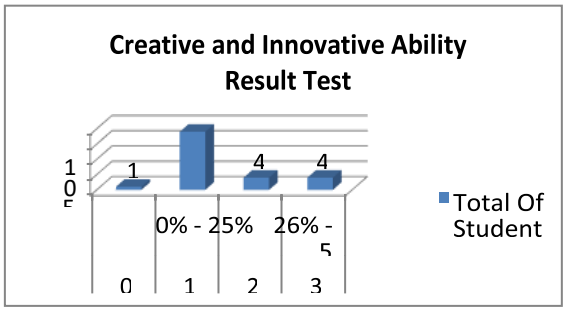

Figure 2. Pretest dan Posttest Result

Based on the results of the analysis of the initial ability test and the creative and innovative thinking ability test or in this case called the pretest and post test, students have the ability to think creatively and innovatively in solving SPLTV problems that reach the Think Creatively indicator. Based on the level of creative and innovative thinking ability, it is included in level 1 or quite creative and innovative.

Level 0 is called lack of creative and innovative thinking. Students are characterized as only being able to define what is known from the problem along with one solution that is less precise and limited or does not reach any of the indicators. At level 1 students are able to master all three indicators in only one problem, while level 2 students are able to define what is known in the problem and the solution is correct with the solution method that has been taught during discussion followed by solving using other methods but only in 2 problems. And the last, level 3, is called very creative and innovative thinking. At this level students are able to find other alternatives in working on problems other than the alternatives used by students in general correctly or have achieved the indicators of Think Creatively, Work Creatively with Others, and Implement Innovation in each problem.

The final results of the leveling of students' creative and innovative thinking abilities through realistic mathematics learning can be seen from the following figure 3.

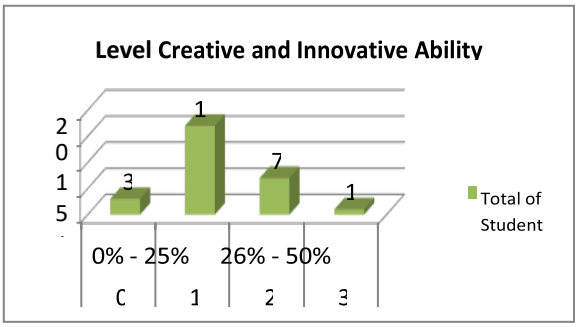

Figure 3. Level Creative and Innovative Ability

Based on the work on question number 2, the answer obtained is correct but the writing of the steps is not correct, such as the writing of elimination which is not clearly marked (figure 4). As well as the repetition of writing the x variable at the time of substitution which should be x replaced with 30,000 but the x variable is still written so it looks like 30,000x. Then on elimination 10,000 - 30,000 which should be negative is written positively by the subject. Based on the scoring criteria on the Think Creatively indicator, namely the subject is able to make arguments from the

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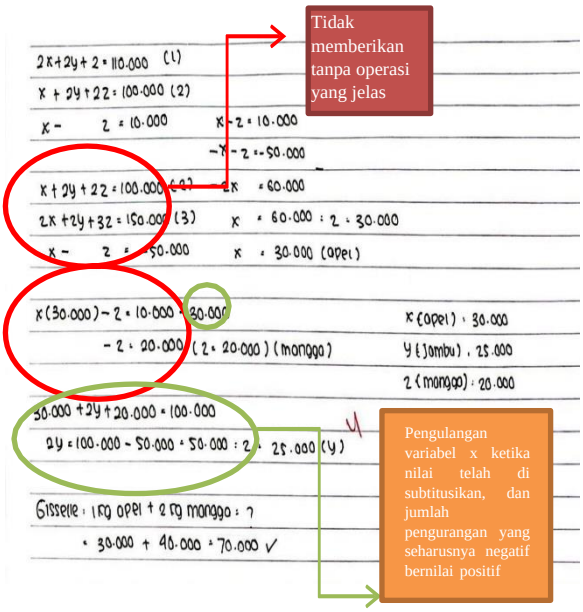

Figure 4. Writing Elimination Unclear

problem and work on problems using several solution methods, S04 only gets a score of 2. Because the subject only works on problems with one method, namely the mixed method with incorrect steps, the subject S04 has level 0 innovative creative thinking ability.

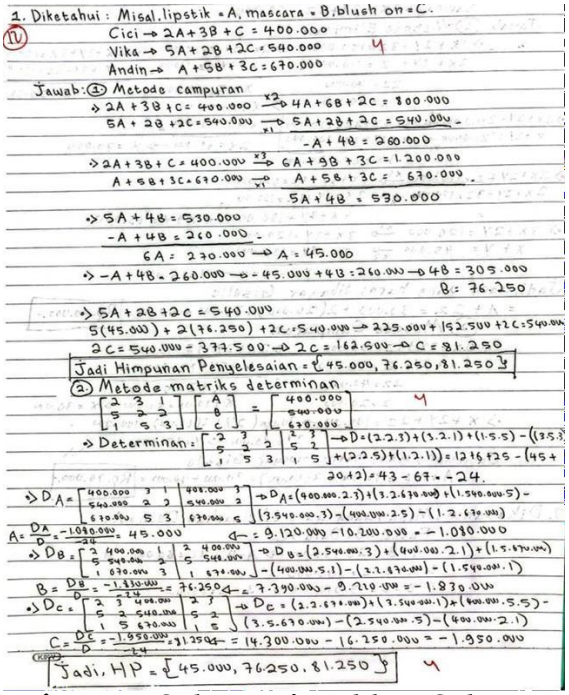

Figure 5. Subject of Problem Solving

Based on Figure 5 above, it shows that subject S16 is able to solve problem number 1 using several methods, namely the mixed method and the elimination method. However, the elimination method written by the subject is not correct and is also unfinished because the value of variable z is not found. So that in the Think Creatively indicator of question number 1, subject S23 scored 3 and has level 1 innovative creative thinking skills.

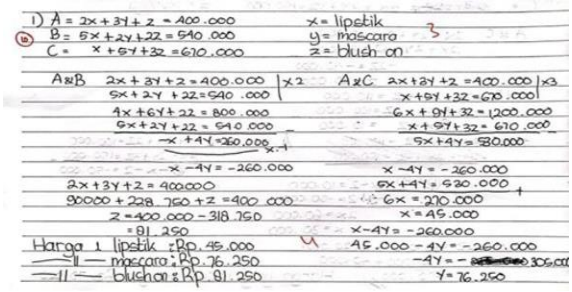

Figure 6. subject of problem solving

In Figure 6 above, it can be seen that subject S11 is also able to work on problem number 2 with several methods, namely the mixed method and the elimination method, the two methods used obtain the same final result and the steps used are written systematically. Thus for the Think Creatively indicator in question number 2, subject S11 obtained a perfect score of 4. As well as having level 2 innovative creative thinking skills because subject S11 was able to achieve all three indicators in questions number 1 and 2.

From figure 7, it can be seen that subject S25 was able to work on problem number 1 using several methods, namely the mixed method and the matrix determinant method.

Number 1 using several methods, namely the mixed method and the matrix determinant method. The solution steps written in both methods are very clear and the results obtained

Figure 8. Subject of Problem Solving

are correct. The results obtained are also correct. Thus subject S25 got a perfect score of 4 on the Think Creatively indicator for number 1, in accordance with the scoring criteria, namely the subject is able to make arguments from the problems given and is able to solve problems with several methods and subject S25 has level 3 innovative creative thinking skills because the subject is able to master all indicators in all the problems given.

Based on the data from the results of the research that has been done, the increase in creative and innovative thinking skills is at level 2. While research conducted by Ashari et. al. (2023), the increase in creative and innovative thinking skills is at level 0, different results also occur in research conducted by Ma'arif (2023), creative and innovative thinking skills are precisely at level 3 where originally only 1 student was able to be at level 3 to 6 students who were at level 3.

CONCLUSION

Based on the results of the pretest and posttest analysis of creative and innovative thinking skills, there are 3 students who have level 0 creative and innovative thinking skills. 17 students have level 1 creative and innovative thinking skills or Think Creatively which tends to only be able to achieve the three indicators in one problem. 7 students have level 2 creative and innovative thinking skills or Work Creatively with Others level. And there is 1 student who has level 3 creative and innovative thinking skills who is able to master all indicators, namely Think Creatively, Work Creatively with Others, and Implement Innovation in each problem.

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BRIEF PROFILE

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