The Effect of Pedagogical Competence and Creativity of Teaching Mathematics Teachers on Students' Creative Thinking Abilities

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Abstract- This study aims to describe the competence of pedagogy, the creativity of mathematics teachers in teaching, and their influence on students' creative thinking abilities. This research uses a quantitative approach involving 6 mathematics teachers and 40 students. Based on the data and discussion above it can be concluded that the pedagogical competence of teachers is dominated by the group with the category of "medium" as much as 65.6%, the creativity of mathematics teachers in teaching is dominated by the group with the moderate category as much as 83.3% and the creative thinking abilities of students are at the low category, which is as much as 47.5%. Based on the results of the T-test it appears that, obtained sig. for the influence of teacher pedagogical competence (X2) is 0.081. The value> 0.05, it means that pedagogical competence does not significantly affect students' creative thinking abilities. The value of sig, for teacher creativity on students 'creative thinking abilities, is equal to 0,000 <0.05, which means that mathematics teacher's creativity in teaching has a significant effect on students' creative thinking abilities.

Keywords: Pedagogic Competence, Mathematics Teacher's Creativity, Students' Creative Thinking Ability

I. INTRODUCTION

Teachers as the main actors in implementing educational programs in schools have a very important role to achieve educational goals. The teacher is one of the spearheads of the successful goals of education. Teachers are the most decisive component in the overall education system that must receive central, first, and foremost attention (Supranoto, 2015). For this reason, in creating a quality education process professional teachers are needed (Alghifari et al., 2016). According to Indonesian law, one indicator of professional teachers is that they have pedagogical competence.

Pedagogical competence is the ability of teachers related to education, the educational process, the character of students, and the assessment of the educational process itself. According to Habibullah (2012), pedagogical competence is the ability to manage the learning process. These competencies include understanding students, designing and implementing learning, evaluating learning outcomes, and developing students to actualize their various potentials. According to Kurniawan & Astuti (2017), pedagogic competence is the ability to manage to learn well. Thus, it is following the role of the teacher, which includes: educating, guiding, training, advising, making updates, being a model and role model, having a personality, researchers, encouraging creativity, generating views, doing routine workers, bringing stories, becoming actors, emancipator and conduct evaluation (Juhji, 2016). Hadi (2018) states that pedagogic competence is the ability of a teacher to manage the learning process of students and help, guide, and lead students. The learning process is essential to develop students' activities and creativity, through various interactions and learning experiences (Wahyuni, 2013).

According to research, pedagogical competence influences student learning habits (Lambok Simamora, 2014). Besides, pedagogical competence can also influence student learning outcomes in sociology subjects (Rasuli & Rivaie, 2013), science subjects (Purnamawanti, Suliswiyadi, & Nugroho, 2018), and economic literacy of students (Wulandari, 2012), also student motivation (Rahman, Mutiani, & Putra, 2019). Pedagogic competence also influences the motivation and performance of

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the teacher concerned (Supriyono, 2017), and (Sappaile, 2017). Thus it can be understood that the teacher's pedagogical competence has a positive impact on the learning process and outcomes. Thus, it is clear that a teacher's pedagogical competence impacts the quality of himself and the quality of his work, namely the implementation of the learning process. Therefore, a teacher ideally has good pedagogical competence.

In addition to teacher pedagogical competence, teacher creativity holds the key to arouse and develop students' creativity. A teacher, who wants to arouse creativity in his students, must first try so that he is creative. In general, creative teachers have been educated by creative people in an environment that supports it (Monawati & Fauzi., 2018). Therefore, teacher creativity in managing learning is one form of demand as a teacher's professional staff (Febriandar, 2018).

Psychological creativity is the ability of a person to produce any composition, product, or idea that is new, and previously unknown to its creator (R.M, 1994). Creativity thinking or creative thinking, creativity is an act of thinking that produces creative ideas or ways of thinking that are new, original, independent, and imaginative. Creativity is seen as a mental process (Sagitasari, 2010). The Fakhriyani (2016) states that creativity is an ability that is not brought from birth but can be learned and developed so that this ability should be developed from an early age. The results of Sambada's (2012) study also state that there is a positive and significant relationship between student creativity and problem-solving skills. Because it can be understood that creativity is one of the potential possessed by every human being, including students and teachers.

One form of teacher creativity in teaching is in making learning media. The development of appropriate learning media by teachers (requires teacher creativity) can improve the quality of learning and improve teacher learning outcomes (Nurrita, 2018). Also, Juandi & Sontani (2017) found that there is a positive influence of teacher's teaching creativity on student achievement. As for Febriandar (2018) found that teacher creativity is very influential on student motivation and learning outcomes. Creative teachers are not only good at decision making and dominating the classroom, but also experts in designing a teaching style that involves students in decision making so that students are active, varied and creative in each episode of learning (Wahyuni, 2013). As for you (2017) in his writing also mentioned that the role of the teacher in developing students' creative thinking abilities is very strategic so that the person should be optimized.

Based on some of the descriptions above, it can be understood that creativity is defined as the ability to create a new product, both truly new and which is a modification or change by developing things that already exist. If this is related to the creativity of the teacher, the teacher concerned creates a teaching strategy that is completely new and original (original creation), or it can be a modification of various existing strategies to produce a new form in implementing the teaching and learning process (Monawati & Fauzi., 2018). The measurement of teaching creativity variables in this study includes 5 indicators as follows: 1) ability to think smoothly, 2) ability to think flexibly (3), 3) ability to think rationally, 4) ability to detail or elaborate, and 5) ability to assess or evaluate (Juandi & Sontani, 2017).

Associated with the ability to think creatively, Nuriadin & Perbowo (2013) defines as the ability of a person to find ideas or new ideas in solving problems using the previous experience they already have. The ability to think creatively is needed by humans in dealing with problems in their lives, creative thinking is generally obtained in the world of education (Tambunan, 2016). Sugilar (2013) emphasized that students' creative thinking skills could not develop properly if in the learning process the teacher did not actively involve students in concept formation, the learning methods used in schools were still conventional, namely learning that was still teacher-centered. Thus it is clear that the ability to think creatively is an ability that is very important to be developed and become the main capital for each individual in the problem-solving process. Besides, some experts also mentioned that the ability to think creatively is also a high-level thinking ability (Musrikah, 2018).

Various attempts have been made to improve students' creative thinking abilities. These efforts involve the macro scale and micro scale. Macroscale in the form of national curriculum design and microscale in the form of a learning process. Related to the teacher's pedagogical competencies, the development of students' creative thinking abilities is carried out at the micro-scale, namely in the learning process. Efforts to improve the ability to think creatively through the learning process by applying certain learning models, for example, problem-based learning models (Siswono, 2004) and (Noer, 2013), through the implementation of project-based learning models (Rahmazatullaili, Zubainur, & Munzir, 2017), the application of problem-solving learning (Nurjannah & Irma, 2019), the development of teaching materials in the form of modules (Anggoro, 2015), through learning with constructivist approaches (Azhari & Somakim, 2014). Besides, efforts to improve the ability to think creatively can also be done through the development of instruments (Moma, 2016).

Based on the description above, it can be understood that there is a link between the teacher's pedagogical competence, teacher's creativity, and students' creative thinking abilities. Therefore, the focus of this study is to find out how the influence of teacher pedagogical competence and teacher creativity in teaching on the creative thinking ability of students.

II. RESEARCH METHOD

This study uses a quantitative approach with a correlational method, which is to see the correlation of pedagogic competence and teacher creativity in teaching mathematics with students' creative thinking abilities. This research data collection uses a questionnaire to measure teacher pedagogic competence, an observation sheet to measure teacher creativity in teaching and tests to measure students' creative thinking abilities. Test

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instruments are arranged based on each indicator on each instrument. Before being used to capture data, all instruments were validated by experts, both construct and content. Thus there is no doubt about the data obtained in this study. The data obtained in the study are the scores. The maximum score for the pedagogic competency variable and the teacher's creative ability is 30 and the minimum score is 0. As for the creative thinking variable, the maximum score is 50 (fifty) and the minimum score is 0 (zero). The scoring of each variable is based on indicators measured on the instrument. Based on the scores obtained, then analyzed to classify each variable in the "low", "medium" and "high" categories. In this study, involving 6 (six) mathematics teachers and 40 students. The data analysis is carried out with the help of SPSS.16 software, this is intended to ensure the accuracy of the data analysis.

III. RESULT AND DISCUSS

Based on data obtained from respondents using instruments that have been developed, data analysis is then performed. The first data analysis is done by classifying the ability level of each respondent based on the score scale obtained, namely in the category of "high", "medium" and "low". Based on this classification, the data obtained as in the following Table 1:

Table 1. Pedagogical Competence, Teacher Creativity and Creative Thinking Abilities of Students

Aspect	Score	Number	Percentage (%)	Category
Pedagogic competence	21-30	1	16,6	High
	11-20	4	65,8	Moderate
	0-10	1	16,6	Low
	Total	6	100	
Teaching creativity	21-30	0	0	High
	11-20	5	83,3	Moderate
	0-10	1	16,7	Low
	Total	6	100	
Students' creative thinking skills	36-50	6	15%	High
	18-35	15	37,5%	Moderate
	0-17	19	47,5%	Low
	Total	40	100	

Based on Table 1 above, it can be seen that the pedagogical competence of teachers is dominated by the group with the category of "moderate", which is as much as 65.6%, this indicates that in general, the pedagogical competence of mathematics teachers in SMA 6 Muaro Jambi is in the medium category. As for mathematics teachers with a low competency category of 16.6%, followed by high abilities of 16.6%. As for the variable of teaching creativity, information is obtained that in general the creativity of mathematics teachers in teaching is dominated by groups with medium categories as much as 83.3%. Then followed by a low category group that is 16.6% and a group with a high category of 0%. Besides, based on Table 1 it can also be seen that in general students' creative thinking abilities are in a low category, which is as much as 47.5%, the medium category is as much as 37.5% and the high category group is as much as 15%.

Furthermore, the score is analyzed to determine the correlation between variables. As for the results of data analysis with the help of SPSS 25 software, the output model summary is shown in table 2 below:

Table 2. Model Summary, Correlations between variables

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.893[a]	.797	.792	1.159

a. Predictors: (Constant), pedagogic competency teacher (X2), Teacher Creativity (X1)

Based on the test summary model above, it appears that the R square value of 0.797. It shows that the mathematics teacher's pedagogical competence and the teacher's creative ability to teach affect the level of students' creative thinking abilities by 79.7%. The remaining 18.3% is influenced by other factors. Therefore it can be said that the teacher's pedagogical competence (X2), the teacher's creativity in teaching (X1) has a strong enough influence on the students' creative thinking abilities.

Table 3. ANOVA Test Results (Test F) between variables

ANOVA[-a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	406.570	2	203.285	151.412	.000[b]
	Residual	103.380	77	1.343		
	Total	509.950	79			

a. Dependent Variable: Students' creative thinking ability

b. Predictors: (Constant), Pedagogic competency (X2), Teacher Creativity (X1)

Based on the ANOVA output table above, it can be seen that the sig values are obtained. in the F test is 0,000, which means <0.05. That means that the two variables of teacher pedagogical competence (X2), teacher creativity in teaching (X1) significantly together affect the students' creative thinking abilities. Besides, if it is based on the value of F-count and F-table, then the value of F-count = 151.421, while the F-table for N = 80 is 3.11. Thus Fcount> Ftable, the hypothesis is accepted,

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namely that the teacher's pedagogical competence (X2), the teacher's creativity in teaching (X1) significantly together affects the students' creative thinking abilities.

Table 4. Coefficients Test Results (T-Test) between variables

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.052	.352		.149	.882
	Pedagogic competency (X1)	.975	.068	.839	14.387	.081
	Teacher creativity (X2)	.113	.064	.103	1.766	.000

a. Dependent Variable: Students creative Thinking

Based on the results of the T-test above, it appears that, obtained sig. for the influence of teacher pedagogical competence (X2) is 0.081. The value> 0.05, it means that pedagogical competence does not significantly affect students' creative thinking abilities. The value of sig, for teacher creativity on students 'creative thinking abilities, is equal to 0,000 <0.05, which means that the mathematics teacher's creativity in teaching has a significant effect on students' creative thinking abilities.

Based on the data above, it can be understood that the three variables, namely pedagogical competence, teacher's creativity in teaching, and students' abilities in creative thinking are interrelated. Although in the next test that the students' creative thinking ability is more influenced by the teacher's creative ability in teaching than the teacher's pedagogical competence. This means that students 'creative thinking abilities can be improved if the mathematics teacher is more creative in implementing the learning process, while the teacher's pedagogical competence has an indirect effect on students' creative thinking abilities.

The difference in teacher pedagogic competence and teacher teaching creativity in influencing students' creative thinking ability can be understood considering pedagogic competence is the teacher's internal ability while the teacher's creativity in teaching is external ability so that it is more easily seen by students. This also proves that the emergence of creative thinking abilities comes from one's ability to make observations. In other words, a person's ability to think can grow and develop because of something that is seen, heard, felt so that it causes curiosity. Mardhiyana & Sejati (2016) explained that through curiosity, learning is not just knowing but exploring to find out more so that it gives meaning to what is obtained in the learning process. Thus, teacher creativity in teaching can trigger curiosity and exploration power of students in learning, thus encouraging the growth of creative thinking abilities.

Given that the teacher's creativity in teaching directly influences students' creative thinking abilities, the teacher as an educator must be able to understand the various factors that influence the teacher's creativity itself. With their ability to understand these factors, it is expected that teachers will be able to optimize their potential so that it will have a positive impact on the development of students' creative thinking abilities. According to Sutrisno & Siswanto (2016) factors that influence creativity are (1) situations that present incompleteness and openness, (2) situations that allow and encourage any questions, (3) situations that encourage producing something, (4) situations that encourage responsibility and independence, (5) situations that emphasize self-initiative, (6) bilingualism, (7) attention from parents, (8) stimulation from the school environment, (9) self-motivation. Thus the creativity practiced by the teacher in the learning process is part of stimuli and situations that encourage the development of creative thinking skills in students. The pedagogic competence is an internal ability of the teacher, meaning that pedagogical competence plays a role in increasing teacher creativity, and teacher creativity plays a role in increasing student creativity.

The findings in this study provide information and thoughts that the teacher's role in arise the full potential of students, in this case, the ability to think creatively is very important (You, 2017). Therefore, in implementing mathematics learning teachers need to develop learning that encourages students to be more active. According to (Kenedi, 2017) active learning allows students to develop creative thinking skills. Also, teachers need to develop learning models that can potentially improve students' creative thinking skills. Some learning models that have the potential to develop students' creative thinking skills include STEM learning models (Ismayani, 2016), learning models with group investigation (Christina & Kristin, 2016), guided inquiry learning models (Suryaningsih, Cahaya, & Poerwati, 2016), project-based learning models (Titu, 2015), and the use of realistic mathematics learning (Wijayanti, 2016).

In addition to the use of varied learning models, enhancing student creativity can also be done by teachers, for example by developing learning tools that are oriented towards student creativity (Kusumaningrum & Djukri, 2016), the use of certain learning media (Nurrita, 2018). Thus, the higher the teacher's creativity in carrying out the process of learning mathematics, the creative thinking ability of students will also develop.

IV. CONCLUSION

Based on the data and discussion above it can be concluded that the pedagogical competence of teachers is dominated by the group with the category of "medium" as much as 65.6%, the creativity of mathematics teachers in teaching is dominated by the group with the moderate category as much as 83.3% and the creative thinking abilities of students are at the low category, which is as much as 47.5%. Based on the results of the T-test shows that, obtained sig. for the influence of teacher pedagogical competence (X2) is 0.081. The value> 0.05, it means that pedagogical competence does not significantly affect students'

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