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Improving creative thinking skills through a mind map

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ABSTRACT

Students must possess 21st-century talents in order to learn efficiently. The goals of the study were to determine the effect of using the mind-mapping learning model on improving students' creative thinking abilities, as well as the average difference in creative thinking abilities between students who used the mind-mapping learning model and students who used the conventional learning model. SPSS version 24 was used to analyze the research data. The hypothesis was evaluated using the Wilcoxon and Mann-Whitney U tests. The results showed that, while using the mind-mapping learning model influenced students' creative thinking abilities, using traditional learning models had little effect on students' abilities. Pupils who use the mind-mapping learning model have higher average creative thinking power than those who use standard learning models.

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Introduction

Education itself has a vital role for students in terms of equipping them with competencies that will be needed in social life. Creative thinking competencies are needed for today's young people to develop (OECD 2019). It was further explained that this creative ability can encourage them to more easily adapt to the world at large which is constantly changing and so fast changes, so it requires humans who have a flexible or creative mindset equipped with 21st-century skills that are more than just literate and numerical but face the challenges of world progress.

The importance of creative thinking competence in students can certainly be possessed by students through creative education as well (Murtafiah 2017). Teaching students to think creatively can assist young people in adapting to improve the capacity they already have to accomplish work that cannot be readily reproduced or replaced by machines, as well as overcoming increasingly complex local and global difficulties through unconventional solutions. In order to motivate students in schools to continue to increase their creative competency, new forms or learning models that use creative energy and recognize the creative potential of all students must be supported. The usage of creative learning models will most likely be able to help kids who are disinterested in school as well as guide them to communicate their ideas so that the desired competencies are met (OECD 2019).

Pre-research data revealed that more than 25 pupils had lower levels of creative thinking capacity. There are just 5 pupils who have exceptional creative thinking ability. The high number of kids with creative thinking abilities is less indicative of a lack of development of the creative thinking process in students both in school and in the community. According to Tony Buzan, one of the reasons is that the school system tends to focus on left-brain skills, such as language, logic, numbers, sequences, linearity, and so on, therefore it lacks the development

of right-brain skills, which directly effects creative thinking skills. As a result, students at school may only be able to use a portion of their creative thinking skills (Buzan 2018).

It is commonly used in essay questions to assess students' capacity to think creatively by offering case studies in which students are expected to come up with new and original ideas. Many researchers, however, employ the Torrance Tests of Creative Thinking - Figural and Verbal (TTCT-F and V) versions; nonetheless, TTCT-F is a more thorough, trustworthy, and valid measure of creativity than TTCT-V (Kim 2017). Also, there are regularly used creative thinking ability test instruments that supplement images or symbols by selecting multiple-choice answers, such as Carter's ability test (Carter 2009). As a result, it is clear that assessments of creative thinking capacity include not just open-ended questions but also closed-ended or multiple-choice questions.

According to the executive summary of the 2019 Senior High School National Examination results, the scope of material covered in the UN questions for the Senior High School (SMA) level economics examination includes economic concepts, development concepts, national and international economic management, service company accounting, and trade. The material's scope is assessed at three cognitive levels: knowledge and understanding, application, and reasoning. Several students are unable to tackle the problem at the application and reasoning levels. According to the findings of the investigation, most students struggle with addressing available issues in the form of applying concepts, determining formulas, and performing economic mathematical calculations (Puspendik 2019).

Many factors influence the phenomenon that occurs at the national and school levels, particularly those that occur in class XI IPS 1 and XI IPS 2 SMAN 1 Tulungagung, namely students who are less than 25% complete in their learning, particularly the level of application and reasoning. There are two types of elements that influence learning, namely internal factors and external influences (Kurniawan, Wiharna, and Permana 2018). Internal variables are causes or triggers that emerge within students in order for them to act on their learning. External factors are those that emerge from outside the learner to influence learning. There are school aspects that might affect student learning results in the external method, one of which is the learning technique or model that students use in learning. As a result, students' learning approaches or models have an impact on the effectiveness of their learning. When the learning model is fitted to student material and characteristics, it promotes efficient learning; conversely, when the model is not appropriate, it promotes inefficient learning (Le, Janssen, and Wubbels 2018).

Learning models utilized or applied to classroom learning come in many varieties, each with its own goal and set of qualities. An effective learning model is one whose impact, when applied to learning, can increase students' grasp of the learning material being presented, ultimately improving student capacities or learning outcomes (Orús et al. 2016).

Numerous scholars have investigated the mind-mapping method for improving student creativity. Another study discovered that the mind mapping method has an effect on primary school children' learning creativity in mathematics topics (Widiari, Agung, and Jampel 2014). According to the findings of the study, employing a mind map to learn efficiently boosts creativity in junior high school pupils (Zubaidah et al. 2017). According to study, generating Mind maps on a regular basis increases kids' creative thinking skills in high schools (Fu et al. 2019). Furthermore, a research gap was discovered in the findings of prior research, specifically Fatmawati's research showing students majoring in biology in the fifth semester were unable to generate innovative ideas using mind mapping (Fatmawati 2014). Furthermore, Meiarti and Ellianawati's research discovered that SMK class X students' creative thinking skills in physics learning can be trained with the use of mind map-based problem-solving but cannot be optimized (Meiarti and Ellianawati 2019).

The study focuses on the impact of ping mind map learning models and traditional learning models on students' creative thinking skills, as well as the differences in average creative thinking ability between students who receive a mind map learning model and students who receive conventional learning models.

Method

This study used a quasi-experimental design, which is a refinement of the difficult-to-implement real experimental design. The distinction lies in the selection of research subjects, where in genuine experimental design the subjects are chosen at random, whereas in quasi-experimental design the subjects are chosen at random or using existing participants.

Based on the three existing classes, two types were chosen for this study that have similar creative thinking ability features and are utilized as experimental and control classes, namely classes XI IPS 1 and XI IPS 3. A pretest of students' creative thinking ability was performed using Carter's creative thinking ability test before

identifying the experimental and control classes of the three current classes. As a consequence, two classes, XI IPS 2 and XI IPS 3, had the same average creative thinking ability among the three.

Once the class is confirmed to be a research class, it is determined which classes will be utilized as an experimental class and which will be used as a control class. The number of distinct pupils in the two classes is taken into account in this determination, with class XI IPS 2 having more than class XI IPS 3. Class XI IPS 2 is selected as a control class with the idea that the model has frequently been utilized in learning materials so that there is no need to reintroduce to students, and students have comprehended the technique for applying the learning model. Class XI IPS 3 has been designated as an exception class, namely applying the mind map learning idea with the consideration that the learning model is only known to class XI IPS 3 students, so students will have the opportunity to learn and understand the procedures for its application in classroom learning.

The researchers created a test kit based on indicators of creative thinking capacity, indicators of learning materials, and Bloom's taxonomy in order to effectively measure what you want to measure and represent the indicators utilized in this study, namely the ability to think creatively. In Bloom's taxonomy, the ability to think creatively falls under the cognitive level of creating (C-6) (Brookhart 2010). As a result, when building test kits, the author pays special attention to C-6 level operative verbs in order to elicit creative responses from students. Furthermore, when developing the test kit, it considers indicators of creative thinking capacity that are tailored to the basic skills to be attained through preset research material indicators.

The Data Normality Test is used to determine whether the distribution of data in a data group or variable is normally distributed. A homogeneity test was run to see if the variance of scores measured on both samples was the same. The Wilcoxon test was used to calculate the average difference between two samples having ordinal or interval scale data. The Mann-Whitney U test was used to calculate the average difference between two unpaired samples. Effect size is a method of knowing how large the scale of effectiveness of a learning model that has been applied to a group of students. The N - Gain Score test is used to assess the efficacy of a procedure in one group pretest-posttest design study, as well as research with experimental and control groups.

Results and Discussions

Prior to the research, particularly the application of treatment in experimental and control classrooms, pretests were provided to students in both classes to determine students' creative thinking abilities before being given treatment. Hence, following treatment, students in experimental and control classrooms are assigned posts to assess students' creative thinking abilities. The following is a descriptive explanation of study data statistics processed with SPSS 24 software:

Table 1. Data Homogeneity Test

	N	Minimum	Maksimum	Mean
Pretes Eksperimen	21	0	28	8.90
Post test Eksperimen	21	0	87	60.67
Pretes Kontrol	36	0	55	22.11
Post test Kontrol	36	0	59	23.94

The result is that because the data is not normally distributed, it cannot meet the requirements of the parametric test, especially the paired sample t-test. The following data will be analysed using a non-parametric test called the Wilcoxon test.

The data homogeneity test is then performed to determine whether or not the item under study has the same real variables (homogeneous). Using SPSS software version 24, this homogeneity test applies the Levene test on experimental and control class post test scores.

Table 2. Data Homogeneity Test

		Levene Statistic	df1	df2	Sig.
Creative Thinking Skills	**Based on Mean**	6.121	1	55	0.016

The data homogeneity test findings in table 2 demonstrate that the average data value (based on mean) of 0.016 < 0.05 can be concluded that the variances of the experimental and control classes are unequal or

homogeneous. Given inhomogeneous data, it cannot meet the parametric test requirements, especially the independent t-test, hence the Mann- Whitney U test is used as the next non-parametric test.

Table 3. Wilcoxon Test Ranks 1

		Postes Kontrol – Pretes Kontrol		
Asymp. Sig. (2-tailed)		0.702		
		N	***Mean Rank***	***Sum of Ranks***
Post test Eksperimen - Pretes Eksperimen	*Negative Ranks*	0^a	.00	**.00**
	Positive Ranks	20^b	10.50	**210.00**
	Ties	$\mathbf{1^c}$		

According to Table 3, there were no students in the experimental class who had a drop in grades from the pretest to the post-test scores. This is demonstrated by the negative ranks, which have a value of zero. Some students in the experimental class saw a rise in their scores from the pretest to the post-test cores. This is demonstrated by the positive number of rankings, which is worth 20 points, indicating that 20 students improved their creative thinking skills from the pretest to the posttest score. The average increase was 10.50, with a 210.00 rise. Ties represent the number of students in the experimental class who have similar pretest and posttest results. Table 3 shows that there can be just one student.

Table 4. Wilcoxon Test Results (Experimental Class)

	Postes Eksperimen - Pretes Eksperimen
Asymp. Sig. (2-tailed)	*0.000*

Table 4 shows that when the significance value is 0.000 0.05, H0 is rejected and H1 is accepted. This suggests that mind mapping learning approaches have an impact on students' creative thinking abilities. The calculated effect size is 10.67 - 4.81: 5.41 = 1.08. According to Cohen's effect size criteria, the effect size value of 1.08 is included in the strong effect category. As a result, using the mind map ping learning paradigm to students in taxes, material economics, and accounting disciplines has a significant impact on increasing students' creative thinking abilities.

Table 5. Wilcoxon Test Ranks 2

		N	**Mean Rank**	**Sum of Ranks**
Postes Kontrol – Pretes Kontrol	Negative Ranks	8^d	13.06	104.50
	Positive Ranks	13^e	9.73	126.50
	Ties	$\mathbf{15^f}$		

In the control group, as many as 8 students saw their scores drop from pretest to posttest. This is demonstrated by the negative ranks, which are worth 8. The average decrease was 13.06, for a total gain of 104.5. Students in the control group improved their marks from pretest to posttest. This is demonstrated by the positive number of rankings, which is worth 13, indicating that 13 pupils improved their creative thinking skills from the pretest to the post test result. The average increase was 9.73, with a total increase of 126.50. Ties is a measure of the amount of students in experimental classes who have similarities between their pretest and post-test scores. Table 5 reveals that there are up to 15 pupils.

Table 6. Wilcoxon Test Results (Control Class)

	Postes Kontrol – Pretes Kontrol
Asymp. Sig. (2-tailed)	**0.702**

Table 6 shows that the significant value is 0.702 > 0.05, indicating that traditional learning techniques have no effect on students' creative thinking capacity.

Table 7. Mann-Whitney Statistical Test Results

	Creative Thinking Skill
Asymp. Sig. (2-tailed)	0.000

According to the Mann-Whitney statistical test results, there is an average difference in creative thinking abilities between students who receive a mind mapping learning model and students who receive a traditional learning model. An n-gain score exam was also performed in the experimental and control classes to evaluate if there was a difference in the average capacity of pupils to think creatively.

Table 8. N-Gain Score Test Results (Experimental Class)

Control Class N-*Gain Score* (%)	**No.**	**Experimental Class N-*Gain Score* (%)**
39.36	Average	57.37
73.63	Minimum	0.00
48.94	Maximum	83.52

Table 9. N-Gain Score Test Results (Control Class)

Experimental Class N-*Gain Score* (%)	**No.**	**Control Class N-*Gain Score* (%)**
0 6.78	Average	1.76
-16.28	Minimum	-51.52
8.86	Maximum	45.00

The N-Gain Score effectiveness is classified as 40% (ineffective), 40%-55% (less effective), 56%-75% (very effective), and >76%. (effective). Hence, based on the N-Gain Score Test calculation results, the average N-Gain score of the experimental class employing the mind map is 57.37, which falls into the fairly effective group. Meanwhile, the N-Gain score reveals that the average score of the control class employing the standard learning model is 1.76, placing it in the ineffectual category.

Students in the experimental class who received the mind mapping learning model treatment did not notice a decline in ability but rather an increase or development of creative thinking capacity. Wilcoxon's statistical results suggest that as many as 20 pupils had increased their creative thinking skills by an average of 10.5 points. Cohen's effect size indicates that the treatment's influence on the experimental class meets the criteria for a strong effect. As a result, applying the mind map ping learning paradigm to students in taxation and material economics disciplines has a significant impact on increasing students' creative thinking abilities. The strong influence of the mind map ping learning model that has been applied to the learning of experimental class students supports Syahidah, who applies mind map ping also to economics subjects, with the results demonstrating that the use of mind mapping can combine the abilities of both brains, thereby developing student creativity (Syahidah 2015). Another research finding that supports the use of mind maps in natural science is that they help creative thinking skills to reach its pinnacle and may be stated to be very efficiently applied to natural science (Zubaidah et al. 2017). Furthermore, several research have shown that students in biotechnology programs may convey their innovative ideas using mind maps (Fatmawati 2014). Although the use of mind maps enhances students' creative thinking skills, there is no influence of interaction between creative thinking skills and instructional tactics on the student's cognitive level, achievement, or gender (Yoon and Kang 2015). According to the findings of earlier studies, the mind map learning model can be employed as one of the most successful ways for properly developing students' learning creativity through each student's unique ideas. In Maharani's research, the same indicators as measured by researchers are present, namely unique or original concepts related to cognitive-intellectual talents (Maharani 2018).

The second outcome of Wilcoxon's statistical test on SPSS software version 24 indicated that conventional learning models had no effect on the ability to think creatively. This typical learning paradigm is used in the control class and includes the teacher providing the prepared information, then question and answer, then discussion with the students about the material delivered. Kresma has previously researched conventional learning models as control classes, but this time the comparison is with problem-based learning models to see how they affect student saturation points and student learning results in mathematics topics (Kresma 2014). The study's findings revealed that students who were taught using problem-based learning methods outperformed those who were taught using traditional learning models in terms of learning outcomes. Furthermore, the

ineffectiveness of conventional learning has been studied in class XI science students in Pontianak, and the findings show that students who use project-based learning models have a better effect on students' science literacy skills when compared to conventional learning models accompanied by experiments (Sari, Rusilowati, and Nuswowati 2017). To assess students' creative thinking capacity, researchers compared the open-ended problem-based learning model (PBMO) in the experimental class to the traditional learning model in the control class. The findings revealed that there was an average difference in the increase of creative thinking ability between students who participated in learning in the two sample groups (Noer, 2013).

Furthermore, the Mann-Whitney U test on SPSS software version 24 revealed a difference in average creative thinking capacity between students who received a mind map learning model and those who received a conventional learning model. The test results indicate that experimental class students who use the mind map learning model have a higher average creative thinking capacity than control class students who utilize traditional learning models. The findings of this study back with prior research, which found substantial disparities in learning outcomes between students who used the mind map learning model and students who used traditional learning models on the subject of social knowledge (I Wayan Darmayoga 2013). The mind map learning model outperforms traditional learning models in terms of learning outcomes. It was also discovered that there was a difference in the average learning results of students who used the mind map learning model vs students who utilized conventional learning models, and its applicability to class XI biology students (Simamora 2018). The mind map learning paradigm encourages students to think creatively, specifically by thinking uniquely, variedly, and fast while coming up with ideas. Tony Buzan stated that the mind map is a creative thinking tool that reflects the natural workings of the brain (Buzan 2018). This mind map enables the brain to employ all images and symbols, as well as their linkages, in radial patterns and tissues as the brain is constructed.

Conclusions

According to the findings of a study on the effectiveness of the mind map learning model in enhancing creative thinking ability, there is an influence of the mind map learning model in improving students' creative thinking capacity after using the mind map learning model. Additionally, traditional learning paradigms have no effect on enhancing pupils' creative thinking abilities. As a result, there is no gain in students' creative thinking abilities after or before applying standard learning methods to them. The eventual result is that there is a difference in average creative thinking skills between students who receive a mind mapping learning model and students who receive a conventional learning model. The mind map learning paradigm is more effective than traditional learning models in enhancing pupils' creative thinking abilities. The use of the mind map learning approach to present material to students must be matched with adequate equipment and time to have the most impact on students' creative thinking abilities. It is recommended that teachers continue to encourage and give a platform for students to develop their creative ideas so that students' ability to address existing challenges is not fixed on one thought or one solution.

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