LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : JURNAL ILMIAH

Judul Jurnal Ilmiah (Artikel)	:	Differences In The Effect Of Quantum Learning Methods With Mind Mapping And Jigsaw Methods On Students With Different Levels Of Creativity Against
Penulis Jurnal Ilmiah	:	Dr. Nasruliyah Hikmatul Maghfiroh, S.Psi., M.Psi., Psikolog
Jumlah Penulis	:	1 (satu) Orang
Status Pengusul	:	~~Penulis Pertama~~/Penulis ke kedua / ~~Penulis Korespondensi~~
Identitas Jurnal Ilmiah	:	a. Nama Jurnal : Educazione
		b. Nomor ISSN : e-ISSN: 2654-4814
		c.Nomor, Volume, Bulan Tahun : No.1, Vol. 11, Mei 2023
		d. Penerbit : Jurnal Pendidikan, Pembelajaran dan Bimbingan dan Konseling Fakultas Keguruan dan Ilmu Pendidikan Universitas Islam Jember
		e. DOI Artikel (Jika Ada) :
		f. Alamat Web Jurnal : http://ejurnal.uij.ac.id/index.php/EDU/article/view/2222/1516
		g. Terindeks di : google scholar, garuda, orcid,Indonesia one research,base

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Jember, 18 September 2023
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- Isi dalam artikel baik dan penjelasan dijelaskan dengan baik
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by Jurnal Educazione

Submission date: 06-Jul-2023 09:53PM (UTC+0800)
Submission ID: 2127255460
File name: Hariyanto.docx (47.46K)
Word count: 4068
Character count: 21885

Differences in the Effect of Quantum Learning Methods with Mind Mapping and Jigsaw Methods on Students with Different Levels of Creativity Against High School Students' Biology Study Results

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ABSTRACT

This study aims to determine the differences in the effect of the quantum learning model with the mind map method and the Jigsaw cooperative learning model on students with various levels of creativity. The subjects of this study were students of class X IPA 1 at SMAN I Subob - Situbondo and class X IPA 1 at SMAN 1 Besuki - Situbondo. This research is experimental. Data collection techniques through tests and observations. Data were analyzed using Two Way ANOVA. The results of the data analysis show that: (1) The learning outcomes of students who have high creativity are better than the learning outcomes of students with low creativity, (2) The learning outcomes of students with high creativity are better in quantum teaching-learning with the mind mapping method than with the Jigsaw method, (3) There is a positive interaction between student creativity and learning models on student learning outcomes.

Keywords: *Quantum Learning method, mind maps, Jigsaw method, level of student creativity, learning outcomes*

One of the goals of education is to prepare students in terms of the knowledge and skills needed to function as adults. With the rapid changes in this world, it is necessary to reassess what students need and learn to balance the global challenges in the future. Schools as social institutions must be conducive and sensitive to the needs of students in the future to be able to develop knowledge and develop students' skills. As stated in Law Number 20 of 2003 article 1, paragraph 1 concerning SISDIKNAS, which states the National Education Goals:

The problems in Biology learning above also occur in SMA Negeri 1 Suboh and SMA Negeri 1 Besuki class X IPA 1. This was revealed when the authors conducted pre-research on biology learning in class X IPA 1 and found several problems which resulted in the learning process being ineffective, including as follows: first, when the teacher uses the lecture method, the researcher gets an idea that class X IPA 1 is a class that is less active in learning biology when compared to other classes that tend to be active and have an interest in learning biology, as evidenced by the enthusiasm shown students in the form of questions and responses raised by students regarding biology material. The lack of activity of class X IPA 1 students during learning can be seen from students' lack of enthusiasm in learning activities, such as asking, responding, and answering questions from the teacher. Students tend to be passive and less involved in teaching and learning activities, only listening to explanations from the teacher without being accompanied by the desired response, such as responses or questions from students. When the teacher asks students, the students do not respond well; only one or two people can answer questions from the teacher; second, when the teacher

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uses the discussion method by giving students the freedom to actively manage the material by inviting students to discuss.

These learning problems directly impact the lack of student activity in class X IPA 1. Researchers see the problem of lack of student activity as one of the reasons the teacher has not developed learning methods so that students are skilled in solving problems in biology material. One of the skills needed to answer the above problems is to cultivate critical thinking skills. As stated by Ennis, someone who has critical thinking skills has tendencies or characteristics, as he stated that (Mudianingsih, 2007):

These critical thinking skills may have to be cultivated to fix problems in class X IPA I. One way that can be done to foster the critical thinking skills of students in class X IPA 1 is by developing learning methods. One of the learning methods that can foster students' critical thinking skills is the Quantum learning method with the mind mapping technique. In the use of the Quantum learning method with mind mapping techniques (Mind mapping) the target is more directed at sharpening understanding, problem-solving, and student memory to foster academic skills (academic skills), achievement, or physical challenges (physical challenges), as well as a learning atmosphere as a fun and meaningful learning process, through the stages of TANDUR (instill, experience, name, discuss, repeat, celebrate) by taking into account the principles of the Quantum learning method, so that the skills formed are expected to create conditions that are conducive to the growth of critical thinking skills class X IPA 1 students.

The description above encourages the interest of researchers to conduct research as well as improvement efforts, which are integrated into research entitled The Effect of the Quantum Learning Method with Mind Mapping and Jigsaw Techniques and Student Creativity on Biology Learning Outcomes in Class X IPA 1 at SMA Negeri 1 Suboh and SMA Negeri 1 Besuki".

Starting from the description above, the research proposes the formulation of the problem (1) Are there differences in the learning outcomes of students with high and low creativity in class X IPA 1 SMA Negeri 1 Suboh and SMA Negeri 1 Besuki? (2) Does student learning outcomes differ between the quantum learning model with the mind mapping technique and the jigsaw-type cooperative learning model in biology class X IPA 1 SMA Negeri I Suboh and SMA Negeri I Besuki? (3) Does learning models and creativity interact with biology learning outcomes in class X IPA 1 at SMA Negeri 1 Suboh and SMA Negeri 1 Besuki?

Thus the objectives of this study were (I) to examine the differences in student learning outcomes with high creativity and low creativity in class X IPA 1 SMA Negeri 1 Suboh and SMA Negeri 1 Besuki. (2) Testing the difference in student learning outcomes between the quantum learning model with the mind mapping technique and the jigsaw-type cooperative learning model for class X IPA 1 SMA Negeri 1 Suboh and SMA Negeri 1 Besuki. (3) Testing the interaction between learning models and creativity on the results of learning biology class X IPA 1 at SMAN I Suboh and SMAN I Besuki.

Quantum Learning

Quantum learning is a translation from a foreign language, namely quantum learning. "Quantum Learning is tips, instructions, strategies and the entire learning process that can sharpen understanding and memory, and make learning fun and rewarding" (DePorter et al., 2011).

Additionally, DePorter et al. state about the environment in the context of the learning stage. "The environment is how the teacher organizes the classroom, lighting colors, setting tables and chairs, plants, music, and all things that support the learning process" (DePorter et al., 2004).

So, quantum learning is very concerned with the conditioning of a class as a learning environment for students, considering that the quantum learning model is an adaptation of the learning model applied abroad.

Quantum Learning Model Syntax

The syntax or steps of the quantum learning model known as TANDUR are as follows (DePorter et al., 2004):

1. Grow
   Cultivate an interest in fulfilling "Is It Benefit Me" (AMBAK) and maximize life learning.
2. do
   Create or bring everyday experiences that all learners can understand.
3. Name
   Provide keywords, concepts, models, formulas, strategies, a "feedback".
4. Demonstrate
   Provide opportunities for students to "demonstrate they know."
5. Repeat
   Show students ways to repeat material and affirm, "I know that I know this."
6. Celebrate
   Recognition for completion, participation, and acquisition of skills and knowledge.

Mind Mapping Learning Method

The mind-mapping learning method is a unique system of storing, retrieving data, and accessing a giant library in the extraordinary human brain (Buzan, 2010). Besides that, according to Tony Buzan, mind mapping is the easiest way to put information into the brain and take information out of the brain. Mind mapping is a way of recording creatively and effectively and will literally "map" our thoughts. With mind mapping, long lists of information can be turned into colorful, highly organized, and easy-to-remember diagrams that work in harmony with how the brain works in doing things.

There are several instructions and steps in making a mind-mapping learning method; before making a map and coloured pencils, use your brain and imagination. The mind requires several materials, namely blank unlined paper, pens and coloured pencils, brain.

As well the imagination, Buzan suggests there are seven steps to making a mind map, namely as follows (Buzan, 2010):

1. Give the blank paper to students.
2. Write the title/theme on the blank paper with the long side placed horizontally.
3. Make the main branches with bold lines with different colours.
4. Students write down the keywords for each branch in written or symbolic form.
5. Develop main branches with curved lines.
6. Using one keyword for each li

Making a mind map also takes courage and high creativity. Variations with capital letters, colours, underscores, or symbols that describe the main point or idea. Animating the mind mapping that has been made will be more impressive.

Cooperative Learning Model

Cooperative learning (cooperative learning) is a teaching system that provides opportunities for students to work together with fellow students in structured tasks. Cooperative learning is known as group learning. But cooperative learning is more than just group study or group work because, in cooperative learning, there is a cooperative structure

of encouragement or tasks that allows for open interaction and effective interdependence among group members (Tukiran, 2011)

According to Lie, the cooperative learning model is not the same as just learning in groups; there are essential elements of cooperative learning that distinguish it from group divisions carried out at random. Implementing cooperative learning model procedures will enable educators to manage classes more effectively. (Lie, 2008)

The characteristics of the cooperative learning model are; (1) studying together with friends, (2) during the learning process occurs face-to-face between friends, (3) listening to each other's opinions among group members, (4) learning from friends themselves in groups, (5) studying in small groups, (6) productive speaking or mutually expressing opinions, (7) decisions depend on the students themselves, (8) active students (Stahl, 1994). In line with these characteristics, Johnson and Johnson (1984) and Hilke (1990) suggest the characteristics of cooperative learning are; (1) there is positive interdependence among group members, (2) can be accounted for individually, (3) heterogeneous, (4) sharing tasks and togetherness, (7) forming social skills, (8) the role of the teacher observing the student learning process, (9) the effectiveness of learning depends on the group. The learning process occurs in small groups (3-4 members) and is heterogeneous without regard to differences in academic ability, gender, ethnicity, or others.

Jigsaw Type Cooperative Learning Model

Jigsaw was developed and tested by Elliot Aronson and colleagues at the University of Texas and adopted by Slavin and colleagues (Arends, 2001). With a jigsaw, students are grouped into 5 or 6 heterogeneous members to become learning teams. Material learning is presented to students in text, and each student is responsible for the part of the material that is his responsibility.

Coherently, the steps of jigsaw cooperative learning are as follows (Tukiran, 2011):

1. Students are grouped into 5-6 team members
2. Each person on the team is given a different part of the material
3. Members of different teams who have studied the same sections/sub-chapters meet in new groups (expert groups) to discuss their sub-chapters
4. After finishing the discussion as a team expert, each member returns to their original group and takes turns teaching their teammates about the sub-chapter they are good at, and each other member listens intently.
5. Each expert team presents the results of the discussion
6. The teacher gives an evaluation
7. Closing

In the jigsaw type, the original group is a combination of several experts; an expert group is a group of students who are assigned to study and explore a particular topic, complete tasks related to the topic, and then explain it to the original group members.

METHOD

This research was conducted at SMA Negeri I Subob and SMA Negeri 1 Besuki, Situbondo Regency, East Java, in the even semester of the 2015/2016 academic year using class X IPA 1 SMAN 1 Subob and class X IPA 1 SMAN 1 Besuki, as a sample of 30 students. from SMAN 1 Besuki and 32 students from SMAN 1 Subob. The research design used by researchers in implementing biology learning tools oriented towards quantum learning with the mind mapping type and the jigsaw type cooperative learning model uses inferential statistics with the two-way ANOVA test. Namely, the two Arabic experimental research used to test the

difference in the mean (average) data from the two research groups (class X IPA 1 SMAN I Suboh and class X IPA 1 SMAN I Besuki). The experiment was divided into two groups, namely the group of students with high creativity and groups of students with low creativity, and then given an initial test (pretest) and a final test (posttest). The draft can be involved as follows.

Table 1. Research design

Learning model	Student creativity (A)	
	high creativity (A1)	low creativity (A2)
Quantum learning model with mind mapping approach (B1)	YA1B1	YA2B1
Jigsaw-type cooperative learning model (B2)	YA1B2	YA2B2

RESULTS AND DISCUSSION

Student Creativity

In this study, the sample consisting of students of class X IPA in two schools, namely SMAN I Suboh and SMAN I Besuki, were divided into three groups based on the results of the creativity questionnaire, namely groups of students with high creativity, medium creativity and groups of students with low creativity.

Students' Cognitive Ability

a. Description of Students' Cognitive Ability Data

The value of students' cognitive abilities in learning using the cooperative jigsaw model and the mind mapping approach to describing essential competencies Phylum characteristics in the Animal World and their role in life is known from the scores obtained by students in the Learning Outcomes Test (THB), then the data is processed to calculate learning completeness per student.

Based on student learning outcomes (THB), information was obtained that no students had reached the KKM before being given learning activities. After the learning activities were given to students, 21 completed the completeness criterion of 65.625% in the mind mapping lessons. At SMAN I Besuki, which applies the jigsaw-type cooperative learning model, it is known that 21 students have passed with a completeness criterion of 70%.

b. Hypothesis testing

Data on the value of increasing (gain) cognitive ability is used to test the hypothesis in this study. Before testing the hypothesis, it is necessary to test the normality and homogeneity of the data first. With the help of SPSS 22.0 Amos, a summary of the normality test with the Kolmogorov-Smirnov test is obtained, as shown in Table 2.

Table 2 Kolmogorov-Smirnov Test

	posttest

N		64
Normal Parameters[a,b]	Mean	78,7378
	Std. Deviation	14,48364
Most Extreme Differences	Absolute	,214
	Positive	,108
	Negative	-,214
Test Statistic		,214
Symp. Sig. (2-tailed)		,100°

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

Meanwhile, a summary of the homogeneity test using the Levene test is shown in Table 3 as follows

Table 3 Levene's Test of Equality of Error Variances

Dependent variable: Student achievement

F	df1	df2	Sig
.924	5	56	.473

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: model_pembelajaran + kreativitas + model_pembelajaran * kreativitas

The rule for determining the data normality test is that if Sig. > 0.05, then the data is declared normal, while the method for determining the homogeneity test of the data is if Sig. > 0.05, then the variance of the two data is homogeneous. Based on the normality and homogeneity tests of the data in Table 4 and Table 5 above, it is found that the requirements for using the parametric statistical test with the

Univariate two-way ANOVA is fulfilled because the data has homogeneous and normal variants. The summary of the univariate two-way Anova test with the help of SPSS 22.0 Amos is shown in the following table 4

Tabet 4 Test of Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Model	367577,202a	6	61262,867	1256,307	,000
Learning model	92,572	l	92,572	1,898	,038
Creativity	2451,440	2	1225,720	25,136	,000
Learning model * creativity	664,520	2	332,260	6,814	,002
Error	2730,798	56	48,764		
Total	370308,000	62			

With a summary of the results of SPSS 22.0, Amos' calculations are as follows.

From Table 6 above, we get essential values that can be concluded as follows:

1. Factor A is the learning model. Because of a = 0.05 > Sig. = 0.038, the hypothesis Ho is rejected, so H1 is accepted. In other words, there is an effect between factor A levels that are not the same. Because factor A consists of two levels, the quantum learning model with the mind mapping approach and the jigsaw-type cooperative learning model significantly affect student achievement.
2. Factor B, namely student creativity. Because of a = 0.05 > Sig. = 0.00, the hypothesis Ho is rejected, so H1 is accepted. In other words, there is an effect between different levels of factor B, or factor B levels 1, 2, and 3, which significantly differ in the response variable. The creativity factor has a significant effect on student achievement.
3. AB interaction factor. Because of a = 0.05 > Sig. = 0.02, the Ho hypothesis is rejected, so H1 is accepted. In other words, the learning achievement of students who received different model treatments (mind mapping and jigsaw) significantly differed regarding creativity in the high, medium, and low categories. Conversely, students with different creativity (high, medium, and low) also have different achievements when given different treatments (mind mapping and jigsaw).

To find out which model produces the best performance, it can be seen from the average descriptive statistics in Table 5 as follows:

Learning model	creativity	Mean	Std. deviation	N
Mind mapping	High	87,5000	9,89949	8
	Middle	83,3333	6,99784	12
	Low	65,6667	5,51582	12
	total	77,7500	11,97578	32
Jigsaw	High	84,0000	5,65685	7
	Middle	73,3750	6,56125	16
	Low	71,4286	7,45782	7
	total	75,4000	8,01980	30
Total	High	85,8667	8,12287	15
	Middle	77,6429	8,30981	28
	Low	67,7895	6,72953	19
	total	76,6129	10,24032	62

The descriptive statistics table above describes the achievement data of SMAN I Suboh (mind mapping) and SMAN I Besuki (Jigsaw) students in terms of each category of creativity. The highest average student achievement is a student with high creativity treated with a mind mapping model of 87.5. Conversely, the lowest achievement is low creativity students who receive the same treatment, namely mind mapping. To find out the correlation between learning models and student creativity can be seen in the comparison table as follows:

Table 6 Multiple Comparisons

Dependent Variable: student achievement LSD

(I) student creativity	(J) student creativity	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower	Upper

					Bound	Bound
High	Middle	8,2238'	2,23440	,001	3,7478	12,6998
	Low	18,0772*	2,41195	,000	13,2455	22,9089
Middle	High	-8,2238*	2,23440	,001	-12,6998	-3,7478
	Low	9,8534*	2,07560	,000	5,6955	14,0113
Low	High	-18,0772*	2,41195	,000	-22,9089	-13,2455
	Middle	-9,8534*	2,07560	,000	-14,0113	-5,6955

Based on observed means.
The error term is Mean Square(Error) = 48,764.
*. The mean difference is significant at the 05 levels.

From the multiple comparisons table, it appears that all Sig. The value is O because of a = 0.05 > Sig. = 0.00, the high, medium, and low creativity factors significantly affect student achievement. Further, to find out which category of students with creativity, it can be seen from Table 7 as follows:

Table 7. Estimate

Student creativity	Mean	Std. error	95% Confidence Interval	
			Lower Bound	Upper Bound
High	85.750	1.807	82.130	89.370
Middle	78.354	1.333	75.683	81.025
Low	68.548	1.661	65.221	71.874

From the Estimated Margin Means table, it appears that the highest average student achievement is the student with high creativity (85,750), then the student with medium creativity (78,354), and the lowest achievement appears to be the student with the lowest creativity (68,548)

Based on the results of hypothesis testing, student learning outcomes in both models are also influenced by their creativity. In the mind mapping approach, student learning outcomes with high creativity have a high score of 87.50. Whereas for students who have low creativity, the value obtained is even smaller than the value obtained by students with the jigsaw model with the same creativity, namely 65.67, while for the same creativity in the jigsaw model, the value is 71.43, this shows that the mind approach Mapping will be effective if given to students with high creativity. This aligns with what Michael Michalko said: making a mind map requires a lot of courage and creativity. Variations with capital letters, colours, underscores, or symbols that describe the main points or ideas (Buzan, 2010). Creativity is needed to create bolder visuals to provoke the brain's interest in capturing the messages conveyed on the map. If someone does not have creativity, the map that is made will feel stiff and dull and even create confusion after the map is formed, even by the maker himself. In the jigsaw-type cooperative learning model, a correlation was also found between the model used and the creativity of students; for students with high creativity, the scores obtained also showed a higher level of 84 than students with the same model but with more creativity. Low with a score of 71. This is not so striking from the results obtained by students using the mind mapping method. Students with high creativity will have the power of innovation in learning and receive learning from others, in this case, from home team friends and expert team friends. With high creativity, they have many ways to convey material obtained from expert team discussions to their friends on the home team so that it will add insight and learning outcomes.

CONCLUSIONS AND SUGGESTIONS

Based on the research results and the results of hypothesis testing, conclusions can be drawn, namely:

1. The learning outcomes of students who have high creativity are better than the learning outcomes of students with low creativity,
2. The learning outcomes of students with high creativity are better in quantum teaching-learning with the mind mapping method than with the Jigsaw method,
3. A positive interaction exists between student creativity and learning models on student learning outcomes.

Based on the research that has been done and the results obtained, the following suggestions are suggested.

1. Implementing learning with a mind-mapping approach cannot be implemented 100%. This is because students are less trained in making mind mapping. The teacher requires intense training to get optimal results.
2. The time needed in this study is insufficient, considering the availability of 45 x 2 hours of lessons is still insufficient to explore students' abilities optimally. It is hoped that more time will be flexible for improvising students' abilities.
3. In drawing maps, students spend more time than planned, so in applying concepts, students do not have enough time to practice applying the concepts that have been found. Therefore, teachers should apply this device to provide sufficient and varied concept application tasks at home.

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