

## APPLICATION OF THE QUANTUM LEARNING MODEL WITH MIND MAPPING METHOD IN HIGH SCHOOL STUDENTS

Hasriyanti<sup>a</sup>, Wiwin Kobi<sup>b</sup>

<sup>a</sup> Geografi, Universitas Negeri Makassar, Jl. Mallengkeri Raya, Makassar, 90224, Indonesia

<sup>b</sup> Pendidikan Geografi, Universitas Negeri Gorontalo, Jl. Jend. Sudirman, Gorontalo, 96128, Indonesia

### INFO ARTIKEL

#### Status Artikel:

Diterima: 05-07-2022

Disetujui: 02-09-2022

Tersedia online: 30-09-2022

#### Kata Kunci:

*Learning Outcomes ; Mind Maps; Quantum learning*

#### Penulis Korespondensi:

Hasriyanti

Geografi, Universitas Negeri Makassar, Jl. Mallengkeri Raya, Makassar, 90224, Indonesia

Email: [yantisakijo@yahoo.com](mailto:yantisakijo@yahoo.com)

DOI: 10.34312/jgej.v3i2.15317

Copyright © 2022 The Authors

### ABSTRACT

This study aims to determine 1) the application of the Quantum Learning learning model, 2) the differences in student interests and learning outcomes using the quantum learning model with the conventional model. This research is a quantitative descriptive type of research. The population of this study amounted to 240 students and a sample of 60 students. The experimental class has 30 students and the conventional class also has 30 students. The sampling technique is purposive sampling. Analysis of research data using descriptive statistical analysis, and inferential analysis. The results showed that the experimental class students' interest in learning tended to be high with 82.97%. Meanwhile, the students' interest in learning in the control class tends to be low, with an average score of 54.85%. And the learning outcomes achieved by students on the subject matter of the atmosphere in the experimental class (taught using the quantum learning model) were in the good category, with an average of 76. The maximum value was 85 obtained and 65 the minimum value. Meanwhile for the control class (taught by the teacher of the subject concerned using the lecture method) is in the sufficient category, with an average learning achievement of 62.8. The highest value achieved by students is 80 and the lowest value is 50.

### ABSTRAK

Penelitian ini bertujuan untuk mengetahui 1) Penerapan model pembelajaran Quantum Learning, 2) Perbedaan minat dan hasil belajar siswa menggunakan model quantum learning dengan model konvensional. Penelitian ini merupakan penelitian jenis deskriptif kuantitatif. Populasi penelitian ini berjumlah 240 siswa dan sampel berjumlah 60 siswa. Masing-masing 30 siswa berada pada kelas eksperimen dan 30 siswa berada pada kelas kontrol. Teknik pengambilan sampel yaitu purposive sampling. Analisis data penelitian menggunakan analisis statistik deskriptif, dan analisis inferensial. Hasil penelitian menunjukkan bahwa minat belajar siswa kelas eksperimen cenderung tinggi dengan 82,97%. Sedangkan minat belajar siswa kelas kontrol, cenderung rendah, dengan perolehan skor rata-rata 54,85%. Dan hasil belajar yang dicapai oleh siswa pada materi pokok atmosfer yang berada pada kelas eksperimen (diajar menggunakan model quantum learning) berada pada kategori baik, dengan rata-rata 76. Nilai maksimum yang dicapai siswa 85 dan nilai minimumnya 60. Sementara untuk kelas kontrol (diajar oleh guru mata pelajaran yang bersangkutan menggunakan metode ceramah) berada pada kategori cukup, dengan rata-rata pencapaian hasil belajar 62,8. Skor tertinggi yang dicapai siswa adalah 80 dan nilai terendah 50.



This open access article is distributed under a Creative Commons Attribution-NonCommercial (CC-BY-NC) 4.0 International License

## 1. Introduction

Learning geography is a natural learning where students are required to open their horizons of knowledge by combining learning in the classroom with learning in nature (Tirtawati, Adnyana, and Widiyanti, 2014). So that it emphasizes that the application of geography in schools is very important because the scientific approach leads to the environment around us (Hasriyanti & Ramadhani, 2019). The interest of students to explore the materials in Geography lessons tends to be low, which will indirectly have an impact on their learning outcomes.

The reason sometimes comes from the teacher who brings the subject of geography. Not only the method or teaching method that still uses conventional methods, where the teacher is much more active than the students, or the teacher only orders the practice questions in the Student Worksheet (LKS) without explaining the subject to be taught, but also because they (students) do not know what the benefits of studying geography are. So that students tend to be indifferent to this subject. Problems or obstacles may

arise in the implementation of the curriculum for teachers and schools for 2013, so that the learning goal will not be complete and optimal (Duhita et al., 2020).

Starting from these problems, the researchers tried to apply a learning model that makes students more active in learning so that they better understand the material presented. The problems that occur above must be given a solution so that the problem can be resolved. The need for an effort in the learning process that is able to help students overcome learning difficulties and eliminate students' bad perceptions of Economics subjects, especially for those who take cross-interest class programs (Acat & Yusuf, 2014). The learning in question is fun learning, involving student activities, and making it easier for students to understand the material and sharpen students' memory and logical analysis (Rahayu, 2016). The learning model that can improve student learning outcomes in accordance with the existing problems is the Quantum Learning model that uses the Mind Mapping method.

The results of (Ridsa et al., 2020) research, it can be concluded that: (1) Quantum Learning is effective for teaching Mathematics on the topic of linear programming; and (2) learning with quantum methods is better than conventional methods. Based on the results of this study, the researchers recommend that quantum learning can be used to teach other topics because this method attracts students' interest (Al-jarf, 2011). The interest of students in this learning is because they experience and build knowledge with their own mode, which in the end they will get complete learning (Al-Jarf, 2011).

Learning with Quantum Learning will make a significant contribution to a fun learning process in the classroom and improve student learning outcomes while the Mind Mapping method can help students understand the lessons delivered. Learning media can also help students to improve understanding, present data in an interesting and reliable manner and facilitate the delivery of information (Ridsa et al., 2020). Furthermore (Hendra et al., 2021) explained that the teaching content must be interesting and in accordance with the needs of students. The purpose of this study is to answer the problems that have been formulated in the problem formulation above. The purpose of this study is to improve student learning outcomes through the Quantum Learning model with the Mind Mapping method in the Geography subject of Class X SMA Negeri 4 Enrekang.

## 2. Method

The types of data in this study are quantitative and qualitative data. Sources of data in this study were obtained from students and teachers through observation and interviews. Data collection techniques in this study through the methods of observation, tests, documentation, and interviews using triangulation as a test of data validity. The data analysis technique used in this classroom action research is to use descriptive analysis techniques for quantitative data, and qualitative data in the form of learning outcomes data, the results of observations of teacher skills and student activities that are presented in the required sentences according to categories to obtain conclusions. The performance indicator of this research is the teacher's steps in applying the Quantum Learning learning model with the Mind Mapping method in learning.

The variables in this study are as follows

### 2.1 Quantum Learning

Is an orchestration of various interactions whose main mission is to design a fun learning process that is tailored to the level of student development (Liu et al., 2014). Quantum learning is tips, instructions, strategies, and the whole learning process that can sharpen understanding and memory, and make learning a fun and rewarding process.

### 2.2 Conventional Learning

Conventional learning is a learning model that still focuses on the teacher. During the learning process, teachers tend to be more active than students. The teacher explains the subject matter presented and the students just listen. Even sometimes teachers only give assignments to students during class hours without explaining the subject matter. The interaction between teachers and students in this model is lacking.

### 2.3 Learning outcomes

According to (Kusno & Purwanto, 2011) learning outcomes are the results shown from an act of learning interaction and are usually indicated by the test scores given by the teacher. The learning outcomes in this study are the scores obtained by students after the implementation of the quantum learning model in the experimental class and the conventional learning model in the classroom. control.

### 2.4 Interest to learn

Interest can be interpreted as a tendency to be interested or compelled to pay attention to someone, something, goods or activities in certain fields (Jones et al., 2012). To find out how students are interested in learning, a questionnaire will be distributed containing indicators to measure students' interest in learning. Where the indicator refers to the four indicators that have been compiled by John Keller (in

<http://tirman.wordpress.com>), namely attention, relevance, confidence and satisfaction or known as ARCS (Attention, Relevant, Confident, Satisfaction). While the tool to measure student interest, the Likert scale is used.

The data collection techniques in this study were observation techniques and questionnaire techniques which aimed to determine the interests and learning outcomes of students who were taught using quantum learning models and conventional models. The data analysis technique used is descriptive analysis technique that will be used in presenting the data in the form of tables, diagrams, mean, median and mode.

The data is grouped into the criteria used to determine the geography learning outcomes of experimental class and control class X SMA Negeri 4 Enrekang students, namely the scale determined by the Ministry of Education and Culture, Directorate General of Primary and Secondary Education, namely [Table 1](#):

**Table 1.** Description of the frequency of student learning outcomes

Frequency of Learning Outcomes	Description of Learning Outcome Frequency
85 – 100	Very Good
65 – 84	Good
55 – 64	Enough
35 – 54	Less
0- 34	Very Less

(Source: Research Result, 2018)

Meanwhile, to measure students' interest in learning after the implementation of this quantum learning model, researchers used a Likert scale calculation. To find out how high the interest of the experimental class and control class students and to describe the difference in interest between the two groups, the following analysis was used:

$$q = \frac{r}{s} \times 100 \tag{1}$$

Where to

$q$  is Percentage of student questionnaire scores (experimental and control classes),  $r$  adalah The total score obtained by each student, and  $s$  adalah Maximum score

Meanwhile, the inferential statistical analysis in the form of the T test was used to determine the difference in student learning outcomes between the control class (using the conventional model) and the experimental class (using the quantum learning model). To test the hypothesis, a two-sample t-test was used with the formula:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S1^2}{n_1} + \frac{S2^2}{n_2}}} \tag{2}$$

Where to

The average score of the Geography learning outcome test in the experimental group,  $\bar{X}_1$  adalah The average score of the control group's Geography learning outcome test,  $\bar{X}_2$  adalah Experimental class post-test variance,  $S_1$  adalah Control class post-test variance,  $S_2$  adalah Number of samples in the experimental group,  $n_1$  adalah Number of samples in the control group.

### 3. Result and Discussion

#### 3.1 Application of the Quantum Learning Model

##### 3.1.1 First activity

Learning using quantum learning focuses on initial activities, namely to foster student interest in learning. The growth of interest in learning is found in the initial step of the quantum learning model, which is to know the benefits of learning.

### 3.1.2 Core activities

At the first meeting, the core activity was started by showing pictures of the layers of the atmosphere. Then students are asked to look at the picture. Furthermore, the researchers explained one by one the understanding, characteristics and benefits of each layer. To strengthen students' memory in understanding the function of each layer, the researcher explained the explanation on a concept map. The use of concept maps is considered to be able to simplify and summarize material that has a lot of content. And some other advantages are flexibility, can focus attention, increase understanding and fun.

In quantum learning, the teacher frees the students' learning styles. Liberating here does not mean that students are free to want to learn or not. However, there are 3 ways of student learning, namely visual learning styles (it is easier to remember learning by looking at pictures), auditory learning styles (preferring to listen to explanations from the teacher) and learning in a kinesthetic way (through direct practice or seeing directly the phenomena that occur). Also in the 2013 learning process, the teacher was asked to present pictures related to the learning material and students were asked to observe the pictures.

### 3.1.3 Closing Activities

Quantum learning learning ends by concluding the learning material that has been taught. In this case the researcher together with the students draw conclusions. And at the second meeting, after concluding the researcher gave post-test questions to see the students' abilities after being given treatment, whether there was a difference with the post-test later.

### 3.2 Differences in Learning Outcomes and Student Interests in Experiment Class and Control Class

The score of student learning outcomes in the research carried out in Class X SMA Negeri 4 Enrekang is presented in the form of descriptive analysis in the form of student learning outcomes scores for the experimental class (using the quantum learning model) and the control class (using the conventional model). The learning outcomes are the results obtained by students after working on post-test questions after being given treatment in each class. The following presents the results of the descriptive analysis [Table 2](#).

**Table 2.** Description of the distribution of the pre-test results of experimental class students (using quantum learning model)

Score	Qualification	Frequency	Percentage (%)
85 – 100	Very Good	-	-
65 – 84	Good	4	13
55 – 64	Enough	12	40
35 – 54	Less	14	47
0 – 34	Very Less	-	-
Total		30	100

(Source: processed primary data in 2021)

**Table 3.** Pre-test scores of experimental class students (using the quantum learning model)

Statistics	Statistics Value
<i>Sample size</i>	30
<i>Maximum Score</i>	80
<i>Minimum Score</i>	35
<i>Mode</i>	50
<i>Median</i>	55
<i>Avarage Value</i>	53,50

(Source: processed primary data in 2021)

**Table 4.** Description of the distribution of post-test results for experimental class students (using the quantum learning model)

Score	Qualification	Frequence	Precentage (%)
85 – 100	Very Good	4	13
65 – 84	Good	25	84
55 – 64	Enough	1	3
35 – 54	Less	-	-
0 – 34	Very Less	-	-
Total		30	100

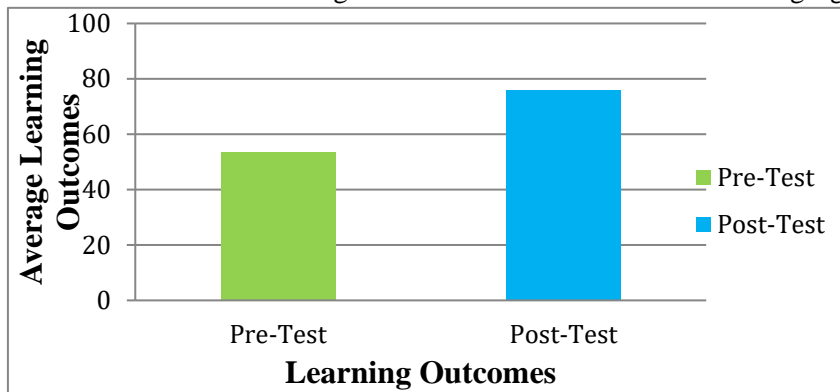
(Source: processed primary data in 2021)

**Table 5.** The value of the post-test results of the experimental class students (using the quantum learning model)

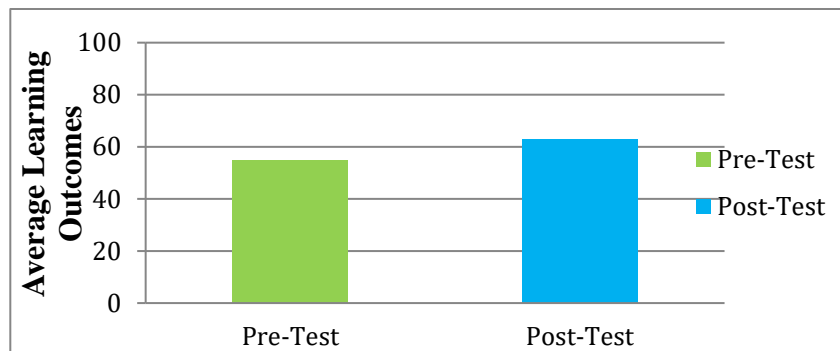
Statistics	Statistics Value
Sample size	30
Maximum Score	85
Minimum Score	60
Mode	80
Median	80
Average Value	76

(Source: processed primary data in 2021)

Diagram of experimental class student learning outcomes can be seen in the following figure.



(Figure 1. Diagram of experimental class student learning outcomes)



(Figure 2. Diagram of student learning outcomes before and after being applied conventional model)

### 3.3 Control class student learning outcomes (using conventional models)

The learning outcomes of control class students using the conventional model used by SMA Negeri 4 Enrekang teachers are presented in the following [table 6](#).

**Table 6.** Description of the distribution of pretest results for control class students (using conventional models)

Score	Qualification	Frequence	Precentage (%)
85 – 100	Very Good	-	-
65 – 84	Good	2	6
55 – 64	Enough	16	54
35 – 54	Less	12	40
0 – 34	Very Less	-	-
<b>Total</b>		<b>30</b>	<b>100</b>

(Source: processed primary data in 2021)

**Table 7.** Description of the distribution of control class students' pretest results (using conventional models)

Statistics	Statistics Value
Sample size	30
Maximum Score	70
Minimum Score	40
Mode	60
Median	65
Average Value	54,60

(Source: processed primary data in 2021)

**Table 8.** Description of the distribution of post-test results for control class students (using conventional models)

Skor	Qualification	Frequence	Precentage (%)
85 – 100	Very Good	-	-
65 – 84	Good	16	54
55 – 64	Enough	12	40
35 – 54	Less	2	6
0 – 34	Very Less	-	-
Total		30	100

(Source: processed primary data in 2021)

**Table 9.** Description of the distribution of post-test results for control class students (using conventional models)

Statistics	Statistics Value
Sample size	30
Maximum Score	80
Minimum Score	50
Mode	65
Median	65
Average Value	62,8

(Source: processed primary data in 2021)

Diagram of experimental class student learning outcomes can be seen in Figure 2 below.

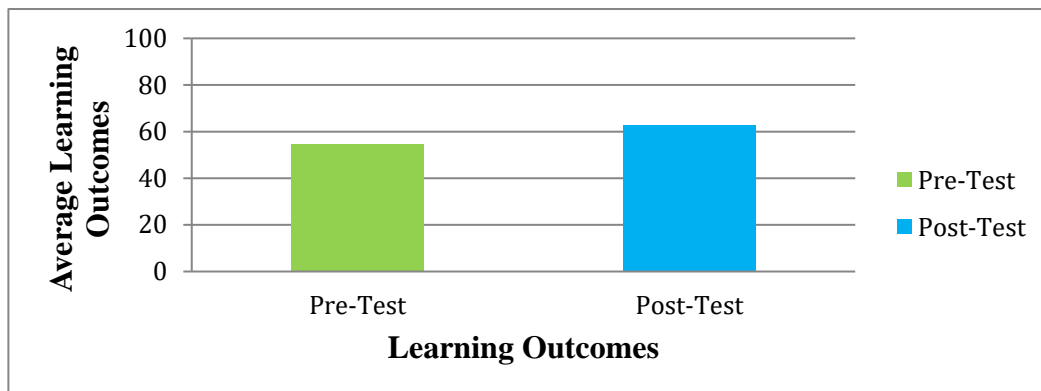


Figure 3. Diagram of student learning outcomes before and after applying the conventional model.

**Table 10.** Scores of student interest in the experimental class

Percentage	Qualification	Frequency Score obtained by students
85% - 100%	Very High	4
70% - 85 %	High	26
55% - 70%	Average	-
40% - 55%	Low	-
Less than 40%	Very Low	-
Total		30

Source: processed data for 2021



**Table 11.** Scores of student interest in control class

Percentage	Qualification	Frequency Score obtained by students
85% - 100%	Very High	-
70% - 85%	High	-
55% - 70%	Average	15
40% - 55%	Low	15
Less than 40%	Very Low	-
<b>Total</b>		<b>30</b>

(Source: processed data for 2021)

From the learning outcomes data that have been obtained and then processed using statistical analysis, the results obtained that there are differences in learning outcomes between the two classes. The average value of the experimental class learning outcomes after applying the quantum learning model is 76 or is in the very good category. While the control class got an average learning outcome of 62.8 and was in the sufficient category. There is a score range of 13.2 between the two classes. For student interest in the two classes, the average experimental class was 82.97% in the high category and 54.85% in the control class in the low category.

To test whether there are differences in learning outcomes between students who use the quantum learning model and conventional learning models, inferential statistical analysis is used. Based on the calculations, the *t*-count value is 7.31 and the *t*-table value is 2.00 with  $\alpha = 0.05$  or 5% and  $dk = (n_1 + n_2 - 2) = (30 + 30 - 2) = 58$  based on the distribution table *t* is two parties, thus it can be seen that the value of  $-t_{table} < t_{count} > +t_{table}$  is  $-2.00 < 7.31 > 2.00$  then  $H_0$  is rejected or  $H_1$  is accepted. This means that there are differences in the learning outcomes of the Geography subject on the subject of the atmosphere between the control class students who are taught using the conventional model (a teaching method that is often applied by the teacher of the subject in question) and the experimental class students who are taught using the quantum learning model.

The positive effect of applying the Quantum Learning learning model with the Mind Mapping method is that learning outcomes increase both in the affective, psychomotor, and cognitive domains. All the steps in the Quantum Learning learning model with the Mind Mapping method greatly affect changes in student learning outcomes, the following steps are applied by the teacher in learning:

1. GROW. Prepare and foster students' enthusiasm for learning and convey learning objectives. In the first syntax of Quantum Learning learning with the Mind Mapping method, it shows that, this first syntax affects the learning outcomes of attitudes and performance (Tirtawati et al., 2014b).
2. EXPERIENCE. Presentation of material from the teacher is conveyed by linking experiences or circumstances that exist in everyday life that are in accordance with the material being studied. In the second syntax of Quantum Learning learning with the Mind Mapping method, it shows that this second syntax affects student learning outcomes, namely student performance (Porter et al., 2015).
3. NAME. Organizing students into teams and working on worksheets by students. In addition, in this syntax, mind mapping is carried out regarding the material being studied using a combination of colors, images, and keywords that are easy for students to remember. In the third syntax of Quantum Learning learning with the Mind Mapping method, it shows that this third syntax affects student learning outcomes, namely students' attitudes and performance.
4. DEMONSTRATE. Presentation of the results of the discussion. In this 4th syntax, Quantum Learning learning with the Mind Mapping method shows that this 4th syntax affects students' learning outcomes, namely the learning outcomes of attitudes, performance, and portfolios.
5. REPEAT. Repeating the material that has been learned during the lesson and followed by taking individual quizzes and calculating the scores of the group discussion results. The fifth syntax shows that this syntax affects student learning outcomes, namely performance, portfolio, and individual tests.
6. EVALUATION. Evaluate the learning activities that have been carried out in each meeting. In the 7th syntax of Quantum Learning learning with the Mind Mapping method, it shows that this syntax affects student learning outcomes, namely performance.
7. CLOSING. In the last syntax in Quantum Learning learning with the Mind Mapping method, it shows that this syntax affects student learning outcomes, namely performance, products, and portfolios. students always increase.

The Quantum Learning learning model with the Mind Mapping method involves students and provides opportunities for students to be able to share information obtained during discussions. It also provides opportunities for groups to share information during the delivery of discussion results (Swadarma, 2013). During the discussion, each group member discusses and tries to solve the existing problems. Each member in a group must understand the material and ways of solving problems well.

When the teacher appoints students at random, then the student is able to do well, because at the time of the discussion he already understood (Aypay, 2017). In addition, after the delivery of the results of the discussion, the next step is to take individual quizzes. When taking individual quizzes, the seats of each group will not be close to its members. This is to overcome fraud or cooperation with members of the group. This is to see whether each group member has really mastered the material (Lisnawati, Suryaningsih, and Muslim, 2020).

Therefore, the Quantum Learning learning model with the Mind Mapping method can improve student learning outcomes. The application of the Quantum Learning learning model with the Mind Mapping method can improve learning outcomes (Boyaci & ÖZHAN, 2018). The learning outcomes that are targeted to reach the completion limit are 80%, have reached more than 80%, and in each cycle there is an increase in both the percentage of completeness and the average class. This shows that in general students have understood the material presented well in the teaching and learning process using the Quantum Learning learning model with the Mind Mapping method

#### 4. Conclusion

The conclusion from the results of this study is that the application of the quantum learning model to the atmospheric subject still refers to the quantum learning syntax. Namely starting from providing an understanding of the benefits of learning to foster student interest in learning, structuring the learning environment, strengthening student memory, delivering material through pictures and concept maps, and celebrating success as a form of appreciation for students. Based on the data obtained, the experimental class students' learning outcomes after being given treatment (using the quantum learning learning model) obtained an average learning achievement of 76. The experimental class students' learning interest tended to be high.

#### Referensi

- Acat, M. B., & Yusuf, A. Y. (2014). An investigation the effect of quantum learning approach on primary school 7th grade students' science achievement, retention and attitude. *The International Journal of Research in Teacher Education*, 5(2), 11–23.
- Al-Jarf, R. (2011). Teaching spelling skills with a mind-mapping software. *Asian EFL Journal Professional Teaching Articles*, 53(4).
- Aypay, A. (2017). A positive model for reducing and preventing school burnout in high school students. *EDUCATIONAL SCIENCES-THEORY & PRACTICE*, 17(4).
- Boyaci, M., & ÖZHAN, M. (2018). The role of hope and family relations of school burnout among secondary school students: A structural equation modeling. *EGITIM VE BILIM-EDUCATION AND SCIENCE*, 43(195).
- Duhita, S. A., Suprpta, S., & Hasriyanti, H. (2020). Problematika Guru dalam Pelaksanaan Kurikulum 2013 pada Pembelajaran Geografi. *LaGeografia*, 18(2), 109–116.
- Hasriyanti, & Ramadhani, A. N. C. (2019). The Influence of the Learning Model Cooperative Integrated Reading and Composition ( CIRC ) on The Learning Outcomes of High School Students. *Jurnal LA GEOGRAFIA*, 18(1), 36–42.
- Hendra, H., Pratama, M. I. L. P., Lahay, R. J., & Hasriyanti, H. (2021). Rancangan Konten Pembelajaran Geografi Pariwisata. *Jurnal Ilmiah Profesi Pendidikan*, 6(3), 529–536.
- Jones, B. D., Ruff, C., Snyder, J. D., Petrich, B., & Koonce, C. (2012). The Effects of Mind Mapping Activities on Students' Motivation. *International Journal for the Scholarship of Teaching and Learning*, 6(1), n1.
- Kusno, K., & Purwanto, J. (2011). Effectiveness of quantum learning for teaching linear program at the Muhammadiyah Senior High School of Purwokerto in Central Java, Indonesia. *Educare*, 4(1).
- Lisnawati, L., Suryaningsih, S., & Muslim, B. (2020). Penerapan Model Quantum Learning Sebagai Upaya Menurunkan Kejenuhan Belajar Siswa Dalam Mempelajari Kimia. *Jambura Journal of Educational*



*Chemistry*, 2(1), 18–27.

- Liu, Y., Zhao, G., Ma, G., & Bo, Y. (2014). The effect of mind mapping on teaching and learning: A meta-analysis. *Standard Journal of Education and Essay*, 2(1), 17–31.
- Porter, De Hernacki, B., & Abdurrahman, M. A. (2015). *Quantum learning : membiasakan belajar nyaman dan menyenangkan / Bobbi De Porter & Mike Hernacki ; penerjemah, Alwiyah Abdurrahman* (Cetakan I). Bandung : Kaifa Learning.
- Rahayu, T. (2016). *Penerapan Model Pembelajaran Quantum Learning Dengan Metode Peta Pikiran (Mind Mapping) Sebagai Upaya Meningkatkan Hasil Belajar Siswa Dalam Mempelajari Ekonomi Kelas X MIA 1 SMA N 5 Surakarta Tahun Pelajaran 2015/2016*.
- Ridsa, A., Sideng, U., & Suprpta, S. (2020). Efektifitas Penggunaan Media Pembelajaran 3D Hologram dalam Meningkatkan Hasil Belajar Peserta Didik Di SMA Negeri 2 Majene. *LaGeografia*, 18(3).
- Swadarma, D. (2013). *Penerapan mind mapping dalam kurikulum pembelajaran*. Elex Media Komputindo.
- Tirtawati, N. L. R., Adnyana, P. B., & Widiyanti, N. L. P. M. (2014a). Pengaruh Pembelajaran Kuantum ( Quantum Learning ) Dan Peta Pikiran ( Mind Mapping ) Terhadap Keterampilan Berpikir Kreatif dan Efektifitas Strategi Peta Konsep dalam Pembelajaran Sains dan Matematika. *E-Journal Program Pascasarjana Universitas Pendidikan Ganesha*, 4(3).
- Tirtawati, N. L. R., Adnyana, P. B., & Widiyanti, N. L. P. M. (2014b). Pengaruh Pembelajaran Kuantum (Quantum Learning) Dan Peta Pikiran (Mind Mapping) Terhadap Keterampilan Berpikir Kreatif dan Hasil Belajar Biologi Siswa SMA. *Jurnal Pendidikan Dan Pembelajaran IPA Indonesia*, 4(2).