Mimbar PGSD Undiksha
Volume 11, Number 3, Tahun 2023, pp. 344-354
P-ISSN : 2614-4727, E-ISSN : 2614-4735
Open Access: https://doi.org/10.23887/jjpgsd.v11i3.65486

Can the SiMaYang Learning Model Improve Elementary School Students' Critical Thinking Skills?

Viviani Nurmala[1*], Fery Muhamad Firdaus[2], Sunyono[3]

[1,2] Primary Education Masters Study Program, Yogyakarta State University,Yogyakarta, Indonesia
[3] Chemistry Education Study Program, Lampung University, Lampung, Indonesia

ARTICLE INFO

Article history:
Received July 07, 2023
Accepted September 10, 2023
Available online October 25, 2023

Kata Kunci:
Keterampilan Berpikir Kritis, Model SiMaYang, Siswa Sekolah Dasar

Keywords:
Critical Thinking Skills, Simayang Model, Elementary School Students

ABSTRAK

Rendahnya kemampuan berpikir kritis ditandai dengan belum mampunya siswa menganalisis ide atau gagasan ke arah yang lebih spesifik. Tujuan penelitian ini adalah untuk menganalisis kemampuan berpikir kritis siswa melalui penerapan model pembelajaran Si-5 Layang-layang (SiMaYang). Penelitian ini menggunakan pendekatan kuantitatif dengan Quasi Experimental Design tipe Nonequivalent Control Group Design. Populasi dalam penelitian ini adalah kelas lima sekolah dasar dengan memiliki kemampuan berpikir kritis yang tergolong rendah berdasarkan hasil pretest. Teknik pengambilan sampel yang digunakan adalah purposive sampling. Jumlah sampel pada kelas eksperimen adalah 30 orang dan jumlah sampel pada kelas kontrol adalah 29 orang. Teknik pengumpulan data yang digunakan adalah tes yang terdiri dari pretest dan posttest. Teknik analisis data yang digunakan dalam penelitian ini adalah analisis statistik deskriptif dan analisis statistik inferensial. Hasil penelitian menunjukkan bahwa terdapat perbedaan yang signifikan kemampuan berpikir kritis siswa antara kelompok yang menerapkan model pembelajaran SiMaYang dengan kelompok yang menerapkan metode konvensional. Hal ini terlihat berdasarkan hasil pretest dan posttest kelas eksperimen yang menunjukkan adanya perbedaan yang signifikan pada kemampuan berpikir kritis siswa sebelum dan sesudah diberikan perlakuan berupa penerapan model pembelajaran SiMaYang. Sehingga penerapan model pembelajaran SiMaYang dapat dijadikan salah satu alternatif model pembelajaran yang dapat diterapkan untuk meningkatkan kemampuan berpikir kritis siswa sekolah dasar.

ABSTRACT

Low critical thinking skills are characterized by the inability of students to analyze ideas or suggestions in a more specific direction. This research aims to analyze students' critical thinking abilities by applying the Si-5 Kite (SiMaYang) learning model. This research uses a quantitative approach with a Quasi-Experimental Design type Nonequivalent Control Group Design. The population in this study was the fifth grade of elementary school with relatively low critical thinking skills based on the pretest results. The sampling technique used was purposive sampling. The number of samples in the experimental class was 30, and the number in the control class was 29. The data collection technique used is a test consisting of a pretest and a posttest. The data analysis techniques used in this research are descriptive and inferential statistical. The research results showed a significant difference in students' critical thinking abilities between the group that applied the SiMaYang learning model and the group that applied conventional methods. This can be seen based on the results of the pretest and posttest of the experimental class, which show a significant difference in students' critical thinking abilities before and after being given treatment in the form of implementing the SiMaYang learning model. So, the SiMaYang learning model can be used as an alternative learning model that can be applied to improve elementary school students' critical thinking skills.

1. INTRODUCTION

Critical thinking ability is the ability to analyze based on logical reasoning. In principle, people who are able to think critically are people who don't just accept or reject something, they will examine, analyze and evaluate before determining whether they accept or reject information (Jannah et al., 2023; Wati & Sari, 2019). Entering a life where the development of information is rapidly increasing and the boundaries

Corresponding author
*E-mail addresses: vivianinurmalaguru@email.com (Viviani Nurmala)

between countries are diminishing in the current global era, it requires every individual to be skilled at critical thinking countries in the current global era requires every individual to be skilled at critical thinking (Dewi et al., 2013; Herlina et al., 2022; Ningsih et al., 2021). Critical thinking is defined as the ability to think again, re-examine, restructure existing thoughts (Baidowi et al., 2023; Davidi et al., 2021; Ningsih et al., 2021). This is due to the rapid development of this modern era, which requires people to always perfect their skills so that they can function more effectively and efficiently in global communication and interaction.

Critical thinking requires individuals to think more clearly, rationally, systematically, logically and have basic scientific reasons that allow them to be different from the concept of metacognitive thinking or creative thinking (Copur-Gencturk & Doleck, 2021; Dhayanti et al., 2018; Fitria et al., 2020; Fitrianawati et al., 2020). With these more complex thinking principles, the context of critical thinking becomes an important and fundamental skill (Dolapcioglu & Doğanay, 2022; Fitriani & Kowiyah, 2023). An understanding of the need for critical thinking skills for elementary school age children is absolute, these critical thinking skills are already owned by elementary school age students (Evi & Indarini, 2021; Wati & Anggraini, 2019). However, elementary school students need to practice critical thinking, especially for elementary school age children because it is appropriate with human needs in this 21st century (Fatimah & Santiana, 2017; Sa'diah et al., 2023).

P21 (Partnership for 21st Century Learning) develops a learning framework in the 21st century which requires students to have 4C skills (Creativity and Innovation, Critival Thinking and Problem Solving, Communication, and Collaboration) (Girsang et al., 2022; Nuraeni et al., 2019). These skills are really needed considering that students are currently in the modern era which is controlled by the rapid flow of information (Rachamatika et al., 2021). The learning process in class, critical thinking skills are needed to help students have a high-level mindset. Someone who has the ability to think critically will be able to find alternative solutions to the problems (Ridzkiyah & Effendi, 2021). Critical thinking skills of students is important things that must be developed in learning, especially at the basic level, because critical thinking skills ffect what students get while learning (Erdem & Adiguzel, 2019; Hasanah et al., 2023). Therefore, because elementary school is the basis for starting learning to be able to move on to the next level of learning, constructive learning that can improve critical thinking skills is an important part of the learning process that is needed in the learning stage at the basic level that students acquire (Wiguna et al., 2022). so that it can be useful at the next level so that they become human beings who can compete in the future

The ability to reason and solve problems of students in Indonesia is still relatively low, this can be seen from the results of the 2018 PISA Survey which shows the results of the mathematics ability of Indonesian students of 379, ranked 7th from the bottom, while the average OECD member countries for mathematics and science are 489 (PISA, 2019). The low of critical thinking skills of students in Indonesia is a problem that must be overcome, this shows the need for improvement in developing students' critical thinking skills, especially from the elementary age level (Annizar et al., 2020; Fauzi & Abidin, 2019). A student can be said to be able to critical reasoning if they can apply theirs knowledge to new conditions that he has never recognized (Annizar et al., 2020). One of the causes of this problem is that the learning model used by the teacher is not suitable, causing the critical thinking skills of students in Indonesia to be low (Dari & Ahmad, 2020; Davidi et al., 2021). The learning model has a great impact on students' mindsets (Sa'adah et al., 2020). The learning model helps students to train their cognitive development, especially critical thinking skills (Fazio et al., 2020; Gandri, 2019), so that the learning model applied by the teacher in learning must be a model that is able to hone and train students to think and reason critically. Teachers must strive for effective learning for students to provide meaningful experiences and to instill critical thinking skills student (Gulo, 2022; Marudut et al., 2020). Previous studies have shown that appropriate learning models play a major role in improving students' critical thinking skills so that student learning outcomes and problem-solving abilities become more optimal (Khoiriyyah et al., 2022; Novitasari et al., 2022; Rahmawati et al., 2023).

It is also shown from the results of observations and interviews with teachers at SD Negeri 1 Linggapura which show that 1) teachers have not attempted ability habituation critical thinking in the learning process; 2) the use of learning models creative and innovative to arouse students' enthusiasm for learning is still lacking; and 3) students are not accustomed to working on problem-based questions that require students to think critically. This is if left will certainly affect the development of students in the future. Based on these problems, it is necessary to make an effort to solve these learning problems. One of the learning models that can be used to improve students' critical thinking skills is the Si-5 Layang-layang learning model (SiMaYang) developed by Sunyono. the SiMaYang learning model is structured based on constructivism learning theory, information processing theory, mental model theory, and 7 factor model theory about students' ability to interpret external representations (Sunyono, 2020; Sunyono et al., 2015).

So with Through this learning, students will be able to hone critical thinking skills as well student creativity in participating in learning.

The SiMaYang learning model is learning that emphasizes three dimensions of representation and integration with a scientific approach so that it can improve intellectual abilities, especially higher-order thinking skills and critical thinking (Lathifa, 2020; Lestari & Annizar, 2020; Lestari et al., 2020; Nurmala & Efkar, 2018). The SiMaYang learning model developed consists of 4 stages, namely orientation, exploration-imagination, internalization and evaluation, with the SiMaYang model students are trained to solve a problem systematically (S. Nurmala & Efkar, 2018; Sholihah & Arif, 2020). with SiMaYang learning the teacher can create learning conditions where students feel that learning is a necessity and train students in communicating ideas in the syntax in this learning model.

The Simayang learning model has been applied to improve students' critical thinking skills in science and chemistry learning (Meidayanti et al., 2015; V. Nurmala et al., 2015). but can also be applied in elementary school level learning and can improve math problem solving skills (Sularsih et al., 2020). Other research findings too states that SiMaYang learning makes the learning process interesting and meaningful so that improve self efficacy, metacognition and science process skills (Aprian et al., 2017; Nurmala et al., 2015; Puspita et al., 2020). So, with the implementation of SiMaYang learning, it is expected to createmeaningful learning for students in developing critical thinking skills and positive impact on student learning outcomes.

Based on this explanation, in the research focuses on the application of the SiMaYang learning model in improving critical thinking skills in elementary school students. Referring to previous studies, the novelty of this research is to modify the application of the SiMaYang learning model at the elementary school level, so the purpose of this study is to describe the effectiveness of the SiMaYang learning model in improving the critical thinking skills of elementary school students by applying it to science material for grade five elementary schools. The aim of this research is to analyze students' critical thinking abilities through the application of the Si-5 Kite (SiMaYang) learning model.

2. METHOD

This study used a quantitative approach to the type of experimental research namely Quasi Experimental Design type Nonequivalent Control Group Design. Quasi experimental is research that compares the whole group of students who are given directions with a group that does not get directions or research that tests two or more groups that are given different treatments (Abraham & Supriyati, 2022)(Taguchi, 2018). In this research design, there were two groups, namely the experimental group and the control group which served as a comparison. The experimental group was given treatment in the form of applying the model SiMaYang while the control group was not given any treatment. The independent variable in this study is the SiMaYang learning model while the dependent variable are critical thinking skills. The SiMaYang learning model steps consist of 5 activities packaged in 4 phases as shown in Figure 1.

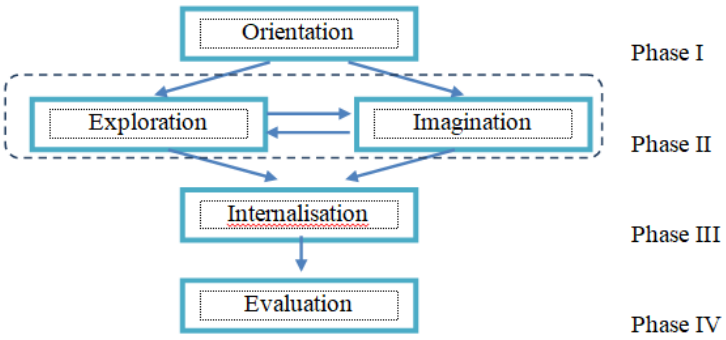

Figure 1. The Phases of SiMaYang Learning Model (Sunyono, 2020)

The sampling technique used was purposive sampling. The participants in this study were fifth grade students from SD Negeri 1 Linggapura Central Lampung, which consisted of two classes, namely the VA class with 30 students as the experimental class treated with the SiMaYang learning model on science material and the VB class with 29 students as the control class with conventional learning. The data collection technique used in this study was a test consisting of pretest and posttest. Pretest used to measure the students' critical thinking skills before being given a treatment in the form of implementing the

SiMaYang Learning model. Meanwhile posttest used to measure students' critical thinking skills after being given treatment in the form of implementing the SiMaYang Learning model.

The test instrument used to measure the ability of critical thinking skills in this study were test questions in the form of descriptions of four related questions fifth grade science material. Test questions are arranged according to indicators of critical thinking ability namely: (1) interpretation; (2) analysis; (3) evaluation; and (4) inference. Process analysis of critical thinking skills is carried out in stages, including: (1) students' answers are corrected; (2) scores students are counted on each item, (3) analysis of critical thinking skills is described in each indicator, (4) the percentage of students counted on each indicator of critical thinking.

There are two kinds of statistics used in this study, namely descriptive statistics and inferential statistics. Quantitative data analysis involves the use of statistics using the IBM SPSS Statistics 25 application. Descriptive statistics assist summarize the research variables in a data set to show what specifically applies to the sample. The measures of central tendency are (mean, median), standard deviation, and measures of computable parameter estimates. Inferential statistics serve to test the truth of hypotheses consisting of influences, relationships, or differences (Kotronoulas et al., 2023). Pretest and posttest results of critical thinking skills are classified into five categories, namely: (1) very high (value 90 – 100); (2) high (value 80 – 89); (3) moderate (value 70 – 79); (4) low (value 60 – 69); (5) very low (≤59), so that students' critical thinking skills can be measured.

3. RESULT AND DISCUSSION

Result

The data analyzed in this study include results of pretest and posttest of the critical thinking skills from the experimental and control classes. In the following, descriptive analysis data is presented on the critical thinking skills based on the results of pretest and posttest showed in Table 1.

Table 1. Descriptive Statistics of the Critical Thinking Skills

No.	Aspect	Pretest of EksperimentalClass	Posttestof Eksperimental Class	Pretestof Control Class	Posttestof Control Class
1	Mean	63.82	79.35	64.04	69.33
2	Median	64.00	76.00	64.00	72.00
3	Mode	56	68	56	72
4	Std. Deviation	12.954	8.735	9.709	7.606
5	Variance	167.795	76.308	94.268	57.846
6	Minimum	44	64	52	56
7	Maximum	88	92	92	88
8	Sum	1752	2088	1756	1872

Based on Table 1 above, it is known that the mean value of the experimental class pretest was 63.82 while the posttest mean value of the experimental class was 79.35, the average difference obtained was 15.53. While the average value of the pretest control class was 64.04, while the posttest value of the control class was 69.33, the average difference obtained was 5.29. The experimental class is a class that applies learning using the SiMaYang learning model. Results data of pretest the experimental group in Table 2.

Table 2. Pretest Results of Experimental Class

No.	Value	Category	Number of Students	Percentage (%)
1	90 – 100	Very High	0	0
2	80 – 89	High	4	13.3
3	70 – 79	Moderate	9	30.0
4	60 – 69	Low	7	23.3
5	≤59	Very Low	10	33.4

Based on Table 2, it is known that there are no students who get very high scores. Based on the results of the descriptive analysis, it can be concluded that the results of pretest the critical thinking skills of the experimental class is in the low category, this can be seen based on the average value (mean) of the critical thinking skills of the experimental class as a whole which amounts to 63.83

The control class is a class that carries out learning without applying the SiMaYang learning model. Pretest aims to determine the initial ability of control class students. Results data of pretest the control group is presented in Table 3.

Table 3. Pretest Results of Control Class

No.	Value	Category	Number of Students	Percentage (%)
1	90 – 100	Very High	0	0.0
2	80 – 89	High	3	10.2
3	70 – 79	Moderate	8	27.6
4	60 – 69	Low	9	31.1
5	≤59	Very Low	9	31.1

Based on Table 3, the results of the descriptive analysis that has been done it can be concluded that the results of pretest the critical thinking skills of the control class is in the low category, this can be seen based on the average value (mean) of the critical thinking skills of the control class as a whole which amounts to 64.04. Posttest intended to determine the critical thinking skills of the experimental class after receiving treatment in the form of applying the SiMaYang learning model. Results data of posttest experimental class in Table 4.

Table 4. Posttest Results of Experimental Class

No.	Value	Category	Number of Students	Percentage (%)
1	90 – 100	Very High	8	26.7
2	80 – 89	High	7	23.3
3	70 – 79	Moderate	9	30.0
4	60 – 69	Low	6	20.0
5	≤59	Very Low	0	0

Based on Table 4, the results of the descriptive analysis that has been done it can be concluded that the results of posttest the critical thinking skills of the experimental class is in the medium category, this can be seen based on the average value (mean) of the the critical thinking skills of the experimental class as a whole which amounts to 79.35.

The learning that was carried out in the control class was learning that applied conventional models, namely the delivery of material by means of lectures and assignments by the teacher. Posttest conducted to determine the critical thinking skills of control class after being given learning without using the SiMaYang learning model. Results data of posttest the control group in Table 5.

Table 5. Posttest Results of Control Class

No.	Value	Category	Number of Student	Percentage (%)
1	90 – 100	Very High	0	0
2	80 – 89	High	4	13.8
3	70 – 79	Moderate	12	41.4
4	60 – 69	Low	11	37.9
5	≤59	Very Low	2	6.9

Based on Table 5, the results of the descriptive analysis that has been done itcan be concluded that the results of posttest the critical thinking skills of the control class is in the low category, this is reviewed based on the average value (mean) of the explanatory text writing skill of the control class as a whole which amounts to 69.33.

Checking the assumption of normality is necessary to decide whether the test used is parametric or non-parametric (Orcan, 2020). The normality test aims to determine whether the data is normally distributed. Normality test data obtained from the results of pretest and posttest the critical thinking skills of the experimental and control classes. Normality test is done with the help of the program IBM SPSS Statistics version 25. The requirement of normally distributed data is the total of Asymp. Sig. (2- tailed) is higher than 0.05. The normality test results of experimental and control class in Table 6.

Table 6. The Normality Test Results of Experimental and Control Class

Data	Asymp. Sig. (2-tailed)	Explanation
Pretest of Experimental Class	0.100	0.100 > 0.05 = normal
Posttest of Experimental Class	0.100	0.100 > 0.05 = normal
Pretest of Control Class	0.095	0.095 > 0.05 = normal
Posttest of Control Class	0.092	0.092 > 0.05 = normal

Table 6 shows that the result pretest and posttest of experimental and control classes are normally distributed. Based on the results of the normality test on these data values are obtained Asymp. Sig. (2-tailed) more than 0.05. Thus, it can be concluded that the distribution of experimental and control class data is normally distributed.

The homogeneity test aims to determine whether the data from the two samples is homogeneous. The data tested for homogeneity is the result of pretest experimental and control classes and results of posttest experimental and control group. Homogeneity test is done with the help of the program IBM SPSS Statistics version 25. The data is said to be homogeneous if the sig. value is higher than 0,05. Homogeneity test results of experimental and control class in Table 7.

Table 7. Homogeneity Test Results of Experimental and Control Class

Data	Sig.	Explanation
Pretest of Eksperimental and Control Group	0.085	0.085 > 0,05 = homogeneous
Posttest of Eksperimental and Control Group	0.150	0.150 > 0,05 = homogeneous

Based on Table 7 shows that the homogeneity test results of pretest experimental and control classes as well posttest the experimental and control classes are said to be homogeneous because of the value Sig. both are higher than 0.05. Determination of the hypothesis test is determined by the results of the assumption test, based onthe results of the normality test it is known that the experimental and control group data are normally distributed and the results of the pretest homogeneity test of the experimental and control group as well as the posttest of the experimental and control classes show homogeneous data. Thus, the hypothesis test used is a parametric test with a t-test which includes independent sample t-test and paired sample t-tes.

Independent Sample t-test conducted to test two samples that are not related to each other. This analysis was carried out by testing the results of pretest experimental group and pretest control group using the help of the program IBM SPSS Statistics version 25. The requirement of significant data is the total of Sig. (2-tailed) is lower than 0.05. This test aims to determine differences in the critical thinking skills between the experimental and control group before being given treatment.

Based on data analysis, the value is known that Sig. (2-tailed) value is higher than 0.05 (0.962 > 0,05 = not significant). This shows thatthere is no significant difference in the critical thinking skills between the experimental and control group before being given treatment. It can be concluded that the critical thinking skills between the experimental group and the control group before learning is at the same level of ability. This finding indicates that students have the same level of understanding or skills before the treatment.

Paired Sample t-test aims to test two samples of data that are interconnected or paired. This analysis was carried out to determine differences in the critical thinking skills before and after being given treatment in the form of the SiMaYang learning model to the experimental group with the help of the program IBM SPSS Statistics version 25. The requirement of significant data total of Sig. (2-tailed) is lower than 0.05.

Based on data anaylsis, it can be seen the value of Sig. (2-tailed) is lower than 0.05, so it can be concluded that there is a significant difference of the critical thinking skills before and after being given treatment in the form of implementation of the SiMaYang learning model. This shows that there is an increase in the critical thinking skills after applying the SiMaYang learning model.

This analysis was conducted to determine differences of the critical thinking skills of control group. This analysis examines the results of pretest and posttest control group with the help of the program IBM SPSS Statistics version 25. The requirement of significant data total of Sig. (2-tailed) is lower than 0.05. Based on data analysis, it can be seen that the value of Sig. (2-tailed) is higher than 0.05 (0.150 > 0.05 = no significant) . This shows that there is no significant difference of the critical thinking skills before and after being taught in the control group. Thus, it can be concluded that the critical thinking skills of the control group both before and after learning with conventional learning methods did not experience a significant increase in ability.

This analysis aims to determine differences of the critical thinking skills between groups that take part in learning by applying the SiMaYang learning model and groups that take part in learning without applying the learning model. This analysis was carried out by testing the results of posttest experimental group and posttest control group. This analysis is carried out with the help of the program IBM SPSS Statistics version 25. Data conditions are said to be significant when the value Sig. (2-tailed) is lower than 0.05.

Based on data analysis, it can be seen that the value of Sig. (2-tailed) is lower than 0.05 (0.001 < 0.05 = significant) . This shows that there is a significant difference of the critical thinking skills between the groups that take lessons using the SiMaYang learning model and the groups that take lessons with conventional methods. Thus, it can be concluded that there is a difference in the critical thinking skills between the group learning using the SiMaYang learning model and the group using the conventional method.

Discussion

Implementation of SiMaYang (Si-5 Layang-layang) learning model is expected to be able to improve students' critical thinking skills. The background to the implementation of this model isthe lack of critical thinking skills of fifth grade at SDN 1 Linggapura Central Lampung. The SiMaYang learning model consists of four phases, namely the (1) orientation; (2) exploration-imagination; (3) internalization; and (4) evaluation phases (Sunyono, 2020). Improving students' critical thinking skills in learning can be done by using learning models that suit the needs of students. The imagination-exploration phase of SiMaYang learning model can improve critical thinking skills, the imagination phase can be seen when students interpret by providing responses or comments when educators provide abstractions while the exploratory phase emphasizes conceptual activities with discussions, laboratory experiments/demonstrations, observing animated shows and exploring information (Ariyana & Putra, 2021; Eliani et al., 2018; Jannah et al., 2023). The results of this data analysis show that there is a significant difference of the critical thinking skills between the groups that take lessons using the SiMaYang learning model and the groups that take lessons with conventional methods.

Based on the descriptive analysis, it is known that the pretest result of the critical thinking skills of the experimental group is in the low category and experienced an increase in the posttest to the medium category. This indicates that there is an increase in the critical thinking skills after the implementation of the SiMaYang learning model to the experimental group. SiMaYang learning model was effective in improving the students' critical thinking skills because creating student activities in improving critical and creative thinking skills based on the knowledge that has been obtained by doing imaginative representations (Eliani et al., 2018; Puspitarini, 2022). Multi-representation-based SiMaYang learning has a function as complementary information, limiting interpretation, and building deeper understanding. SiMaYang learning is able to increase mastery of concepts (Alibas et al., 2020; Dasna et al., 2022). The application of the SiMaYang learning model in previous research also shows that it can improve students' problem-solving abilities and mastery of concepts and can be combined with digital media that supports (Ariyana & Putra, 2021; Sularsih et al., 2020). So that the implementation of the SiMaYang learning model can be used as an alternative learning model that can be applied to incrase critical thinking skills for elementary students. Having the ability to think critically is very important for students, because students in learning activities as well as in everyday life students need the ability to think critically, the ability to think critically is the ability that a person must have in digging up information to make a decision or in solving a problem by asking questions.

The contribution of this research to the development of the field of education is to play a role in providing alternative learning that can develop critical thinking skills that are much needed in this modern era. The ability to think critically makes a person skilled and responsible in studying a problem from the point of view that is faced then able to engage in obtaining opinions, judgments and consider to attract conclusion (Islami & Soekamto, 2022; Lina & Desnita, 2022; Pratiwi & Setyaningtyas, 2020). Critical reasoning is one of the profiles of Pancasila students developed in the independent curriculum, Pancasila students who think critically are able to obtain and process information and ideas, analyze and evaluate reasoning, reflect on thoughts and thinking processes, and make decisions (Rusnaini et al., 2021; Sulastri et al., 2022). It is the hope of the authors that the findings in this study can be a reference for teachers in developing students' thinking skills at the basic level, one of which is with the SiMaYang learning model.

SiMaYang learning can be applied at the elementary school level but there are obstacles that arise such as students who are not used to being taught with this learning model so that learning time management needs to be improved when implementing SiMaYang learning, especially at the elementary school level, so to overcome these obstacles it is necessary to master syntax and have student worksheets when implementing the SiMaYang learning model (Mawardi et al., 2022). the use of supporting media in

SiMaYang learning such as worksheets and other digital media that are aligned with syntax can improve students' thinking skills such as critical thinking and metacognition and make students more active in learning so that students' mastery of concepts becomes better (Alkham et al., 2021; Saputra, 2020). So when implementing SiMaYang learning at the elementary school level, it is recommended to combine it with learning media that can attract students' interest, such as digital kahoot media, educational games, worksheets digital or other media that raises students' enthusiasm when learning.

The limitation of this study is that the number of samples is only 59 people, of course it is still not sufficient describes the actual situation, the facilities and media used by researchers are still limited and the variables studied are only limited to students' critical thinking skills (Mau et al., 2022). Based on these shortcomings and limitations, the researcher provides recommendations so that future researchers can pay more attention in further perfecting research related to the application of the SiMaYang learning model, specially at the basic education level, namely in future research, it is recommended to take a sample more so that the accuracy of the data is more good at research (Puspitarini, 2022). Apart from that, in order to maximize the application of the SiMaYang learning model, it is recommended to be assisted by modern digital media such as kahoot, quizizz or others, and it is hoped that there will be additional other important variables that might also influences many things in research so that it can contribute more in the field of education and improve the quality of students.

4. CONCLUSION

Based on the results of hypothesis testing it is known that the implementation of the SiMaYang learning model can improve the students' critical thinking skills. This is based on the results of the analysis of the critical thinking skills of the group that applied the SiMaYang learning model which experienced an increase while the group that applied the conventional method did not experience a significant increase of the critical thinking skills. So that the implementation of the SiMaYang learning model can be used as an alternative learning model that can be applied to incrase critical thinking skills for elementary student.

5. REFERENCES

Abraham, I., & Supriyati, Y. (2022). Desain Kuasi Eksperimen Dalam Pendidikan: Literatur Review. *Jurnal Ilmiah Mandala Education*, *8*(3), 2476–2482. https://doi.org/10.58258/jime.v8i3.3800.

Alibas, A., Susianna, N., & Rosalina, M. (2020). Penerapan model pembelajaran simayang tipe ii dengan metode gasing untuk meningkatkan penguasaan konsep dan motivasi belajar siswa SMA. *Indonesian Journal of Natural Science Education*, *5*(1), 63–67. https://doi.org/10.31002/nse.v5i1.2444.

Alkham, F. F., Haryani, S., & Ridlo, S. (2021). Understanding the Macroscopic, Microscopic, and Symbolic Levels of Angiosperms through SiMaYang Type II Learning. *Journal of Innovative Science Education*, *10*(3), 298–305. https://doi.org/10.15294/JISE.V10I1.45241.

Annizar, A. M., Maulyda, M. A., Khairunnisa, G. F., & Hijriani, L. (2020). Kemampuan Pemecahan Masalah Matematis Siswa dalam Menyelesaikan Soal PISA pada Topik Geometri. *Jurnal Elemen*, *6*(1), 39–55. https://doi.org/10.29408/jel.v6i1.1688.

Aprian, R. D., Sunyono, & Efkar, T. (2017). Pengaruh Strategi Scaffolding pada Pembelajaran SiMaYang dalam Meningkatkan Keterampilan Proses Sains. *Jurnal Pendidikan dan Pembelajaran Kimia (JPPK*, *6*(1), 1–11.

Ariyana, N., & Putra, F. G. (2021). SiMaYang type II learning model assisted by kahoot application: Its Impact in improving student's concept understanding based on apos theory. *Online Learning in Educational Research*, *1*(1), 17–23. https://doi.org/10.58524/oler.v1i1.9.

Baidowi, N., Ridwan, M. A., Utami, N. C. M., & Dallion, E. (2023). Upaya Meningkatkan Kemampuan Berpikir Kritis Siswa Kelas Iv Sd Dengan Menggunakan Metode Eth Pada Mata Pelajaran IPA. *DE_JOURNAL (Dharmas Education Journal*, *4*(1), 346–352. https://doi.org/10.56667/dejournal.v4i1.980.

Copur-Gencturk, Y., & Doleck, T. (2021). Strategic competence for multistep fraction word problems: an overlooked aspect of mathematical knowledge for teaching. *Educational Studies in Mathematics*, *107*(1), 49–70. https://doi.org/10.1007/s10649-021-10028-1.

Dari, F. W., & Ahmad, S. (2020). Model Discovery Learning Sebagai Upaya Meningkatkan Kemampuan Berpikir Kritis Siswa SD. *Jurnal Pendidikan Tambusai*, *4*(2), 1469–1479. https://doi.org/10.31004/jptam.v4i2.612.

Dasna, I. W., Permatasari, M. B., & Rahayu, S. (2022). Chemistry Learning Using Multiple Representations: A Systematic Literature Review. *Journal of Science Learning*, *5*(2), 334–341. https://doi.org/10.17509/JSL.V5I2.42656.

Davidi, E. I. N., Sennen, E., & Supardi, K. (2021). Integration Of STEM (Science, Technology, Engineering And Mathematic) Approache For Improving Critical thinking skills of Elementary School Students. *Scholaria: Jurnal Pendidikan dan Kebudayaan*, *11*(1), 11–22. https://doi.org/10.24246/j.js.2021.v11.i1.p11-22.

Dewi, N. N. S. K., Arnyana, I. B. P., & Margunayasa, I. G. (2013). Project Based Learning Berbasis STEM: Meningkatkan Kemampuan Berpikir Kritis dan Hasil Belajar Siswa. *Jurnal Ilmiah Pendidikan Profesi Guru*, *6*(1), 133–143. https://doi.org/10.23887/jippg.v6i1.59857.

Dhayanti, D., Johar, R., & Zubainur, C. M. (2018). Improving Students' Critical and Creative Thinking Through Realistic Mathematics Education using Geometer's Sketchpad. *JRAMathEdu (Journal of Research and Advances in Mathematics Education)*, *3*(1), 25. https://doi.org/10.23917/jramathedu.v3i1.5618.

Dolapcioglu, S., & Doğanay, A. (2022). Development of critical thinking in mathematics classes via authentic learning: An action research. *International Journal of Mathematical Education in Science and Technology*, *53*(6). https://doi.org/10.1080/0020739X.2020.1819573.

Eliani, N. B. N., Muflihah, & Widiyowati, I. I. (2018). Pengaruh Model Pembelajaran Simayang Terhadap Hasil Belajar dan Aktivitas Siswa. *Jurnal Universitas Mulawarman*, *2*(1), 45–57.

Erdem, A. R., & Adiguzel, D. C. (2019). The opinions of primary school teachers ontheir creative thinking skills. *Eurasian Journal of Educational Research*, *2019*(80), 25–38. https://doi.org/10.14689/ejer.2019.80.2.

Evi, T., & Indarini, E. (2021). Meta Analisis Efektivitas Model Problem Based Learning dan Problem Solving Terhadap Kemampuan Berpikir Kritis Mata Pelajaran Matematika Siswa Sekolah Dasar. *EDUKATIF Jurnal Ilmu Pendidikan*, *3*(2), 385–395. https://doi.org/10.30651/must.v4i1.2822.

Fatimah, A. S., & Santiana, S. (2017). Teaching in 21St Century: Students-Teachers' Perceptions of Technology Use in the Classroom. *Script Journal: Journal of Linguistic and English Teaching*, *2*(2), 125. https://doi.org/10.24903/sj.v2i2.132.

Fauzi, A. M., & Abidin, Z. (2019). Analisis Keterampilan Berpikir Kritis Tipe Kepribadian Thinking-Feeling dalam menyelesaikan Soal PISA. *Suska Journal of Mathematics Education*, *5*(1), 1–8. https://doi.org/10.24014/sjme.v5i1.6769.

Fazio, C., Paola, B., & Battaglia, O. R. (2020). A study on science teaching efficacy beliefs during pre-service elementary training. *International Electronic Journal of Elementary Education*, *13*(1), 89–105. https://doi.org/10.26822/iejee.2020.175.

Fitria, R., Suparman, Hairun, Y., & Ruhama, M. A. H. (2020). Student's worksheet design for social arithmetic based on PBL to increase the critical thinking skills. *Universal Journal of Educational Research*, *8*(5). https://doi.org/10.13189/ujer.2020.080541.

Fitrianawati, M., Sintawati, M., Marsigit, & Retnowati, E. (2020). Analysis toward relationship between mathematical literacy and creative thinking abilities of students. *Journal of Physics: Conference Series*, *1521*(3). https://doi.org/10.1088/1742-6596/1521/3/032104.

Fitriani, F., & Kowiyah. (2023). Mathematics Critical Thinking Skills for The Third Grade Elementary School Students on Fractions Material. *Mimbar PGSD Undiksha*, *10*(3). https://doi.org/10.23887/jjpgsd.v10i3.48741.

Gandri, M. (2019). Preliminary analysis of Problem Based Learning model implementation in the development of module assisted multimedia interactive game for improving critical thinking skill learners. *Journal of Physics: Conference Series*, *1185*(ue 1)). https://doi.org/10.1088/1742-6596/1185/1/012140.

Girsang, B., Sinaga, E. A. L., Tamba, P. G., Sihombing, D. I., & Siahaan, F. B. (2022). Analisis Kemampuan Berpikir Kritis Siswa Dengan Model Program For International Student Assesment(PISA) Konten Quantitiy Pada Materi Himpunan di Kelas VII SMP HKBP Sidorame Medan. : *: Journal of Mathematics Education and Applied*. https://doi.org/10.36655/sepren.v3i2.

Gulo, A. (2022). Penerapan Model Discovery Learning Terhadap Hasil Belajar Peserta Didik Pada Materi Ekosistem. *Educativo: Jurnal Pendidikan*, *1*(1), 307–313. https://doi.org/10.56248/educativo.v1i1.54.

Hasanah, U., Astra, I. M., & Sumantri, M. S. (2023). Exploring the need for using sciencelearning multimedia to improve critical thinking elementary school students: Teacher perception. *International Journal of Instruction*, *16*(1), 417–440. https://doi.org/10.29333/iji.2023.16123a.

Herlina, L., Remana, M. T., Nurcahya, M. A., & Prihantini. (2022). Pembelajaran ProjectBased Learning dalam Meningkatkan Berpikir Kritis Siswa. *Bidayatuna*, *10*(10), 162–172. https://doi.org/10.54471/bidayatuna.v5i2.1660.

Islami, M., & Soekamto, H. (2022). Efektivitas model pembelajaran inquiry menggunakan quizizz multimedia berbasis gamification terhadap kemampuan berpikir kritis siswa. *Jurnal ilmiah*

pendidikan profesi guru, *5*(2), 383–392. https://doi.org/10.23887/jippg.v5i2.48338.

Jannah, L., Listyarini, I., Nugroho, A. A., & Saputro, S. A. (2023). Analisis Kemampuan Berpikir Kritis Melalui Model Pembelajaran Problem Based Learning Kelas IV SDN Pandeanlamper 03 Kota Semarang. *Journal on Education*, *5*(4), 12265–12271. https://doi.org/10.31004/joe.v5i4.2198.

Khoiriyyah, N., Qomaria, N., Ahied, M., Putera, D. B. R. A., & Sutarja, M. C. (2022). Pengaruh Model Project Based Learning dengan Pendekatan STEAM Terhadap Kemampuan Berpikir Kritis Siswa. *Vektor: Jurnal Pendidikan IPA*, *3*(2), 55–66. https://doi.org/10.35719/vektor.v3i2.61.

Kotronoulas, G., Miguel, S., Dowling, M., Ortega, P. F., Lahiguera, S. C., Bağçivan, G., Pape, E., Drury, A., Semple, C., Dieperink, K. B., & C, P. (2023). An Overview of the Fundamentals of Data Management. *Analysis, and Interpretation in Quantitative Research. Seminars in Oncology Nursing*, *39*(2), 1–9. https://doi.org/10.1016/j.soncn.2023.151398.

Lathifa, U. (2020). Improving chemistry teacher candidates' mental models in the kinetics course using SiMaYang type II learning. *Journal of Physics: Conference Series*, *1594*, 12018. https://doi.org/10.1088/1742-6596/1594/1/012018.

Lestari, A. C., & Annizar, A. M. (2020). Proses Berpikir Kritis Siswa dalam Menyelesaikan Masalah PISA ditinjau dari Kemampuan Berpikir Komputasi. *Jurnal Kiprah*, *8*(1), 46–55. https://doi.org/10.31629/kiprah.v8i1.2063.

Lestari, D., Fibonacci, A., & Alawiyah, N. (2020). Efektivitas model pembelajaran simayang tipe ii berbasis multipel representasi terhadap penguasaan konsep dan attitudes toward chemistry pada materi larutan penyangga. *Jurnal Pendidikan Kimia Universitas Halu Oleo*, *5*(2), 93–104. https://doi.org/10.36709/jpkim.v5i2.13629.

Lina, Y. E., & Desnita. (2022). Validity and reliability of critical thinking instruments to measure the effectiveness of context-based physics e-module on wave materials. *JPPPF (Jurnal Penelitian dan Pengembangan Pendidikan Fisika*, *8*(1), 57–64. https://doi.org/10.21009/1.08106.

Marudut, M. R. H., Bachtiar, I. G., Kadir, & Iasha, V. (2020). Peningkatan Kemampuan Berpikir Kritis dalam Pembelajaran IPA Melalui Pendekatan Keterampilan Proses. *Jurnal Basicedu*, *4*(3), 577–585. https://doi.org/10.31004/basicedu.v4i3.401.

Mau, M., Saenom, S., Martha, I., Ginting, G., & Sirait, S. (2022). Model Pembelajaran Orang Dewasa di Era Masyarakat 5.0. Skenoo. *Jurnal Teologi Dan Pendidikan Agama Kristen*, *2*(2), 165–178. https://doi.org/10.55649/skenoo.v2i2.38.

Mawardi, E., Vitasari, M., & Berlian, L. (2022). Validity of infographic learning media theme of green growth in training critical thinking skills. *Jurnal Pena Sains*, *9*(1), 29–37. https://doi.org/10.21107/jps.v9i1.13721.

Meidayanti, R., Sunyono, & Tania, L. (2015). Pembelajaran Simayang untuk Meningkatkan Self-Efficacy Dan Keterampilan Berpikir Kritis. *Jurnal Pendidikan dan Pembelajaran Kimia (JPPK*, *4*(5), 856–861.

Ningsih, M. Y., Efendi, N., & Sartika, S. B. (2021). Pengaruh Model Project Based Learning Terhadap Berpikir Kreatif Peserta Didik dalam Pembelajaran IPA. *Jurnal Inovasi Pendidikan Sains (JIPS*, *2*(2), 42–51. https://doi.org/10.37729/jips.v2i2.1403.

Novitasari, F., R., & Wulandari, I. A. (2022). Students' Worksheet Effectivity Ethnomathematics-Based with STEM Approach to Critical Thinking Ability. *Vygotsky: Jurnal Pendidikan Matematika Dan Matematika*, *4*(1), 57–66. https://doi.org/10.30736/voj.v4i1.521.

Nuraeni, S., Feronika, T., & Yunita, L. (2019). Implementation of Self-Efficacy and Critical thinking skills Students in Chemistry Learning in the 21st Century. *Jambura Journal of Educational Chemistry*, *2*(1), 49–56. https://doi.org/10.34312/jjec.v1i2.2553.

Nurmala, S., & Efkar, T. (2018). Pengaruh Model Pembelajaran SiMaYang dalam Meningkatkan Keterampilan Proses Sains. *Jurnal Pendidikan dan Pembelajaran Kimia (JPPK*, *7*(2), 1–12.

Nurmala, V., Sunyono, & Tania, L. (2015). PembelajaranSimayang Tipe II Untuk Meningkatkan Kemampuan Metakognisi Dan Keterampilan Berpikir Kritis. *Jurnal Pendidikan dan Pembelajaran Kimia (JPPK*, *4*(3), 832–843.

Orcan, F. (2020). Parametric or Non-parametric: Skewness to Test Normality for Mean Comparison. *International Journal of Assessment Tools in Education*, *7*(2), 255–265. https://doi.org/10.21449/ijate.656077.

PISA, O. (2019). PISA 2018 Assessment and Analytical Framework. In *OECD Publishing. OECD*. https://doi.org/10.1787/b25efab8-en.

Pratiwi, E. T., & Setyaningtyas, E. W. (2020). Kemampuan Berpikir Kritis Siswa melalui Model Pembelajaran Problem Based Learning dan Model Pembelajaran Project Based Learning. *Jurnal Basicedu*, *4*(2), 379–388. https://doi.org/10.31004/basicedu.v4i2.362.

Puspita, L., Putri, R. A., & Komarudin. (2020). Analisis Keterampilan Berpikir Kritis: Dampak Model Pembelajaran simayang dan Concept Map Pada Materi Struktur dan Fungsi Jaringan Pada

Tumbuhan. *Bioeduscience jurnal pendidikan biologi dan sains*, *4*(1), 82–89.
Puspitarini, D. (2022). Blended Learning as a 21st Century Learning Model. *Ideguru: Jurnal Karya Ilmiah Guru*, *7*(1), 1–6. https://doi.org/10.51169/ideguru.v7i1.307.
Rachamatika, T., Sumantri, S., Purwanto, A., Wicaksono, J. W., Arif, A., & Iasha, V. (2021). *Pengaruh Model Pembelajaran dan Kemandirian Belajar Terhadap Kemampuan Berpikir Kritis IPA Siswa Kelas V SDN di Jakarta Timur*. https://doi.org/10.36456/bp.vol17.no1.a3162.
Rahmawati, H., Pujiastuti, P., & Cahyaningtyas, A. P. (2023). Kategorisasi Kemampuan Berpikir Kritis Siswa Kelas Empat Sekolah Dasar di SD se-Gugus II Kapanewon Playen, Gunung Kidul. *Jurnal Pendidikan dan Kebudayaan*, *8*(1), 88–104. https://doi.org/10.24832/jpnk.v8i1.3338.
Ridzkiyah, N., & Effendi, K. N. S. (2021). Analisis Kemampuan Literasi Matematis Siswa SMA Dalam Menyelesaikan Soal Program For International Student Assessment (PISA. *Jurnal Ilmiah Pendidikan Matematika*. https://doi.org/10.26877/jipmat.v6i1.8237.
Rusnaini, R., Raharjo, R., Suryaningsih, A., & Noventari, W. (2021). Intensifikasi Profil Pelajar Pancasila dan Implikasinya Terhadap Ketahanan Pribadi Siswa. *Jurnal Ketahanan Nasional*, *27*(2), 230–249. https://doi.org/10.22146/jkn.67613.
Sa'adah, M., Suryaningsih, S., & Muslim, B. (2020). Pemanfaatan multimedia interaktif pada materi hidrokarbon untuk menumbuhkan keterampilan berpikir kritis siswa. *Jurnal Inovasi Pendidikan IPA*, *6*(2), 184–194. https://doi.org/10.21831/jipi.v6i2.29680.
Sa'diah, Y. N., Dian Ayu Afiani, K., & Setiawan, F. (2023). Analisis kemampuan berpikir kritis siswa sekolah dasar pada pembelajaran matematika dengan model problem based learning. *Jurnal Ibriez : Jurnal Kependidikan Dasar Islam Berbasis Sains*, *8*(1), 47–60. https://doi.org/10.21154/ibriez.v8i1.338.
Saputra, B. (2020). Efektivitas Penggunaan LKPD Berbasis Model SimaYang untuk Meningkatkan Penguasaan Konsep Siswa. *Jurnal Pendidikan dan Pembelajaran Kimia (JPPK*, *9*(1), 12–22. https://doi.org/10.23960/jppk.v9.i1.202004.
Sholihah, N. A., & Arif, S. (2020). Efektivitas model pembelajaran Simayang berbantuan flash card terhadap kemampuan representasi siswa. *Natural: Jurnal Ilmiah Pendidikan IPA*, *7*(1), 64–72. https://doi.org/10.30738/natural.v7i1.7998.
Sularsih, F., Mahfud, H., & Marmoah, S. (2020). Penerapan model pembelajaran si-5 layang-layang (simayang) untuk meningkatkan keterampilan pemecahan masalah keliling dan luas bangun datar pada peserta didik kelas IV sekolah dasar. *JPI (Jurnal Pendidikan Indonesia): Jurnal Ilmiah Pendidikan*, *6*(1), 40–45.
Sulastri, S., Syahril, S., Adi, N., & Ermita, E. (2022). Penguatan pendidikan karakter melalui profil pelajar pancasila bagi guru di sekolah dasar. *JRTI(Jurnal Riset Tindakan Indonesia)*, *7*(3), 413–420. https://doi.org/10.29210/30032075000.
Sunyono. (2020). *Model Pembelajaran Multipel Representasi. Pembelajaran Empat Fase dengan Lima Kegiatan: Orientasi, Eksplorasi Imajinatif, Internalisasi dan Evaluasi Edisi 2*. Graha Ilmu.
Sunyono, Y., L., & Ibahim, M. (2015). Mental Models of Students on Stoichiometry Concept in Learning by Method Based on Multiple Representation. *The Online Journal of New Horizons in Education*, *5*(2), 30 – 45.
Taguchi, N. (2018). Description and explanation of pragmatic development: Quantitative, qualitative, and mixed methods research. *System*, *75*, 23–32. https://doi.org/10.1016/j.system.2018.03.010.
Wati, K. W., & Sari, P. M. (2019). The Relationship Between Critical Thinking Ability and Creative Thinking Abilityin Science Learning in Elementary School. *Tunas Jurnal Pendidikan Guru Sekolah Dasar*, *8*(2), 80–88. https://doi.org/10.33084/tunas.v8i2.5147.
Wati, M., & Anggraini, W. (2019). Strategi Pembelajaran Kooperatif Tipe Jigsaw: Pengaruhnya Terhadap Kemampuan Berpikir Kritis Siswa. *Indonesian Journal of Science and Mathematics Education*, *2*(1), 98–106. https://doi.org/10.24042/ijsme.v2i1.3976
Wiguna, M. B., Sutisnawati, A., & Uswatun, D. A. (2022). Self-Efficacy Analysis in Learning Mathematics in Grade 5 Elementary School Students. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, *6*(3), 2489–2497. https://doi.org/10.31004/cendekia.v6i3.1603.