The Children Learning in Science (CLIS) Model on Critical Thinking Skills

Hendrik Widya Yusup, and Ari Widodo✉

Primary Education, Universitas Pendidikan Indonesia, Bandung, Indonesia

hendrikyusup47@upi.edu; ✉ widodo@upi.edu

Abstract: This research is motivated by a lack of primary school students' critical thinking skills. This research was conducted to recognize the influence of the CLIS learning model on the students' critical thinking skills on natural science subjects on the material of phase transition in fourth-grade. This research employed a quantitative approach with a quasi-experiment, namely the nonequivalent group pretest-posttest control group design. The sources of data in this research were 40 fourth-grade students in one of the primary schools in Sumedang Regency, which was divided into 20 students in the experimental class and 20 students in the control class. The research results revealed that the CLIS learning model influenced the students' critical thinking ability.

Keywords: Learning Model, CLIS, Critical Thinking, Primary School

How to Cite: Yusup. H. W., & Widodo, A. (2021). The Children Learning in Science (CLIS) Model on Critical Thinking Skills. *The 3rd International Conference on Elementary Education*, *3*(1). 524-530.

INTRODUCTION

In the 21st-century learning encourages students to become active learners to be able to seek, find, construct, process, and use their knowledge so that meaningful learning will be created, in the 21st-century education era so that students are expected to be able to have various competencies including understanding abilities conceptual, critical thinking skills, collaboration and communication skills, as well as Abidin's creative thinking skills (2015 p. 62). Meanwhile, according to (Trilling & Fadel, 2009 p. 23) 21st-century learning has 4 essential characteristics to spur in producing superior resources, including knowledge work (knowledge to work), thinking tools, learning research), digital lifestyle.

The processes of active students in the 21st century have been adapted in the education system in Indonesia through the current 2013 revised curriculum with a scientific approach. The application of the scientific approach in learning is carried out by involving the 5 M procedures, such as observing, asking, trying, reasoning, and communicating. Therefore, the learning conditions are directed to encourage students to find out from various sources (observation), be able to formulate problems (ask questions), not only solve problems (Hosnan, 2016). Implementation of the 2013 curriculum trains students to improve their critical thinking skills. Every learning activity in the 2013 curriculum at SD plays an important role in shaping students' thinking abilities. In the implementation of the learning process, students' thinking skills can be developed by enriching meaningful experiences through decision making and problem-solving related to analyzing, evaluating, and creating (Anderson & Krathwohl, 2015). Educators are expected to be able to train students to improve critical thinking skills where students are encouraged to become critical students. (Zubaidah, 2016) also states that in the 21st century the teacher acts as a guide who tries to help students when they encounter difficulties in the process of constructing their knowledge and skills. Teachers need to strengthen students' intellectual curiosity, identification and problem-solving skills, and their ability to build new knowledge with others. For this to be realized, it is necessary to systematically prepare teachers to design learning activities that can make students active by linking the concepts learned by students that link the learning material being taught to real-world situations in the

environment around students. One of the lessons related to real life in the environment around students is Natural Sciences. Natural knowledge (IPA) is the result of human activities in the form of organized knowledge, ideas, and concepts about the natural surroundings obtained through the experience of a series of scientific processes. This process includes investigating, compiling, and testing ideas. That is, science learning does not only emphasize product aspects but also emphasizes process aspects, namely involving student activity.

Science trains students to think critically and objectively. Science learning emphasizes how children learn, so science is seen as an active process and is strongly influenced by what children want to learn. From this viewpoint, learning outcomes are not solely dependent on what the teacher presents, but are influenced by the interaction between the information that the child is interested in and how the child processes information based on prior understanding.

The results of observations found by researchers on learning activities on September 7-13 in class IV at one of the Sumedang District primary schools showed that during the learning process, students did not respond to the material presented by the teacher. The learning process has not emphasized the importance of encouraging students in the process of finding out and finding knowledge about what they are learning, it still emphasizes the transfer of knowledge. When science learning takes place, students are less able to analyze the problems around them. The science learning process requires a lot of practice, but students just listen to the explanation from the teacher, the teacher is more dominant in learning activities. This causes students' thinking ability is still not optimal and can affect learning outcomes. So that most students have not met the standard value of the Minimum Completion Criteria (KKM) set by the school, namely 68. Of the 20 students who reach the KKM only 8 students.

In the 2013 curriculum, especially in elementary schools, which have been running until now, it is hoped that there will be changes in the implementation of teacher learning, which are expected to be more creative and innovative in presenting learning material. Students are also accustomed to train and develop their critical thinking potential. Science learning is not just memorizing the material provided by the teacher, it takes practical activities so that students experience it firsthand, but in its delivery, the teacher explains the material in an outline. Students carry out practical activities intended to find their information about the learning material being taught, but the role of the teacher is also needed only as a facilitator.

For learning to take place to attract students' interest and activity in learning, it is necessary to create a pleasant learning atmosphere using the right learning model. That way students will be interested in learning, to try and prove themselves, so that they can strengthen their cognitive abilities and achieve learning goals. If the learning model used is not precise and varied, especially in science learning, it will result in boredom which will have an impact on students 'lack of responding to objects and events in the surrounding environment, as well as the lack of students' ability to think to solve problems. Presentation of material that is easy for students to understand and applying a learning model can provide student stimulus to improve critical thinking skills. The occurrence of critical thinking skills will lead to improving student cognitive learning outcomes (Fadhila et al, 2013; Nugraha et al, 2017). One of the methods used for optimal learning is by applying a learning model. The CLIS model is a learning model that is used to develop critical thinking skills and solve a problem.

The model *CLIS* is one of the recommended learning models, the CLIS (Children Learning in Science) Learning Model to develop students' critical thinking skills and solve a problem. In this model, students are involved in various stages of the learning process so that the progress of students'

thinking can be seen. By using this model students are also involved in various experiments so that the application of ideas will be more meaningful because it is experienced directly by students. This model is also based on the constructivism model which all involves a thought process.

The *Children Learning in Science* (CLIS) learning model is a learning model that has characteristics based on the constructivism paradigm by paying attention to students' prior knowledge. This is in line with the opinion (Widiyati, 2012) which states that the CLIS Model is a learning model that seeks to develop students' ideas or ideas about a problem in learning and to reconstruct ideas or ideas based on observations or experiments. The stages that must be carried out in the CLIS learning model according to (Samatowa, 2010, p. 74) The CLIS learning model consists of five main stages, namely orientation (a), elicitation of ideas (b), rearranging of ideas, or restructuring of ideas. (c), application of ideas (d), consolidating ideas or reviewing the change in ideas (e). The rearrangement of ideas is divided into three parts, namely disclosure and exchange of ideas or clarification and exchange (i), exposure to conflict situations (ii), and construction of new ideas and evaluation or construction of new ideas and evaluation.

Applying the right learning model is very important in learning changes to objects. With a good and appropriate learning model, well planned, adapted to the conditions and characteristics of students, active, creative, effective, and fun, Natural Science learning will run well and learning objectives will be achieved. Also, students will be motivated in their learning. They will feel happy because the form of learning that is carried out is per the daily conditions and environment of the students.

Based on the explanation above, the authors are interested in researching critical thinking skills using the *Children Learning in Science* (CLIS) model. Therefore, the authors create a thesis with the title, " The Children Learning in Science (CLIS) Model on Critical Thinking Skills

METHOD

This research uses a quantitative approach while the method used is experimental. The experimental method was carried out to find out how the influence of the independent variable on the dependent variable in controlled conditions (Sugiyono 2018, p. 111). Also, this experimental research is used to measure a variable against other variables directly and can test the hypothesis of a causal relationship (Abidin 2011, p. 112). This study uses a quantitative approach with a research type *quasi-experimental*. The research design used is the *Nonequivalent Control Group*.

The selection of the research sample was carried out by purposive sampling and was not carried out randomly (Sugiono 2018, p. 138; Creswell 2016, p. 228). The research subjects used were fourth-grade students of SDN Negeri Cibungur, Sumedang Regency which consisted of two classes, class IV A and IV B in the academic year 2019/2020 even semester. Class IV A was designated as an experimental class taught by the CLIS model with a total of 20 students, while class IV B was designated as a control class taught by conventional learning models of 20 students. The variables in this study are the independent variable (CLIS and conventional models), the dependent variable (critical thinking skills), and the moderator variable (initial ability).

The instruments used by the researcher were pre-test and post-test about critical thinking skills that had previously been validated by expert validators. It is also necessary to carry out several tests such as validity, reliability, the difficulty level of the items, and differentiation. The data analysis technique in this study used parametric inferential statistics. This data analysis calculation uses the help of the *SPSS 21.0 for Windows program*.

RESULTS AND DISCUSSION

Research conducted in grade IV at SDN Cibungur was obtained from primary data to measure critical thinking skills, learning outcomes, and students' initial abilities in

the form of multiple-choice questions. The number of students in this study was 40 divided into two classes, with details of 20 students in the experimental class in class IV A and 20 students in the control class in class IV B. In the experimental class, the CLIS model was applied and the control class applied the conventional model. Data on students' initial abilities were obtained from the pre-test results which were carried out in the experimental and control classes before the learning process on the material "changes in the form of objects". The pre-test aims to determine whether the initial abilities possessed by students in the two classes are the same. Initial capability data graders experimental and control can be seen in Table 1.

Table 1. Initial Ability

Class	Number of Students	Maximum Score	Minimum Score	Average	Sd
Experiment (CLIS Learning Model)	20	66	41	51,9	8,1
Control (Conventional Learning)	20	67	40	54,1	7,9

The initial ability of students in the experimental class was 51.9, while in the control class it was 54.1. The maximum and minimum scores in the two experimental and control classes were not much different. This shows that the mean value of the initial ability in both classes a class is still lacking. The standard value of the Minimum Completeness Criteria (KKM) on the natural science content set by SDN Cibungur is 68. The initial abilities of students from the experimental class and the control class are grouped into two groups, namely a group of students with a high initial ability and a group of students with low initial ability. This grouping is applied before the class experiences the learning model treatment.

Data on students' critical thinking skills were obtained from the results *post-test* which were carried out in the experimental class and the control class after the students received the material "changes in the form of objects". The number of test questions to measure critical thinking skills consists of 10 items. Data on students' critical thinking skills can be seen in table 2:

Table 2. Data on critical thinking skills

Class	Number of students	Maximum Score	Minimum Score	Average	Sd
Experiment	20	100	60	80.8	12.8
Control	20	100	50	72.7	14.9

Table 2 shows that the average value of students' critical thinking skills in the experimental class was 80.8, while in the control class it was 72.7. The maximum value in both the experimental and control classes have the same value, while the minimum value for the experimental class is 60 and the control class is 50.

Hypothesis testing in this study through the help of the *SPSS 21.0 for Windows program* uses the test *MANOVA* (*Multivariate Analysis of Variance*). The results of hypothesis testing for the variable critical thinking ability in the experimental and control classes can be seen in Table 3.

Table 3. Hypothesis Test Results critical thinking skills of Students Tests of Between Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Critical	2609.127a	3	869.709	5.564	.003
Intercept	Critical	248614.238	1	248614.238	1.591E3	.000
Class	Critical	679.035	1	679.035	4.344	.043
Initial Ability	Critical	1850.375	1	1850.375	11.838	.001
Class * Initial	Critical	11.122	1	11.122	.071	.791

Ability

a. R Squared = ,284 (Adjusted R Squared= ,233)

b. R Squared = ,215 (Adjusted R Squared = ,159)

The results of the hypothesis test of the variable critical thinking skills listed in table 3 can be used to answer the hypothesis that has been proposed. The first hypothesis is obtained with a significance value of 0.043 <0.05 so that H0 is rejected and H1 is accepted. So, it can be concluded that there is a significant difference in critical thinking skills between students in the experimental class and students in the control class.

The second hypothesis is obtained with a significance value of 0.001 <0.05 so that H0 is rejected and H1 is accepted. It can be concluded that there is a significant difference in critical thinking skills between students with high initial abilities and students with low initial abilities.

The third hypothesis is obtained with a significance value of 0.791> 0.05 so that H_0 is accepted and H1 is rejected. So, it can be concluded that there is no interaction between the model *CLIS* and the initial ability of students' critical thinking skills.

The fourth hypothesis is obtained with a significance value of 0.011 <0.05 so that H0 is rejected and H1 is accepted. It can be concluded that there is a significant difference in student cognitive learning outcomes between students in the experimental class and students in the control class.

Based on the results of data analysis, it shows that the students' critical thinking skills in the experimental class are better than the control class. This is inseparable from the differences in the characteristics of the stages of the Children Learning in Science model with conventional learning models. In the learning material "changes in the form of objects" in the experimental class, student learning completeness is more than in the control class.

The results of data analysis that have been carried out there are significant differences in critical thinking skills between students with high initial abilities and students with low initial abilities. Critical thinking skills in this study, students with high initial abilities will also have high thinking skills, and vice versa. Each learning process has its starting point or originates from the initial abilities of certain students to be developed into new abilities, each of which is the goal in the learning process. Initial abilities also illustrate the readiness of students in receiving new subject matter that will be provided by the teacher. The initial ability is stored in long-term memory so that one day if needed it can be reused. Students with higher initial abilities will find it easier to understand a concept. The construction of the concept that will be studied by an individual is strongly influenced by his initial abilities (Hendryawan et al., 2017; Kozma, 2003).

The results of data analysis concluded that there was no interaction between the Children Learning in Science Model and the initial ability of students' critical thinking skills. Students' initial abilities in a class can vary in level between one student and another. This is the main thing that must be considered by teaching designers (Uno, 2008). The influence between the learning model and students' initial (low, high) ability on students' critical thinking skills is called the interaction between learning models and students' initial abilities. This is thought to be due to the strong influence of each independent variable on the dependent variable so that this factor can weaken the interaction of each variable.

CONCLUSION

Based on the research results obtained from this study as follows: (1) There is a significant difference in critical thinking skills between students in the experimental class and students in the control class, (2) there is a significant difference in critical thinking skills between students with high

initial ability and students with initial ability. against critical thinking skills of students. Referring to the research results, the suggestion in this study is a model *CLIS* to improve critical thinking. Initial ability is an internal student factor that influences critical thinking skills. Teachers must be able to awaken or improve students 'initial abilities so that students' critical thinking skills can be improved.

REFERENCES

Abidin, Y. (2011). *Penelitian Pendidikan Dalam Gamintan Pendidikan Dasar dan PAUD*. Bandung: Rizqi Press.

Abidin, Y. (2015). *Pembelajaran Multiliterasi*. Bandung: PT Refika Aditama.

Anazifa, R. D. (2016). The Effect of Problem-Based Learning on Critical Thinking and Student Achievement in the 1 Bantul Senior High School. *International Conference on Educational Research and Innovation*, *6*(2),190—193. https://doi.org/10.1080/00220671.2018.1514357

Anderson, L.W., & Krathwohl, D. R. (Eds). (2015). *Kerangka Landasan untuk Pembelajaran, Pengajaran, dan Asesmen: Revisi Taksonomi Pendidikan Bloom*. Terjemahan: Agung Prihantoro. Yogyakarta: Pustaka Belajar.

Ardiyanti, F. W. (2013). Pengaruh Model Pembelajaran Berbasis Fenomena Meningkatkan Keterampilan Berpikir Kritis Siswa Sekolah Dasar. *Kaunia: Integration and Interconnection Islam and Science*, 9(2), 27—33.

Creswell (2016) Research Design: Kualitatif, Kuantitatif, dan Campuran. Yogyakarta: Pustaka Pelajar

Kemendikbud (2014). *Materi Pelatihan Implementasi Kurikulum 2013*. Jakarta

Hair, J. F., Anderson, R. E., Tatham, R. L., & Balck, W. C. (1995). *Multivariate Data Analysis with Reading*. Fourth Edition. New Jersey: Prenctice-Hall, Inc

Hendryawan, S., Yusuf, Y., Wachyar, T. Y., Siregar, I., & Dwiyanti, W. (2017). Analisis Kemampuan Berpikir Kritis Matematis Siswa SMP Tingkat Rendah pada Pembelajaran Berbasis Masalah dengan Green's Motivational Strategies. *Aksioma: Jurnal Matematika dan Pendidikan Matematika*, *1*(1), 50-58.

Hosnan, M. (2016). *Pendekatan Saintifik dan Kontekstual dalam Pembelajaran Abad 21*. Bogor: Ghalia Indonesia.

Kozma, R. 2003. The Material Features of Multiple Representations and Their Cognitive and Social Affordances for Science Understanding. *Journal Science Direct*, 3(2), l205—226.

Limbach, B., & Waugh, W. 2010. Developing Higher Level Thinking. *Journal of Chemical Education*, 3, 1-9.

Nugraha, A. J., Suyitno, H., & Susilaningsih, E. (2017). Analisis Kemampuan Berpikir Kritis Ditinjau dari Keterampilan Proses Sains dan Motivasi Belajar melalui Model PBL. *Journal of Primary Education*, *6*(1), 35-43. https://doi.org/10.1086/688581

Praptiwi., & Handika. (2012). Efektivitas Metode Kooperatif Tipe GI dan STAD ditinjau dari Kemampuan Awal. *Jurnal Penelitian Pembelajara Fisika*, 3(1), 41-50. https://doi.org/10.1598/JAAI.52.7.6

Sugiono (2018). *Metode Penelitian Kuantitatif*. Bandung: Alfabeta

Sugiyono. (2012). *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif*

Samatowa, U, (2010). *Pembelajaran IPA di Sekolah Dasar*. Jakarta: PT Indeks

Trilling, B. & Fadel, C. (2009). *21st-Century Skills: Learning for Life in Our Times*.

San Francisco: Jossey-Bass A Wiley Imprint.

Uno, H. B. (2006). *Perencanaan Pembelajaran*. Jakarta: Bumi Aksara.

Widyarti, Aktris, dkk. (2012). Penelitian, Pendidikan dan Penerapan MIPA. Makalah disajikan dalam *Seminar Nasional Fakultas MIPA, Universitas Negeri Yogyakarta* Juni 2012