Analysis of Logical Thinking Ability in Natural Science Learning Using Blended Learning Based on Google Classroom

Henni Riyanti[1]✉ & Putri Dewi Nurhasana[2]

[1]✉Univeritas PGRI Palembang, henniriyanti@univpgri-palembang.ac.id, Orcid ID:0000-0002-7051-116X
[2] Univeritas PGRI Palembang, putridewi.nurhasana@univpgri-palembang.ac.id,
 Orcid ID:0000-0001-8793-9800

Article Info	Abstract
	The ability to use technology during the COVID-19 pandemic is needed to empower logical thinking ability as one of the 21st-century competencies. This study aims to analyze the effect of learning natural science assisted by google classroom on improving students' logical thinking abilities during COVID-19. The use of Google Classroom potentially facilitates educators to create creative, innovative, and collaborative blended learning to still build classroom interactions in social distancing period. This quasi-experimental research employed a pre-experimental one-group pretest-posttest design. The research subjects were 39 sixth-grade students. The validity and reliability of the data on the ability to think logically used a logical thinking ability instrument tested. The data analysis utilized the N-gain test with the help of SPSS 21. The results revealed that the N-gain was 82.43 or 82.4%, with a minimum N-gain score of 53.3% and a maximum of 83.5%, included in the high category (g) ≥ 0.7. Thus, it could be concluded that natural science learning assisted by Google Classroom media significantly affected students' logical thinking abilities. Educators can use the analysis results to evaluate natural science learning, especially in elementary schools, to encourage the quality of students' logical thinking abilities.
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Info Artikel	Abstrak
	Kemampuan menggunakan teknologi pada masa pandemi COVID-19 dibutuhkan untuk memberdayakan kemampuan berpikir logis sebagai salah satu kompetensi abad ke-21. Penelitian ini bertujuan untuk menganalisis pengaruh pembelajaran IPA berbantuan google classroom terhadap peningkatan kemampuan berpikir logis siswa selama COVID-19. Penggunaan Google Classroom berpotensi memfasilitasi pendidik untuk menciptakan blended learning yang kreatif, inovatif, dan kolaboratif untuk tetap membangun interaksi kelas dalam masa social distancing. Penelitian kuasi eksperimental ini menggunakan desain pre-eksperimental one-group pretest-posttest design. Subjek penelitian adalah 39 siswa kelas enam. Validitas dan reliabilitas data kemampuan berpikir logis menggunakan instrumen kemampuan berpikir logis yang diuji. Analisis data menggunakan uji N-gain dengan bantuan SPSS 21. Hasil penelitian menunjukkan bahwa N-gain sebesar 82,43 atau 82,4%, dengan skor N-gain minimal 53,3% dan maksimal 83,5% termasuk dalam kategori tinggi (g) $\geq$ 0,7. Dengan demikian, dapat disimpulkan bahwa pembelajaran IPA berbantuan media google classroom berpengaruh signifikan terhadap kemampuan berpikir logis siswa. Hasil analisis dapat digunakan oleh pendidik untuk mengevaluasi pembelajaran IPA khususnya di sekolah dasar untuk mendorong kualitas kemampuan berpikir logis siswa.
Kata Kunci:	Kemampuan Berpikir Logis, Blended Learning, Google Classroom
Cara Mensitasi:	Riyanti, H. & Nurhasana, P. D. (2021). Analysis of logical thinking ability in natural science learning using blended learning based on Google Classroom. *EduBasic Journal: Jurnal Pendidikan Dasar, 3*(1), 29-36.

INTRODUCTION

The demands of the 21st century have led to educational reform in Indonesia regarding pedagogical change. Afandi et al. (2018) stated that the change in learning pedagogy in the 21st century is a change in traditional teaching that emphasizes Low Order Thinking Skills (LOTS) into learning that highlights High Order Thinking Skills (HOTS).

Logical thinking ability is one of the Higher Order Thinking Skills that individuals need to understand concepts and solve complex problems (Riyanti et al., 2018). Thinking ability also is defined as a process in which students develop ideas, discover knowledge, and solve problems in their lives (Suhirman & Yusuf, 2019). The ability to think logically has a role in connecting the concept of natural science with the knowledge and experience in its cognitive structure so that students can understand the concept and make decisions to solve a problem (Riyanti et al., 2019).

Judging from its characteristics, NSTA (2013) explained that natural science learning has difficulties because of the students' difficulties from a concept's complexity due to the information's complexity, the material's characteristics, and the many biological terms that are difficult for students to master.

Moreover, the emergence of the COVID-19 virus at the end of 2019 immediately became a hot issue in the world of global education, including for education in Indonesia. Through Circular Number 262/E.E2/KM/2020, The Ministry of Education and Culture advised the learning process to be carried out at home, either online or offline, to reduce the spread of disease outbreaks. It is homework for Indonesian educators to design lessons that can provide opportunities for students to develop their abilities and achieve learning goals.

Mulenga and Marbán (2020) stated that one positive way that can be done to respond to the COVID-19 pandemic is to implement digital learning in the education process. Perienen (2020) added that technological developments affect almost all areas of life, one of which is education. Adverse impacts can occur if educators are not responsive in

fulfilling the elements of the education process and educational facilities (Sintema, 2020).

The interaction limitation due to the COVID-19 pandemic has indirectly directed a shift in the educational paradigm to digital learning. In this case, blended learning is a learning method that combines offline and online meetings (Murtikusuma et al., 2019; Spring et al., 2016). One of the advantages of blended learning was expressed by Pappas (2015); namely, learning takes place more effectively. One of the digital learning platforms that are easy to use and access is Google Classroom.

In addition to the class discussion platform, there are also classwork features in Google Classroom, including (1) assignments, (2) quizzes, (3) questions, and (4) material. Giving topics on the assignment feature in Google Classroom is used to emphasize the students' active roles to construct an understanding of the themes/topics they are learning using their language, ideas, and thoughts. The construction of these ideas is closely related to the knowledge and experience that each student has. These student activities can direct them to improve their logical thinking abilities and optimize their reasoning power. Using Google Classroom can make it easier for educators to manage creative and innovative blended learning. Teachers can easily create collaborative classes to build their students' interactions (Gunawan et al., 2020).

Teachers perceive Google Classroom as an alternative facilitation tool that can be used for document management and basic classroom management, without having a significant impact on teaching methodologies for elementary school students (Azhar & Iqbal, 2018). Another research also found that the majority of the students felt satisfied with the Google Classroom tool that was introduced in the class where all ratios are above averages (Shaharanee et al., 2016; Sukmawati & Nensia, 2019).

Based on the description, natural science learning using blended learning based on Google Classroom is considered effective in developing students' logical thinking abilities. Therefore, it is vital to analyze students' logical thinking abilities in natural science learning using blended learning based on Google

Classroom. This study aimed to determine students' logical thinking abilities in natural science learning using blended learning based on Google Classroom.

METHODS

This quasi-experimental research design used a pre-experimental design. The research was conducted at the State Elementary School of 91 Palembang. The research population in this study were students of class VI a, b, and c, with a total population of 90 students. Meanwhile, the research sample was students of class VI c of the State Elementary School of 91 Palembang, with a total of 39 students. They were selected employing random sampling techniques because each individual in the population, either individually or in groups, was given the same opportunity to be selected as the research sample.

The instrument utilized in this study was the Logical Thinking Ability Test Instrument. Indicators of logical thinking abilities used in this study referred to Stevens in *How to be a Better Problem Solver*, including sorting, comparing, contrasting, evaluating, and selecting. The instrument was tested using item validation and met the requirements for difficulty level, discrimination power, and item reliability.

In this study, the validity calculation was conducted utilizing SPSS. The item is valid if the value is Sig. > 0.05. Furthermore, the item reliability test was done by calculating Cronbach's Alpha value using SPSS. Based on the results of the calculation performed, Cronbach's Alpha value of 0.672 was obtained. Based on these results, the test instrument met the validity and reliability test requirements for research purposes.

Logical thinking ability data was obtained from the test results. The test was made in the form of questions with answers in the form of descriptions that referred to the five indicators of students' logical thinking abilities. The test results came from pre-test and post-test data on logical thinking abilities. The data analysis technique employed the normality test, homogeneity test, and N-Gain.

$$\text{N-Gain} = \frac{Post-test\ Score - Pre-test\ Score}{Maximum\ Score - Pre-test\ Score}$$

N-gain is used to find the change in the class average score divided by the maximum possible gain indicating the improvement or differences. Then, the normalized gain (n-gain) was interpreted according to the criteria by Hake (2002), as in the table below:

Table 1. Gain Score Categories (Hake, 2002)

Interval	Category
$(g) \geq 0{,}7$	High
$0{,}7 > (g) \geq 0{,}3$	Moderate
$(g) < 0{,}3$	Low

RESULTS AND DISCUSSION

Data Analysis

The data analysis technique used in this study was N-Gain. The prerequisite tests were first carried out by testing the data normality and homogeneity on the logical thinking ability data obtained.

Normality Test

The normality test was performed using the Kolmogorov-Smirnov normality test utilizing SPSS 21. To fulfill the prerequisite of a parametric test, the data should be normally distributed. The proposed hypothesis is:

H_0: Data is normally distributed.
H_a: Data is not normally distributed.

The data normality test results using SPSS 21 are presented in Table 2 below.

Table 2. Normality Test

	Class	Kolmogorov-Smirnov[a]		
		Statistic	*df*	*Sig.*
Logical thinking ability	Experiment	0,256	8	0.131

Based on these data, it was known that the significance value obtained for logical thinking ability was 0.131> 0.05; thus, it could be concluded that the data were normally distributed.

Homogeneity Test

The homogeneity test was conducted using the Levene test with SPSS 21. To fulfill the prerequisite of a parametric test, the data should be homogeneous. Conclusions were drawn using the principle that the data is said to be homogeneous if the Sig. > 0.05. The proposed hypothesis is:

H_0: Data is homogeneous.
H_a: Data is not homogeneous.

Homogeneity test data obtained from this study are displayed in Table 3 below.

Table 3. Homogeneity Test

	Levene Statistic	*df1*	*df2*	*Sig.*
Logical thinking ability	0.097	1	76	0.774

Based on the homogeneity test results, the significance value of 0.774 > 0.05 was obtained. Therefore, it could be denoted that the data used were homogeneous.

N-Gain test

In this study, testing the improvement of students' logical thinking abilities was carried out using the N-Gain (g) test with SPSS 21. The SPSS 21 test results are shown in Table 4.

Table 4. N-Gain Test of Logical Thinking Abilities

	Descriptive		
	Class	Statistic	Std. Error
N-gain percentage	Pre-test Mean	43.32	
	Pre-test Minimum	30.43	2.251
	Pre-test Maximum	35.00	
	Post-test Mean	82.43	
	Post-test Minimum	53.33	2.642
	Post-test Maximum	83.57	

The calculation results of the N-gain score test above showed that the mean N-gain score for the pre-test class before implementing natural science learning using blended learning based on Google Classroom was 43.32 or 43.3%, with a minimum N-gain score of 30.43% and a maximum of 35%, included in the low category. Meanwhile, the mean N-gain score for the post-test class after implementing natural science learning using blended learning based on Google Classroom was 82.43 or 82.4%, with a minimum N-gain score of 53.3% and a maximum of 83.5%, which was a high category.

Discussion

The use of appropriate learning media in the learning process is one way that can be used to provide opportunities for students to develop thinking abilities (Nihayah et al., 2019). Not all learning media can be utilized to empower students' logical thinking abilities, but they must include student activities (Pamungkas & Setiani, 2017): (1) students are faced with problems that require solutions, (2) raise doubts and questions to be answered, (3) connecting facts with relevant information, (4) drawing conclusions based on generalizing data, and (5) testing students' reasoning. The varying opinions about the effectiveness of online learning have led to greater confusion about education institutions should use these tools (or even if they should implement them at all) and how educators can use students' appetite medium to enhance learning in boosting the higher order thinking skill of students (Putra et al., 2020).

In this study, by learning natural sciences using blended learning based on Google Classroom, there were activities in which students faced problems in the surrounding environment. The presentation of problems that require logical interpretation directly affects providing support for empowering students' logical thinking abilities and problem-solving (Seyhan, 2015). This problem then provokes students' logical thinking power to relate it to the existing knowledge in their cognitive structure to produce problem-solving solutions.

Furthermore, at the end of the learning process, there was a test of student reasoning through the phenomena given by the teacher. Riyanti et al. (2019) revealed that the importance of testing students' logical thinking is to train students to use the concept of generalizing the ideas they have learned about events that occur in nature. It will then

generate self-confidence and motivation to develop ideas and make it easier for students to use their logical thinking abilities in their daily lives.

The increase in students' logical thinking abilities who got learning natural science assisted by Google Classroom was better, in the high category. At the beginning of learning using Google Classroom, students explored their knowledge to obtain alternative solutions to problems from the images obtained. Based on Ausubel's (1968) theory in *Educational Psychology: A Cognitive View*, student activities to connect their knowledge to real events make learning meaningful.

Google Classroom provides a kind of learning process that encourages student participation in the process of making summaries, providing logical explanations, and proving based on the data using responses (Fadiana et al., 2019; Papadopoulos et al., 2017). The events given are a phenomenon closely related to the students' daily experiences. The presentation of problems that require logical interpretation provides support for empowering students' logical thinking abilities and problem-solving (Lierde et al., 2013; Seyhan, 2015).

CONCLUSION

Based on the analysis and description of the research results that have been carried out, it could be concluded that the students' logical thinking abilities who received natural science learning using blended learning assisted by Google Classroom increased into the high category. Learning took place better in the aspect of providing real phenomena, which required students to use their reasoning to think logically about the relationships contained in the phenomena given. The analysis results can be used by educators to evaluate natural science learning, especially in elementary schools, to encourage the quality of students' logical thinking abilities. For future researchers, this study can be used as a reference in carrying out similar research on other materials and developing a better logical thinking ability test instrument.

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