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Video-Assisted Inquiry Learning in Science Lessons and Implementation to Enhance Students' Critical Thinking Abilities in Elementary School

Mayarni[1,2]; Fasli Jalal[1]; M. Syarif Sumantri[1]

[1] Pascasarjana Universitas Negeri Jakarta, Indonesia,

[2] Universitas Muhammadiyah Prof. DR. Hamka, Indonesia

E-mail: mayarni_7527167504@mhs.unj.ac.id

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Abstract

This research aims to see the impact of inquiry-based learning (IBL) using video-assisted has on science studies on critical thinking ability. The study used a total of 58 students from both classes VA as an experiment class and VB as an expository class, conducted in one of Bekasi elementary schools. This research used a mixed method, while tests, surveys, interviews, and observations were used for the data gathering. The tests have been tested for validity and reliability. This study also used pre-test and post-test of the control group design. According to Kolmogorov Smirnov, the results of the N-Gain score from experiment class Sig. is 0.98 > 0.05 and the N-Gain result from the expository class is 0.20 > 0.05, thus, this means that both of the class have normal distribution classes. Homogeneity test using SPSS 22 produces a Sig. value of 0.292 > 0.05, this means both data are homogeneous then analysis followed through the T-test. Based on the independent sample test in Levene's Test for Equality of Variances conclude that Sig. the score is 0.000 < 0.05. This means, there is a significant difference in effectiveness between the use of inquiry-based learning with video-assisted-in experiment class to improve the critical thinking ability of students in class V elementary school in Bekasi. Then, in conclusion, H0 is denied and H1 is approved, which means that the user of inquiry-based learning with video assistance can improve students' critical thinking skills in class V on the science subject of human motion tools.

Keywords: *Video-Assisted Inquiry; Critical Thinking; Science; Elementary School*

Introduction

Critical thinking is the ability to systematically evaluate personal opinions and the opinions of others, and can argue in an organized manner and is used in decision-making activities, solving problems, analyzing assumptions, and conducting scientific research (Cahyana et al., 2017). Meanwhile, according to (Anggraeni et al., 2018) critical thinking is a type of thinking that goes to one point or converges.

According to another opinion, critical thinking is the ability of a person who can take advantage of ideas, and information or look for additional relevant information and modify it to produce the best idea (Hidayah et al., 2017). Most of the time, critical thinking is referred to as a metacognitive process that combines several sub-skills such as analysis, assessment, and inference) that, when properly applied, could increase the likelihood of creating a logical conclusion to an argument or solution to a problem (Dwyer et al., 2014). Critical Thinking requires one's effort to collect, interpret, analyze and evaluate the information to arrive at a reliable and valid conclusion (Chukwuyenum, 2013). From some of the views expressed above, it can be inferred that critical thinking is a type of thinking of a person who can take advantage of ideas, find relevant information to solve problems, explore assumptions, and conduct research to make decisions.

Numerous measures can be taken to increase one's critical thinking abilities in the context of problem-solving, (Fakhriyah, 2014) namely:

1) Identify the problem, and the suitability of the information obtained. 2) Explore interpretation. 3) Define alternatives as solutions. 4) Communicate conclusions.

The advancement of science and technology requires a person to master knowledge and information. This ability also requires critical thinking, systematic thinking, logic, and creativity (Siregar et al., 2020). According to (Sari & Winda, 2019) communication, collaboration, critical thinking, and creativity are essential to prepare students for the 21st century. One of the key skills that must be taught is critical thinking (Fisher, 2009). In line with previous opinions, according to (Indraswati et al., 2020) one of the high-level thinking components that are the focus of 21st-century learning is critical thinking skills. Based on research conducted by (Susilowati et al., 2018) and (Utami et al., 2019). Because critical thinking is a complicated idea that calls for both cognitive abilities and affective dispositions, and this has an impact on how some teachers teach it to their students (Chukwuyenum, 2013). Therefore, critical thinking is very much needed to prepare students to be able to compete in life in society they can.

Now we have entered the twenty-first century (21st century), which is a century that requires everyone in various fields to be able to improve digital literacy, including work related to teaching. According to one of the studies, the 21st century is a century known for the transformation from an industrial society to a knowledgeable society (Sari & Winda, 2019) or it can also be called from manufacturing services to services that emphasize knowledge and information (Scott, 2015a). According to the article (Scott, 2015b), key elements in 21st-century learning include communication, collaboration, informal learning, content creation, and the value of possessing human qualities like initiative, accountability, risk-taking, networking, empathy, and compassion in addition to managerial and metacognitive abilities. This means that teachers must be able to master various important elements in 21st-century learning, including being able to make the most of the network.

In this case, teachers must be initiated to design a learning process that utilizes technology, one of which is by making learning videos. Learning videos are one of the references for the use of innovative and interesting media and utilize digital that is suitable for 21st-century learning, besides that the use of videos can motivate students in learning science because watching videos as if they are in the real world (Rahmawati & Atmojo, 2021). The use of video media in science learning in grade V elementary schools also received great attention from teachers, and students became easier to understand science learning material (Risky, 2019).

However, for high-grade primary school kids to see the greatest gains in their capacity for critical thought, it is certainly not enough to present the learning process in the form of videos. An educator must think even harder to design a learning process that allows students to be motivated to improve their critical thinking skills. One of the things worth considering is the choice of the use of learning models. A

study developing a model offered that "Inquiry-based learning (IBL) to improve critical inquiry-based learning (CIBL) ability (Prayogi et al., 2018)".

Inquiry-based learning (IBL) is a type of learning that uses inquiry as a tool to explore and learn information. Learning with an inductive approach begins with observing problems in the data or complex world, when students study data or problems they create a need for facts, procedures, and principles. According to research (Kamal & Suyanta, 2021), In the experiment class, critical thinking abilities are higher than in the control class as a result of inquiry-based learning because at each step of inquiry learning at every step students will be conditioned for the improvement of critical thinking abilities for educational purposes.

(Hamruni, 2012) explains some of the things that are the main characteristics of learning strategies. The first focus of the inquiry is the activity of looking for and discovering. Second, it is assumed that all of the activities students complete will encourage a confident attitude because they are all designed to help students discover and independently arrive at solutions to problems. Third, the goal of employing learning methodologies is to foster systematic, logical, and critical thinking, or to foster intellectual prowess as a component of mental processes.

Learning objectives using the inquiry-based learning method in a scientific approach includes several things, including strengthening students' cognitive skills, particularly their capacity for high-level thinking, developing their systematic problem-solving skills, establishing an environment in which students sense a need to study, achieving excellent learning results, teaching students how to communicate ideas, especially when writing scientific publications, and helping them to develop as people (Kusmaryono, Heru, & Setiawan, 2013).

Methods

This type of research is quasi-experimental research. Pseudo-experimental research was carried out to determine the differences in treatment regarding the characteristics of the subjects studied. In pseudo-experimental research, it is not possible to control all relevant variables. The purpose of this study is to ascertain the difference between science learning and video-assisted IBL strategies and with an expository defense strategy on critical thinking skills and scientific attitudes of grade V elementary school students. Pseudo-experiments in which treatment cannot be fully controlled by researchers (Laursen et al., 2014). Pseudo-experimental research was carried out to determine the differences in treatment to the characteristics of the subjects studied. Meanwhile, experimental research is a study in which researchers manipulate subjects given or not given treatment, and fully control the scare over treatment, as well as compare the results of the two different treatments (Hasnunidah, 2017).

This research was carried out at SDN Jati Rangon II, which is a high-grade elementary school student, in this case, a grade V elementary school student. The time for the research is from July to September 2022. The design of this experimental research is the non-equivalent pretest-posttest group design. According to (Bulus, 2021), a non-equivalent pretest-posttest group design is an unscrambled sample and a sample size of less than 70 for different domains and results. Based on the design, the first step to take is to determine the experimental and control group. The second step is to give the same pretest (initial test) to the experimental and expository groups. Then the experimental group was given a different treatment from the expository group, namely learning with video-assisted IBL and expository classes were not given. This learning lasted for six meetings on theme 1 and two sub-themes until the 6th lesson in sub-theme 2. After that, the same posttest was administered to the experimental and control groups.

Results and Discussion

Based on the results of the analysis of experimental class data, the pretest score of the experimental class was obtained, namely, the data on the learning outcomes of the critical thinking ability of Natural Sciences (IPA) students class VA at SDN Jatiranggon II with the highest score is 67, the lowest score is 17, the average of 27 students are 45.85, and the deviation of 12,594 can be seen in the table as follows in Table 1

Table 1. Score Pretest Experiment Class

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
17	1	3.7	3.7	3.7
28	4	14.8	14.8	18.5
37	2	7.4	7.4	25.9
42	3	11.1	11.1	37.0
45	2	7.4	7.4	44.4
47	3	11.1	11.1	55.6
48	2	7.4	7.4	63.0
50	1	3.7	3.7	66.7
53	2	7.4	7.4	74.1
55	1	3.7	3.7	77.8
58	3	11.1	11.1	88.9
62	1	3.7	3.7	92.6
67	2	7.4	7.4	-
Total	**27**	**100.0**	**100.0**	**100.0**

The table above shows a description of the experimental class pretest data. In the table, it is clear that the description of each student's overall score acquisition shows the highest score of 67 for as many as 2 students and the lowest score of 17 for as many as 1 students.

Based on the results of the experimental class research analysis, data on the results of posttest learning results for critical thinking ability of Natural Sciences (IPA) students of class 5A at SDN Jatiranggon II with the highest score is 95, the lowest score is 63, the average is 80.78, and the standard deviation is 8,776. Of the 27 students in the experimental class, researchers had different student post-test results, which can be seen in the distribution table 2.

Table 2. Score Posttest Experiment Class

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
63	2	7.4	7.4	7.4
68	1	3.7	3.7	11.1
72	1	3.7	3.7	14.8
73	1	3.7	3.7	18.5
75	2	7.4	7.4	25.9
77	3	11.1	11.1	37.0
78	2	7.4	7.4	44.4
80	3	11.1	11.1	55.6
83	1	3.7	3.7	59.3
85	4	14.8	14.8	74.1
88	1	3.7	3.7	77.8
90	1	3.7	3.7	81.5

92	3	11.1	11.1	92.6
93	1	3.7	3.7	96.3
95	1	3.7	3.7	-
Total	**27**	**100.0**	**100.0**	**100.0**

The table above shows a description of the experimental class post-test data. In the table, it is clear that the description of each student's score as a whole shows the highest score of 95 for as many as 1studentst and the lowest of 63 for as many as 2 students.

Based on the results of the expository class research analysis, data on the learning outcomes of critical thinking ability of Natural Sciences (IPA) students of class VB at SDN Jatiranggon II with the highest score is 58, the lowest score is 11, the average of the 27 students is 36.16, and the standard deviation is 12.31. During the pretest experimental class, researchers have different results that can be seen in the following table 3.

Table 3. Score Pretest Expository Class

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
12	1	3.2	3.2	3.2
17	3	9.7	9.7	12.9
20	1	3.2	3.2	16.1
25	3	9.7	9.7	25.8
27	1	3.2	3.2	29.0
30	3	9.7	9.7	38.7
33	1	3.2	3.2	41.9
35	1	3.2	3.2	45.2
37	1	3.2	3.2	48.4
40	3	9.7	9.7	58.1
43	1	3.2	3.2	61.3
45	4	12.9	12.9	74.2
46	1	3.2	3.2	77.4
47	3	9.7	9.7	87.1
48	1	3.2	3.2	90.3
50	1	3.2	3.2	93.5
55	1	3.2	3.2	96.8
58	1	3.2	3.2	-
Total	**31**	**100.0**	**100.0**	**100.0**

The table above shows a description of the expository class pretest data as a control class. In the table, it is clear that the description of each student's score as a whole shows the highest score of 58 for as many as 1 student and the lowest of 12 for as many as 1 student.

Based on the results of the expository class posttest research that has been obtained, the data on the results of posttest learning ability to think using critical thinking in natural sciences subject for VB class students at SDN Jatiranggon II with the highest score is 73, the lowest score is 37, the average of the 31 students are 56.68, and the standard deviation 9,282, posttest expository classes, researchers had different results that can be seen in the table as follows:

Table 4. Score Posttest Expository Class

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
37	1	3.2	3.2	3.2
38	1	3.2	3.2	6.5
43	1	3.2	3.2	9.7
45	1	3.2	3.2	12.9
47	1	3.2	3.2	16.1
48	1	3.2	3.2	19.4
50	3	9.7	9.7	29.0
52	2	6.5	6.5	35.5
53	1	3.2	3.2	38.7
55	1	3.2	3.2	41.9
57	3	9.7	9.7	51.6
58	1	3.2	3.2	54.8
60	2	6.5	6.5	61.3
62	3	9.7	9.7	71.0
63	3	9.7	9.7	80.6
65	1	3.2	3.2	83.9
67	1	3.2	3.2	87.1
68	2	6.5	6.5	
72	1	3.2	3.2	93.5
73	1	3.2	3.2	96.8
Total	**31**	**100.0**	**100.0**	**100.0**

The table above shows a description of expository class posttest data. In the table, it is clear that the description of each student's overall score can be seen as the highest score of 73 for as many as 1 students and the lowest score of 37 for as many as 1 students.

When compared to the pretest of the experimental class using the video-assisted IBL, it is higher than the post-test of the experiment class. this we can see from the highest value of 67 and the lowest value of 17. Of the 27 students' the mean was 45.85, and the standard deviation of 12.594, the pretest of the experimental class was compared with the highest value of 95, and the lowest value of 63 means of 80.78, with a standard deviation of 8.776. Of the 27 students in the experimental class. That means the use of video-assisted IBL affects improving learning outcomes.

When compared between the pretest score and the expository class post-test, the post-test learning outcomes were higher than the pretest. This we can see, in the expository class pretest of 27 students: the highest score of 58, and the lowest score of 11. Mean 36.16, standard deviation 12.31, and posttest expository class of 31 students: highest score 73 and lowest score 37, student Mean 56.68, standard deviation 9,282. This means that expository classroom learning can also improve critical thinking skills.

However, when compared between improving the critical thinking ability of the experimental class using video-assisted IBL with expository classes. Video-assisted IBL experiments are much higher in improved learning outcomes in video-assisted IBL classes. This can be seen from the average Posttest expository class of 56.68 and the average Posttest of the experimental class of 80.78 The normality test in this study was carried out in the experimental class and expository class using the Kolmogorov Smirnov normality test, using SPSS 23. The normal test with Kolmogorov-Smirnov compares the distribution of

data to be tested normally with normal standard data that has been transformed into a Z-Score form and is presumed to be normal.

The experimental class's critical thinking ability pretest normalcy test results are as follows: Sig. > 0.05 ; 0.200 > 0.05. This indicates that the data is normally distributed because the data does not differ significantly from the standard normal data. While the results of the pretest of the critical thinking ability of the expository class were Sig. > 0.05; i.e. 0.071 > 0.05 this indicates that the data is normally distributed. Therefore, it may be said that the experimental class's pretest data and the expository class's pretest data are regularly distributed.

The results of the posttest critical thinking ability of the experimental class are Sig. > 0.05; 0.200 > 0.05 This shows that the data are normally distributed While the posttest results of the expository class critical thinking ability are Sig. > 0.05; 0.200 > 0.05 This indicates that the data is normally distributed. Therefore, it may be concluded that the experimental class and the expository class' post-test data are regularly distributed.

The results of the homogeneity test on the pretest and Posttest experimental classes and expository classes are as follows: The variance of the pretest data of the critical thinking ability of the experimental and expository classes is Sig. based on the mean > 0.05; 0.645 > 0.05 This indicates that the data variance is homogeneous. And the variance of the posttest data of the critical thinking ability of the experimental and expository classes is Sig. based on mean > 0.05; 0.740 > 0.05 This indicates that the data variance is homogeneous.

Table 5. Tests of Normality N-Gain Score of Class Experiment and Class Expository

	Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
N-Gain_Score	Experiment	.154	27	.098	.922	27	.043
	Expository	.083	31	.200*	.980	31	.823

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Normality test results using smirnov colmogorov method. N-gain score, under the stipulation that when sig. value is gained 0.05, which means the data is abnormal and when sig. > 0.05 means the data is normal. According to Kolmogorov swinov snov's method sna.0.98 > 0.05 and n-gain score sig. 0200 > 0.05 meaning the n-gain score is a normal distribution class. Once known n-gain data is normal, then the next step is to test both the n-gains on experimental classes and the capture classes, whether they are homogeneous or not. Below is shown the results of the homogeneous value n-gain test.

Table 6. Result of Homogeneity of Variance N-Gain Score

		Levene Statistic	df1	df2	Sig.
N-Gain_Score	Based on Mean	1.130	1	56	.292
	Based on Median	1.049	1	56	.310
	Based on the Median and with adjusted df	1.049	1	54.332	.310
	Based on trimmed mean	1.164	1	56	.285

Guiding decision making on the significance (sig) on base on mean, if sig value > 0.05 then the genius data, and if its significance value on base means <.05 then the data is not homogeneous. The homogenized test table above shows sig's value at the base on mean 0.292 > 0.05, and the two classes are homogeneous.

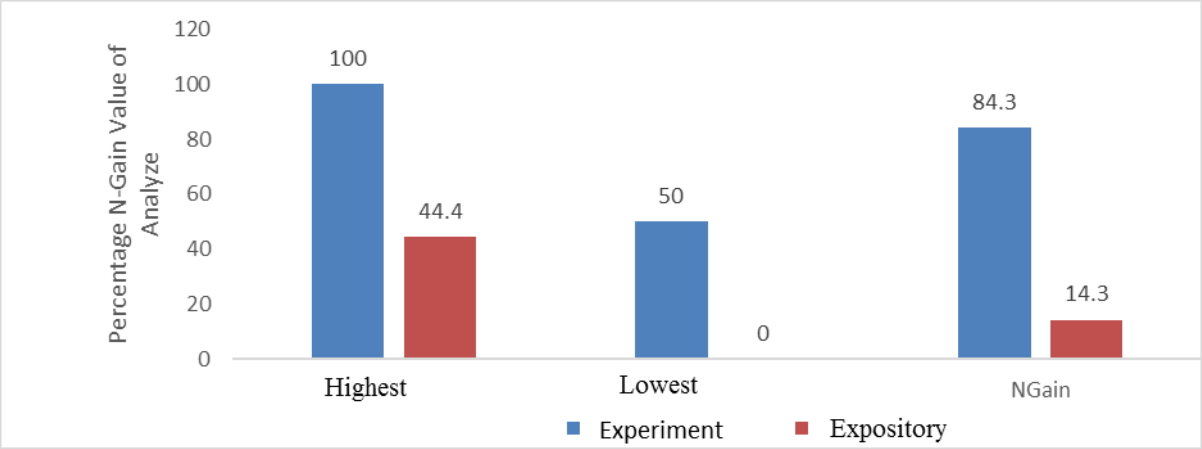

Figure 1. Diagram N-Gain Value of Analyze Indicator

The diagram above shows the difference in the n-gain value between the highest score, the lowest value, and the n-gain score by percent of experimental and exploitative classes. The highest value is n-gains experiment class 100, fact-capture class 44.4, the lowest grades of experiment class 50, the expositors class of 0.00, and the n-gains score is 84.36 percent of experiment class 84.36, discovery class 14.3. Under the experimental class, the n-gain criteria falls in the high category and the exclusion class falls in the low category.

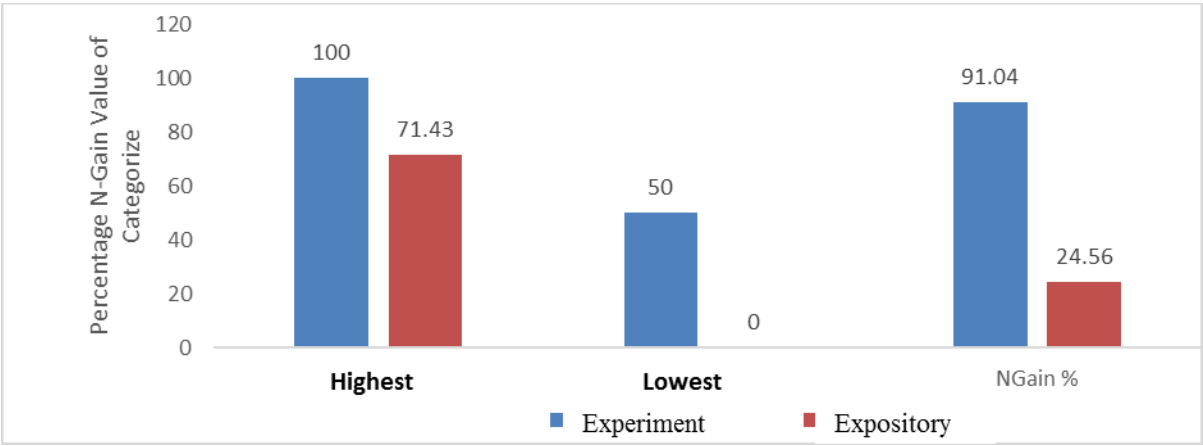

Figure 2. Diagram N-Gain Value of Categorize Indicator

The above diagram shows a difference in n-gain values between the highest value, low value, and n-gain score by percent of experimental and exploitative classes. The highest value n-gains experiment class 100, experiment 71.43 expositors, the lowest grades of experiment class 50, the exhibitionist class of.00 and the n-gain score by % of experiment class 91.04, the exhibitionist class 24.56. Under the experimental class, the n-gain criteria falls in the high category and the exclusion class falls in the low category.

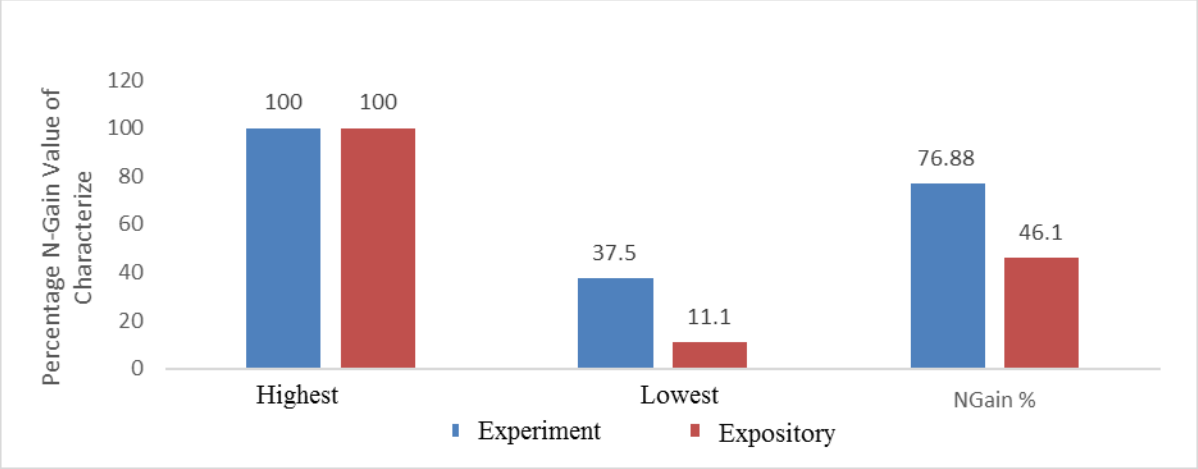

Figure 3. Diagram N-Gain Value of Characterize Indicator

The diagram above s was a difference in n-gain values between the highest value, low value, and n-gain score by percent of experimental and exploitative classes. The highest value is n-gains experiment class 100, fact-100 expositors class 100, the lowest value experiment class 37.5, the factory class 11.1 and the n-again score is 76,88. Under the n-gains experiment, class criteria fall into high categories and moderate exclusion classes.

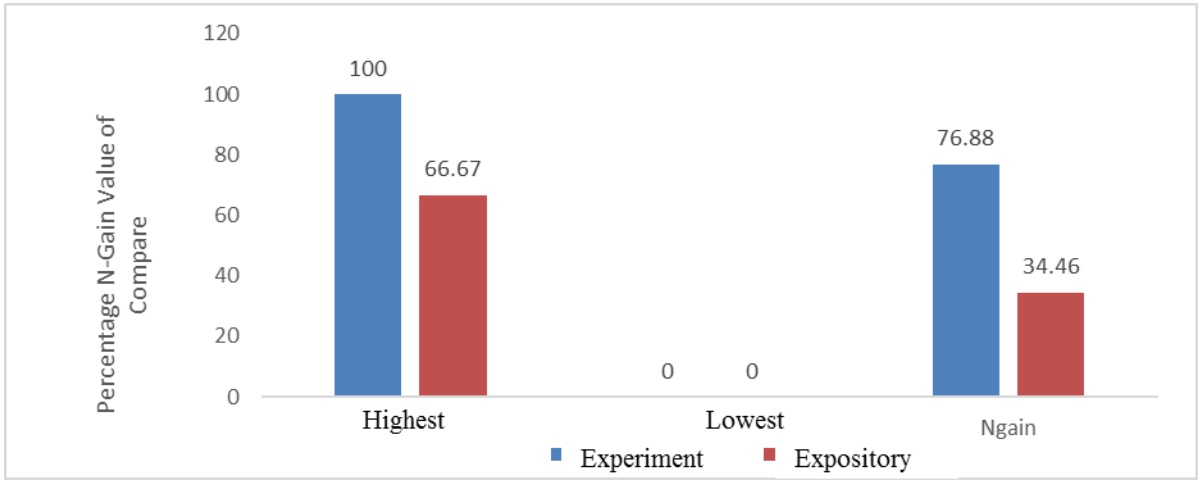

Figure 4. Diagram N-Gain Value of Compare Indicator

The above diagram shows a difference in n-gain values between the highest value, low value, and n-gain score by percent of experimental and exploitative classes. The highest value is n-gains experiment class 100, the 66.67 expository class, the lowest value of experiment class is 0.00, the exhibitionist class of 0.00, and the n-gain score percent of experiment class 76.88, the extension class 34.46. Under the n-gains experiment, class criteria fall into high categories and moderate exclusion classes.

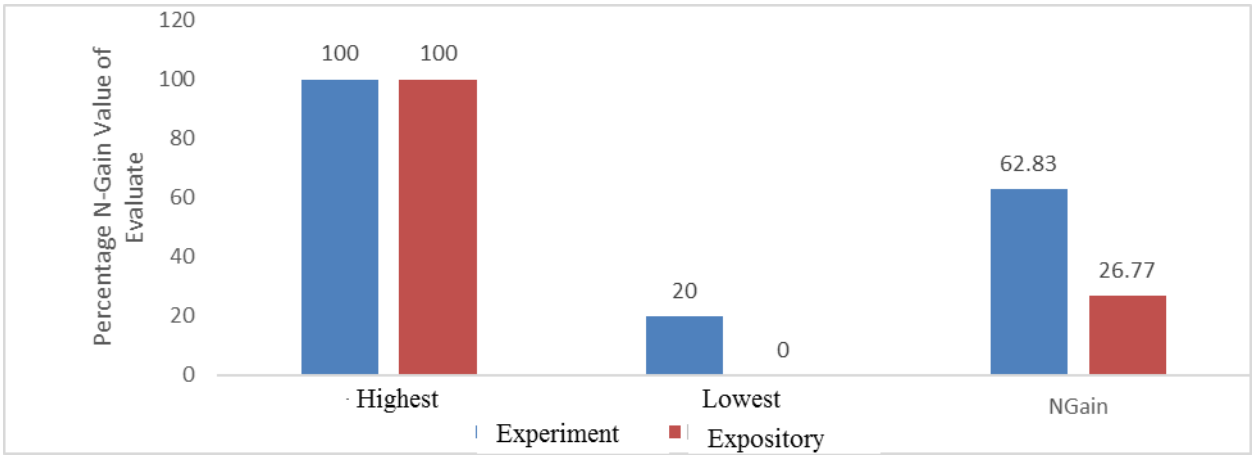

Figure 5. Diagram N-Gain Value of Evaluate Indicator

The above diagram shows a difference in n-gain values between the highest value, low value, and n-gain score by percent of experimental and exploitative classes. The highest value was n-gains experiment class 100, the risk-100 expository class 100, the lowest value of experiment class 20, the extractant class of 0.00, and the n-gains score of 62.83 experiment class 62.83, and the 26.77 expository class. Under the n-gains experiment, class criteria fall under a moderate category and the exclusion class falls into a low category.

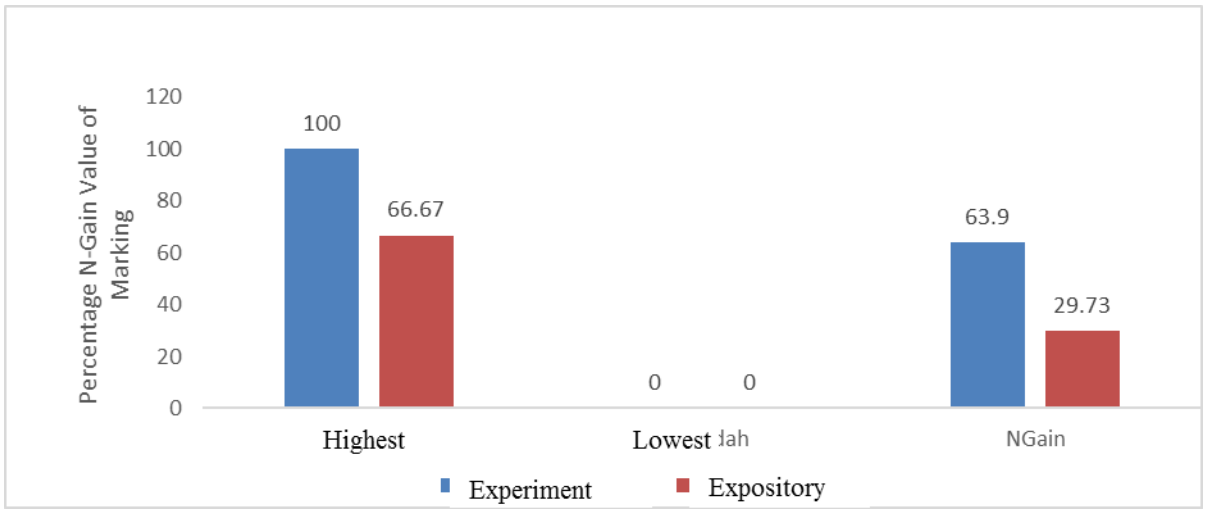

Figure 6. Diagram N-Gain Value of Marking Indicator

The above diagram shows a difference in n-gain values between the highest value, low value, and n-gain score by percent of experimental and exploitative classes. The highest value was n-gains experiment class 100, the 66.67 expository class, the lowest value of the experiment class was 0.00, the exhibitionist class of 0.00, and the n-gain score of 63.9 experiment class, the 29.73 expository class. Under the n-gains experiment, class criteria fall under a moderate category and the exclusion class falls into a low category.

Table 7. T-test Results Of Class Experiment and Class Expository

Independent Sample Test										
		Levene's Test for Equality of Variances		T-test for Equality of Means						
		F	Sig	t	df	Sig. (2-tailed)	Mean	Std. Error Mean	95% Confidence Interval of the Difference	
									Lower	Upper
Pair 1:	Equal Variances assumed	.764	.386	19.014	56	.000	71.04326	3.73641	63.55833	78.52818
	Equal Variances not assumed			19.133	55.855	.000	71.04326	3.71304	63.60472	78.48180

The results of the t-test results are viewed on sig. (2-tailed) n-gain percent equal variances acquired by sig. 0,000.0,000.05, and the results of t-tests deduced there is a significant difference between the average results of learning the critical thinking ability of the experimental class and the average results of learning the critical thinking ability of the exposit class. Based on the statistical chart calculative table 4.8 above in any mean experiment class and mean the expository class 75.88 mean experiment class and 33.66 mean expository class.

From the description above it can be concluded that H_0 is denied and H_1 received, which means the use of inquiry-based learning with video aid can enhance the thinking ability of the student class v elementary science materials on animal and human motion materials. As a result, it can be argued that inquiry-based learning of science lessons has a greater favorable impact on student's critical thinking skills (Duran & Dökme, 2016). The results are also in line with Triyono et al., (2022) research that inquiry-based learning using video-assisted significantly improves students' critical thinking ability.

Conclusion

From the results and discussions, can be summarized that H_0 was denied and H_1 was received. It can be said that using video-assisted the inquiry-based learning (IBL) method to teach primary school students in grade V has a significant positive impact on their critical thinking abilities. Meanwhile, the use of expository learning methods in schools is considered ineffective to boost the critical thinking abilities of grade V elementary school students.

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