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#### Abstract





This research will describe the interaction of learning and gender approaches to the critical thinking skills of Science Elementary School students. This study used a quasi-experimental design method using a 2 x 2 factorial research design and saturated samples. Data were collected using the essay questions given at the beginning and end of the treatment. Test the hypothesis using Two way ANOVA. This study resulted in differences in critical thinking skills among students who were given treatment with video-based IBL approach in science learning is higher than conventional. Critical thinking skills among the group of female students outnumbered male students. There is no interaction effect of the video-based inquiry-based learning (IBL) strategy and gender on critical thinking skills. In the group of female students, the critical thinking ability of students who were given a video-based IBL approach was higher than conventional. In the group of male students, students who received a video-based IBL approach demonstrated greater critical thinking skills than conventional students. In the group of students who were given a video-based IBL approach, female students outperformed male students in critical thinking abilities. Male students have a stronger critical thinking capacity than female students in the group of students given the standard approach.

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**Research Article****Video-Based IBL and Conventional Approaches to Critical Thinking Skills in Terms of Gender \***Mayarni MAYARNI <sup>1</sup>  Fasli JALAL <sup>2</sup>  M. Syarif SUMANTRI <sup>3</sup>  Wardani RAHAYU <sup>4</sup> **Abstract**

This research will describe the interaction of learning and gender approaches to the critical thinking skills of Science Elementary School students. This study used a quasi-experimental design method using a 2 x 2 factorial research design and saturated samples. Data were collected using the essay questions given at the beginning and end of the treatment. Test the hypothesis using Two way ANOVA. This study resulted in differences in critical thinking skills among students who were given treatment with video-based IBL approach in science learning is higher than conventional. Critical thinking skills among the group of female students outnumbered male students. There is no interaction effect of the video-based inquiry-based learning (IBL) strategy and gender on critical thinking skills. In the group of female students, the critical thinking ability of students who were given a video-based IBL approach was higher than conventional. In the group of male students, students who received a video-based IBL approach demonstrated greater critical thinking skills than conventional students. In the group of students who were given a video-based IBL approach, female students outperformed male students in critical thinking abilities. Male students have a stronger critical thinking capacity than female students in the group of students given the standard approach.

**Keywords:** Critical thinking, inquiry based learning, conventional, gender**1. INTRODUCTION**

The drawback for weak critical thinkers can be divided especially in two categories; First they are generally more likely to score poorly when compared to high critical thinkers. Secondly generally they have less motivation in improving their critical way of thinking in a positive direction (Stockdale, 2003). But what cannot be denied is that one of the causes of unmotivation of students in improving critical thinking is that teachers are very often the main source of all information so that Students lack the chance to engage in learning activity, students become passive, because students are rarely given the opportunity to convey their arguments against solving existing problems (Bustami, Syafruddin, & Afriani, 2018). The statement describes that what happens in schools is that the learning process is dominated by teachers and students only receive teacher orders. It is clearly not trying to change from active teachers to active students, of course, will make the development of students' analytical abilities will not progress in a positive direction in terms of improving critical thinking skills.

A person must become proficient in more advanced information as the development of science and technology increasing. To achieve this requires critical, logical, and acceptable thinking (Siregar,

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Mujib, Hasratuddin, & Karnasih, 2020). According to (Sari & Winda, 2019) critical thinking, thinking creativity is very necessary in order to be capable of competing in life in the 21st century. Critical thinking is one that needs to be learned from an early age (Fisher, 2009). Indraswati, Marhayani, Sutisna, Widodo, and Maulyda, (2020) explained that one thing that becomes a high-level thinking point to focus on in 21st century learning is the skill to be able to think critically. In another research article submitted by (Susilowati, Relmasira, & Hardini, 2018) and (Utami, Koeswati, & Giarti, 2019) critical thinking is needed for learners to be capable of competing in real society. Some previous opinions can be concluded that it is very important to teach critical thinking and should start from elementary school. This is important because it will be used in real life.

This statement is also reinforced by the opinion expressed in the article which states that critical thinking capacity still needs to be improved Dwi Ferdiani, Yudiono, and Murniasih, (2019) states that critical thinking of high-class elementary school children is found to be still low. Likewise, the results of PISA in 2018, Indonesia's value for critical thinking is lower than the OECD mean, especially in reading, science, and mathematics (OECD, 2018). However, if students since primary education is given an education that is able to develop critical thinking skills, it will have a real impact in a positive direction in the lives of students at a later stage (Richardson, 2016). Some of the findings of the preceding study is that primary school critical thinking abilities children need to be improved and should have started since elementary school.

In addition to the importance of efforts to enhance critical thinking abilities, there are several factors that can affect students' ability to think critically, one of which is gender. According to a research article stated that the IBL approach can eliminate the gender gap and can improve interest and learning outcomes (Khalaf & Zin, 2018). Likewise, the findings stated that inquiry learning in samples taken in Beijing reported an increase in student learning activities and that a sample of Dutch students in some lessons liked inquiry activities (Huang, Doorman, & van Joolingen, 2021).

Critical thinking is a skill to make essay questions so that it can be seen the depth of the student's ability to make questions and classify arguments, define and capture the content of a general concept. Critical thinking is a way of thinking where when someone has a goal in his mind then he wants to know how to achieve it and question what is right, what is wrong, what is believed, and what is rejected. Critical thinking is a powerful and much-needed thinking (Facione, 2011). Critical thinking is mind control, which develops high thinking skills and can help control propaganda, analyze arguments and be aware when there is intentional deception and be able to consider the truth of the source of information and be able to think about the best decision (Halpern, 2013).

According to Wiyoko, (2019) critical thinking skills must be trained starting from elementary school. Thinking skills from the very beginning became the best basis for his further schooling. A critical thinker can influence the effectiveness of learning as well as the speed of learning, and the ability to learn (Heong, Othman, Yunos, Kiong, Hassan, Bin & Mohamad, 2011).

The opinions above can be concluded that, critical thinking is a way of thinking that is able to control the mindset in order being able to think clearly, and be able to analyze arguments and not easily propagated, and have goals and be able to think how to achieve them. One of these goals can be achieved by providing essay questions as often as possible to be able to pour ideas or thoughts in solving them.

### **1.1. Aim of Study**

The results are expected to provide additional knowledge and scientific insight not only for the field of basic education, but also for researchers and academics engaged in all fields of education in general.

## 2. METHOD

### 2.1. Research Model

This research is a quantitative research with quasi experiment method. Quasi experiment is an experiment in which the treatment can not be fully controlled by a researcher (Laursen, Hassi, Kogan, & Weston, 2014). Experimental research is research in which a researcher manipulates subjects to be treated or not, and controls the treatment fully and compares the results between different treatments (Hasnunidah, 2017).

### 2.2. Participants

The target population was taken as a saturated sample consisting of two classes, Class A and Class B. Next, Class A was designated as the experimental class, whereas Class B was designated as the control class. The number of Class A students is 27 people consisting of 13 female and 14 male students. The number of students in Class B is 27 people, comprised of 13 male and 14 female. The research design that will be applied is treatment design by level 2x2 factorial. Sample research is an indispensable sampling, where one is unlikely to examine the entire population (Gowda, Komal, Sanjay, Mishra, Kumar, & Math, 2019). Part of the population is a source in research data collection where the population is part of the characteristics of the population (Etikan, 2016).

### 2.3. Analysis of Data

SPSS package program was used to analyze the data. The percentage frequencies of the given data were calculated, normal distribution tests were performed, and as a result of these checks, t-test was used for those with 2 variables and analysis of variance was used for multiple variables. Tukey test was used to determine the differences between groups.

## 3. FINDINGS

Interaction of inquiry based learning (IBL) and gender approaches to critical thinking skills using two way Anova analysis. Further shown is a table of descriptive statistics two way ANOVA.

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**Table 1. Descriptive statistics of IBL and gender interactions**

Dependent Variable: Critical Thinking Ability Results

Pendekatan Pembelajaran	Jenis Kelamin	Mean	Std. Deviation	N
Video-based IBL	Male	71.0921	14.74155	14
	Female	81.1246	10.09803	13
	Total	75.9226	13.48386	27
Conventional	Male	32.7613	10.53734	16
	Female	38.5618	20.92211	11
	Total	35.1244	15.51947	27
Total	Male	50.6490	23.08982	30
	Female	61.6167	26.69885	24
	Total	55.5235	25.12609	54

The table above shows descriptive statistics of 30 male students and 28 female students, as well as video-based IBL and conventional approach classes. In the table above, it can be seen the difference in the average grades of male and female students, both video-based IBL classes and conventional classes. Further examination of the normality test, the results of the test are shown in the table below.

**Table 2. Normality test**

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Standard residual for critical thinking results	.068	54	.200*	.950	54	.026

\*. This is the actual significance's lower bound.

<sup>a</sup>. Lilliefors Significance Correction

The table above shows the standardized residual value of Kolmogorov Smirnov Sig. 0.200. means the data is normal, because the value of Sig.  $0.200 > 0.050$ . Because the two-way anova condition is that the data is normal and homogeneous, the next analysis is a homogeneous test. The table below shows the results of homogeneous tests.

**Table 3. Homogeneous test**

Dependent Variable: Critical Thinking Results Test			
F	df1	df2	Sig.
1.135	3	50	.344

Homogeneous test results show the value of Sig.  $0.344 > 0.050$ , this value clearly state that the data is homogeneous. The basis of decision making is that if the level of relevance is higher than 0.05, this indicates that the data is homogeneous and vice versa, if the significance value is less than 0.05, the data is not homogeneous. The following investigation will look at the relationship between video-based IBL and gender on critical thinking skills. The chart below shows how this exam uses two-way anova to determine whether IBL and gender interact on critical thinking abilities.

**Table 4. Two way Anova test**

Test of Between-Subjects Effects						
Dependent Variable: Critical Thinking Results Test						
Source	Type III sum of squares	df	Mean square	F	Sig.	Partial eta squared
Corrected Model	23368.385 <sup>a</sup>	3	7789.462	38.594	.000	.698
Intercept	165594.948	1	165594.948	820.460	.000	.943
Approach	21685.356	1	21685.356	107.443	.000	.682
Gender	830.742	1	830.742	4.116	.048	.076
Gender Approach *	59.348	1	59.348	.294	.590	.006
Error	10091.594	50	201.832			
Total	199934.478	54				
Corrected Total	33459.979	53				

<sup>a</sup>. *R squared* = .698 (*Adjusted R squared* = .680)

The two way anova table uses the basis of decision makers, if the significance value is lower than 0.05, then there is a difference or interaction and if the significance value is greater than 0.05, then there is no difference or interaction between the video-based IBL learning approach and gender (male and female) towards critical thinking. The table above shows the video-based IBL approach and conventional learning approaches obtained Sig values.  $0.000 < 0.05$  means that critical thinking abilities differ between video-based IBL lessons and conventional classes. Furthermore, for male and female gender obtained the value of Sig.  $0.048 < 0.05$  shows male and female have different critical thinking abilities. The value of interaction between video-based IBL learning approaches obtained Sig value.  $0.590 > 0.05$  means that on critical thinking skills, there is no connection between video-based IBL and gender. Furthermore, we will see the mean value based on video-based IBL learning approach and conventional learning approach in the table below.

**Table 5. Video-based IBL approach and conventional approach**

Dependent Variable: Critical Thinking Results Test				
Learning Approach	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Video-based IBL	76.108	2.736	70.613	81.604
Conventional	35.662	2.782	30.073	41.250

The table above shows the results of critical thinking skills of video-based and conventional IBL approaches. Obtained mean based on video-based IBL learning approach is 76.108 and mean conventional approach is 35.6. The video-based IBL learning approach is much higher in the average worth of critical thinking abilities when compared to conventional classes. Further below are shown the average values by gender.

**Table 6. Difference in mean by gender**

Dependent Variable: Critical Thinking Results Test				
Gender	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Male	51.927	2.600	46.705	57.148
Female	59.843	2.910	53.998	65.688

The findings of critical thinking skills are shown in the table above. The average score based on male gender was 51,927 and the average score based on female gender was 59,843. On average, male and female students differ from one another. The average value of emale pupils have a stronger critical thinking capacity than male students, it means that the critical thinking ability of female is greater on average than male students.

The next analysis is the difference in the ability to think critically about gender separately seen from video-based IBL learning approaches and conventional learning approaches. The results of these differences are presented in the table below.

**Table 7. Learning approach and gender**

Dependent Variable: Critical Thinking Results Test					
Learning Approach	Gender	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Video-based IBL	Male	71.092	3.797	63.466	78.718
	Female	81.125	3.940	73.210	89.039
Conventional	Male	32.761	3.552	25.627	39.895
	Female	38.562	4.283	29.958	47.165

The table above shows that in the video-based IBL learning approach, the average critical thinking ability of male is 71,092 and the average critical thinking ability of female is 81,125. While in the conventional learning approach the average critical thinking ability of male obtained 32.761 and the average critical thinking ability of female obtained 38.562.

The findings of the male students hypothesis test on the difference in improving critical thinking skills in the group of students who applied the video-based IBL model with conventional shown below.

**Table 8. Independent sample test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Condence Interval of the Difference	
									Lower	Upper
Ngain Persen	Assumption of equal variances	1.789	.192	8.2	28	.000	38.25964	4.63077	28.773	47.74534
	The assumption of equal variances is not made			8.0	23	.000	38.25964	4.73517	28.469	48.04994
				80	221				35	

The hypothesis testing of the male group above was preceded by a normal test and a homogeneous test. Normal test results and homogeneous test data are normal and homogeneous. Sig Value.  $0.192 > 0.05$  at Ngain percent equal variances assumed shows homogeneous data. Further analysis of hypothesis testing as seen in the table above. The T-test table above shows the results of the t-test for mean equality on equal variances is assumed Sig. (2-tailed) 0,000. Decision-making provisions if the acquisition value  $< 0.050$  there is a difference and if  $> 0.050$  there is no difference. Based on Sig value acquisition. (2-tailed)  $0.000 < 0.050$  concluded that there are considerable distinctions. in critical thinking ability of the male group between the use of video-based IBL learning approach and the use of conventional learning approaches. On average, male get a score of 71 and female 32.7 so there are clear differences between the two treatment groups.

The results of the hypothesis test of the female students on the difference in the growth of critical thinking abilities in the group of students who applied the IBL model with conventional can be seen below.

**Table 9. Independent sample test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Condence Interval of the Difference	
								Lower		Upper
Ngain Persen	Assumption of equal variances	.154	.698	10.943	26	.000	46.9131	4.28707	38.10091	55.72532
	The assumption of equal variances is not made			11.100	25.947	.000	46.9131	4.22659	38.22438	55.60185

Hypothesis testing has met the requirements of normal and homogeneous data. Homogeneous test results seen in Ngain percent assumption of equal variances in Levene's Test for equality of variances Sig. 0,698. This significance value  $> 0.050$  then the data is homogeneous. The mean of equal variations assumed t-test for equality of means Sig. (2-tailed) 0,000. Significance value (2-tailed)  $0.000 < 0.050$  then there is a substantial distinction between the experimental class female students with conventional class female students in improving critical thinking abilities in science learning grade V primary school. On average, male students scored 81 and female students scored 38.5. On average, the disparities between the two groups were significant.

The results of the hypothesis test group of students who were given a video-based IBL approach demonstrated that female students' critical thinking abilities were superior to male. The findings are shown in the table below.

**Table 10. Results of t-test group of male and female students on video-based IBL approach**

		Levene's Test for Equality of Variances		T-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Condence Interval of the Difference	
								Lower		Upper
Critical Thinking Skill	Assumption of equal variances	1.429	.243	2.063	25	.050	10.1039	4.89750	20.19050	.01730
	The assumption of equal variances is not made			2.092	23.088	.048	10.1039	4.83005	20.09352	.11428

Due to the value of Sig. (2-tailed)  $0.050 = 0.050$ , then to take a decision on the significance of the Sig value. (2-tailed) should be smaller than 0.05. The decision-making must compare  $T_{\text{count}}$  with  $T_{\text{table}}$ . The table above shows  $T_{\text{count}}$  (2.063) and  $T_{\text{table}}$  (2.059), provided that If  $T_{\text{count}} > T_{\text{table}}$ , then reject  $H_0$  and accept  $H_1$  means there is a significant difference and if  $T_{\text{count}} < T_{\text{table}}$  there is no significant difference. Because the results obtained  $T_{\text{count}}$  (2,063)  $>$   $T_{\text{table}}$  (2,059), concluded reject  $H_0$  and accept  $H_1$  means that there is a substantial distinction between the critical thinking skills of female and male students on video-based IBL approach. On average, female students scored 81 and male students scored 71.

The results of the hypothesis test group of students given the conventional approach critical thinking ability of male students is greater than that female. The results of this hypothesis test are not proven because the male mean is 32,761 and the female mean is 38,562. Based on the results of the mean obtained by female slightly higher than male, it was concluded accept  $H_0$  and reject  $H_1$  means it is not proven that in the conventional approach of critical thinking skills of male are higher than female.

#### 4. DISCUSSION and CONCLUSION

The value of interaction between approach and gender based on t-test obtained Sig value.  $0.590 > 0.05$  means that there is no association between method and gender to critical thinking skills. This result is supported by research findings that states gender differences are not found, which is significant to the critical thinking ability posttest scores (Baker, Rudd, & Pomeroy, 2001; Bustami et al., 2018). Reinforced by the findings of research results in journals stating that male and female are not statistically distinct. from one another in applying critical thinking skills (Nurrahmah, 2015). A similar opinion is also conveyed by Mayers that there is a similarity in male and female critical thinking abilities (Myers & Dyer, 2006).

Significance value (2-tailed)  $0.000 < 0.050$  female with IBL and conventional and Sig values. (2-tailed)  $0.000 < 0.050$  male with IBL and conventional determined that there is a substantial influence between the critical thinking abilities of female with video-based IBL approach and female students using conventional approaches, as well as male students with video-based IBL approach and male students with conventional approach. The IBL approach is able to have an impact on improving critical thinking abilities in Science learning for grade V primary school students. These results are supported by similar studies that using IBL can provide a substantial impact on critical thinking abilities between video media inquiry approach and conventional approach significantly (Duran & Dökme, 2016). Similarly, the study conducted by Friedel et al., (2008), the results of his research found that inquiry can help pupils develop their critical thinking abilities. This is because the video-assisted IBL approach at every step presents students to think critically, students learn fully independently and groups and teachers only as facilitators in the process.

Male and female critical thinking differences on the video-based IBL approach obtained  $t_{\text{count}}$  (2,063)  $>$   $t_{\text{table}}$  (2,059), it means that there is a huge gap between female and male pupils' critical thinking abilities on the IBL approach. This data is evidenced by the average value of female obtain a value of 81 and male obtain a value of 71 means that female students have a greater growth in male students' critical thinking abilities. The findings of this study support previous research by Manahal that found disparities between critical thinking abilities of men and women (Manahal, 2011). In addition, gender affects students' critical thinking skills. The female gender also prefers to read and is more happy to discuss, being one of the causes of the higher critical thinking ability of the female gender while the male gender prefers practical, working on what they see, working quickly without analyzing. This statement is in line with the results of an article that women are better at learning by prioritizing language while boys prefer practical direct learning (Syahrudin-Amin, 2018). Therefore,



the use of IBL which uses a lot of language in the sense that it will make a lot of use of good communication with teachers, fellow students or in response to discussions and presentations.

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*The researchers confirmed that the data in this study were collected before the year 2020.*

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