

# The Effect of Information Technology - Based Game on Fifth Graders' Critical Thinking Skill

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**Abstract-** This study aims to describe the effect of information technology-based game media on critical thinking skill of fifth graders on social studies subject under the theme of the Indonesia's struggle for independence. The research subjects were 26 fifth graders of SDN Lakarsantri III/474 Surabaya, 2018/2019. The research subjects were divided into 2 groups of control and experimental groups. Data collection was carried out through tests, observations, and validation of learning devices with information technology-based game media. Information technology -based game media significantly affected students' critical thinking skill. This result is based on Normalized gain (N-gain) or Gain Score and t test. The results of the Gain score calculation for the experimental group indicated an increase in students' critical thinking skills of 0.81 (High). T test analysis resulted in the Sig. (2-tailed) of 0,000 with a significant level of 0.05. in conclusion, information technology-based game media had a significant effect on students' critical thinking ability.

**Index Terms-** Game, Critical Thinking Ability

## I. INTRODUCTION

Improvement of learning quality is developed with the right learning strategies that encourage students to be active in learning activities. Students' activitiveness in the learning process is expected to improve their critical thinking skills. In this case, the role of the teacher in determining learning strategies becomes highly important to make learning process run well. Learning process is a process in which there is an activity of interaction between teacher-student and reciprocal communication that takes place in an educative situation to achieve learning goals. Stated that learning resources are all things that contain information, ideas, concepts, and can facilitate, concretize, and simplify material so that students can understanding learning material faster and easier [1]. A conducive learning environment is able to create an effective and efficient learning process by utilizing everything that can channel messages and deliver messages from sources in a planned manner in the form of media.

Media is all forms of intermediaries that are used by humans to convey or spread ideas and the expressed ideas reach the intended recipient [2]. Games are structured or semi-structured activities that are usually aimed at entertainment and can sometimes be used as educational facilities [3]. Games containing educational content are usually known as educational games. This game aims to attract students' interest in material. Information Technology (IT) is defined as any technology that can help

humans in creating, changing, storing, communicating and disseminating information. Information technology brings together high-speed computing and communication for data, voice and video. Examples of information technology in addition to personal computers are telephone, television, electronic household appliances, and modern handheld devices [4].

Critical thinking is an intellectual process that actively and skillfully conceptualizes, implements, analyzes, synthesizes, and evaluates information collected or generated from observation, experience, reflection, reasoning or communication to guide beliefs or actions. Critical thinking requires effective communication and the ability to solve problems as well as a commitment to overcome the potentials of the state of egocentrism and sociocentrism of the perpetrators themselves. Interactive games developed as learning media can improve students' critical thinking skills. Based on the observations of researchers in January 2019 towards fifth grade students at Lakarsantri III Elementary School in Social Studies learning on theme 7, teachers still used conventional learning with the lecture method. Students were not active in the class because they only saw and listened to the lecture teacher during learning. From this observation, the researchers chose this problem to be used as an initial source of research to create new breakthroughs in the application of learning media that are in line with technological developments in the form of information technology-based game to improve critical thinking skills of elementary school students.

## II. IDENTIFY, RESEARCH AND COLLECT IDEA

The research subjects were 26 fifth grade students of SDN Lakarsantri III/474 Surabaya, 2018/2019. The research subjects were divided into 2 groups. The first group is the control group, i.e a group of students who did not receive information technology-based game media. This group comprised 13 students (attendance number 1-13). The second group is experimental group, i.e a group of students who received information technology-based game media. This consisted of 13 students (attendance number 14-26). The study was conducted by testing information technology-based game media with Nonequivalent Control Group Design. This research was conducted by comparing groups that did not use information technology-based game media with group that used information technology-based game media.

III. RESULTS AND DISCUSSION

A summary of the results of lesson plan validation, Game Media, and Learning Outcomes Test that has been performed by

validator 1 (V1) and validator 2 (V2) is presented in the following table.

**Table 1. Recapitulation of the Validation of Lesson plan, Game Media, and Learning Outcomes Test**

No.	Learning Media	Score		Avergae	Category	R (%)
		V1	V2			
1.	Lesson plan	3,1	3,3	3,2	Valid	80,0
2.	Game media	3,7	3,6	3,65	Valid	91,3
3.	Learning Outcomes Test	3,3	3,4	3,35	Valid	83,8
Average		3,37	3,43	3,4	Valid	85,03

Table 1 shows that the two validators concluded that lesson plan, Game Media, and Learning Outcomes Test were valid and suitable for use in learning information technology-based game media. The efficiency or practicality of information technology-based game media in improving students' critical thinking skills can be assessed through classical completeness assessment shown in table 2.

**Table 2. Pretest and Post-test scores of Control Group Students**

No.	Name	Pretest	Result	Posttest	Result
1	AI	50	Fail	80	Pass
2	AYD	50	Fail	80	Pass
3	AZR	55	Fail	80	Pass
4	ARE	45	Fail	80	Pass
5	AIS	40	Fail	70	Fail
6	CZS	70	Fail	90	Pass
7	DOW	45	Fail	70	Fail
8	DAP	60	Fail	80	Pass
9	DA	55	Fail	80	Pass
10	FMG	60	Fail	90	Pass
11	FAF	45	Fail	80	Pass
12	KA	50	Fail	80	Pass
13	KHD)	60	Fail	100	Pass
Total		685		1060	
Classical Average		52,7		81,5	
The percentage of students who passed the test		0		84,6	
The percentage of students who failed		100		15,4	

Table 2 also shows the posttest results of students who experienced a significant increase. A total of 11 (84.6%) students scored above 75 and passed the test. Only 2 (15.4%) students scored below 75 and failed the test.

**Table 3. Pretest and Post-test scores from experimental group students**

No.	Name	Pretest	Result	Posttest	Result
14	MFA	45	Fail	80	Pass
15	MA	60	Fail	90	Pass
16	MRA	45	Fail	90	Pass

17	MGA	50	Fail	100	Pass
18	MAH	60	Fail	90	Pass
19	NCL	60	Fail	90	Pass
20	NFI	50	Fail	100	Pass
21	RSA	40	Fail	80	Pass
22	RAK	45	Fail	90	Pass
23	RDA	40	Fail	80	Pass
24	RR	75	Pass	100	Pass
25	SAR	70	Fail	100	Pass
26	VNP	75	Pass	100	Pass
Total		715		1190	
Classical Average		55		91,5	
The percentage of students who passed the test		15,4		100	
The percentage of students who failed the test		84,6		0	

Table 3 shows the posttest results of students who experienced a significant increase. A total of 13 (100%) students in the experimental group scored above 75 and passed the test. This means that the information technology based- game was efficiently applied on social studies subject with the theme of Indonesia’s struggle for independence in fifth graders of elementary school. The influence of information technology-based game media on students’ critical thinking skills can be determined by assessing the effectiveness of the game media and through the t test.

Table 4. Improvement of Critical Thinking Ability of Experimental Group

No.	Name	Score		N. Postes - N.Prestes	N. Maks. - N.Prestes	< G >	Improvement Category
		Pretest	Posttest				
1	AI	50	80	30	50	0.6	Moderate
2	AYD	50	80	30	50	0.6	Moderate
3	AZR	55	80	25	45	0.6	Moderate
4	ARE	45	80	35	55	0.6	Moderate
5	AIS	40	70	30	60	0.5	Moderate
6	CZS	70	90	20	30	0.7	High
7	DOW	45	70	25	55	0.5	Moderate
8	DAP	60	80	20	40	0.5	Moderate
9	DA	55	80	25	45	0.6	Moderate
10	FMG	60	90	30	40	0.8	High
11	FAF	45	80	35	55	0.6	Moderate
12	KA	50	80	30	50	0.6	Moderate
13	KHD	60	100	40	40	1.0	Moderate
Total		685	1060				
Avergae		52,7	81,5				
The highest score		70	100				
The lowest score		40	70				

Calculation of G Score for Control is as follows:

$$G \text{ score} = \frac{(81,5 - 52,7)}{(100 - 52,7)} = \frac{28,8}{47,3} = 0,61$$

The results of the Gain score calculation for the control group showed an increase in students' critical thinking skills of 0.61 (moderate). This means that conventional learning has the effect of increasing the critical thinking skills of class V students on the concept of the material of Indonesian's struggle for independence with moderate level of improvement

**Table 5. Improved Critical Thinking Abilities of the experimental group**

No.	Name	Score		N.Postes - N.Pretes	N. Maks. - N.Pretes	< G >	Improvement Category
		Pretest	Posttest				
14	MFA	45	80	35	55	0.6	Moderate
15	MR	60	90	30	40	0.8	High
16	MRA	45	90	45	55	0.8	High
17	MGA	50	100	50	50	1.0	High
18	MAH	60	90	30	40	0.8	High
19	NCL	60	90	30	40	0.8	High
20	NFI	50	100	50	50	1.0	High
21	RSA	40	80	40	60	0.7	High
22	RAK	45	90	45	55	0.8	High
23	RDA	40	80	40	60	0.7	High
24	RR	75	100	25	25	1.0	High
25	SAR	70	100	30	30	1.0	High
26	VNP	75	100	25	25	1.0	High
Total		715	1190				
Average		55	91,5				
The highest score		75	100				
The lowest score		40	80				

The calculation of G Score for the Experiment Group is as follows:

$$G \text{ score} = \frac{(91,5 - 55,0)}{(100 - 55,0)} = \frac{36,5}{45,0} = 0,81$$

The results of the Gain score calculation for the experimental group showed an increase in students' critical thinking skills of 0.81 (High). This means that learning with information technology-based game media could improve the critical thinking skills of class V students on the concept of Indonesia's struggle for independence with a high level of improvement.

Normality test is performed to test whether the sample being studied comes from a normal distribution. The test was carried out by Liliefors test with the results shown in table 6 and table 7.

**Table 6. Results of Pretest Normality Test for Control and Experimental Group**

**One-Sample Kolmogorov-Smirnov Test**

		Pretest of control group	Pretest of experimental group
N		13	13
Normal Parameters <sup>a,b</sup>	Mean	52.69	55.00
	Std. Deviation	8.321	12.583
Most Extreme Differences	Absolute	.165	.193
	Positive	.165	.193
	Negative	-.118	-.117
Test Statistic		.165	.193
Asymp. Sig. (2-tailed)		.200 <sup>c,d</sup>	.200 <sup>c,d</sup>

- a. Test distribution is Normal.
- b. Calculated from data.
- c. Lilliefors Significance Correction.
- d. This is a lower bound of the true significance.

Table 6 shows the results of the normality test in the Control and Experiment Group, each of which had a significance value of 0.200. This value is far greater than the alpha value ( $\alpha$ ) = 0.05. In conclusion, students' pretest data in this study were normally distributed.

**Table 7. Results of Postes Normality Test for Student of Control and Experimental Groups**

**One-Sample Kolmogorov-Smirnov Test**

		PostesKK	PostesKE
N		13	13
Normal Parameters <sup>a,b</sup>	Mean	81.54	91.54
	Std. Deviation	8.006	8.006
Most Extreme Differences	Absolute	.345	.239
	Positive	.345	.192
	Negative	-.270	-.239
Test Statistic		.345	.239
Asymp. Sig. (2-tailed)		.148 <sup>c</sup>	.240 <sup>c</sup>

- a. Test distribution is Normal.
- b. Calculated from data.
- c. Lilliefors Significance Correction.
- d. This is a lower bound of the true significance.

Table 7 shows that the normality test in the Control Group and Experimental Group had a significance value of 0.148 and 0.240, respectively. The values are far greater than the alpha value ( $\alpha$ ) = 0.05. In conclusion, students' posttest data in this study were normally distributed.

The data of homogeneity test results performed on the pretest and posttest scores of both groups are shown in tables 8 and 9.

**Table 8. Pretest Homogeneity Test Results of Students in both groups ANOVA**

Experimental Group Pretest					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	350.000	5	70.000	.316	.888
Within Groups	1550.000	7	221.429		
Total	1900.000	12			

Table 8 shows the results of the homogeneity test on the pretest scores of both groups is Fcount (0.316) <F-table (1.782) with significance of 0.888. This is far greater than the alpha value ( $\alpha$ ) = 0.05. In conclusion, the pretest data of students in the two groups in this study were homogeneous.

**Table 9. Homogeneity of Postes Test Results for Students of Control and Experimental Groups ANOVA**

Experimental Group Pretest					
	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	181.731	3	60.577	.928	.466
Within Groups	587.500	9	65.278		
Total	769.231	12			

Table 9 shows the results of the homogeneity test on the posttest scores of the students of the two groups with F-count (0.928) <F-table (1.782) and significance of 0.466. This value is greater than alpha value ( $\alpha$ ) = 0.05. In conclusion, posttest data of students in both groups in this study were homogeneous. Students' posttest hypothesis test in both groups is shown in table 10.

**Table 10. t Test Results**

	Test Value = 0					
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Control Group Posttest	36.719	12	.000	81.538	76.70	86.38
Experimental Group Posttest	41.223	12	.000	91.538	86.70	96.38

From the results of students' posttest data analysis in both groups the value of Sig. (2-tailed) was 0,000 with a significant level of 0.05. The value is 0,000 <0,05 means Ho is rejected and Ha is accepted.

The results of this study concluded that information technology-based game had a significant effect on students' critical thinking skills which empirically supported the results of Anggraini et al. (2016), Panggayudi et al. (2017), and Wulandari et al. (2017). Anggraini et al. (2016) concluded that students were more enthusiastic and more motivated to study with the use of

educational games. Approach with game in learning can stimulate emotions, intellectual, and psychomotor.

A research by Panggayudi et al. (2017) concluded that culture-based educational game media for learning to recognize numbers in early childhood was valid, practical, and effective with an average percentage of 88.23%. The contribution of the success of the use of educational game learning media to the trials was 90.44% small scale and the 85.19% for large scale. Wulandari et al. (2017) concluded that interactive multimedia loaded with educational games fitted to be used as learning media in schools. In conclusion, information technology-based game media have a

significant effect on the critical thinking skills of fifth grade elementary school students on social studies subjects with the theme of Indonesia's struggle for independence.

#### IV. CONCLUSIONS AND SUGGESTIONS

Information technology- based game media significantly affected students' critical thinking skill. This result is based on Normalized gain (N-gain) or Gain Score and t test. The results of the Gain score calculation for the experimental group showed an increase in students' critical thinking skills of 0.81 (High). T test analysis resulted in the Sig. (2-tailed) of 0,000 with a significant level of 0.05. In conclusion, information technology-based games had a significant effect on students' critical thinking ability. Based on the results of the research and conclusions, teachers are expected to use interesting learning media that students are motivated to take part in learning; for example using game media to improve students' learning outcomes and critical thinking skills. Future research can use the results of this study as a reference source for conducting further research on information technology-based game media.

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