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Critical Thinking Skills and Learning Outcomes by Improving Motivation in the Model of Flipped Classroom

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Abstract

The study was based on students' high motivation for gadgets but low in learning. The renewal of learning based on active, innovative, creative, efficient and fun learning (PAIKEM) that is the Flipped Classroom model and additional variables (motivation) is required to improve the process of critical thinking skills and student learning outcomes. The purpose of this study was to analyze the effectiveness and influence of the Flipped Classroom Model towards the ability to think critically and student science learning outcomes of students by increasing their motivation. The method used in this study was an experiment with the Control Group Post-test – Only Design. The sample comprised of 121 students from 4 elementary schools in Pati. The data collection consisted of performance tests to measure critical thinking skills and learning outcomes while questionnaires to measure student's learning motivation. The data were analyzed using the average difference test and single line regression. The analysis result of the average difference test showed that Asymp. Sig. (2-tailed) of 0.000 and result of single line regression Asymp. Sig. (2-tailed) of 0.000 (sig < 0.05). The results in this study showed that Model Flipped Classroom learning is effective in improving the ability of critical thinking, science learning outcomes and student motivation, there is positive influence between learning motivation and critical thinking skills and student learning outcomes science.

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INTRODUCTION

21st century life is synonymous with the development of science and technology, the demands on the elements of life to flourish, including in education. Arifin (2017) stated that in the 21st century, education is becoming increasingly important to ensure students have the skills to learn and innovate, skilled in the use of ICT, and persisted with skills for life (life skills). According to Wechsler, Saiz, Rivas, Vendramini, Almeida, Mundim, and Franco (2017) learning system in many countries have emphasized the creative, critical thinking, problem-solving, and decision-making is a major component in developing the education system in the 21st century. One of the skills that are needed in the 21st century is the ability to think critically.

Kurniawati, Wartono, and Diantoro (2014) argues that critical thinking is an intellectual process in making scientific concepts and allow students to analyze their thoughts in determining the choice and draw conclusions smartly. Furthermore, Syah, Haryani, and Wijayati (2016) found that people with critical thinking will be trustworthy and responsible that would affect a person's life.

One implementation of Curriculum 2013 is an integrated science subject. Attachment Regulation of the Minister of Education and Culture Number 68 of 2013 states that learning science in elementary school aims to teach the basic concepts of the natural surroundings and the environment. Learning science aims to pursue students able to process the ability to think, act, perform, and the act of scientific inquiry (Wiyanto, 2008). Nugraha, Suyitno, and Susilaningsih (2017) suggested that the main purpose of science education is to help students develop higher-level thinking skills through learning activities that encourage the use of the principle of High Order Thinking Skills (HOTS) such as critical thinking, reasoning, reflective, and science process skills. Critical thinking makes students able to interpret, analyze, and provide alternative solutions to problems.

Based on the description, it can be concluded that science able to facilitate students to develop critical thinking. However, in practice tends to be less than optimal, such as teachers do not understand the application. Observation in class V Public Elementary School Puri 02 reveals that the learning process dominated by lecture activities, activities to record material in the book, and the continued provision of duty by the teacher. Teachers lacking facilitate student and not yet directly involved to conduct a scientific performance in the process of learning science, so that students' achievement in science subject is less than optimal. They need strategies that can stimulate students' critical thinking activities following the development trend of the 21st century, namely the Flipped Classroom Model.

Flipped Classroom expressed as "what is done at school to do at home, homework at home completed in class." (Bergmann, and Sams, 2012). According to Ozdamli, and Asiksoy (2016), Flipped Classroom is an active approach centered on the students to improve the quality of learning in the classroom. Yulietri, Mulyoto, and Agung (2015) also revealed a Flipped Classroom utilizing technology that provides additional support for student learning that can be accessed online. Research from Maolidah, Ruhimat, and Dewi (2017) showed that the application of the Flipped Classroom Model effectively used to enhance students' critical thinking skills. Another study was also carried out by Agustiningrum (2017); Fakhriyah, Masfuah, Roysa, Rusilowati, and Rahayu (2017); Rokhmania, and Kustijono (2017); Subagia (2017); Wulandari (2017) but less significant and tend to fluctuate against the influence of model variables Flipped Classroom.

Their research gap above provides an opportunity for researchers propose hypotheses about other factors that bridges the Flipped Classroom Model influence on the ability to think critically and learn science results are motivation to learn as an intervening variable. Susanti, and Wahyudin (2017) explained that students who have high motivation to learn would have a high learning spirit anyway study results will be optimal. Video presentation science learning content as a stimulus in the syntax of the model Flipped Classroom is expected to motivate

students to improve critical thinking skills and student learning outcomes of science.

METHODS

This research was a quantitative research design of experiments. The experimental design used is the post-test – only control group design (Azwar, 2013). There were two class groups. Grades given experiment using a model Flipped Classroom treatment, while the control group was given using a conventional model.

The population in this study was the fifth-grade students of elementary schools in the district of Pati. The sampling technique used was random cluster sampling, the sampling technique applied when the scope is too broad population. (Wahyudin, 2015). The sample consisted of 121 students from four elementary school, Elementary Schools Puri 02 and Elementary Schools Puri 03 are included in the experimental class, and Elementary Schools Sidokerto 01 and Elementary Schools Sidokerto are the control class.

The variable in this study was the Flipped Classroom Model (FC), Critical Thinking Skills (CTS), Learning Outcomes (LO), and Student Motivation (SM). The data collection technique is a matter of critical thinking skills test and the results to learn science students and questionnaire responses Flipped Classroom Model learning and students' learning motivation. The data analysis technique is a prerequisite test research including normality test, homogeneity, and linearity test and test hypotheses include the average difference test and single linear regression.

RESULTS AND DISCUSSION

Normality test results in this study include tests of normality in grade control and test for normality in the experimental class — analysis of the test data processing using SPSS Statistics 22 normality with the Kolmogorov-Smirnov test. Based on SPSS output, it is known that the significant value of the variable critical thinking skills and learning outcomes are 0.016 and 0.029. The normality assumption has not been met because of the Kolmogorov-Smirnov value is less than 0.05 so that data processing is continued into hypothesis testing using non-parametric statistics.

Homogeneity test results are done in class control and experiment on variable Critical Thinking Skills and Learning Outcomes Science students. Based on SPSS output in table 1 and table 2, the significant value that is equal to 0.295 homogeneities and 0.317, more than the limit of the significance of 5% and the assumptions are met. Data were tested. Conclusion is said to have a homogeneous variance on aspects of assessment and item questionnaire given to each of the elements in the sample apply proportionally.

Results of regression linearity test in this study include linearity regression analysis on the variables of motivation to learn about critical thinking skills and learning motivation toward science learning outcomes. It is known that the significant value of deviation from linearity was 0.537 and 0.909 greater than the significance level of 5%. Data were tested had a positive linearity regression in the variable learning motivation towards critical thinking skills and learning outcomes. CTS homogeneity test result data of students are summarized in table 1.

Table 1. CTS Homogeneity Test

Variables	Data	df_1	df_2	Sig.
Critical Thinking Skills	Based on mean	1	115	.295
	Based on median	1	115	.292
	Based on median and with adjusted df	1	110.491	.293

Meanwhile, data presentation homogeneity test results are summarized in LO science students table 2.

Table 2. LO Homogeneity Test

Variables	Data	df_1	df_2	Sig.
Learning Outcomes	Based on mean	1	115	.317
	Based on median	1	115	.334
	Based on median and with adjusted df	1	113.160	.334

Flipped Classroom Model Effective in Improving Critical Thinking Skills, Learning Outcomes and Students Motivation

Different test average grade experimental and control is performed to determine the effectiveness of the model Flipped Classroom

against critical thinking skills. In summary, the results of different test average CTS are presented in table 3.

Table 3. The Average Different test of CTS

	Critical thinking skills
Mann-Whitney U	945.000
Wilcoxon W	2598.000
Z	-4.203
Asymp. sig (2-tailed)	.000

Based on the calculation of the Mann-Whitney U test, in table 3 obtained by the Sig (2-tailed) of 0.000. These results indicate that the score is smaller than the limit of 0.05. It is that there is a significant influence in the Flipped Classroom Model of the ability of critical thinking in the experimental class compared with the control class. The average score of critical thinking skills in the experimental class of 75 and the control class is 67.

The average difference is most significant on item number 4 on indicators build basic skills. The average difference in the experimental class and control of 26 units. This shows that the flipped classroom teaching can improve critical thinking skills. The average score difference about the CTS is presented in figure 1.

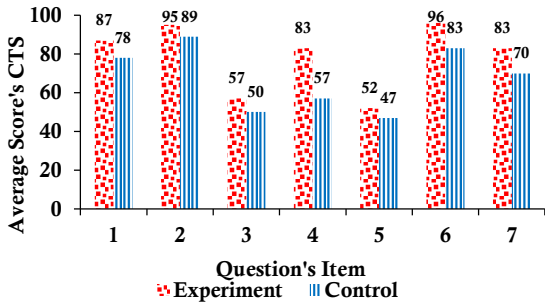

Figure 1. The Average Difference Score of CTS

Information:
The indicator I = Item Number 1, 2, 3
Indicator II = Item Number 4
Indicator III = Item Number 5
Indicator IV = Item Number 6
Indicator V = Item Number 7

In a flipped classroom, learning are scaffolding instruction, social interaction, and activities of common perception. These activities can encourage and build the basic skills of students in critical thinking. This is consistent with Vygotsky theory in the context of the development of critical thinking. According to Widayat, Wiyanto, and Hindarto (2017) scaffolding instruction to support students in improving critical capability in an understanding of the concept.

Research conducted by Hantla (2014) that the model Flipped Classroom provides more room and critical thinking paradigm of complex and involves a good student social interaction that makes the classroom an innovative and autonomous. Sofya (2018) also suggested that the Flipped Classroom can be applied to improve critical thinking through activities outside and inside the classroom. When the students are doing activity, they can pass exploration variety of learning resources such as videos, powerpoint, e-books, and scientific articles. In the classroom, students attend a learning process to deepen the understanding of the material through discussion and problem solving to improve critical thinking skills.

Different test average and class Descriptive Statistics Test experimental, and control is performed to determine the effectiveness of the model Flipped Classroom to the students' learning outcomes. Data from different test average LO students are summarized in table 4.

Table 4. The Average Different Test of LO

	Learning outcomes
Mann-Whitney U	631.500
Wilcoxon W	2284.500
Z	-5.899
Asymp. sig (2-tailed)	.000

Based on table 4, the value Asymp. Sig (2-tailed) of 0.000. These results indicate that value is smaller than the limit of the significance of 5%. This means there is a significant influence in the Flipped Classroom Model of the Science Learning Outcomes Students in the experimental class compared with the control class.

Table 5 there are differences in the average scores of learning outcomes science experiment class and control. The results mean in the experimental class is 86.45 and the mean in the control class is 70.93, so that the learning outcomes in the classroom science experiment better than the score in the control class.

Presentation of test result data Descriptive statistics are summarized in table 5.

Initial instruction in the flipped classroom is watching instructional videos at home before learning in school. Orús, Barlés, Belanche, Ariño, Fraj-Andrés, and Gurrea (2016) prove the existence of the positive results obtained that video content provides effective influence on the development and student learning outcomes.

Table 5. Descriptive Test Result

	N	Range	Max score	Min score	Mean
Experiment	60	49	51	100	86.45
Control	57	60	31	91	70.93

Flipped Classroom learning also directly affects student learning conditions, so the impact on learning outcomes. Ozdamli, and Asiksoy (2016) states that the interactive activities carried out during the Flipped Classroom teachers and students face to face directly in the classroom with a humanist approach to video content-based learning. Research conducted by Widyastuti, and Yulianto (2018) shows the flipped classroom model of creativity and capable of improving student learning outcomes from 62.78 into 73.39. Stimulation and encouragement of constructive learning in a flipped classroom give students flexibility in thinking.

Different test average of the experimental class and control is performed to determine the effectiveness of the model Flipped Classroom to the students' motivation. In summary, the results of different test average SM summarized in table 6.

Table 6. The Average Different Test Result of SM

	Students motivation
Mann-Whitney U	869.5000
Wilcoxon W	2522.500
Z	-4.591
Asymp. sig (2-tailed)	.000

Results of the calculations in table 6, the value Asymp sig. (2-tailed) of 0.000. These results indicate that value is smaller than the limit of the significance of 5%, so there is a significant influence in the Flipped Classroom Model to motivate students in the experimental class compared with the control class. The average score of motivation to learn in the experimental class at 79 and the control class is 70.

Based on figure 2 indicators of motivation to learn the highest value is indicator II and III, which is an indicator of the urge and the need to learn and indicators of their hopes and ideals of the future. The average value of learning motivation in the experimental class and control is relatively high compared with other indicators that there is a difference on average by nine units. While the average difference is less significant at indicator V, namely the activities that interest in learning. In the experimental class, the difference in average grade experimental and control only by 3 points. Differences in average scores SM questionnaire is presented in figure 2.

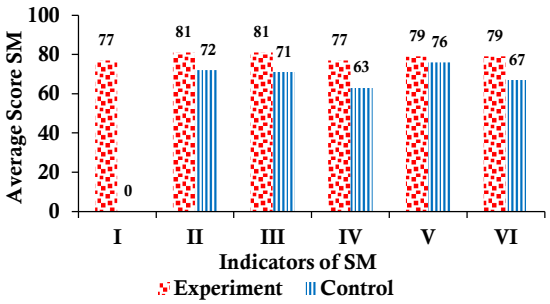

Figure 2. The Average Score of Questionnaire SM

Information:
I = their passion and desire to succeed
II = the urge and need to learn
III = their hopes and ideals of the future
IV = the award in the group
V = their interest in learning activities
VI = the existence of a conducive environment

Flipped Classroom learning models provide a stimulus to the students and cause a reaction or response which vary as the driving force and a positive attitude in the learning process. The application of the model Flipped Classroom provides stimulation in the form of video content learning science illustrative and contextual, so the motivation students will react positively and inspire the spirit of the students in learning. Encouragement and needs of students in the study increased significantly, and students feel optimistic about the hopes and ideals of a better future.

This is according to research conducted by Lestari, Nurbaity, and Hadinugrahaningsih (2017) that flipped classroom learning with cooperative learning can increase students' motivation on specific indicators. Changes experienced by students when learning to use the flipped classroom because students learn to use the video to be passionate in doing the task. Another study was also carried out by Suo, and Hou (2017) which revealed that the effective design and implementation strategies flipped classroom will increase student motivation, critical thinking skills, cooperative skills, and creative power.

Motivation Positively on Critical Thinking Skills and Learning Outcomes

Single linear regression in this study to analyze the effect of learning motivation towards critical thinking skills and student learning outcomes with simple linear regression test. The analysis results of the SM on CTS are presented in table 7.

Table 7. Result of Analysis Effect of SM on CTS

R	R square	β	t	Sig.
.104[a]	.111	85.738	6.199	.000

Grain effect analysis results of the SM on LO are summarized in table 8.

Table 8. Result of Analysis Effect of SM on LO

R	R Square	β	t	Sig.
.676[a]	.456	34.292	5.100	.000

The result of the calculation in table 7, the Sig. 0.000. The regression equation i.e., CTS = 85.738-0.139 SM. These results indicate that value is smaller than the limit of the significance of 5%, so there is a significant effect on learning motivation towards critical thinking skills. The result of the calculation in table 8, the Sig. 0.000. i.e. the regression equation, LO = 34.292 + 0.590 SM. These results show the significant value is smaller than the limit of the significance of 5%, so there is a significant effect on the motivation of learning on student learning outcomes.

Based on figure 3a indicators on learning motivation enough to affect the students' critical thinking ability is an Indicator III, hopes and ideals of the future and Indicators V are interesting in learning activities. The average score SM questionnaire is presented in Figure 3a.

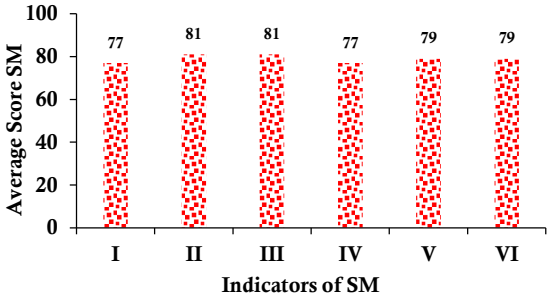

Figure 3a. The Average Score of Questionnaire SM

Information:
I = their passion and desire to succeed.
II = the urge and need to learn
III = their hopes and ideals of the future
IV = the award in the group
V = their interest in learning activities
VI = the existence of a conducive environment

Presentation of the average Score of Questionnaire CTS can be seen in the following in figure 3b.

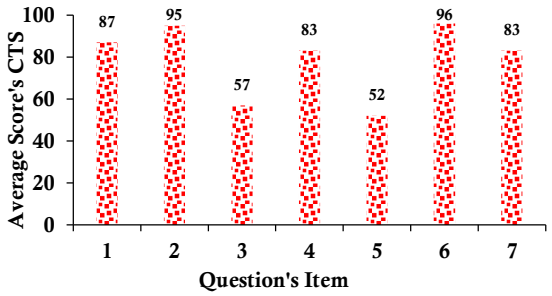

Figure 3b. The Average Score of Questionnaire CTS

Information:
Indicator I = Item Number 1,2,3
Indicator II = Item Number 4
Indicator III = Item Number 5
Indicator IV = Item Number 6
Indicator V = Item Number 7

Indicators motivation to learn enough to affect the students' critical thinking skills. This is consistent with the theory Behavioristic that the stimulus and the response will improve students' critical thinking skills. The stimulus provided in learning is interesting in learning activities Flipped Classroom Model, which is done at home, which is self-learning, online activities

with peers, and watch video content for learning science. The influence of the video content spurs and generate reactive mind, participatory, and critical in understanding the material. Results Anita (2015) shows the influence of the trade-offs between learning motivation of students to mathematical students' critical thinking skills, which showed an increase from the first cycle to the second cycle the results are significant. In line with this, Sanderayanti (2015) suggested that achievement motivation have a direct impact very real critical thinking skills (t_{value} = 7.201 > t_{able} = 2.627 with α = 0.01). Miele, and Wigfield (2014) also analyzed the factors of motivation on critical thinking skills, value orientation of achievement, and goal attainment interlocked. Motivation learning has a vital role in determining the psychological attitude and cultivates students in mind.

Based on figure 4a, the average learning motivation questionnaire is 79.0, and the average questionnaire study results in 84.0. Indicators of motivation that influence learning outcomes are no indicator II (impulse and the need to learn) and indicators III (hopes and ideals of the future) they both get a score of 81. The average score SM questionnaire is presented in figure 4a.

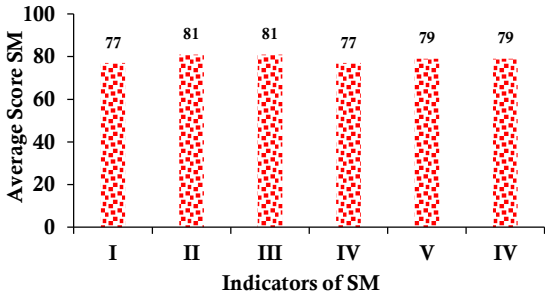

Figure 4a. The Average Score of Questionnaire SM

Information:
I = their passion and desire to succeed
II = the urge and need to learn
III = their hopes and ideals of the future
IV = the award in the group
V = their interest in learning activities
VI = the existence of a conducive environment

The average score LO of Students summarized and presented in figure 4b.

In the theory of Maslow's hierarchy of needs, someone will succeed in learning, that in itself, there is a motivation to learn. Desire or urge to learn is called the motivation to learn. Therefore, the motivation is high as a fulfillment of the need for knowledge (cognitive needs) could affect the study results, in this case science student learning outcomes.

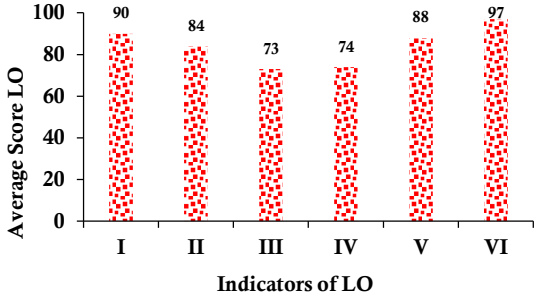

Figure 4b. The Average score of LO

Information:
I = analyzing the sources of thermal energy in our daily lives
II = identifying objects around to deliver heat
III = demonstrate activities to distinguish heat and displacement
IV = discuss the benefits of heat transfer and heat in everyday life
V = heat Transfer generalize that exist in everyday life;
VI = discussing observations about heat transfer

Based on the research conducted by Nurmala (2014) that the motivational effect on student learning outcomes. Motivation as a function of psychological factors cause, the underlying and direct act of learning. Results of other studies of Palupi, Anitah, and Budiyono (2014) showed a positive relationship between learning motivation and student learning outcomes. The higher the students' motivation and performance of teachers in the learning activities of students, the higher the learning outcomes in science. Taiyeb, and Mukhlisa (2015) also revealed the presence of significant relevance between motivation and learning outcomes with inferential statistical analysis and SEM analysis. Student motivation fit in either category with an average score of 141.36. Learning outcomes of students in the high category with an average value of 78.89.

CONCLUSION

The conclusions of this research are Flipped Classroom learning model is effective in

improving critical thinking skills and science learning outcomes through the increased of students motivation, and there is positive influence between motivation to learn about critical thinking skills and learning outcomes.

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