Building Critical Thinking Skills Through ollaborative Learning and E-Learning on Basic Computer and Network Subject in Vocational School

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Abstract. Critical thinking is the art of analyzing and evaluating thinking and issues with a view to making improvements and increasing understanding The aim of this research is to find out how effective the use of E-learning and Collaborative Learning is to improve Critical Thinking on Basic Computer and Network subjects. The method used is Resaerch and Development (R & D). Media validation is categorized as very feasible with an average of 82%. Material validation is categorized as very feasible with an average of 100%. Linearity test concluded that there is a significant linear relationship between each independent variable (Use of E-front and Collaborative Learning) with Improved Critical Thinking. As a result there is a significant correlation between Collaborative Learning towards improvement, or Communicatio Skill. Effective Contribution (SE) The use of E-fronts is 1% Collaborative Learning is 16.9% and Relative Contribution (SR) is 6% Collaborative Learning is 94%.

Keywords: critical thinking, collaborative learning, e-learning

1. Introduction

Society is becoming more polarized every day. News pundits on both sides of every issue try to convince us they are right. People are bombarded with more information on a daily basis than our ancestors might have experienced in a lifetime. The average person sees/hears close to 3000 pieces of advertising every day. We need to be able to make sense of all this data besides being consumers and producers of content on social media that is far from our control. That is one of the triggers why critical thinking is important at this time.

While studying at school today tends to teach students what to think not how to think. Einstein thought that learning how to think was even more important than being taught the knowledge in one's particular field. An attempt to replace the paradigm was carried out in this study by applying learning strategies through hybrid learning to measure students' competence in critical thinking.

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1.1 Critical Thinking

Critical thinking is the art of analyzing and evaluating thinking and issues with a view to making improvements and increasing understanding[1][2]. Critical thinking involves evaluating information through employing diverse skills like: (1)analyzing; (2)conceptualizing; (3)listening; (4)asking questions; (5)reasoning; (6)defining; (7)refining our thought processes; (8)examining and (9)synthesizing. While there are some universal intellectual standards consist of clarity, accuracy, precision, relevance, depth, breadth, logic and sense making.

A critical thinker could raise vital questions and formulate them clearly , then gather and asses relevant information, using abstract ideas to interpret effectively, think open-mindedly and remain open to change , comes to well-reasoned conclusions and communicates his/her thoughts effectively[3]. There are seven stages in critical thinking development as shown in figure 1.

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Fig. 1. Stages of Critical Thinking Development

1.2 Hybrid/ Blended Learning

Population growth and employment are increasingly unbalanced. The productive age at school becomes both a strength and a weakness if it is not managed properly. The world of education, especially the Vocational Middle School (Vocational School) as one of the agencies that prepares ready-to-use personnel must improve and catch up with the industrial world as the use of outcomes or SMK graduates. This century is the 21st century with an industrial revolution that runs fast in need of relevant Human Resources (HR).

The process of learning and teaching in vocational schools must be standardized to the needs. Learning models, methods and media are directed at supporting mastery of all 21st century skills, one of which is critical thinking. Students are given the opportunity to explore the material according to the subject matter and then are given challenges in the method of problem based learning (PBL) to build thinking sensitivity in a systematic sequence while collaborating with other students in one group. Learning methods with E-learning are very necessary [4], because students are easier to access material without being limited by space and time, for example because of the existence of internship (industrial work practices) so that there is not much time to attend school optimally. Subject matter can be learned directly through the learning management system (LMS) directly and needs to discuss with other students as knowledge transfer. However, the conventional learning process with face-to-face still applies especially when applying collaborative learning to discuss resolving challenges. So that the learning model taken is hybrid / blended learning.

E-learning is an effective learning process strategy by combining digital technology as a service to transfer learning support content[5]. PBL model is a learning model that is conducted to help teachers develop thinking skills and problem solving skills for students as long as they learn learning material. E-learning has a positive and significant effect on student learning quality. The influence is in the strong category. While intensive e-learning is utilized, the quality of student learning will also increase. The use of e-learning web will improve learning outcomes indirectly [6][5]. The purpose of using e-learning in learning systems is to expand access to public education, as well as in order to improve the quality of learning [7]. In the study built learning media that aims to determine how effective the use of E-learning and Collaborative Learning to improve Critical Thinking on Basic Computer and Network subjects.

2. Methodology

The research method used in this study is Resaerch and Development (R & D), because this study intends to describe the nature or circumstances that they are currently running and try to develop the extent to which variable relations one with other variables.The blend of learning used are collaborative learning and e-learning on basic computer subjects and networks, at the level of vocational school. According to the third level of thought as a highest order with capabilitis of explicitly reflective, highest skill level routine in using critical thinking tools and consistently fairis used in this study by giving some challenge to the student as Problem Based Learning with certain question.

2.1 Data Collection

In this study the population was students of Muhammadiyah Vocational High School 3 Surakarta in the 2018/2019 academic year as many as 385 students. While the sample was students of Muhammadiyah 3 Vocational High School in Surakarta in class X 2018/2019 academic year as many as 59 students. And the sampling is students of Surakarta Muhammadiyah 3 Vocational High School in class X majoring in Computer Engineering and Networking for 2018/2019 academic year as many as 29 students.

The initial data collection technique uses observations and interviews with teachers and students to find out about existing problems. To find out the feasibility of the product using material, media, and question validation tests. Whereas to determine the effectiveness of the product using Linearity Test, Normality Test, Mann-Whitney U Test, Multiple Regression Analysis Test, Simultaneous Test (F Test), Partial Test (Test-t), Effective Contribution (SE) and Relative Contribution (SR) .

2.2 Design Process

In the design phase of the design of learning media, a description is used in the form of an Unified Modeling Language (UML), including the use case (figure 2) and diagram activity (figure 3).

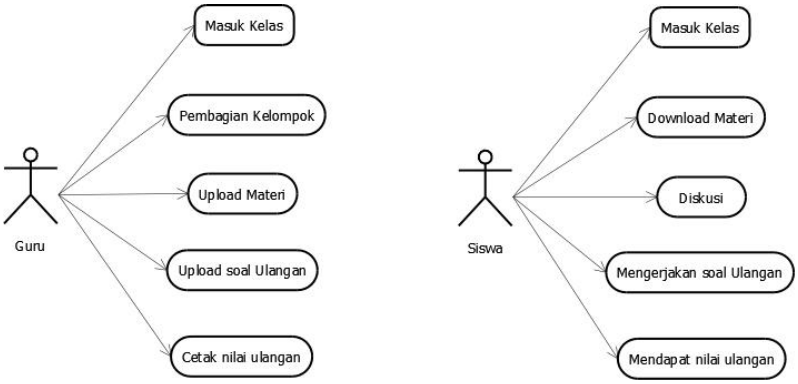

Fig. 2. Use Case Diagram

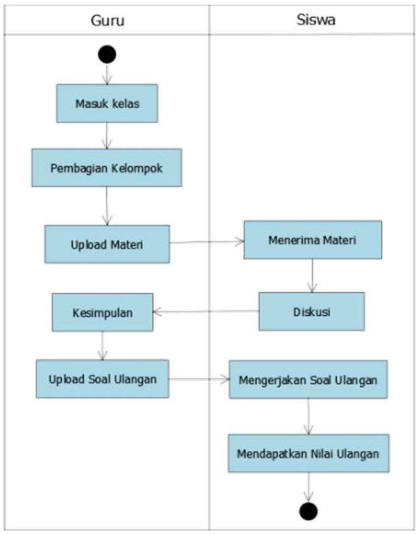

Fig. 3. Activity Diagram

3. Result and Discussion

The front page of learning media using E-front shown on figure 4, on the start page there is a login menu that is used for access to learning media and there are several other menus such as subjects and subject matter that will be used to carry out teaching and learning activities.

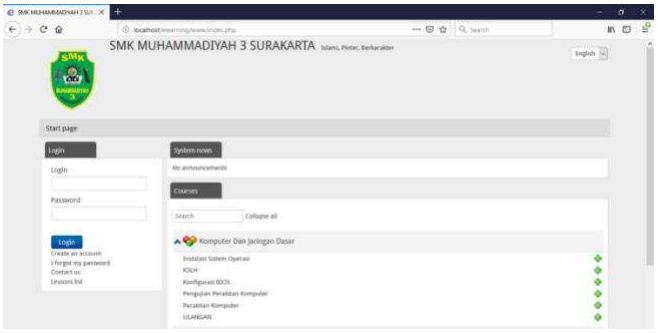

Fig. 4. Front page of e-learning

On the teacher's page (figure 5) there are various menus that can be used but in this study only the teacher is limited to using the lessons menu to provide material and test questions.

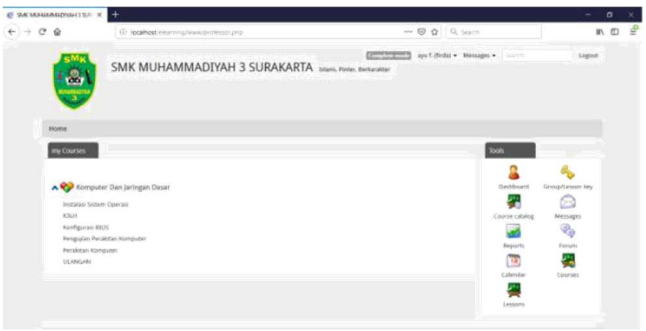

Fig. 5. Front page of teacher menu in e-learning

3.1 Linearity Test

Linearity test is a test to find out whether between each independent variable and the dependent variable is linear or not.

Table 1. Linearity Test X1 against Y

	Font size and style	Sum of Squares	df	Mean Square	F	Sig
Skill21*Nilai Ulangan	Between Groups (Combined)	543.721	10	54.372	.639	.762
	Linearity	67.140	1	67.140	.790	.386
	Deviation from Linearity	476.581	9	52.953	.623	.763
	Within Gropus	1530.417	18	85.023		
	Total	2074.138	28			

From the results above, the value of Deviation From Linearity Sig. is 0.763 greater than 0.05, it can be concluded that there is a significant linear relationship between the use of E-front (X1) with an increase in Critical Thinking (Y).

Table 2. Linearity Test X2 against Y

		Font size and style	Sum of Squares	df	Mean Square	F	Sig
Skill21*Nilai Ulangan	Between Groups	(Combined)	809.257	4	202.314	3.839	.015
		Linearity	366.041	1	366.041	6.945	.014
		Deviation from Linearity	443.216	3	147.739	.2.803	.061
	Within Gropus		1264.881	24	52.703		
	Total		2074.139	28			

From the results above, the Deviation From Linearity Sig value is obtained. equal to 0.061 greater than 0.05, it can be concluded that there is a significant linear relationship between Collaborative Learning (X2) and Improved Critical Thinking (Y).

3.2 Normality Test Results

The normality test is intended to find out whether the data to be analyzed is in the form of normal distribution or not, in other words, a sample from the population in the form of normal distributed data or not.

Table 3. Normality Test Results

	Kelas	Kolmogorov-Smimov[a]			Shapiro-Wilk		
		Statistic	df	Sig	Statistic	df	Sig
Hasil Ulangan	Kelas Penelitian	.163	29	.048	.906	29	.014
	Kelas Kontrol	.447	30	.000	.447	30	.000

From the results of the table above, the Sig value is obtained. the research class was 0.014 and the control class was 0,000. Because the significance value (Sig) is smaller than 0.05. Then the research data is not normally distributed. So that the results of the statistics used are non-parametric statistics using Mann-Whitney U.

3.3 Mann-Whitney U Test Results

The hypothesis is "there are differences in learning outcomes of computers and basic networks between Research Classes and Control Classes".

Table 4. Mann-Whitney U Test Results

	Hasil Ulangan
Mann-Whitney U	146.500
Wilcoxon W	611.500
Z	-4.431
Asymp. Sig.(2-tailed)	.000

a.Grouping Variable:Kelas

From the results of the table above, the value of Asym is obtained. Sig. (2-tailed) of 0,000 less than 0.05. Then it can be concluded that the hypothesis is accepted. Thus it can be said that there are differences in learning outcomes of Basic Computers and Networks in Research Classes and Control Classes, so that because there are differences it can be said that there is an influence of the use of learning media with PBL methods on learning outcomes of Computers and Basic Networks.

3.4 Results of Multiple Regression Analysis

Multiple regression analysis is used to determine whether there is an influence of one variable (increasing Critical Thinking) caused by other variables (Use of E-front and Collaborative Learning). From the results of multiple regression tests to obtain a multiple linear regression formula as follows: Y = 129,778 - 0,075 X1 - 0,432 X2.

So it can be interpreted that this constant means that if the independent variable (Use of E-front and Collaborative Learning) has a value (0) then the dependent variable (Critical Thinking) is 129,778. The coefficient value of the use of E-front (X1) is 0.075 and is negative, this means that every increase in the use of E-front (X1) one unit then the Critical Thinking (Y) variable will decrease by 0.071 assuming that the other independent variables of regression model is fixed. Collaborative Learning (X2) coefficient value is 0.432 and has a negative sign, this means that every increase in Collaborative Learning (X2) one unit then the Critical Thinking (Y) variable will decrease by 0.432 assuming that the other independent variables of the regression model are fixed.

3.5 Simultaneous Test Results (Test F)

Used to determine the significance of the influence between two independent variables (Use of E-front and Collaborative Learning) together towards improving Critical Thinking.

Table 5. Simultaneous Test Results (Test F)

Fhitung	Ftabel
2.787	3.37

From the calculation results there is no significant correlation between the two independent variables (Use of E-front and Collaborative Learning) together towards an increase in Critical Thinking, because at the research stage there is one variable that is only used as a learning medium not as a learning method that is use E-front as a learning media and Collaborative Learning as a learning method using the PBL method. Fcount <Ftable which means Ho is accepted and rejects Ha.

3.6 Partial Test Results (Test -t)

Used to determine the significance of the influence of each independent variable (the use of E-fronts and Collaborative Learning on increasing Critical Thinking) individually.

Table **6**. Partial Test (t-Test) Use of E-fronts against Increased Critical Thinking

Fhitung	Ftabel
-0.297	2.055

As already discussed in the simultaneous test that the use of E-front is only a learning media, where students access material and conduct examinations. Then the value of the results of the data analysis obtained is t count 0.297 with t table 2.055, tcount <t table which means that Ho is accepted and processed Ha. Thus it can be concluded that there is no significant correlation between the use of E-fronts to increase Communicatio Skill. The negative t value indicates that X1 has an opposite relationship with Y.

Table 7. Partial Test (t-Test) Collaborative Learning towards increasing Critical Thinking.

Thitung	Ttabel
-2.157	2.055

As has been discussed in the simultaneous test that Collaborative Learning is a learning method used in research that is by the PBL method, where students are taught to do learning to speak both in small group discussions and explain the results of the discussion to all students. Not only that students are given the opportunity to ask about the problems they are facing in the group concerned with the material discussed, with that in mind the enthusiasm of students to argue with each other about their opinions. So the value of the results of data analysis obtained is tcount 2,157 with ttable 2,055, tcount> ttable which means Ho is rejected and accepts Ha. Thus it can be concluded that there is a significant correlation between Collaborative Learning to increase Critical thinking. The negative t value indicates that X2 has a relationship opposite to Y.

3.7 Results of Effective Contributions (SE) and Relative Contributions (SR)

After carrying out the test simultaneously and the formal test here it will be known how many contributions each independent variable has on the dependent variable. From the results of calculations that Effective Donation (SE) Use of E-front is 1% and Relative Contribution (SR) is 6%, while Collaborative Learning Effective SE (SE) is 16.9% and Relative Contribution (SR) is 94%.

4. Conclusion

Based on the results of the discussion on the effectiveness of using E-Learning and Collaborative Learning to improve Critical Thinking on Computer and Basic Network subjects, it can be concluded that the product feasibility test is done by testing the feasibility of material, media, and questions. For material feasibility, obtain an average value of 100%, the feasibility

of the media with an average of 82. Test the effectiveness of the product is done by various types of testing in order to get accurate results. Linearity test between independent variables and dependent variables get the results that between the use of Efront with an increase in Collaborative Learning there is a significant linear relationship. The normality test to get the results of the research data is not normally distributed, so the data is included in non-parametric statistics and uses the Mann-Whitney U test to find out whether there are differences in learning outcomes using the PBL method and the lecture method. From the results of the study it was found that between the research class and the control class there were differences in learning outcomes of basic Computer and Network subjects. Double Regression Analysis Test, the results of the table in the multiple regression test obtained multiple linear regression formulas as follows Y = 129,778 - 0,075 X1 - 0,432 X2. Simultaneous Test (F Test), from the calculation results there is no significant correlation between the two independent variables (Use of E-front and Collaborative Learning) together towards the improvement of Critical Thinking. Partial Test (Test -t), The use of E-fronts to Increase Critical Thinking has no significant correlation. Collaborative Learning towards Improving Critical Thinking has a significant correlation. From the results of calculations that Effective Donation (SE) Use of E-front is 1% and Relative Contribution (SR) is 6%, while Collaborative Learning Effective SE (SE) is 16.9% and Relative Contribution (SR) is 94%.

A critical thinker strives to always be open to new ideas and interpretations of the situation, has the ability to realize his shortcomings and mistakes and is willing to leave old opinions that are not appropriate.

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