

# Does Blended Learning Method Impact on Critical Ability?

Roni Faslah, Ari Saptono, Agus Wibowo, Suparno, Pinky Kandy, Susan Febriantina, Wisudani Rahmaningtyas

**Abstract--** *This study reveals how the Blended Learning Method can improve students' critical thinking skills. The ease of use of information technology, if not balanced with specific skills in managing learning by the teacher, makes students trapped in surfing to find information. This condition will make students not optimal in exploring analytic thinking; the level of plagiarism increases, and students tend to spoiled with technology. For this reason, the authors investigate the blended learning method used by teachers in the learning process by using quiz forms in improving analytical thinking skills. The results of this study indicate that: 1) There are differences in critical thinking skills between students who use the blended learning method and conventional methods, 2) There are differences in critical thinking skills between students who are given essay and multiple choice quiz forms, 3) There is an interaction between learning methods and forms of quiz on critical thinking skills, 4) There are differences in students' critical thinking abilities given the form of essay quiz in the blended learning method and conventional methods, 5) There are differences in students' critical thinking skills which are given a multiple choice quiz form on the blended learning method and conventional methods, 6) There are differences in students' critical thinking skills using the method blended learning by providing essay and multiple choice quiz forms, 7) There are differences in students' critical thinking skills using conventional methods by providing essay test and multiple-choice forms.*

**Keywords—** *Technopreneurship; MSMEs, Business Empowerment*

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## I. INTRODUCTION

The critical thinking ability of Indonesian students based on TIMSS (reports The Trend International Mathematics and Science Study) in 2011 is still low, Indonesia ranks 36th out of 42 other countries with an average score average 386, while the international average score is 500 [1] and in the 2015 TIMSS survey results Indonesia still has low critical thinking skills of students, Indonesia ranks 45th out of 48 countries in the field of science and ranked 45 out of 50 countries in the field of mathematics with each field getting an average score of 397 from an international average score of 500 [2]. The data shows that the level of thinking ability of Indonesian students in the fields of science and mathematics is still relatively low. In other words, Indonesian students have not been able to solve problems with a high degree of difficulty or questions with the completion of higher-order thinking skills (HOTS).

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*Roni Faslah, Faculty of Economics, Universitas Negeri Jakarta, Indonesia.*

*Ari Saptono, Faculty of Economics, Universitas Negeri Jakarta, Indonesia.*

*Agus Wibowo, Faculty of Economics, Universitas Negeri Jakarta, Indonesia,*

*Suparno, Faculty of Economics, Universitas Negeri Jakarta, Indonesia*

*Pinky Kandy, Faculty of Economics, Universitas Negeri Jakarta, Indonesia*

*Susan Febriantina, Faculty of Economics, Universitas Negeri Jakarta, Indonesia*

*Wisudani Rahmaningtyas, Faculty of Economics, Universitas Negeri Semarang, Indonesia*

The results of a preliminary study conducted some researchers by conducting tests of critical thinking questions in several State Senior High Schools (SMAN) in East Jakarta, namely SMAN 53, SMAN 9, SMAN 14, and SMAN 11 with the total number of students sampled as many as 144 students which shows that there are still many high school students in East Jakarta who still have low levels of thinking ability. Several factors cause the development of critical thinking skills during the learning process is the curriculum that focuses on extensive material so that teachers are only focused on delivering materials and a lack of understanding of teachers to the teaching methods used in the class challenge of education in the 21st century is the use of the learning system of digital technology, technology has a significant role in building 21st-century learning skills so that students' skills training using emerging technologies [3]. Based on the results of published data published by [4], that: Indonesia maintains the position of the top five largest internet user countries in the world, internet user penetration in 2017 was 54.68% or 143.26 million of the total Indonesian population which is 262 million people. This number shows an increase of 10.56 million people, and the most significant number of penetration is in internet users with a vulnerable age of 13-18 years, which is equal to 75.50%. There are three primary motivations for adolescents and children to access the internet, including information seeking (related to schoolwork), communication (social media), and entertainment.

Blended or hybrid courses that combine online content with traditional face-to-face classes (B-learning and Flipped Classrooms, for example), and technology-enhanced face-to-face classes [5]. The application of the method of blended learning can provide its attraction in the learning process. Some benefits from the application of the method blended learning to start from increasing students' interest in independent learning. Because students can find factual and actual information from the internet, and blended learning can also develop and instill student involvement in the learning process using students being actively required to know developments that occur, and blended learning can also overcome teacher problems in the delivery of material that has not been conveyed in the learning process because with blended learning they can access subject matter using smartphones, tablets, and laptops that are connected to the internet anywhere and anytime.

The results of previous relevant studies conducted by Alotaibi [6] show the results that there are no statistically significant differences between the experimental and control groups in critical thinking skills. Furthermore, research conducted by Akyüz & Samsa [7] shows the results that there is no significant difference in critical thinking abilities in the pre-test and post-test scores. Different from the results of previous studies conducted by Manurung [8] address the results that there is an influence of blended learning strategies on students' critical thinking skills. The blended learning approach was significantly more effective in improving students' critical thinking skills in a plant tissue culture course at Medan State University compared to conventional learning approaches. Furthermore, the results of previous studies conducted by Alfi, Sumarmi & Amirudin [9] show the results that there are significant differences between the average value of the experimental class and the control class and the results of the hypothesis test show that the application of problem-based learning models with blended learning affects the ability students' critical thinking. Moreover, the results of research conducted by Ferry Dwi Cahyadi [10] show the results that blended learning can influence critical thinking skills. Moreover, the results of research conducted by Ambar Ningsih, Suana & Maharta [11] show that the results of the application of Schoology-based blended learning have a significant influence on students' critical thinking skills.

In addition to the method factors blended learning that can affect students' critical thinking abilities, the form of test variables can also influence on students' critical thinking skills because, in order to be able to measure the results of the learning process, there needs to be an assessment or evaluation aspect. This is also supported by the opinion of Ennis which states that the measurement of one's critical thinking ability can be done by using a reasonable multiple-choice test, a skills test and a description test [12] – [13], the form used is a written test, there are two forms of written tests frequently used are objective test forms and essay test forms. The form of objective tests or short answer tests is one form of test to measure learning outcomes by providing several alternative answer choices, forms of objective tests include: multiple-choice, true-false, match and complement or short entries [14], the physical test form the researcher chooses is the multiple-choice form. The form of the essay test is a matter that demands the cognitive abilities of students to be able to think complexly. Description test questions require students to answer by describing, explaining, comparing, giving reasons using their own words or language or expressing ideas or ideas through written language [14], because of their characteristics the essay test does not doubt its capacity again to measure students' critical thinking skills.

Based on some of the results of previous studies and exposure to the above problems and from the results research of previous researchers, there have not been many studies that reveal research on blended learning and the form of tests on students' critical thinking skills. Therefore researchers are interested in researching the effect of methods blended learning and forms of tests on the Critical thinking skills of students in economic subjects class XI IIS in East Jakarta High School.

### **Critical Thinking Ability**

Critical thinking is not new in the field of cognitive development, because according to Penner, critical thinking skills are a fundamental part of human maturity [15]. The definition of critical thinking continues to undergo renewal along with increased knowledge about the elements of critical thinking itself; this can be seen from the many experts who have formulated the definition of critical thinking. As stated by Chaffee, who defines critical thinking is thinking to systematically investigate the process of thinking itself with the aim of students having an exceptional understanding of the subject matter, starting from the learning process to the real circumstances that occur around them [16].

Walker [17] explains and defines critical thinking as follows: critical thinking is a mental process in conceptualizing, applying, analyzing, locating, and or evaluating various information obtained from observations, experiences, reflections where the results of this process are used as a basis when taking action. The above statement is also strengthened by Jansen's statement, which states that critical thinking skills are valid and reliable mental processes used in the pursuit of relevant and relevant knowledge about the world [18].

### Blended Learning

The learning theory underlying the design of blended learning, according to Davidson-Shivers & Rasmussen [19], is 1) Behavioristic Learning Theory [20], which discusses behavioral change as a result of experience and learning is a result of there is an interaction between stimulus and response [21]. 2) Cognitive Learning Theory [22] which focuses on the learning process compared to learning outcomes because this theory assumes that learning does not merely involve the relationship between stimulus and response, but learning will involve a very complex thought process, so learning is a process of changing perception and understanding and not always in the form of behavioral change, 3) Constructive Learning Theory [23] which states that in the learning process students must get emphasis. The essence of constructivism theory is that students must find and transform complex information into themselves so that students can construct their knowledge through their interactions with their environment [24].

Blended learning etymologically comes from two syllables, namely blended and learning. Blended means to mix or combine with the right dose, while learning means learning. Furthermore, according to Moebis & Weibelzahl [25] defines blended learning as mixing between meetings face-to-face and online in an integrated learning activity. Confirming the above statement, Glazer states that "Over time, the class evolved in away. I know now that it is called Blended Learning, where the content taught using face to face and on-line methods" [26]. The purpose of the statement above is that blended learning is learning that integrates traditional face-to-face learning with online-based learning with a variety of communication media choices for learning that can be used.

Wilson defines blended learning as follows: "Blended learning generally means the application of two or more methods or solutions to a learning need" [27]. Furthermore, according to Semler [28] asserts that: blended learning combines the best realms of online learning, structured face-to-face activities, and real-world practice, online learning systems training in class and on-the-job experience will provide valuable experience for themselves. Blended learning uses an approach that empowers various other sources of information.

Sometimes we are still challenging to distinguish several terms that are similar to blended learning such as E-learning; for example, the basis of the difference is only in the percentage of online media usage in learning. According to Allen [29] distinguish the percentage of the use of instructional media as follows:

**Table 1.** Percentage of Use of Online Media in Learning

<b>Online Presentation</b>	<b>Type of Learning</b>	<b>Description Each Type of Learning</b>
0%	Traditional	Learning with content sent not online is delivered in written or oral form
1% - 29 %	Facilitated <i>Web</i>	Learning uses facilities <i>web</i> to facilitate something very important in face-to-face learning. Using a course ( <i>management system Course Management System / CMS</i> ) or <i>web pages</i> to post <i>syllabus and exam questions / materials</i>
30% -79%	<i>Blended / Hybrid</i>	Learning by integrating online and face-to-face systems. The proportion of online content substance sometimes uses face-to-face meetings
> 80%	<i>Online / Full E-Learning</i>	learning which is mostly or even entirely using the online system. This study does not use face-to-face at all.

### **Form of Test Description (Essay)**

According to Sukardi, a description test or often referred to as an essay test is one form of the written test whose composition consists of items of questions that each poses a problem and demanding students' answers through word descriptions that reflect students' thinking abilities [30]. The form of the test has the characteristics of the question preceded by words such as describe, explain, why, how, compare, simplify, and so on [31].

The form of the description test has the following characteristics [32]: a) The test is in the form of a question or order that requires an answer in the form of a description or exposure to a sentence which is generally quite long, b) The forms of the question or order are demanding to test to provide explanations, comments, interpretations, compare, and differentiate. c) The number of items is generally limited, which ranges from five to ten items, d) Generally the items are preceded by the words: explain, why, how, or other words similar to that

### **Objective Test Form (Multiple Choice)**

The form of multiple-choice tests is one form of test that is widely used in assessment methods because the form of multiple-choice tests is considered capable of measuring all levels of thinking ability in the cognitive domain. In line with that Arifin stated that the ability that can be measured by the form of multiple-choice tests between questions about terms, facts, principles, methods, and procedures, identifying the use of facts in principle, interpreting cause and effect relationships, and assessing methods and procedures [33]. Furthermore, Anas stated that the multiple-choice test is one of the forms of objective tests consisting of questions that are not yet completed, and to complete it, one (more) of the possible answers that have been provided for each question is provided [32].

According to Martinis, multiple-choice is a form of questions consisting of incomplete questions, the possibility of an answer to a question or statement is called a choice, the number of answer choices ranges from three to five, and there is only one correct answer, the rest are distractors [34].

#### **Formulation of Hypotheses**

Based on the study of the theory and framework of thinking that has been described above, the researchers propose the following research hypotheses:

- H1. : There are differences in the ability of critical thinking among the student group that method *blended learning* with groups of students who use the conventional learning method
- H2. : There is a difference in the ability to think critically between groups of students who are given the form of a description test (essay) with groups of students who were given an objective test (multiple choice)
- H3. : There is an interaction between the method *blended learning* and the form of tests on the critical thinking skills of students
- H4. : There are differences in critical thinking skills between students who are given the form of tests (essays) on the *blended learning* method and conventional learning methods.
- H5. : There are differences in critical thinking skills between students who are given the form of tests (Multiple Choice) with the *blended learning* method and conventional learning methods.
- H6. : There is a difference in students' critical thinking skills using the method *blended learning* by providing a form of *essay* test and an objective test form (*multiple choice*).
- H7. : There is a difference in students' critical thinking skills using conventional learning methods by providing an *essay* test form and an objective test form (*multiple choice*)

## II. METHOD

The method used in this study is an experimental research method. According to McMillan & Schumacher [35] explains that experimental research is "research in which independent variables are manipulated to investigate causes and effects of relationships between the independent and dependent variables" which means that research in independent variables is manipulated to investigate the relationship of cause and effect relationships between variables(independent), and variable bound(dependent). Furthermore, McMillan & Schumacher [35] asserted that Quasi Experiment research is "a type of experiment where research participants are not randomly assigned to the experimental and control group" which means that individuals do not randomly have the same excellent opportunities in the experimental group and the control group.

Design of this study used a 2x2 factorial design with two-way ANAVA analysis techniques. The following is the research design used:

**Table 2.** Factorial Design

Test Forms	Method of Learning	
	<i>Blended learning</i> (A1)	Conventional (A2)
Essay (B1)	A1B1	A2B1
Multiple Choice (B2)	A1B2	A2B2

Description:

A1B1 = The ability to think critically in a class that is treated with the method *blended learning* with the description form test (essay)

A1B2 = The ability to think critically in a class treated by the method of *blended learning* with an objective test (multiple choice)

A2B1 = The ability to think critically in classes treated with conventional methods with essay test forms

A2B2 = The ability to think critically in a class treated with conventional methods in the form of objective test forms (multiple choice).

In this study, researchers used research with affordable populations. Affordable population that will be studied are spread across three state high schools in East Jakarta, namely 61 state high schools, 44 state high schools, and 9 state high schools. These schools are selected based on passing grade ranking data or selection data for senior high school entrance in 2018/2019 with classification the passing grade highest, medium and lowest.

The sampling technique in this study uses a non probability sampling technique which is a sampling technique that provides equal opportunity or opportunity for each population element to be selected as a sample [36]. In this study the non probability sampling technique used was purposive sampling based on classifications grade passing the highest, medium and lowest school. Understanding purposive sampling according to Sugiyono [36] is a sampling technique with certain considerations.

This research was conducted in both classes (experimental class and control class) in each school with 212 students. There were 22 multiple choice questions and 5 essay questions. The following are the results of the processed data obtained from class scores blended learning and conventional classes that were given the form of essay tests and multiple choice tests at three schools in East Jakarta.

## BI. RESULTS AND DISCUSSION

### Normality Test

This research uses the *Shapiro-Wilk test* [37] with the calculation results, as follows:

**Table 3. Normality Test**

	Shapiro-Wilk		
	Statistic	df	Sig.
Standardized Residual for Critical Thinking	Ability.989	212.	115

Test output results using the normality Shapiro-Wilk to the significant value of the residual standard data critical thinking ability of students is equal to  $0,115 > 0,05$  decision taken is  $H_0$  H accepted or  $H_1$  rejected, thus then it can be concluded that the research data is normally distributed

### Homogeneity Test Homogeneity

Testing is done by the test *Levene* [37] with the following results:

**Table 4. Homogeneity Test Levene**

F	df1	df2	Sig.
,829	3	208	,479

Can be seen the results of the test levene obtained a figure of 0.829 with a significance value equal to 0.479 in other words  $0.479 > 0.05$ , based on these data it can be concluded that the results of research consisting of four groups have the same or homogeneous variance.

### Testing Two-Way ANAVA Test

After the prerequisite testing will be conducted two-way ANAVA test [37] to test the research hypothesis. The following is the two-way ANAVA test data:

**Table 5. Two-way ANAVA Test Results**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	107.635 <sup>A</sup>	3	35.878		11.900,000
Intercept	65159.228	1,	65159.228	21611.210	000
Method	18.663	1	18.663	6.190	.014
Quiz Form	17.603	1	17.603	5.838	017
Method * Quiz Form	71.331	1	71.331		23.658,000

Error	627.134	208	3,015		
Total	65905,000	212			
Corrected Total	734,769	211			
a. R Squared =0.146 (Adjusted R Squared =0.134)					

Based on the two Anava output data contained, the researcher will discuss the research hypotheses that have been proposed previously, as follows: First, there are differences in thinking abilities critically between groups of students who use themethod blended learning with groups of students who use conventional learning methods.

Based on the two line Anava output data contained in the column section Method significance values obtained of 0.014 in other words  $0.014 < 0.05$  based on these data, it can be concluded that there are differences in critical thinking skills between students taught by the method blended learning and students taught by conventional learning methods.

Second, there is a difference in the ability to think critically between groups of students who are given the form of a description test (essay) with groups of students who were given an objective test form (multiple choice). Based on the two line Anava output data contained in the Forms Test section significance values obtained of 0.017 in other words  $0.017 < 0.05$  based on these data it can be concluded that there are differences in critical thinking skills between students who are given the form of essay tests and students who are given the form of multiple choice tests.

Third, there is an interaction between the method *blended learning* and the form of the test on students' critical thinking skills. Testing the interaction between the Method and Form of Test can be seen in the Method \* Form of Test the significance value obtained 0,000 in other words  $0.000 > 0.05$  then  $H_0$  is rejected or  $H_1$  received, based on these data we can conclude that there are significant interaction between learning method and a test of the ability of critical thinking. Because there is an interaction between learning methods and the form of tests on students' critical thinking skills, it is necessary to do further t-Dunnet tests.

### T-Dunnet

The *output test Anova* two lines give the results of the influence of the interaction between learning method and a test of the ability of critical thinking in students, testing this hypothesis using analysis of variance (ANOVA) two lanes then followed by t-Dunnet [37] used to compare the mean values of all treatments with the mean values of the control treatments. The following is a recapitulation of the next hypothesis testing using the t-Dunnet test with a procedure that requires converse into four treatments, namely (A1B1, A2B1, A1B2, A2B2) with the following information:

- A1B1 = Method *Blended learning* with essay test form
- A1B2 = Method *Blended learning* with multiple choice test forms
- A2B1 = Conventional methods with essay test forms
- A2B2 = Conventional methods with multiple choice test forms

**Table 6.** Recapitulation of Hypothesis Test Results with Statistics t-Dunnet Test

Variance	Contrast Value	(Se)	$t_0$	t-table	Decisions
[A1B1] and [A2B1]	$ \bar{Y}_{11} - \bar{Y}_{21}  = 1.75$	0.336	5.22	1.645	Significant
[A1B2] and [A2B2]	$ \bar{Y}_{12} - \bar{Y}_{22}  = -0.57$	0.336	-1.69	1.645	Significant



[A1B1] and [A1B2]	$ \bar{Y}_{11} - \bar{Y}_{12}  = 1,74$	0,339	5,12	1,645	Significant
[A2B1] and [A2B2]	$ \bar{Y}_{21} - \bar{Y}_{22}  = -0.58$	0.336	-1.74	1.645	Significant

Data recapitulation hypothesis testing with statistic test t-Dunnet above, the researcher will discuss the research hypotheses that have been proposed previously, as follows: First, there are differences in critical thinking skills between students who are given the form of tests (essays) on the *blended learning* method and conventional learning methods. Based on the recapitulation of the results of the hypothesis test with the t-Dunnet test statistics contained in table 6, obtained a contrast value  $|\bar{Y}_{11} - \bar{Y}_{21}| = 1.75$  with a value of  $t_{\text{arithmetic}} (5.22) > t_{\text{table}} (1.645)$  then a decision can be drawn  $H_0$  is rejected and  $H_1$  is accepted. This shows that the critical thinking ability of students taught with the method *blended learning* is higher than students taught with conventional learning methods, for students who are given a description test.

Second, there are differences in critical thinking skills between students who are given the form of tests (Multiple Choice) with *blended learning* methods and conventional learning methods. Based on the recapitulation of the results of the hypothesis test with the t-Dunnet test statistics contained in table 6, obtained a contrast value  $|\bar{Y}_{12} - \bar{Y}_{22}| = -0.57$  with the value of  $t_{\text{arithmetic}} (-1.69) > t_{\text{table}} (1.645)$  then it can be decision withdrawn  $H_0$  is rejected and  $H_1$  accepted. This shows that the critical thinking ability of students taught with the method *blended learning* is lower than students taught with conventional learning methods, for students who are given multiple choice tests.

Third, there is a difference in students' critical thinking skills using the method *blended learning* by providing a form of *essay* test and an objective test form (*multiple choice*). Based on the recapitulation of the results of the hypothesis test with the t-Dunnet test statistics contained in table 6, obtained a contrast value  $|\bar{Y}_{11} - \bar{Y}_{12}| = 1.74$  with a value of  $t_{\text{arithmetic}} (5.12) > t_{\text{table}} (1.645)$  then a decision can be drawn  $H_0$  is rejected and  $H_1$  is accepted. This shows that the critical thinking ability of students who are given essay tests is higher than students who are given multiple choice tests for students with methods *blended learning*.

Fourth, there are differences in students' critical thinking skills using conventional learning methods by providing *essay* test forms and test forms objective (*multiple choice*). Based on the recapitulation of the results of the hypothesis test with the t-Dunnet test statistics contained in table 6, obtained a contrast value  $|\bar{Y}_{21} - \bar{Y}_{22}| = -0.58$  with the value of  $t_{\text{arithmetic}} (-1.74) > t_{\text{table}} (1.645)$  then it can be decision withdrawn  $H_0$  is rejected and  $H_1$  accepted. This shows that the critical thinking skills of students who are given essay tests are lower than students who are given multiple choice tests for students with conventional learning methods.

#### IV. CONCLUSION

Based on the results of research and data analysis regarding the effect of method *blended learning* and a test of the ability of students' critical thinking on economic subjects in class XI IIS in SMA Jakarta Timur it can be concluded as follows: First, critical thinking skills the student group that method *blended learning* more higher than the ability to think critically groups of students who use conventional learning methods. Second, the ability to think critically groups of students who are given the form of *essay* test higher than the ability to think critically groups of students who are given the form of objective tests (*multiple choice*). Third, there is the effect of interaction between learning methods and forms of tests on critical thinking skills. Fourth, Specifically groups of students who are given a test description (*essay*), critical thinking skills of students who use the method *blended learning* higher than the

ability to think critically groups of students who use conventional learning methods. Fifth, specifically groups of students who are given an objective test (multiple choice), the critical thinking skills of students who use the method blended learning are lower than the ability to think critically groups of students who use conventional learning methods. Sixth, specifically groups of students who use the method blended learning, the critical thinking skills of students who are given the form of essay tests are higher than the critical thinking abilities of students who are given the form of objective tests (multiple choice). Seventh, specifically for groups of students using conventional methods, the critical thinking skills of students who are given the form of essay tests are lower than the critical thinking abilities of students who are given the form of objective tests (multiple choice)

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