Project Based Blended Learning and Independent Learning on Critical Thinking Skill

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Abstract. This study aimed to determine the effect of the project based blended learning and independent learning of critical thinking skill. The study used the quasi-experimental research method in the 2x2 treatment by level model. The subjects of this study were vocational high school students in Grade 10. The samples were divided into two groups; one group learned through the project based blended learning model with 73 students while the other group learned through the blended learning model with 74 students. Both groups were then given an independent learning test to divide students into categories of students who had high independent learning and students who had low independent learning. The research showed that the critical thinking skill of students who learned through the project based blended learning models was higher than those who learned through only blended learning models. Also, the critical thinking skill of students who had high independent learning was greater than students who had low independent learning. The results of the hypothesis test indicated that there is a significant interaction effect between learning models and independent learning on critical thinking skill.

1. Introduction
Graduates' competencies are based on the Indonesian National Education Goals that must consider 21st century learning and skills such as critical thinking skills, creativity, collaboration, and communication. Therefore, classroom learning must help students in training and improving 21st century skills so that students can be successful in their future. Critical thinking skills are one of the 21st century skills that must be possessed by students. Critical thinking skills are mental processes in the form of higher-order thinking skills, including knowledge and skills to analyze, evaluate, draw conclusions, make decisions and solve problems [1]. Critical thinking skills can be trained and developed by adjusting appropriate educational strategies or models [2]. According to Duron, the right strategy or learning model to improve critical thinking skills is learning that make students as the center so that students can practice their skills in critical thinking [3].
Research conducted by Suharno, Pambudi & Harjanto (2020) states that learning approaches still tend to be theoretical and less relevant. In addition, 74% of students feel bored while studying [4]. Some of these things are also in line with the results of a preliminary study using a survey method via Google Form which was distributed to class X students and physics teachers at the vocational education level. With the number of responses from 167 students and 15 physics teachers, it shows that 152 of 167 or 91% of students feel that classroom learning has not led to the reconstruction of knowledge, analyzing a phenomenon and solving problems. Classroom learning occurs only in one direction between the teacher and the students. This has an effect on not being able to develop and train the skills needed. A total of 149 out of 167 or 89% of students also stated that the learning process currently being carried out still prioritizes theoretical studies and has not trained in processing skills in depth.

Learning must be able to integrate knowledge, skills, attitudes and abilities of ICT. Higher education institutions also continue to familiarize themselves with online and blended learning [5]. In addition, considering the current conditions that make many educational institutions adjust to blended learning as a result of the COVID-19 pandemic. One of the learning models of the development of blended learning that can improve critical thinking skills is Project Based Blended Learning (PjB2L). Project Based Blended Learning is a combination of the Project Based Learning (PjBL) model with the Blended Learning model. This is because of the characteristics of PjBL learning models that can improve students' knowledge and skills of working within a period of time to investigate and respond to complex questions, problems or challenges [6]. By combining the blended learning model, students can be more active, communicative and interactive in learning and increase their knowledge. Because the advantages of blended learning are providing individual learning experiences, supporting and encouraging independent and collaborative learning, increasing teacher pre-service involvement in education, and being flexible in learning, meaning anytime and anywhere [7]. Through the concept of PjB2L learning, students are trained to express facts, ideas, and conclusions through giving project assignments. Not only that, the skills to search and dig up data from various internet-based sources are also trained [8].

In distance learning due to the COVID-19 pandemic and the application of blended learning, students must be able to learn independently. In addition, according to the Victoria State Government (2018) learning independence is one of the important principles in learning that is recommended to be in accordance with classroom settings in the 21st Century [9]. Independent learning will be realized if students have control over personal awareness, motivation, competence, and skills that they will achieve [10]. Students who are able to study independently have greater potential to achieve high academic achievement because they have the ability to identify and choose their own problems, plan activities, and submit results at the end of the activity [11] [12]. Independent learning means developing active and participatory learning methods for students to improve skills and abilities in the learning process without being bound by the teacher or classmates, the teacher only acts as a facilitator. So that the independence of student learning has an important influence. Independent learning that can be applied properly by students will certainly affect the intellect of these students [13]. Which means that independent learning has an influence on critical thinking skills.

Based on the previous description, the authors are interested in conducting research on the influence of project based blended learning and independent learning of critical thinking skill. In this study, researchers used two learning models, which is project based blended learning model and blended learning model.
2. Method

The method used in this study is a quasi-experimental research method using a treatment by level 2 x 2 design. The dependent variable in this study is critical thinking skills while the independent variable is the learning approach with the moderator variable being independent learning. The treatment variables were divided into two, namely the learning model through project-based blended learning and blended learning model. The moderator variable is high independent learning and low independent learning. The method aims to predict conditions that can be achieved in actual experiments, but there is no control or manipulation of all variables. The design that will be used in this experimental research is as follows Table 1.

Table 1. Research Design

| Independent Learning (X₂) | Learning Model (X₁)          |                  |                  |
|---------------------------|------------------------------|------------------|------------------|
|                           | Project Based Blended Learning (X₁a) | Blended Learning (X₁b) |
| High (X₂a)                | (Y₁a-2a)                     | (Y₁b-2a)         |
| Low (X₂b)                 | (Y₁a-2b)                     | (Y₁b-2b)         |

The population in this study was all students of grade 10 in the 2020/2021 semester II academic year at SMK Negeri 2 Sukabumi. While the sample in this study was 74 students of grade 10 SMK Negeri 2 Sukabumi which were divided into 2 classes. The experimental class consists of 37 students who will learn to use a project based blended learning model. While the controller class consisting of 37 students will learn using blended learning. Furthermore, as many as 74 students were given a test to determine the learning independence of students. The values obtained from the results of the questionnaire will be sorted starting from the highest value to the lowest. Based on this value, 27% of the top scores were taken as the upper group, namely students who had high learning independence and the lowest 27% as the lower group, namely students who had low independent learning. Based on these proportions, students are then given a critical thinking skill test. Data obtained from these two instruments were tested for analysis prerequisites which are normality and homogeneity test, followed by two-way ANOVA hypothesis test.

3. Result and Discussions

The research data is in the form of critical thinking skills test scores. The mean scores for critical thinking skill test in each group are presented in Table 2.

Table 2. Mean Scores for Each Group

| Independent Learning | Learning Model (X₁)          |                  |
|----------------------|------------------------------|------------------|
|                      | Project Based Blended Learning | Blended Learning |
| High                 | 87.21                        | 83.84            |
| Low                  | 74.83                        | 81.83            |

In table 2, it can be seen that project based blended learning with high independent learning has the highest average score of 87.21. And the lowest average score is project based blended learning with low independent learning. Before testing the hypothesis, the normality test was carried out using the Shapiro-Wilk test, which resulted in a significant value of p > 0.05 which means that students’ critical thinking skill test data were normally distributed. The homogeneity of the variance of the Levene’s test also resulted in a significant value of p > 0.05. This shows that students’ critical thinking skill test for two groups of learning models were homogeneous. Then, hypothesis testing was carried out using two-way ANOVA. On Table 3 presents dependent variable ANOVA using SPSS.
Table 3. Two-way ANOVA Output using SPSS

Dependent Variable: Critical Thinking Skill

| Source                      | Type III Sum of Squares | Def | Mean Square | F       | Sig.    |
|-----------------------------|-------------------------|-----|-------------|---------|---------|
| Corrected Model             | 3215.063a               | 3   | 1405.021    | 31.740  | 0.334   |
| Intercept                   | 323244.188              | 1   | 323244.188  | 7302.141| <.001   |
| Learning Approach           | 873.021                 | 1   | 963.021     | 21.755  | 0.461   |
| Independent Learning        | 4056.879                | 1   | 3056.021    | 69.036  | 0.243   |
| Learning Approach * Independent Learning | 196.333 | 1 | 196.021 | 4.428 | 0.298 |
| Error                       | 1947.750                | 44  | 44.267      |         |         |
| Total                       | 329677.000              | 48  |             |         |         |
| Corrected Total             | 6188.813                | 47  |             |         |         |

R Squared = .684 (Adjusted R Squared = .662)

The results of the tests that have been carried out in table 3 show that there are significant differences in the critical thinking skills test between learning model \(F = 21.755\) and \(\text{Sig.} \ 0.461\). It means that there are differences in students' critical thinking skills with the implementation of project-based blended learning and blended learning. In table 3 also show that there are significant differences in the critical thinking skills test between independent learning \(F = 69.036\) and \(\text{Sig.} \ 0.243\). It means that there are differences in students' critical thinking skills among students with high independent learning and law students. And there is significant interaction between the learning models and independent learning \(F = 4.428\) and \(\text{Sig.} \ 0.298\). It means that there is an influence on learning approach and independent learning of students' critical thinking skills. The interaction between learning models and independent learning on students’ critical thinking test is shown in Figure 1.

![Figure 1. Interaction between learning models and independent learning on students’ critical thinking skill test](image-url)
In Figure 1, it shows that there are differences in the results of students' critical thinking skills among students with project based blended learning model and blended learning models. In addition, there are also differences result between students with high independent learning and low independent learning. Students who study with a project based blended learning model and have higher independent learning get the highest results compared to other students. This means that project based blended learning is effective for improving critical thinking skills [14]. In addition, this is because project based blended learning allows students to learn independently, so students can learn better [15].

4. Conclusion
Based on the research results obtained from data analysis, it shows that the critical thinking skills test for students who learn through using the project based blended learning model is different from the students who learn through the blended learning model. In addition, there are significant differences between students who have high independent learning and low independent learning. Also, there is a significant interaction between the learning model and independent learning to the students' critical thinking skills test.

Acknowledgement
The author is grateful to several parties involved in this research, such as school institutions that have given permission and Jakarta State University

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