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Hybrid Project-based Instructional Model: Fostering Critical Thinking Skills and Creative Thinking Skills

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ABSTRACT

Project-based learning is a learning approach that emphasizes students as learning actors who facilitate students' construct of their knowledge. However, the application of project-based learning to learning at the tertiary level is a learning syntax that has not been designed by adjusting the characteristics of learning for the tertiary level. This study aims to analyze the effectiveness of case study-based learning conducted using a hybrid project-based learning model in improving students' critical thinking and creative thinking skills. This study used a non-equivalent control group research design with 70 samples divided into the experimental and control groups. The instruments used are standard critical thinking skills tests, namely Cornell Critical Thinking Test (CCTT) level X, creative thinking skills test instruments, and observation sheets. The results showed that the gain value in critical thinking of the experiment class is 0,52 in the medium category and the control class is 0,34 in the medium category. Meanwhile, the gain value in the creative thinking of the experiment class is 0,32 in the medium category, and the control class is 0,29 in the low category. It concluded that hybrid project-based learning effectively improved students' critical and creative thinking skills. The increase in students' critical thinking skills is higher than students' creative thinking skills.

Keywords: hybrid project-based learning, critical thinking skills, creative thinking skills, Instruction model

INTRODUCTION

The development of technology and information has now penetrated the world of education, so teachers and lecturers have begun to design innovative learning (López-Pérez et al., 2011). One of the efforts to integrate technology in education is the application of hybrid learning (Kaur, 2013), also known as blended learning (Husamah, 2015a, 2015b). This learning process combines the process of delivering material online, offline, mobile, and online. Face-to-face learning has been applied at various levels of education (Kaur, 2013; Napier et al., 2011). The application of hybrid learning has a significant impact on the educational environment. During the Covid-19 pandemic and after the pandemic, it has become the Indonesian government's discourse to implement hybrid learning (Firdausi, 2020).

Although various studies show the advantages of hybrid learning, teachers/ lecturers must determine the appropriate design to achieve the expected learning outcomes. A good and effective learning process will help students achieve the competencies formulated in the learning objectives optimally (Dunlosky et al., 2013). Focus on this research with student research object. Quality learning can facilitate students to prepare themselves as individuals who can compete in the world of work (McFarlane, 2013) because individuals who can compete master life

skills and thinking skills (Buku et al., 2015; Masigno, 2014; Wilson, 2016). Thinking skills can be divided into critical thinking and creative thinking (Anjarsari, 2014). This thinking skill is a 21st-century skill. Therefore, the learning process is expected to improve students' 21st-century skills. In this case, lecturers must be able to develop skills such as problem-solving and creative thinking to overcome the world's challenges (Osman et al., 2010).

21st-century skills are highly demanded in today's era (Ersoy & Başer, 2014; Ritter & Mostert, 2017). Students trained with 21st-century skills will be flexible, see opportunities, and face challenges in a world that continues to overgrow (Ritter & Mostert, 2017). Given the importance of thinking skills, many educators have focused on preparing students for the 21st century (Bernie Trilling, 2012; Conley, 2007; Drew, 2012). As the main component that interacts the most with students, the lecturer is expected to design learning that empowers students' thinking abilities optimally (Nagappan, 2010).

One of the learning models by 21st-century competencies is Project-based Learning or PjBL (Bell, 2010). Students will participate in the PjBL learning process actively and independently (Kokotsaki et al., 2016). PjBL is also considered a suitable form of learning for students in scientific studies (Movahedzadeh et al., 2012). Various studies have been conducted to assess the impact of PjBL. However, modification of learning activities with the PjBL model is rarely done. In learning during the pandemic, it isn't easy to carry out whole face-to-face learning so that PjBL can be implemented in a hybrid manner. Based on the explanation above, researchers will conduct research activities by modifying the hybrid- PjBL model to improve students' critical and creative thinking skills.

RESEARCH METHOD

Purpose of the study

This study aims to analyze the effectiveness of hybrid project-based learning in improving students' critical thinking and creative thinking skills. Specifically, the problem in this research is how does the hybrid-Project base Learning model influence students' critical and creative thinking skills?

Research design

This study uses a non-equivalent control group research design (Robson & McCartan, 2016). In this research design, two-class groups were used as the experimental and control groups. In the experimental group, hybrid-project-based learning was applied, while in the control group, project-based learning was applied without hybrid-based learning. See Table 1 for more details on learning in the experimental and control groups. The same teacher teaches each group in 6 meetings; each meeting is 120 minutes. The students investigated two cases, and each case was solved in a duration of 3 meetings. Before and after the meeting, a critical thinking skill test was conducted. During the learning process, observations were made on students (in groups) to obtain data about student independence in research to solve the problems given.

Table 1. Research design

Before giving treatment	Giving treatment	After giving treatment
Pretest experimental group	Learning hybrid project-based learning	Posttest experimental group
Control group pretest	Project-based learning without hybrid	Posttest control group

Participant

The research subjects were 70 prospective science teacher students at one of the state universities in Indonesia, precisely in Central Java. The research subjects were divided into two groups, where each class consisted of 35 students.

One group was the experimental group, and the other group was the control group. This research was conducted in Basic Physics lectures in semester 3 (the second year).

Data collection and analysis

In this study, data were collected using standardized test instruments to measure critical thinking skills: the Cornell Critical Thinking Test (CCTT) level X and a test of creative thinking skills. The test was carried out two times, a pretest and a posttest. The data obtained in the form of pretest and posttest data were analyzed based on the experimental group and the control group. In addition to the test instrument, an observation instrument was also used to assess the implementation of learning.

RESULT AND DISCUSSION

Achievement of students' critical and creative thinking skills

The student's critical thinking skills are shown through quantitative data analysis of pretest and posttest scores. The differences in the results of critical thinking skills from the two groups with different treatments were compared and the theoretical and actual results were discussed. The pretest and posttest data were tested for normality and homogeneity to determine the data analysis performed. The results of the normality test using the Kolmogorov-Smirnov test on the experimental group pretest data ($z = 0.041$, $p > 0.05$), the control group pretest ($z = 0.200$, $p > 0.05$), the experimental group post-test ($z = 0.200$, $p > 0.05$), and post-test control group ($z = 0.108$, $p > 0.05$). The data analysis showed that the posttest data of the experimental group, the pretest, and the control group's posttest values were greater than 0.05, so the data were normally distributed. However, the experimental class pretest data is less than 0.05, so the data can be said to be not normally distributed. The next test is the homogeneity test with the results ($z = 0.229$, $p < 0.05$), so it can be concluded that the data is homogeneous. This data analysis information becomes a reference for determining more in-depth data analysis.

The difference test for the average pretest and posttest of the experimental group using the Wilcoxon test got the Asymp value. Sig. (2-tailed) of 0.00, $p < 0.05$. These results indicate a difference between the results of the pretest and posttest in the experimental group. In addition, a different test for the average pretest and posttest of the control group was also conducted using the paired sample T-test. The results of the calculation of the data obtained the value of Sig. (2-tailed) of 0.00, $p < 0.05$, so it can be concluded that there is a difference between the pretest and posttest results in the control group. The results of this test indicate that the treatment given to both the experimental class and the control class impacts students' critical thinking skills. To see the significant impact of case-based learning using the hybrid project-based learning model, it was done by comparing the experimental and control groups' data.

The difference test for the average pretest of the experimental group and the control group was carried out using the Mann-Whitney test. The test results obtained the Asymp value. Sig. (2-tailed) was 0.188, $p < 0.05$. This shows that the value obtained is > 0.05, so it can be concluded that there is no difference in the pretest value between the experimental class and the control class. These results indicate that before the class received different treatment, the critical thinking abilities of the two groups were the same. The impact of different treatments was seen through a different test of the average posttest of the experimental group and the control group using the independent T-test. The results show that the value of Sig. (2-tailed) of 0.00, $p < 0.05$, it can be concluded that there is a difference in posttest scores between the experimental group and the control group. These results indicate that the treatment is given to the experimental group and the control group impacts students' critical thinking skills. Statistically, it is answered that the hybrid

project-based learning model improves critical thinking skills. The results of the difference in critical thinking skills between the experimental and the control groups can be seen with the gain values presented in table 2.

Table 2. Improving students' critical and creative thinking skills in the experimental group and control group

Skills	Group	gain	Improvement criteria
Critical Thinking	experiment	0.52	Medium
	control	0.34	Medium
Creative Thinking	experiment	0.32	Medium
	control	0.29	Low

Table 2 shows that the increase in critical thinking skills in the experimental and control groups is on the same criteria. However, the gain value for the experimental group is greater than the gain value for the control group. These results indicate that hybrid project-based learning improves students' critical thinking skills than project learning without a hybrid design. However, there are differences in critical and creative thinking skills. The increase in critical thinking skills is higher than creative thinking skills. This shows that students are more focused on critical thinking. Creative thinking skills are less improved because assistance in completing projects does not free students to solve problems. Problem solved creatively but with guidance. This causes the increase in creative thinking skills is not to increased.

Discussion

The results showed increased students' critical and creative thinking skills in classes that applied hybrid project-based learning. In learning design, students are stimulated to think critically and creatively to complete projects. The project that is raised is in the form of an analysis of problems that arise around students. The process of students analyzing problems can bring up critical thinking skills. In contrast, students think creatively to provide solutions to the issues displayed. It is supported by research by Liu & Pásztor (2022), which states that critical thinking skills can be improved through problem-solving. Each stage in designing solutions through activities based on objectives and questions, selecting information, and finding solutions (Mutakinati et al., 2018). In addition, creative thinking skills can be developed through problem-solving activities (Eny et al., 2018). Students solve problems through problem analysis in group discussions. Both classes experienced increased critical thinking skills because students were asked to solve cases critically through group discussions on learning cases. It is reinforced by the research results showing that discussion affects the ability to think about issues (Levin, 1995; Weil et al., 2011). Through discussion, students benefit from obtaining information that enhances their ability to critically review case information (Weil et al., 2011). Case studies should be integrated into the classroom to encourage critical thinking (Akins et al., 2019).

However, critical thinking skills are higher than creative thinking skills. This result is different from Ulger K's (2018) research, which shows that problem-based learning is better able to improve creative thinking skills than critical thinking skills. This difference is because, in project-based hybrid learning activities, more critical thinking activities arise to analyze problems, find solutions, and analyze problem-solving results. While creative thinking activities are more raised when students look for solutions to problems. Therefore, the hybrid project-based learning model can improve critical thinking skills more effectively than creative thinking skills.

Limitation of the study and Future Work

Some of the shortcomings in this study are described as follows. First, the research was conducted on a small number of samples and at one level so that the generalizability of the research results is limited. Second, the instrument used to assess critical and creative thinking skills is only at the beginning and end, so it cannot

describe students' thinking skills at each phase of learning implementation. Other similar studies can pay attention to the following points, namely: 1) increasing the number of samples at several levels of students so that the scope of generalization is broader, 2) using instruments to assess critical and creative thinking skills during the student process of solving cases. This can be done to see which phase can substantially impact students' critical and creative thinking skills.

CONCLUSION

The results showed that hybrid project-based learning could effectively improve students' critical and creative thinking skills based on the research conducted. The analysis results of the critical and creative thinking skills of students whose learning uses hybrid project-based learning are higher than those of students without hybrid project-based learning. The results of other studies show that the increase in students' critical thinking skills with the hybrid project-based learning model is higher than the increase in students' creative thinking skills.

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