



The Development of Project-Based E-Learning Tool to Improve Students' Creative Thinking Skill

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Abstract: This study aimed to determine the form, the level of effectiveness, and the obstacles and challenge in developing project-based e-learning tool to improve students' creative thinking skills. The learning media developed are syllabus, lesson plans, modules, and creative thinking skills test. The model which is developed is the Plomp model which consists of some phases namely investigation, design, realization/construction phases and the evaluation, revision, test phase. Based on the validation test, the syllabus was 4.48, the RPS was 4.48, the module was 4.36, and the THB was valid. Based on the practicality test, the students' responses were 76.25% and the lecturers' responses were 4.70 and the category is very good. Based on the individual effectiveness test of 43.8% > 5%, classical completeness z count = 0.976 is between the z table and the N-gain test, 2 students had increasing creative thinking ability test scores in the high category, 6 students were in the medium category. Then it can be concluded that the learning tools developed are valid, effective, and practical.

Abstrak: Penelitian ini bertujuan untuk mengetahui bentuk, tingkat efektivitas, dan hambatan dalam mengembangkan perangkat e learning berbasis proyek untuk meningkatkan kemampuan berpikir kreatif. Perangkat pembelajaran yang dikembangkan adalah silabus, RPS, modul, dan THB. Model pengembangan yang digunakan adalah model Plomp yang terdiri dari fase investigasi awal, desain, realisasi/konstruksi dan fase tes evaluasi, revisi. Berdasarkan uji validasi diperoleh hasil silabus sebesar 4,48, RPS sebesar 4,48, modul sebesar 4,36, dan THB valid. Berdasarkan uji efektivitas ketuntasan individual sebesar 43,8% > 5%, ketuntasan klasikal z hitung = 0,976 berada antara z tabel, dan uji N-gain, 2 mahasiswa mengalami peningkatan pada kategori tinggi, 6 mahasiswa pada kategori sedang. Berdasarkan uji kepraktisan respon mahasiswa sebesar 76,25% dan respon dosen rata-rata 4,70 kategori sangat baik. Sehingga dapat disimpulkan bahwa perangkat pembelajaran yang di kembangkan memenuhi valid, efektif, dan praktis.

Kata Kunci: E-learning, Proyek, Berpikir Kreatif

Keywords: E-learning, Project, Creative Thinking skill

INTRODUCTION

Indonesia is facing a new industrial era, that is 4.0 era. In This period, the development of technology which results in the physical, biological, and digital dimensions are integrated and that is difficult to separate (Schwab, 2016). The digitalization of information and the massive uses of artificial intelligence in various sectors of people's lives are included in the field of education also. In the field of education, the industrial era 4.0 is marked by the role of cyber technology in human life. So it is not surprising that in the field of education then the term "Education 4.0" appears. Education 4.0 (Education 4.0) is a term which is usually used by education experts to describe the various ways to integrate cyber technology in learning physically and mentally (Priatmoko, 2018).

In achieving the goal of education 4.0 era, Both the lecturers and educational sector must be able to strengthen the various aspects such as curriculum, management systems, learning models, learning strategies, and learning approaches. One of the ways is by strengthen the literacy skills for lecturers and educational institutions from old method such as reading, writing, arithmetic to new literacy (data, technology, HR/humanism) (Ibda, 2018). Having competency to produce competitive human resources in industry 4.0 who are able to apply the new literacy education curriculum, educational students as future teacher candidates must develop the 4 C aspects, there are communication, collaboration, critical thinking and problem solving, and creativity and innovation (Kivunja, 2015; Nur Eva Zakiah et al., 2020; Fitriani et al., 2022).

The students as teacher candidates in the future must be guided by lecturers in their learning in order to develop aspects of 4C, it can be approached through designing strategies, methods, media, and evaluation tools in the learning process. Based on observations made in the State Islamic Institute of Takengon, Central Aceh, especially in Mathematics department, most of the courses did not facilitated by

technology media, especially digital technology. Mathematics department has E-Learning which is connected to the *Siakad* application, but it was not used optimally. Moreover, the project-based assignments were not effective also. The average of assignment submitted, especially in the Learning Evaluation course given to students, is only about written assignments, exercises, and discussions. There are no project assignments which are integrated with technology such as the use of learning applications to serve as virtual classes (online classes).

E-learning is a technology-based learning model that can be used to sustain the learning process in the digital era like today (Hakim, 2018). E-Learning is learning innovation as well as an alternative solution for the development of student's needs, educators, and education personnel (Khairat & Fuaddin, 2019). The e-learning model is a learning model that uses electronics as a tool which is not limited by space and time (Situmorang, 2016). E-learning is internet-supported in learning (A. Gunasekaran et al., 2002). The effectiveness of e-learning can be measured by the extent to which a learner actually acquires relevant knowledge or skills presented online (Shute & Towle, 2003). E-learning provides faster learning in lower costs, increased access to learning, and clear accountability for all participants in the learning process (A. Gunasekaran et al., 2002). Various applications that can be used in e-learning include Edmodo, Quipper School, and Kahoot applications. Project-based e-learning is expected to be able to develop one of the 4c aspects, namely creativity. This is supported by Zakiah's research which states that project-based learning can explore students' creative thinking skills (Nur Eva Zakiah et al., 2020).

This research used a qualitative-quantitative research and it is done in the one course in math department *pengembangan sistem evaluasi pembelajaran matematika* (learning evaluation development). The implementation of e-learning in this study

utilizes the Edmodo application and video conference Zoom.

METHOD

The research approach used is qualitative-quantitative research (Mix Method) with this type of research being research and development (R & D). The learning device used is the Plomp model which consists of 5 stages but it is only taken in 4 stages, namely the preliminary investigation phase, the design phase, the realization/construction phase (realization/construction), and the test phase, evaluation and revision (test, evaluation and revision). The learning tools developed include: (1) syllabus, (2) lesson plan, (3) modules, and (4) creative thinking skills test for learning evaluation materials.

The parameter of this development of learning tools is valid, effective, and practical. The following describes data analysis to measure valid, effective, and practical criteria. There are :

- a. Validation was obtained from all validators' assessment toward the learning tools and score analysis
- b. The practicality was obtained from data on students' responses toward the learning process and lectures' responses toward the learning media.
- c. The effectiveness was obtained based on students' score. Class' scores, and N-Gain tests score. The Student' score is said to be successful if the student has achieved an average learning achievement of 72. The class' score is said to be successful if the number of students who have reached the minimum completeness criteria of 72 is 80%. The N-Gain test is said to be successful if there is an increase in the creative thinking ability test score from the previous score.

In collecting the data, the researcher used four instrument there are learning media validation sheets, observation sheets, creative thinking skills test and student and lecturer response questionnaires.

RESULTS AND DISCUSSION

Results

The project-based e-learning learning tool that was developed to improve students' creative thinking skills in the course "learning evaluation development" in mathematics department in IAIN Takengon.

The development of learning media in this study used the phases of Plomp which consisted of:

Investigation Phase (Preliminary Investigation)

The investigation phase is divided into Students' responses analysis, task analysis, and material analysis.

1) Students' responses Analysis

Students responses analysis were conducted through giving questionnaires to find out the learning experience and e-learning facilities owned by students. The following results of student analysis are presented in table 1.1.

Table 1.1. Students' responses Analysis

No	Questions	Students' responses percentage	
		Yes	No
1.	Was your learning done face-to-face only?	11%	89%
2.	Have you ever done online learning?	100%	-
3.	Have you ever done project-based learning through online?	-	100%
4.	Do you have a Hand phone which is connected to the internet?	100%	-
5.	Do you have a laptop that is connected to the internet?	89%	11%

Based on the table 1.1., it is known that all students have already internet facilities so that there will be no problem to conduct learning through. In addition, based on the results of the questionnaire, it is known that project-based online learning is something new for students. Online learning has been conducted by students but it is not through online.

2) Analyzing material

Analyzing material is an important phase in order to develop learning tools systematically. Analyzing material in the course "Learning evaluation development" is

presented as follows: (1) material for constructing instrument such as a test, test distribution, simulation, answer keys and scoring, (2) material for content and construct validation, (3) material for empirical validity, reliability, item analysis (level of difficulty of the test).

3) Analyzing Task

Analyzing Task in developing project-based e-learning tools to sustain students' creative thinking skills, there are (1) practicing in constructing written test instruments, such as the test distribution of questions, simulation, answer keys and scoring, (2) practicing in identifying content and construct validity, (3) practicing empirical validity in a school that has same subjects, (4) practicing in calculating empirical validity, reliability, item analysis (5) making reports and holding a presentation

Design Phase

Based on the results of analyzing students' responses, materials and test on investigation phase, then the design of project-based e-learning learning tools was created in this phase. The Learning tools developed included syllabus, lesson plans, modules, and creative thinking skills test. The design phase in this research is designing the syllabus, lesson plans, modules, and creative thinking skills test formats.

The syllabus design follows the following format: (1) Identity, (2) objectives, (3) Description, (4) Learning approach, (5) Evaluation, (6) Details of material for each meeting, (7) Bibliography.

The lesson plans design follows the following format: (1) identity, (2) Learning outcomes in general, (3) Descriptions, (4) Learning outcomes, (5) Meeting, (6) Competency, (7) Material, (8) learning strategies, (9) Date, (10) experiences, (11) indicators and assessment criteria, (12) Scoring.

The module design follows the following format: (1) Identity, (2) General instructions, (3) Material, (4) Evaluation.

The creative thinking skills test design follows the following format: (1) Test prediction, (2) Scoring, (3) test.

Realization/Construction Phase

The realization/construction Phase is related to the phase of developing the syllabus, lesson plans, modules and creative thinking skills test which are concerning the format created at the design phase. The following is an example of the syllabus and lesson plans. They are presented in Figure 1.1.

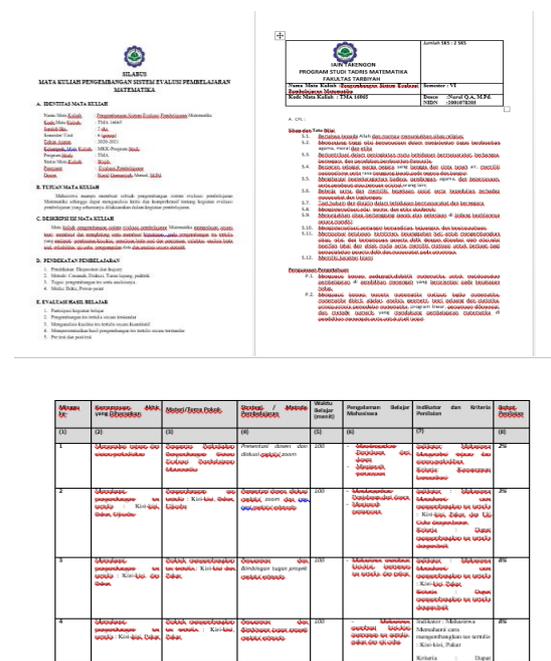


Figure 1.1. Developing syllabus and lesson plans

The difference between the syllabus that was developed and the previous syllabus is that the learning approach used in the previous syllabus used the Expository and Inquiry approach, while the syllabus developed used a project based learning model. The learning media used in the previous syllabus were powerpoints and books, while the syllabus developed was using the Zoom and Edmodo Video Conference applications.

Test, Evaluation and Revision Phase

In the test phase, evaluation and revision phase, the validation, effectiveness and practicality of learning tools were conducted.

a. Analyzing validity of learning tools

The validation of learning tools was conducted by three validators. The result was presented below:

Table 1.2. Learning Tool Validation Results

Learning tools	Validation conducted by three validators				
	V1	V2	V3	Average	Category
Syllabus	4,77	4,27	4,41	4,48	Very good
Lesson Plans	4,77	4,27	4,41	4,48	Very good
Module	4,85	4,15	4,09	4,36	Very good
Test	Valid	Valid	Valid	Valid	Valid

Based on the table above, it is known that the learning tools developed are in the very good category.

b. Analyzing practicality of learning tools

1) Analyzing students' responses

It was conducted by giving questionnaire to the students. The results were 76.25% > 75% response, which means that students gave a positive response to project-based e-learning.

Analysis of lecturers' responses to learning tools

2) Analyzing lecturers' responses

The average of the lecturer's responses toward learning tools is 4.70. It can be concluded that lecturers' responses toward learning tools was in the very good category.

c. Analyzing the effectiveness of learning tools

1) Independent sample t- test

Independent sample t- test was conducted in order to determine whether the score average in experimental class has reached 72. By using SPSS version 16 and on sample T-Test, the result presented as follow:

Table 1.3. Output using one -sample statistics

Table 1.3 presented the average students' achievement in the experimental class is 75.120 with a standard deviation of 10.74958, while based on Table 1.4, from the output of the one sample t test, the value of sig = 0.438 = 43.8% is obtained. Since the value of sig = 43.8% > 5%, the null hypothesis (H0) is accepted, it can be concluded that the average student achievement has reached an average of 72.

2) Classical test

Classical test is used to determine whether student learning achievement has reached the passing grade (KKM) of 80%. The calculation conducted using this formula

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Experiment	8	75.1250	10.74958	3.80055

Table 1.4. Output using *One Sample T Test*
One-Sample Test

Test Value = 72						
	T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Experiment	0.722	7	.438	3.12500	-5.86119	12.11119

$$z = \frac{\frac{x}{n} - \pi_0}{\sqrt{\frac{\pi_0(1-\pi_0)}{n}}} \quad \text{then } z = 0.976. \quad \text{With a}$$

significance level of 5%, the z table was obtained between -1.96 and 1.96. Since z count = 0.976, then H0 is accepted. Therefore it can be concluded that the average student learning achievement of the experimental class KKM of 80% (passing grade).

3) N-Gain Test

The N-gain test is used to identify the development of students' creative thinking

skills before and after being given project-based e-learning. Based on the results of the N-Gain test, 25% of students are in the high criteria and 75% in the medium criteria. It can be concluded that there was the development of students' creative thinking after treatment given.

The difficulties found in developing project-based e-learning tools to improve students' creative thinking skills in "learning evaluation development" course at math department IAIN Takengon.

To find out the obstacles during the implementation of project-based e-learning, questionnaires were distributed to lecturers and students. Questionnaire indicators related to the network, the time required for learning, student understanding, and the need for learning quotas. The following describes the obstacles experienced lecturers and students:

Obstacles experienced lecturers during implementing project-based e-learning: (1) Unstable network during the learning process, (2) project-based e-learning requires a longer time, (3) student responses in e-learning process were sometimes slow, (4) It took many time to check students' assignments.

While the difficulties found by students such as: (1) unstable network that make students misunderstood toward the lesson lecturer delivered (2) Students had no good understanding about Edmodo , (3) excessive use of internet quotas.

Discussion

To determine the validity of the learning tools in terms of draft 1, validation test was carried out by experts. Then results showed that the syllabus validation value was 4.48 in the very good category, lesson plans was 4.48 in the very good category, Module was 4.36 in the very good category, and creative thinking skills test was valid, high reliability, medium difficulty level, and sufficient distractor. Although the learning tools were in the very good category, The critics and suggestion from validator was needed.

The practicality test of learning tools was measured through of students' and lecturers' responses toward the developed learning tools. Based on the analysis, it was found that students' responses were 76.25%, which means that students gave a positive response to project-based e-learning. Meanwhile, based on the lecturer's responses, it was found average 4.70 which means the result was in very good category.

After measuring the validity and practicality of the learning tools, the effectiveness test was conducted. The next step was to identify whether test the learning tools developed is effective and practical. The effectiveness test consists of Independent sample t- test, classical test, and N-gain test. In the Independent sample t- test test, it was known that the sig value was $43.8\% > 5\%$, which means that the average student achievement has reached an average of 72. In the classical test, the results of z count = 0.976 are between z table, which means the average students' scores in experiment class approached passing grade of 80%. Meanwhile, for the N-Gain test, it was found that there was an increasing of students' creative thinking skill after being given project-based e-learning treatment. The result showed high criteria obtained by 2 students while 6 students obtained medium criteria. The results related to the previous research from Fatmawati (2011), it was states that there was the development of students' creative thinking skill after being given project-based learning about 0.52. Moreover, research conducted by Izzati (2014) stated that the implementation of project-based learning had given significant effects on students' creative thinking abilities. Project-based learning is one of the innovative learning models and emphasizes contextual learning and involves students conducting collaborative investigations, through complex activities to motivate students to be more active and take the initiative to get what they want both in terms of knowledge, understanding, and understanding. skills (Mustika & Ain, 2020). The application of project-based learning has

shown that the learning model makes students experience a meaningful learning process (Antika & Nawawi, 2017; Sari et al., 2019) because project-based learning requires students to solve problems and overcome problems that occur in the real world related to the concepts obtained. At school, when students feel what they are learning is related to their daily experiences, students will feel motivated to find out more (Arisanti et al., 2016). In addition, the application of project-based learning encourages the growth of creativity, independence, responsibility, self-confidence and, critical and analytical thinking in students (Arisanti et al., 2016; Sulaeman, 2016).

Zakiah et al (2020) states that project learning is able to explore students' creativity and creative thinking skills. Furthermore, Husamah (2015) also shows that project learning is learning that has the potential to further develop students' thinking skills. Through project assignments, students are encouraged to use their creativity starting from the process of product planning, making products (building knowledge, understanding and skills, developing products), presenting and evaluating products N. E. Zakiah & Fajriadi (2020). In addition, students will build knowledge through communicating with their groups to provide explanations or express ideas (Bell, 2010; Kokotsaki et al., 2016). This activity is the main feature of the project learning model. This result is in line with the findings of Isabekov & Sadyrova (2017) that the application of project activities in learning is an innovative breakthrough that can transform the learning process into a means to develop student creativity.

In the research of developing project-based e-learning tools, researcher found some difficulties struggled by lecturers and students. The problem appeared such as unstable network in the process of online learning. This was also faced by Huzaimah & Risma (2021) which states that poor internet makes it difficult for students to participate in online learning. In addition, it

is also difficult for lecturers to make students understand material and lesson effectively and efficiently since the material delivered through online application such as Edmodo and zoom. This is supported by research by Abroto et al. (2021), Sadikin & Hamidah (2020) dan Sholichin et al. (2020) which state that the obstacles in the implementation of online learning are unstable internet networks, limited internet quota, and students having difficulty understanding the material.

CONCLUSION

Based on the results of research and discussion, the conclusion obtained as follows:

- a. Developing of project-based e-learning tools was conducted through several phases such as the investigation phase, the design phase, and the realization/construction phase.
- b. The learning tools developed have met the valid, effective, and practical criteria.
- c. In the development of project-based e-learning learning tools, researchers found some difficulties got by lecturers and students. One of the difficulties was that lecturers and students got the unstable network during learning.

After conducting research and being directly involved, the researcher gives suggestions as follows:

First, For further research, adding a comparative test while conducting the effectiveness test and for practical test, more item such as observing the teacher/lecturer's in implementing developed learning tools. Second, For further researchers, more subjects should be used to test the implementation of learning tools. And the last, For lecturers who want to implement project-based e-learning tools, they must be able to consider the time used and the task given in order to make it optimal.

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