The Effect of e-Learning Based on Problem Based Learning (PBL) on the Learning Outcomes of Inferential Statistics in the Educational Technology Department

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Abstract—The development of information and communication technology (ICT) has provided many changes in the world of education. Teaching materials, strategies, media, and learning evaluations have also changed. The learning materials, originally presented manually or printed, are currently presented digitally or electronically. In Educational Technology Department, the result of learning descriptive statistics for semester III students is still low with an average score of 75.53. One way to overcome this problem is by adopting ICT in the Inferential Statistics learning outcomes. Therefore, the purpose of this research is to design a Problem Based Learning (PBL) strategy in the e-learning development and analyze the effects on the assigned learning outcomes of statistics inferential course. This research uses a quasi-experiment using designed posttest control group design. The population of this study was 36 fourth semester students consisting of 2 classes, namely class A (experimental group) and class B (control group). The data was collected using a non-test instrument in the form of a case study project and was given as an online learning. The data were then analyzed using t-test statistics assisted using SPSS. The results of this research show that the mean score of the experimental class is 87.45 and the mean score of the control class is 78.93. The result of tcount is 2.0 6 while ttable is 1, 692 (p <0.05). The results indicated there is a significant increase when problem-based learning (PBL) is applied to the learning outcomes of inferential statistics students. It was also found that 81% of respondents in the experimental class scored above 80 and this indicates that students have been able to solve cases in statistics. In the control class, only 53.33% of respondents scored above 80.

Keywords—e-learning, problem based learning, learning outcomes

I. INTRODUCTION

The influence of information and communication technology (ICT) in the world of education is increasingly felt in line with the shift in learning patterns from face-to-face (conventional) towards more open and media learning [1]. Nowadays, it shows signs that learning in the future will be more flexible, open, and can be accessed from anywhere, anytime, and by anyone. This can happen considering that currently the internet network has been grounded in all levels of society.

The internet is a technology used to make online learning a reality. According to Haughey [2] disclosing that there are three possibilities in developing an internet-based learning system, namely: a web course is the full use of the internet for learning activities. web centric course is the use of the internet that combines distance learning and face-to-face (conventional). The web enhanced course model is the use of the internet to support the improvement of the quality of learning conducted in class. The use of the internet in education is still on the web enhanced course model. There are still very few educational institutions that apply the web-centric course model.

E-learning is often referred to as the use of information technology networks and communication technology in learning [3]. There are various applications that are more commonly known as the Learning Management System (LMS) which can be used to build e-learning, namely Moodle, Edmodo, Schoology, Campus, and so on. In this study, the Moodle LMS will be used. According to Wahono [4] him, Moodle is among the best in terms of features compared to another LMS software. One of the highlights of Moodle is the relatively hassle-free customization process, even though the learning developer doesn't understand programming skills well. According to Surjono [5] there are several steps to develop an e-learning portal using Moodle, including: free web hosting registration which can be used to create an e-learning portal with Moodle, set the identity of the portal, change the theme, create categories, create user, raise user status, register as a user, change personal profiles, change course settings, enter learning materials, create quizzes, create and manage assignments, create discussion forums, and enter to chat.

Problem-based learning (PBL) teaches students to remember basic medical information, which is intended so that they are able to answer tests in lectures, causing them not to know how to apply information to the real world and forgetting it so quickly [6]. According to Wheeler [7] define PBL as learning based on 'thinking through' real life problems or more precisely awareness of situations. According to Thalib [8] suggested the following characteristics of problem-based learning: 1) presentation or question; problem-based learning organizes teaching around questions and problems that are both socially important and personally meaningful to students, 2) focuses on interdisciplinary linkages; the problem being investigated has been chosen really real so that in solving it, students review the problem from many things, 3) authentic investigation; problem-based learning conducts real investigations of real problems, 4) produces products or works and displays them; This learning requires students to produce certain products in the form of real work and demonstrations that explain or represent the form of problem solving they find, and 5) cooperation; learning is characterized by students working collaboratively with one another, most often in pairs or small groups. According to Arends [9] explains that there are five main activity stages that can be applied in PBL. The PBL process starts from student orientation to the problem, then organizes students to learn, guides investigations in groups, develops and presents work, and analyzes and evaluates the results of problem solving. Presentation of the problem to be solved by students is done in the first stage.

According to Arends [10] states that the direct learning model is one of the teaching approaches specifically designed to support student learning processes related to declarative knowledge and well-structured procedural knowledge that can be taught with a gradual, step-by-step pattern of activities. This statement means that the direct learning model is a learning model that can help students learn basic skills because in direct learning, subject matter will be spelled step by step so that it can develop students' declarative knowledge and procedural knowledge.

The purpose of this study was to determine the significant effect of problem-based learning e-learning on inferential statistics learning outcomes for fourth semester students in the Education Technology Department, Universitas Pendidikan Ganesha.

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II. METHODS

This research is an experimental research. Given that not all variables (symptoms that appear) and the experimental conditions can be strictly regulated and controlled, this study is categorized as quasi-experimental research.

This experimental research involves several variables which can be grouped as follows: 1) the dependent variable in this study is the learning outcome. Learning outcomes are indicated by the learning outcomes test score, in this case the initial test score and the final test score and 2) the independent variables in this study are the e-learning model based on problem-based learning and the e-learning model based on direct learning.

The population of this study were 37 semester IV students in the Educational Technology Department, consisting of 2 classes. Given the small number of populations used as the research sample, student learning outcomes data will be analyzed using inferential statistics. Before testing the hypothesis, a prerequisite test is conducted which includes: normality test and homogeneity test. The prerequisite test will be carried out with the help of SPSS software.

III. RESULTS AND DISCUSSION

The results showed that the experimental class average score was 87.45 and the control class average score was 78.93. The t-count result obtained is 2.06 while the t-table is 1.692 ($p < 0.05$). This means that there is a significant difference in inferential statistical learning outcomes between those who learn through PBL-based e-learning and those who learn using non-PBL e-learning.

Additionally, a survey conducted shows that 81% of respondents in the experimental class scored above 80 and this indicates that students have been able to solve cases in statistics. In the control class, only 53.33% of respondents scored above 80.

The results showed that problem-based learning e-learning had an effect on inferential statistics learning outcomes. The findings of this study are in line with previous studies [11,12].

The advantages of e-learning are more attractive because the learning process is interactive and flexible compared to other media, students are not bound by place and time to relax, lecturers as facilitators provide and support in the learning process provided by lecturers through e-learning, learning can be done anywhere and whenever. Through e-learning, lecturers can support lecture timing and learning resources to provide a more enjoyable and interactive learning climate. Thus it can be concluded that there is a significant effect of problem-based learning (PBL)-based e-learning on inferential statistics

learning outcomes of fourth semester students of the 2019-2020 academic year in the Educational Technology Department.

IV. CONCLUSIONS

Based on the results of the research and discussion, the following conclusions were obtained. Learning outcomes between groups of students who study with problem-based learning-based e-learning and between groups without e-learning indicate a significant difference. A significant difference shows that learning with problem-based learning e-learning has an effect on learning outcomes compared to learning without e-learning.

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