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PROBLEM-BASED LEARNING DIGITAL MODULE ASSISTANCE OF NUMERATION OF PROSPECTIVE ELEMENTARY SCHOOL TEACHERS

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Abstract

The researcher conducted a study to determine the effectiveness of the PBL model assisted by digital modules on the numeracy of elementary school teacher candidates. Numeracy is needed to face the challenges of the future. However, there are many prospective elementary school teachers whose numeracy is still low. The application of the Problem Based Learning (PBL) learning model assisted by digital modules can be used to improve numeracy. This study was conducted to determine the effectiveness of the PBL model assisted by digital modules on numeration. This research is a quantitative experiment on students of PGSD University PGRI Adi Buana Surabaya. The method used is a test. The instrument is a valid and reliable enumeration test. The study results stated that the PBL model assisted by a digital module was effective for numeracy. The effectiveness is shown from the results of the numeracy test.

Keywords: numeracy, digital module, problem-based learning

INTRODUCTION

Numeracy is a competency that prospective elementary school teachers need to have. The scope of numeracy competence includes competence in using and solving mathematical problems related to numbers. Numeration is related to a person's ability to manage data and numbers to evaluate statements based on certain contexts (Steen, 2002; De Lange, 2007; Yustitia & Siswono, 2021; Nuryani, H., Haryanto, H., & Atmojo, S. E. 2020). In line with that, numeracy is related to the ability needed to interpret numbers (Nahdi et al., 2020). The preliminary research results by researchers identified that the numeracy of prospective elementary school teacher students was still low. Students have not developed their thinking skills in solving numeracy problems (Yustitia & Siswono, 2021). This is a big challenge for the lecturer in Mathematics at the PGSD Study Program, Adi Buana University, Surabaya. The low result shows that student numeration still needs to be a concern.

A lecturer is expected to present learning that emphasizes students to solve numeracy problems according to content and process rather than just memorizing facts or information. One alternative learning model that can be used is problem-based learning. *Problem-based learning* emphasizes contextual problem-based learning to train students to solve problems and find conceptual knowledge through what is learned (Hung, 2008). Research also states that PBL makes students' thinking skills better. Through PBL learning, student activities become better. Students carry out active learning that fosters learning motivation so that it has an impact on student learning outcomes. This is in line with the research results of Farhan & Satianingsih (2021), which said that the implementation of PBL can improve students' mathematical literacy.

In addition to the application of the PBL model, to make students learn independently and proficiently solve

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numeracy problems, digital modules are needed as support. Digital modules can be modifications of conventional modules that are integrated with information technology so that existing digital modules can be more interesting and interactive (Hendri et al., 2021; Astawan, I. G., Anggreni, N. M. D., Atmojo, S. E., & Ardiansyah, A. 2021). The digital module can allow students to explore interesting, interactive learning resources and answer their curiosity. The research results by Turnip and Karyono (2021) stated that the digital model was able to improve students' critical thinking skills.

Based on the above background, the researcher conducted a study to determine the effectiveness of the PBL model assisted by digital modules on the numeracy of elementary school teacher candidates.

METHOD

This research is quantitative research with quasi-experimental. The design used is a posttest-only control design (Creswell, 2017). Through quasi-experimental research, the researcher aims to determine the effectiveness of the PBL model assisted by digital modules on the numeracy abilities of elementary school teacher candidates. The population is all PGSD Universitas PGRI Adi Buana Surabaya Class of 2019, who passed the Advanced Mathematical Concepts Course. The population consists of 7 parallel classes, namely classes A to G. Through random cluster sampling, the selected research samples used in this study were class A as the experimental class and class C as the control class. Class A consists of 35 students, while class C consists of 27 students. Class applies the PBL model with the help of a digital module, while class C applies the PBL model without a digital module.

The test method was used to obtain numerical data. The instrument used is a numerical description test question which consists of 5 questions. The instrument was developed by the researcher himself based on numerical indicators. After being developed, the test questions were tested on 30 students so that a valid and reliable numeration test instrument was arranged. Data were analyzed descriptively and inferentially. Descriptive is used to describe the average value and percentage of students' numeracy completeness. The KKM determined is 72. The inferential analysis uses the mean difference test (t-test) to determine whether there is a difference in numeration between classes treated with the PBL model assisted by digital modules and those that are not. Before the t-test, the normality and homogeneity tests were first performed.

RESULTS AND DISCUSSION

Before conducting the research, the researcher collected initial data using UTS scores in the Advanced Mathematical Concepts Course. UTS data is used to ensure that the initial conditions of the experimental class are homogeneous. The initial population data (the value in the form of the UTS value was analyzed using a two-party t-test). Prerequisite test using normality test and homogeneity test. Based on the initial data, it was obtained that the data came from normally distributed data. The variance is homogeneous. Two classes were selected through random cluster sampling, namely class A as the experimental class and class C as the control class. After selecting two classes, the researchers conducted PBL learning with the help of digital modules in class A and PBL learning in class C. After being given treatment in three meetings, the researchers gave a numeracy skill test.

The researcher developed the test. The test is in description questions and grids adapted to numeric indicators. Before the questions were given, the test was validated by experts, namely two PGSD lecturers in the Mathematics group. Furthermore, the enumeration test instrument was tested in the 2019 F class. The test results stated that the test was valid, and the reliability was 0.8. The results of the enumeration test showed that the average value of the experimental class was better than the control class. The description is shown in Table 1 below.

Table 1. Description of Test Results

	Class A	Class C
Average	76.24	72.81
Max Value	96	93
Min Value	50	37

The following are the results of the normality test of the numeration test data.

Table 2. Normality Test Results

	Class A	Class C
X2 count	5.26	2.27
X2 table	7.81	7.81
Criteria	Normal distribution	Normal distribution

The following are the results of the homogeneity test of the numerical test data.

Table 3. Homogeneity Test Results

	Class A and	Class C
F count	1.44	
F table	1.92	
Criteria	Both classes have the same variance	

The following are the results of the similarity test of the two numerical test data averages.

Table 4. Results of the Similarity Test of Two Means

Class A	Class C
Average	76.24 72.81
N	36 40
T Count	2.86
T table	1,993
Criteria	The mean of the experimental class is not the same as the control class

Based on Table 4 above, the average numeracy for class A is 76.24, while the mean numeracy for the control class is 72.81. This shows that the experimental class numeration is better than the control class. This result is in line with the research results of Arta et al. (2020), which states that PBL can have a positive effect on students' mathematical abilities. Through PBL, students are given the responsibility to solve the problems given.

The PBL learning steps are as follows: (1) students are problem-oriented. The materials used are numbers; (2) students are organized to think about the solution to a given problem; (3) students are guided to conduct investigations individually or in groups; (4) students are directed to present the results of their discussions; (5) students analyze and evaluate the problem-solving process.

Student activity when learning using PBL is classified as very good. Students are active in question-and-answer activities to identify problems and alternative solutions during the discussion process. This is in line with Ningsih's (2020) research results that the application of PBL can increase student activity.

The use of digital modules also makes the learning process more effective. The results of the response questionnaire to the digital module show a good category. Students stated that digital modules support and support students' independence in understanding concepts independently. This is in line with Linda et al. (2021), which states that the application of digital modules increases student learning independence. The digital module is systematically designed based on the PGSD Study Program

curriculum and is packaged with an attractive appearance.

CONCLUSION

The results showed an effect of Problem Based Learning assisted by digital modules on the numeracy skills of PGSD students at PGRI Adi Buana University Surabaya. Implementation of Problem Based Learning can be used as an alternative to improve the numeracy of PGSD students. Based on the results of this study, researchers suggest that lecturers should apply PBL and digital modules to improve the numeracy of prospective elementary school teachers.

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