Implementation of Flipped Classroom Model and Personal Project to Improve Students' Numeracy Skills

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Abstract. This study aims to determine the effectiveness of the Flipped Classroom and Personal Project models in lectures in the PGSD Study Programm, Faculty of Education, Universitas Negeri Medan (UNIMED). The background of this research are: 1) the main task of lecturers is to create an environment that supports the improvement of student knowledge, 2) learning with the Flipped Classroom and Personal Project models introduces new innovations in the learning process in the PGSD Study Program at UNIMED, and 3) the importance of numeracy literacy skills for prospective elementary school teachers. The research method used is quantitative with a quasi-experiment design. The pre-test results showed the average value of numeracy literacy skills of 69.67 in class A and 67.67 in class B. After the application of the two models, the average value of numeracy literacy skills was 69.67. After the application of the two models, the average value of the post-test on Flipped Classroom was 81.50, while on Personal Project was 73.83. Based on statistical analysis, it shows a significant difference with a Sig. (2-tailed) of 0.004, meaning that the Flipped Classroom model is more effective in improving students' numeracy literacy skills than Personal Project

Keywords: Numeracy Literacy, Personal Project, Upside Down Classroom.

1 Introduction

Education is the key to improving the quality of human resources. The world of education is expected to produce individuals who are critical, innovative, and able to work. Lecturers play an important role in designing effective, innovative, and learner-focused learning scenarios. An effective learning process involves active involvement of students mentally, physically, and socially, as well as creating a conducive and enjoyable environment.

According to Andreas Schleicher of the OECD [1], numeracy skills are important to prevent unemployment and improve welfare. UNESCO in 2006 [2] emphasized that numeracy literacy is a determinant of national progress. In Indonesia, the 2018 PISA survey showed the need to

improve numeracy literacy, especially in mathematics. Since 2016, the Minstry of Education and Culture has been promoting the National Literacy Movement to address this issue [3].

Flipped Classroom is a learning model where students learn the material at home before class. It matches the technological development of the Industrial Era 4.0 and requires teacher readiness in designing learning. This method can be combined with Personal Project learning that focuses on "How to Learn" and develops various student competencies. Personal projects allow students to explore a topic of their choice, improving communication skills, media literacy, research, self-development, creative thinking, and understanding of global issues[4].

The combination of Flipped Classroom and Personal Project is expected to improve numeracy literacy and students' ability to create. The effectiveness of this method varies depending on the learning material. Therefore, this research is interested in exploring the improvement of students' numeracy literacy with the flipped classroom and personal project model, which can make a significant contribution in creating quality and innovative human resources [5].

2 Method

Data collection techniques in this study include content and construct validation using validation sheets. Furthermore, observatiions were made observing the implementation of learning devices using observation sheets. The scale sheet is used to collect lecturer and student responses, while interview are used for supporting data to measure the practicality and effectiveness of learning devices with interview guidelines as the instrument.[6]

The data analysis method employed involves both quantitative and qualitative descriptive analysis. Data from expert evaluations and small group tests were analyzed using percentages and qualitatively explained, while data from field tests were analyzed using a flow model and multipurpose principles. The analysis process includes data reduction, presentation, and the drawing or verification of conclusions. Data is presented in the form of descriptions, tables, diagrams, or other visual formats. Once presented, the data is verified, interpreted, and conclusions are drawn. The analysis focuses on three levels: observation, description, and explanation. Observation level, data are selected, categorizeed, and coded. Description level, patterns or meanings are identified and presented. Finally, at the explanatory level, the analysis assesses the effectiveness of the trials.[7]

3 Result And Discussion

3.1 Result

Data Description

Based on statistical calculations on pre-test data on students' numeracy literacy skills in class A, it is found that the lowest value is 50 and the highest value is 90. The average value is 69.67, the mode is 70, the median is 70, the standard deviation is 12.38 and the variance is 153.33. While in class B students obtained that the lowest value is 40 and the highest value is 90. The average value is 67.67, the mode is 70, the median is 70, the standard deviation is 13.44 and the variance is 180.57. While the statistical calculation of the post-test data on the numeracy literacy

skills of students taught with the flipped classroom model obtained that the lowest value was 60 and the highest value was 95. The average value was 81.50, the mode was 85, the median was 85, the standard deviation is 9.02 and the variance was 81.29. While the results of the numeracy literacy post-test of students taught with the Personal Project model obtained that the lowest value was 50 and the highest value was 90. The average value was 73.83, the mode was 70, the median was 75, the standarrd deviation was 10.64 and the variance was 113.25.

Prerequisite test

Normally test

Table 1. Normally Test Result

Kolmogorov-Smirnov[a]					Shapiro-Wilk		
Class		Statistic	Df	Sig.	Statistic	Df	Sig.
Literacy	Flipped Classroom	.184	30	.011	.947	30	.143
Numeracy	*Personal Project*	.159	30	.050	.947	30	.141

The table shows that the significance value from the Shapiro-Wilk test for numeracy literacy data in class A is 0.143, and for class B it is 0.141, both of which are greater than 0.05. Therefore, it concluded that the data for both classes are normaly distributed.

Homogenity Test

Table 2. Homogenity Test Results

Levene Statistic	df1	df2	Sig
.674	1	58	.415

Based on this table, known that the sig. value is 0.415> 0.05, with the conclusion that the data is homogeneous.

Hypothesis Test

Table 3. Output SPSS Independent Test Sample t Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the difference	
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	lower	upper
Literacy Numeracy	Equal variances assumed	.674	.415	3.011	58	.004	7.667	2.547	2.569	12.764
	Equal variances not assumed			3.011	56.476	.004	7.667	2.547	2.566	12.767

Table 4. Comparison Of Numeracy Literacy Skills by Clas

	Class	N	Mean	Std. Deviaton	Std.Error Mean
Literacy	Flipped Classroom	30	81.50	9.106	1.646
Numeracy	Personal Project	30	73.83	10.642	1.943

Based on the SPSS output shown in the table, the Sig. (2-tailed) value is 0.004, which is less than 0.05, along with a Mean Difference of 7.667. This result leads to rejecting the null hypothesis (H0) and accepting the alternative hypothesis (Ha). Concluded that there is a significant difference between the average numeracy literacy skills of students taught using the flipped classroom model and those taught using the Personal Project model.[8]

In reference to Table 4, the average numeracy literacy score of students taught using the flipped classroom model is 81.50, while the average for students taught using the Personal Project model is 73.83. These results indicate that students taught with the flipped classroom model have higher numeracy literacy skills compared to those taught with the Personal Project model.[9]

Discussuion

This study aims to compare the effectiveness of the Flipped Classroom model and the Personal Project model on students' numeracy literacy skills. The results showed that the Flipped Classroom model had a more significant impact than the Personal Project model. This discussion outlines the factors that influence these results and their implications for learning practices in higher education. The Flipped Classroom model integrates technology in the learning process by providing materials to be studied outside the classroom, while in-class time is used for interactive activities such as discussions and problem solving.[10]

Factors that contribute to the effectiveness of the Flipped Classroom model include increased student engagement, optimal utilization of class time, use of relevant technology, and more personalized and directed learning. Students are more engaged as they are able to explore the material independently before class meetings, prepare questions, and follow discussions more effectively [11]. Class time is used for productive activities that enable in-depth understanding of difficult concepts. Technology such as learning videos and interactive quizzes make learning more interesting and reinforce concept understanding. Lecturers can give individualized attention to students during class sessions, identify their difficulties, and provide targeted guidance.[12]

The Personal Project model emphasizes project-based learning where students explore a specific topic in depth and produce a final product. Although effective, research shows that Flipped Classroom provides better results in numeracy literacy. Some of the factors affecting these results are excessive learning independence, lack of interaction and collaboration, and restrictions in the assessment of the learning process. Students who lack time management skills may struggle to complete the project effectively, and the focus on the final product may reduce attention to the learning process which is important for deep understanding.[

The practical implications of the results of this study include the adoption and customization of the Flipped Classroom model, improvement of technology skills for students, development of integrated learning strategies, and improvement of the quality of classroom interaction. Universities can adopt the Flipped Classroom model in their curriculum by involving training for lecturers to develop digital learning materials. Students need to be trained to optimize the use of technology tools in learning. The integration of Flipped Classroom model with elements from the Personal Project model can create a more holistic learning strategy. Lecturers need to create a classroom environment that supports active interaction and collaboration through group discussions, Q&A sessions, and problem-solving activities.

4 Conclution

Based on the discussion provided earlier, several important conclusions can be drawn regarding the comparison between the flipped classroom model and the personal project model in terms of improving students' numeracy literacy skills:

1. There is a significant statistical difference between the numeracy literacy skills of students who were taught using the flfipped classroom model and those who were taught using the personal project model. The analysis of the data shows that the Sig. (2-tailed) value is 0.004, which is less than the threshold of 0.05. This indicates that the differences observed in the study are not due to random chance, leading to the rejection of the null hyipothesis (H0) and acceptance of the alternative hypothesis (Ha). Therefore, it can be confidently concluded that the teaching model has a substantial impact on students' numeracy literacy abilities.

2. Furthermore, when comparing the two teaching approaches, students were taught using the flippepd classroom model exhibited higher average numeracy literacy skills than those taught using the personal project model. The analysis revealed a mean difference of 7.667 between the two groups, further reinforcing that the flipped classroom model is more effective in enhancing numeracy literacy. Specifically, students taught with the flipped classroom model achieved an average score of 81.50, while those taught with the personal project model had an average score of 73.83. This significant difference highlights the potential advantages of using the flipped classroom approach to foster stronger numeracy literacy among students.

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