

Application Of The Superitem Learning Model With A Culturally Responsive Teaching Approach To Improve Children's Numeracy Skills At The Elementary School Level

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ABSTRACT

Numeracy is one of the important competencies that students, especially at the elementary school level, must master. However, many students have low numeracy competency scores in mathematics because they believe mathematics is a difficult and boring subject. The superitem learning method with a culturally responsive teaching approach is an effective and innovative solution for improving children's numeracy skills, especially at the elementary school level. This research is experimental research with a matching pretest and post-test control group design. The sample used consisted of 56 samples, namely 28 children from class 5A and 28 children from class 5B at SD Negeri Bandungrejosari 2. Data analysis using the N-Gain Score test, which measures the effectiveness of learning by comparing pretest and posttest scores. The research results show that using the superitem learning method and the CRT approach is proven effective in improving children's numeracy competency outcomes, especially at the elementary school level.

Keywords: Superitem, Culturally Responsive Teaching, Mathematics.

1. INTRODUCTION

Numeracy is one of the important competencies that students must possess. This is because numeracy is the ability to understand, analyze, and solve basic mathematical symbols that can be used to solve numerical problems in everyday life contexts. Numeracy competence is closely related to mathematics subjects in elementary school. Mathematics itself can be described as learning that constructs students' understanding of concepts, facts, principles, and skills in solving everyday problems. Mathematics has three functions, including being a tool for understanding and conveying information, an effort to construct a mindset in understanding a concept and in reasoning to see the interconnectedness of those concepts, and a science, where mathematics always seeks truth and tries to develop discoveries by following the correct rules [1].

Numeracy skills themselves are often a daunting prospect for elementary school children. In Indonesia, based on the 2018 PISA (Program for International Student Assessment) results, the competency levels of Indonesian students can be categorized as minimum competency or higher and below that, with only 24% of students having minimum or higher mathematics competency [2]. In addition, Indonesia also has a program called ANBK (Computer-Based National Assessment), which is a program to determine the quality of education in an educational institution from elementary to high school levels. In this ANBK, students are required to master AKM (Minimum Competency Assessment) in both reading and writing. This program will synergize with the Education Reports of each educational unit as a form of reflection indicator for the Ministry of Education, Culture, Research, and Technology to assess the quality of educational unit performance.

Based on this, elementary school education levels must be able to provide learning innovations to improve and enhance students' numeracy skills. Teachers need interesting learning innovations for students. Using models and approaches that are appropriate for students is also a supporting factor for teachers in improving students' numeracy skills. Teachers must be able to implement student-centered learning. In the learning process, it's not just about transferring knowledge from teacher to student, but also creating situations that can lead students to actively learn and achieve effective learning [3]. Thru learning models and approaches appropriate for students, it is hoped that they can stimulate students to be interested and active in learning, thus improving their numeracy skills.

The solution offered to address this problem is to implement the superitem learning model and a culturally responsive teaching approach. The superitem model is a learning model that provides students with material, questions, tasks, and other stimuli in a step-by-step manner, from simple to complex, in the form of problem-solving [4]. With this model, students can think critically by applying tasks and questions that are graded from the simplest to the HOTS level. With this model, students do not feel burdened by heavy tasks, but rather by progressing step by step until they reach the critical thinking stage. Beside the implementation of learning models, learning approaches also play an active role in improving learning outcomes, one of which is thru a culturally responsive teaching approach. The CRT approach is a learning approach that integrates the cultural diversity found in students [5]. The application of the CRT approach encourages teachers to package learning that is relevant to the culture surrounding the students. Culture itself takes on a very diverse form, allowing teachers to freely incorporate cultural elements into their lessons. Cultural elements are classified by Koentjaraningrat into 7 elements, including language, knowledge systems, economic systems, social organization, technological systems, religion, and art [6]. With the CRT approach, it is hoped that students will be more interested in learning because it aligns with the culture in their environment, thus improving numeracy skills as well.

Before the idea of research on the application of the superitem learning model and the culturally responsive teaching approach, there was previous research titled "The Influence of the Superitem Learning Model Based on Newman's Procedure on Students' Mathematical Problem-Solving Abilities at MTSN 3 Cilegon." The research was conducted by Mastinah et al., the results showed that the "Superitem learning model had a significant impact on students' mathematical problem-solving abilities, accounting for 62%, while the remaining 38% was influenced by other factors" [7]. The difference from this study is that the Superitem learning model was linked to a culturally responsive teaching approach to improve the numeracy competence of different subjects, courses, and materials. Subsequently, the Superitem learning model and the culturally responsive teaching approach were used as treatments in an experimental study with control and experimental groups.

This research provides benefits in determining the effectiveness of the superitem learning model and the culturally responsive teaching approach in improving numeracy competence thru pretests and posttests. Additionally, it is hoped that this research will make a tangible contribution to educators in Indonesia by demonstrating that learning models can be linked to the cultures present in the school's surrounding environment. This aligns with the goals of culture-based education, which is a manifestation of educational democratization thru the expansion of educational services for the benefit of society, providing opportunities for everyone to expand their knowledge and skills thru lifelong learning [8].

2. METHOD

This research is an experimental study. The experimental research method is a research method conducted thru experiments, which is a quantitative method used to determine the effect of the independent variable (treatment) on the dependent variable (outcome) under controlled conditions [9]. This research was conducted to determine the effect of the superitem learning method and culturally responsive teaching approach on improving elementary school students' numeracy skills. This study used a matching pretest and post-test control group design, where two classes were selected directly, then given a pretest to determine the initial state and whether there were differences between the experimental and control groups [9]. The research was conducted over a period of approximately 3 months, from February 3, 2025, to April 30, 2025. The research was conducted at Bandungrejosari State Elementary School, located on Kalyatan 2 Street, Bandungrejosari Village, Sukun District, Malang City. The sample selection was not randomly chosen from classes 5A and 5B at SD Negeri Bandungrejosari 2. As for the instrument used in this study, it is in the form of a test with 20 questions. The data obtained is from the results of pretest and posttest scores, which were then analyzed to compare learning outcomes between the pretest and posttest.

This research uses several stages: (1) determining the experimental and control group samples; (2) developing instruments in the form of 20 posttest and pretest questions; (3) conducting pretests on the control and experimental groups to measure the initial level of understanding and numeracy competence of the samples; (4) providing special treatment, namely data processing material using the superitem learning method and culturally responsive teaching approach for the experimental group, while the control group received the material conventionally; (5) administering posttests in the control and experimental classes; (6) analyzing the experimental and control groups using the N-Gain Score test, which measures the effectiveness of learning by comparing scores on the pretest and posttest. The research design to assist this experiment is as follows.

Tabel 1. Desain Penelitian Eksperimen Model Matching Pretest–Posttest Control Group Design

Group	Pretest	Treatment	Posttest
Group 5A (Control)	O ¹	-	O ²
Group 5B (Experimental)	O ³	X	O ⁴

Explanation:

O¹ = Pretest score of the control group (before treatment)

O² = Posttest score of the control group (after treatment)

X = Treatment

O³ = Pretest score of the experimental group (before treatment)

O⁴ = Posttest score of the experimental group (after treatment)

3. RESULTS AND DISCUSSION

3.1. Results

Implementation

Pretest

Pretest is a test given to determine the numeracy competency score of the sample before receiving treatment. This test is used so that the researcher knows the sample's initial competency without any intervention. The learning outcomes of the sample in class 5A as the control group and class 5B as the experimental group are shown in the following table.

Table 1. Statistical Test Results

Student Number	Control Group Score	Experimental Group Score
1.	50	30
2.	54	54
3.	71	71
4.	44	78
5.	81	80
6.	81	80
7.	50	45
8.	81	65
9.	50	65
10.	45	70
11.	59	62
12.	86	60
13.	77	80
14.	54	68
15.	72	80
16.	45	60
17.	77	80
18.	68	54
19.	77	80
20.	77	80
21.	77	71
22.	63	82
23.	59	80
24.	59	60
25.	63	82
26.	71	71
27.	68	65
28.	71	70
Quantity	1830	1923
Average Value	65.36	68.68
Highest Value	86	82

Lowest Value	44	30
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Based on Table 2 above, the control group obtained an overall initial test score of 1830 with an average of 65.36, with the note that this is below the minimum passing score of 70. Meanwhile, the experimental group obtained an overall initial test score of 1923 with an average of 68.68, with the note that this is below the minimum passing score of 70.

Posttest

Posttest is the test administered after the control and experimental groups have received treatment. The control group received the treatment of data processing material using the superitem learning method and a culturally responsive teaching approach in the experimental group, while the control group received the material conventionally.

Tabel 3. Numeracy Skills Scores on the Posttest

Student Number	Control Group Score	Experimental Group Score
1.	52	42
2.	54	54
3.	77	100
4.	80	100
5.	100	100
6.	82	100
7.	54	60
8.	71	100
9.	71	88
10.	80	100
11.	77	88
12.	80	100
13.	82	82
14.	71	100
15.	88	100
16.	77	88
17.	88	94
18.	77	100
19.	88	100
20.	82	100
21.	82	100
22.	88	71
23.	80	100
24.	65	88
25.	70	100
26.	77	100
27.	71	100
28.	77	100
Quantity	2141	2555
Average Value	76.46	91.25
Highest Value	100	100
Lowest Value	52	42

Based on Table 3 above, the control group obtained an overall final test score of 2141 with an average of 76.46, with the explanation that it is above the minimum passing grade of 70, but the difference from the initial test is only 11.1. Meanwhile, the experimental group obtained an overall initial test score of 2555 with an average of 91.25, with the explanation that it is above the minimum passing grade of 70, and the difference in the final test is 22.57.

Data Analysis

Data analysis includes normality tests, homogeneity tests, and the N-Grain Score test as results that meet the

requirements before proceeding to hypothesis testing.

Normality Test

The normality test is used to determine whether the obtained numeracy competency scores are normally distributed or not. This normality test uses the Kolmogorov-Smirnov test with a significance level of 0.05. This indicates that when the Sig. value is > 0.05 , the data can be declared normally distributed.

Table 4. Normality Test Result

Class	Stage	N	Sig. (Kolmogorov-Smirnov)	Criterion	Description
Class 5A (Control)	Pretest	28	0,200	$> 0,05$	Normal
Class 5A (Control)	Posttest	28	0,156	$> 0,05$	Normal
5B Class (Experiment)	Pretest	28	0,182	$> 0,05$	Normal
5B Class (Experiment)	Posttest	28	0,097	$> 0,05$	Normal

Based on the normality test results in Table 4 above using the Kolmogorov-Smirnov test, since all data reached a Sig. value > 0.05 , the data can be declared normally distributed.

Variance Homogeneity Test

Test The homogeneity test is a test performed after the normality test. This test uses the formula for Levene's Test for Equality of Variances. With this test, if the Sig. value is > 0.05 , then the two data sets in the control and experimental groups are considered to have homogeneous variance.

Table 5. Result of Variance Homogeneity Test

Class	Levene Statistic	df1	df2	Sig.	Criterion	Description
Pretest (Class 5A & 5B)	0,502	1	54	0,481	$> 0,05$	Homogen
Posttest (Class 5A & 5B)	0,427	1	54	0,516	$> 0,05$	Homogen

Based on the results from Table 5, it can be concluded that the control group and the experimental group have a Sig. value > 0.05 , indicating homogeneity and allowing for further analysis.

N-Grain Score Test

N-Grain Score Test The N-Gram score test is conducted to determine the difference in numeracy scores between pretests and posttests for each group before and after receiving treatment. The formula for N-Gain according to Hake is as follows [10].

$$\text{N-Gain} = \frac{\text{Posttest} - \text{Pretest}}{100 - \text{pretest}}$$

Data test results using N-Gain values can be categorized as follows to facilitate data analysis.

Tabel 6. N-Gain Categories

Criteria	Value
High	$> 0,7$
Medium	$0,3 - 0,7$
Low	$< 0,3$

Based on the N-Gain formula and categories, the following are the results of data analysis before and after the implementation of the superitem learning method and culturally responsive teaching approach to improve children's numeracy skills at the elementary school level.

Table7. Result of N-Gain Score Data Analysis

Class	Pretest Average	Posttest Average	N-Gain Score	Criterion	Description
Control Group	65,36	76,46	0,32	Moderate (tending to be low)	Limited because the increase was only based on conventional application
Experimental Group	68,68	91,25	0,73	High	Significant because the increase used the superitem learning method and CRT approach

Based on the results above, it can be concluded that the experimental group receiving the superitem learning method treatment and the culturally responsive teaching approach achieved a score of 0.72, which falls into the high category (i.e., > 0.7).

Paired Sample T-Test

The paired sample t-test is a data test used to determine if there is a significant difference between pretest and posttest scores. With this test, the effectiveness of the treatment can be determined. This test uses a Sig. (2-tailed) value < 0.05 , which means there is a significant improvement before and after the treatment.

Table 8. Results of the Sample T-Test

Class	Pretest Average	Posttest Average	t-value	df	Sig. (2-tailed)	Criterion
Class 5A (Control)	65,36	76,46	4,12	27	0,000	$< 0,05$
Class 5B (Experiment)	68,68	91,25	8,94	27	0,000	$< 0,05$

Based on Table 8, it can be seen that the control and experimental classes achieved significant differences, but the increase was greater in the experimental group.

3.2. Discussion

The superitem learning model, which provides treatment in stages, makes students feel comfortable and active in learning. This is evidenced by the data analysis results, which prove that the application of the superitem learning method and culturally responsive teaching approach can improve students' numeracy competency scores. This aligns with the explanation provided by Permatasari, that the superitem learning model can provide students with the opportunity to understand mathematical problems step by step according to their readiness, and teachers can provide appropriate assistance to students based on their responses [11]. With the superitem model, students become more active in asking questions, discussing within groups, and between groups. This is in line with the statement that learning using the Superitem learning model has a positive influence on improving students' mathematical reasoning abilities [12].

Beside the existence of a learning model that supports student learning outcomes in mathematics, data processing material, the learning approach also has an important influence. In this study, the researcher used a culturally responsive teaching approach. The Culturally Responsive Teaching (CRT) approach is a teaching method that emphasizes cultural relevance in the educational process, with the hope of making the material more meaningful for students from diverse cultural backgrounds [13]. In this study, the researcher incorporated cultural elements into the stimulus activity, using the traditional hopscotch game, and employed culture as a theme in the interview process to collect data for frequency tables and pictograms. By using culture-based themes, students become more interested in learning and develop a high level of curiosity about their classmates' other hobbies during interview activities. By doing so, students will be more active in the learning process and it will encourage an increase in their learning outcomes. This aligns with the explanation that the CRT approach is a learning approach that utilizes students' cultural references as a medium for learning a subject matter. Integrating culture into learning can make learning more meaningful and boost learning motivation [14].

Overall, this research can help educators incorporate innovative and creative teaching methods without losing local cultural elements. By utilizing local cultural elements, it can attract students, especially at the elementary school level, to improve their numeracy competency results in a more engaging way and, of course, achieve satisfactory learning outcomes. It is also hoped that this experimental research will provide a new paradigm for educators out there and can be innovated with other competencies and subjects.

4. CLOSURE

Based on the results of this experimental study, it shows that the application of the superitem learning method and culturally responsive teaching approach can help teachers improve students' numeracy skills, particularly at the elementary level in SD Negeri Bandongrejosari 2, Malang City. The availability of these methods and approaches makes it easier for teachers to capture students' interest in improving their numeracy skills, which are often considered difficult and boring. By incorporating local cultural elements into teaching methods and materials, students are given the opportunity to learn more about their culture in an engaging way. Additionally, this can help students understand numeracy problems related to local culture. Overall, the superitem learning method and culturally responsive teaching approach not only provide an effective solution for improving children's numeracy skills but also broaden collaboration between innovative and creative methods and approaches, and foster an enjoyable learning environment.

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