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Application of Gross Motor Skills-Based and Conventional Learning Models to the Understanding of Mathematics Concepts in Grade 1 Elementary Schools in Karanganyar District

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ABSTRACT: This research focuses on the application of gross motor skills-based and conventional learning models to the understanding of mathematical concepts in grade 1 elementary school (SD). The purpose of the research is to describe which is better between gross motor skills-based learning and conventional learning on understanding the concept of mathematics in grade 1 elementary school. The study population was grade 1 elementary school students in Karanganyar district. Research sampling using randam sampling. Data retrieval techniques using tests. Data analysis using two-way Anava with unequal cells. The results showed that the Anava test of two-way unequal cells obtained data that FHitung (43.52)> FTabel (3.84) and the marginal mean of the gross motoric learning model 88.18 was greater than the conventional learning model which had an average of 74.51. The conclusion of the research is that there is a difference between the two learning models and the gross motor skills learning model is better than conventional learning on understanding the concept of mathematics in grade 1 SD.

KEYWORDS: Conventional learning, Concept understanding, Gross motor skills learning.

INTRODUCTION

Mathematics learning cannot be separated from the understanding of mathematics itself. Radiusman (2020) explains that mathematics is a hierarchical subject where knowledge of a topic is a continuation of the previous topic so that students must be able to understand new knowledge by having pieces of information about previous knowledge. Meanwhile, Khaesarani and Hasibuan (2021) explain that mathematics is a systematic discipline that examines patterns of relationships, patterns of thinking, art, and language that are studied through logic and are deductive in nature. This confirms that mathematics is knowledge that is structural and formal or abstract.

Learning mathematics in elementary school, needs learning methods that are in accordance with the stages of psychological development of students. Like playing and grouping is one of the characteristics of the development of students in elementary school. Lusianisita and Rahaju (2020) explain that mathematics learning is a process of constructing students' understanding of facts, concepts, principles, and skills according to their abilities where the teacher conveys material, students with their respective potentials compile their understanding of facts, concepts, principles, and skills and problem solving. The description above provides an understanding that learning mathematics in elementary school has characteristics and is different from the advanced level. Wandini, et al, (2021) explained that mathematics learning in elementary school has several characteristics, namely: Learning using the Spiral method; Gradual learning; and Learning using the Inductive method. This statement emphasizes that mathematics learning starts from concrete, semi, and abstract stages, and pays attention to the initial abilities of students.

Suparni (2019: 115) explains that initial ability is a collection of some basic knowledge that is used as a requirement in participating in learning. Meanwhile, Lestari et al. (2019) explain that initial ability is the main foundation that will provide clues and align newly learned knowledge with knowledge. This statement emphasizes that mathematics as structured knowledge requires initial abilities to learn further material and is concrete for elementary school students.

Facts in the field show that learning mathematics in elementary schools in Karanganyar district, data obtained that the learning used by teachers is to use concrete media at the beginning of introducing the material to be taught; the method used is lecturing and giving examples of problems and answers; exercises using student worksheets (LKPD); and giving assignments. This condition is less favorable for students because the understanding of mathematical concepts is not optimal. This is evident from the

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results of the math test obtained data that from 138 students obtained a minimum score of 42.50; maximum score of 100; mean 77. 97; and standard deviation 6.18. Low understanding of mathematical concepts results in a lack of readiness to receive further material.

The lecture method and utilizing LKPD are often referred to as conventional learning models. The learning model explained by Saputri & Rahmi (2021) is a plan or pattern that can be used to design teaching patterns. Taking into account the definition of the learning model, the conventional learning model that utilizes LKPD has a design pattern, namely the teacher provides material, the teacher provides sample problems and answers, exercises questions from LKPD, gives assignments to do at home, and evaluations. The conventional learning model is explained by Fahrudin, Murtadlo, & Handayaningrum (2021) that conventional learning is learning in which the teaching and learning process is carried out in a monotonous and verbalist rhythm, namely in delivering subject matter that still relies on lectures or in the term used in this study is a teacher-centered teaching and learning process. While Wulandari (2022) explains that conventional learning models are teaching that uses the lecture method or conveys information verbally to students. description of conventional learning models, directing to the advantages of the model. Nourhasanah and Aslam (2022) explain that the advantages of conventional models with the lecture method, namely: The teacher easily controls the class; Easy to organize seating/class; Can be followed by a large number of students; Easy to prepare and implement; The teacher easily explains the lesson well.

Mathematics learning needs to build an understanding of mathematical concepts according to the stages of learner development. Understanding of mathematical concepts is explained by Sujarwanto (2019) that learning concepts includes learning one response to two or more stimuli, so that the ratio between stimulus and response is not one-to-one, but one to many. Indah & Hidayati (2021) explain that indicators of understanding mathematical concepts, namely: restate a concept; classify objects according to certain properties in accordance with the concept; give examples and not examples of a concept; d) present concepts in various forms of mathematical representation; Develop necessary and sufficient conditions of a concept; use and utilize and select certain procedures or operations; apply concepts or algorithms to problem solving. Meanwhile, Husna, Purwosetiyono, & Endahwuri (2020) explained that one of the signs that they understand the concept is that they can explain or restate what they have understood.

Improving understanding of mathematical concepts needs to be done by providing a variety of learning models. one of the learning models used in this study is the demonstration model, which utilizes gross motor skills. Citrowati (2020) explains that the demonstration model is a method of presenting lessons by demonstrating and showing students about a certain process, situation or object, either actually or just an imitation. Meanwhile, Suardana and Putu. (2019) explains that the demonstration model is a teaching model by demonstrating goods, events, rules, and sequences of doing an activity, either directly or through the use of teaching media relevant to the subject matter or material being presented.

Noting the description of the definition of the Demonstration learning model, Hartiningsih, Hartiningsih, Subandowo, and Karyono (2023) explained that the purpose of the demonstration method is imitation of a model that can be done so that students can imitate examples of actions demonstrated by the teacher, there are several important things that must be considered by the teacher, namely (1) Something that the teacher shows and does must be clearly observable by students. therefore, it is best to use large media and activities must be repeated slowly. (2) The teacher's explanation must be clearly audible. The intonation of the teacher's voice should be appropriate and interesting so that learners do not get bored. (3) The demonstration should be followed by the learners imitating what the teacher has shown and done.

The demonstration model in this study utilizes gross motor skills that students already have before sitting in grade I, namely stepping forward and stepping backward. Learning based on gross motor skills is explained by Saputri and Rahmi (2021), namely oriented to the needs of students, learning through play, the environment must be created in such a way that it is attractive and fun by paying attention to safety and comfort that can support learning through play, using integrated learning carried out through themes, developing various life skills, using various educational media and learning resources, carried out gradually and repeatedly, active, creative, innovative, effective, and fun. Meanwhile, the elements of gross motor skills are explained by Munar & Oktadinata (2019), namely: 1). Strength; 2). Coordination; 3). Speed; 4). Balance; 5). Agility. Based on these elements, one of the functions of gross motor skills is to train the skills or agility of movement and thinking of students, as well as to improve the emotional development of students.

Based on the description above, the purpose of this study is to describe which is better between the understanding of mathematical concepts of grade 1 elementary school students who are taught with a gross motor skills learning model and

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conventional learning. So that researchers can formulate the title of their research, namely: Application of Gross Motor Skills-Based and Conventional Learning Models to Understanding 1st Grade Mathematics Concepts in Karanganyar Regency.

RESEARCH METHODS

The type of research is quantitative with the research design is One Group Pretest-Posttest Design, namely there is one group given a pretest before being given treatment / treatment and then observed the results. This experimental research is to investigate the effect of two independent variables simultaneously, namely gross motor skills-based learning models and conventional learning models on one dependent variable, namely understanding of mathematical concepts. The study population was all grade I elementary school students in Karanganyar district, Central Java, who had studied number material with different competency stages. The sampling technique used was randam sampling.

Data collection techniques using tests. The test material was tested for validity, reliability, differentiation, and difficulty level. The incoming data were tested for prerequisites, including tests: normality, homogeneity, and balance. The data analysis used was Analysis of variance (Anava) two-way with unequal cells.

RESULTS AND DISCUSSION

Research Results

The results of this study are described in stages, as follows:

a. Test Material

The test material in this study is in the form of descriptions with different score weights for each question. The test material test includes:

Content Validation Test

The content validity test uses the Product Moment correlation formula. Arikunto (2017) explains that the instrument is said to be valid when it can reveal data from the variable appropriately without deviating from the actual situation. The results of the content validity test are as follows:

Table 1. Results of Correlation Coefficient of Content Validation of Descriptive Tests

Question Number														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
.62	.73	.36	.59	.43	.50	.71	.56	.45	.56	.63	.53	.53	.64	.72

Conclusion: $r_{xy} > 0$, then the test material is said to be valid.

Reliability Test

Test the reliability of the description test items using the Cronbach Alpha formula. The acquisition of its value uses the help of SPSS version 26. The results of the calculation for the description test items are arranged in the following table:

Table 2. Results of the Reliability of the Description Test Content

Question Number														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
.64	.64	.69	.69	.69	.69	.65	.65	.65	.65	.65	.65	.65	.72	.72

Conclusion: Cronbach's Alpha value > 0.6, so it is declared reliable.

Distinguishing Power Test

The results of the calculation of the distinguishing power of the description test items can be arranged in the table below:

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Table 3. Test of Distinguishing Power of Item Description Test Questions

Question Number														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
.79	.63	.58	.53	.53	.62	.72	.56	.59	.66	.60	.66	.64	.73	.74
SB	B	B	B	B	B	SB	B	B	B	B	B	B	SB	SB

Conclusion: The description test questions are dominated by Good (B) and Very Good (SB) distinguishing criteria, so the items are declared suitable for field data collection.

Index of Difficulty

The results of the calculation of the difficulty index of the description test items can be arranged in the table below:

Table 4. Item Difficulty Index of the Descriptive Test Questions

Question Number														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
.92	.89	.69	.68	.68	.70	.70	.65	.70	.70	.69	.69	.70	.27	.25
M	M	S	S	S	S	S	S	S	S	S	S	S	Slt	Slt

Conclusion: the composition of the description test questions, consisting of: 2 questions with easy difficulty index (M), 11 questions with medium difficulty index (S), and 2 questions with difficult difficulty index (Slt), so that the description test questions can be said to be suitable for data collection in the research field.

b. Test Results

The tests in this study were carried out in two stages, namely Pretest and Posttest. The test results in the study include:

Pretest Results Before Research Treatment

Data on pretest results with many questions of 15 short entries, arranged in the table as follows:

Table 5. Experimental and Control Group Pretest Results

	N	Mean	Std. Deviation
Pretest Experiment Result	138	47.8623	8.10262
Pretest Control Result	139	49.8201	8.10730

Posttest Results After Research Treatment

After the Pretest, the experimental group applied gross motor skills-based learning, while the conventional learning model was used in the control group. The implementation of treatment for six lessons and then given a Posttest. The Pretest and Posttest question material is the same. The results of the students' Posttest are compiled in the following table.

Table 6. Posttest Results of Experimental and Control Groups

	N	Mean	Std. Deviation
Posttest Experiment Result	138	89.7101	6.88191
Posttest Control Result	139	78.6691	8.73473

c. Prerequisite Test

Pre-test data of grade I students in control and experimental groups are used as data to conduct prerequisite tests. The prerequisite test stages, namely:

Normality Test Before Treatment (Pretest)

The results of normality testing on students are arranged in the table as follows:

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Tabel 7. Normality Test Results

		Kolmogorov-Smirnov[a]	Shapiro-Wilk
	Class	Sig.	Sig.
Results	Pretest Experiment	.142	.162
	Posttest Experiment	.062	.078
	Pretest Control	.173	.203
	Posttest Control	.074	.083

Conclusion: Considering that the sample is more than 100, in this study the researcher took the method of Kolmogorov Smirnov. From the results of statistical calculations, it was found that all significant values were greater than 0.05, so the data came from a normally distributed population.

Homogeneity Test

Homogeneity test to see the data comes from the same variant (homogeneous). Based on the homogeneity test, the result shows that sig. count (0.928) > 0.05, then the data is from the same variant (homogeneous).

Balance Test

Based on the balance test in the study, the results were sig. count (0.928) > 0.05, meaning that the data from the experimental and control groups had the same strength before being given treatment in the study.

d. Hypothesis Test

Two-way Analysis of Variance with Unequal Cells (Anava)

Hypothesis testing in this study used analysis of variance (Anava) two-way unequal cells. A summary of hypothesis testing using two-way variance analysis of unequal cells in the following table.

Table 8. Results of Two-Way Analysis of Variance with Unequal Cells

	JK	dk	RK	F_{count}	F_{table}	Decision
Learning Model (B)	14379	1	14379	43.52	3.84	Reject H_{0B}
Initial Ability (A)	411,21	2	205,61	0.62	3.00	Accept H_{0A}
Interaction (BA)	1807942,3	2	903971,15	2735,83	3.00	Reject H_{0BA}
Error	89542,34	271	330,42	--	--	--
Total	1.912.274,55	276		--	--	--

Based on the Anava above, it can be interpreted as follows:

1) There is a difference in the understanding of mathematical concepts of grade 1 elementary school students who are taught with a gross motor skills learning model with conventional learning; 2) There is no difference in the understanding of mathematical concepts of grade 1 elementary school students who have initial competence in the high group, middle group, or lower group; and 3) There is an interaction between the gross motor skills learning model and the initial competence of students with the understanding of mathematical concepts in grade 1.

Anova Further Test

Based on the decision in the hypothesis test, H_0B is rejected, H_0A is accepted, and H_0BA is rejected. Given the interaction between the gross motor skills learning model and the initial ability of students to understand the concept of mathematical operations, it is necessary to test the follow-up Anava. The stages for the Anava follow-up test, starting from the preparation of a summary of the calculation of the marginal mean, which is arranged in the following table:

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Table 9. Marginal Mean

Learning Model (B)	Initial Ability (A)			Marginal Mean
	High (A1)	Middle (A2)	Low (A3)	
Gross Motor (B_1)	91,27	84,48	88,80	88,18
Conventional (B_2)	70,31	75,94	77,27	74,51
Marginal Mean	80,79	80,21	83,04	

Based on the table above, that students who are given a learning model based on gross motor skills (B_1), the learning outcomes of understanding first grade mathematics concepts are better than students who are given learning with conventional models (B_2) because they have a higher maximum average, B_1 (88.18) compared to B_2 (74.51).

The multiple comparison test between cells is used to sharpen the anova further test. Based on the results of the multiple comparison test between cells, the conclusions are obtained, namely: 1) Students who are given a gross motor learning model, each different criterion gets a different average. By looking at the mean, students with High initial ability have a better mean than students with Middle, Low criteria, and students with Middle criteria have a worse mean than students with Low criteria; 2) Learners who are given conventional learning models, each criterion gets a different average. By looking at the mean of learners, learners with high initial ability have a worse mean than learners with Middle criteria initial ability, and learners with Middle criteria have a worse mean than learners with Low criteria; and 3) Gross motor skills model and conventional model have different results when imposed on learners with high initial ability criteria, but not so if given to learners with middle and low criteria. Taking into account the respective means, it can be concluded that the gross motor learning model is more effective than the conventional learning model only when given to learners with high initial ability criteria.

DISCUSSION

The results of the calculation of the two-way variance analysis test of unequal cells obtained data that F_{count} (43.52) > F_{Table} (3.84), This means that there are differences in the understanding of mathematical concepts of grade 1 elementary school students who are taught with the gross motor skills learning model with conventional learning. The existence of these differences, researchers followed up with the Anava further test, obtained data in the marginal mean table, obtained that the mean for the gross motor learning model was 88.18 greater than the conventional learning model which had an average of 74.51.

The gross motor skills learning model is better than the conventional learning model because gross motor skills can provide emotional control for students, so they are able to concentrate and build mathematical concepts. This is explained by Hasbin (2021) who states that the benefits of gross motor skills are training and improving eye sense coordination and hand activities, increasing attention and concentration, improving children's abilities such as accuracy and speed. The description above indicates that the gross motor skills learning model is able to channel students' energy and continue the habit of learning while playing.

In contrast to conventional learning models, although the provision of mathematical concepts is relatively fast, the level of students to analyze and synthesize is still low. This is explained by Fahrudin, et. al., (2021) explaining that the concept of conventional learning is learning in which the teaching and learning process is carried out in a monotonous and verbal rhythm, namely in delivering subject matter that still relies on lectures or in the term used in this study is a teacher-centered teaching and learning process. The statement above indicates that the learning is teacher-centered, so the possibility of exploration to build knowledge is very far away (impossible to implement). Considering the description above, it can be interpreted that students in the group with gross motor skills learning model are better than those with conventional learning model.

Based on the description above, it is evident that the understanding of the concept of math arithmetic operations of grade 1 elementary school students who are taught with a gross motor skills learning model is better than conventional learning.

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CONCLUSION

Understanding the concept of math arithmetic operations of grade 1 elementary school students who are taught with a gross motor skills learning model is better than conventional learning. This is because the two-way variance analysis test of unequal cells obtained data that FHitung (43.52)> FTabel (3.84), meaning that there is a difference in understanding the concept of math arithmetic operations taught with the gross motor skills learning model with conventional learning; There is a difference in marginal means, where the average for the gross motor learning model is 88.18 greater than the conventional learning model which has an average of 74.51.

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