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The Effect of Puzzle Learning Media on Independence and Circle Understanding of Third Grade Students of SD Negeri Keleyan I Socah

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ABSTRACT
Media is needed in the implementation of mathematics learning to make it easier for students to understand the learning topic. Media has an important role in clarifying learning topics and being a concrete example of abstract mathematics learning. One of the learning media that can be used by teachers is a puzzle where students can disassemble the puzzle parts and rearrange them into a complete form. The purpose of this study was to prove: 1) the effect of puzzle learning media on the learning independence of third grade students of SD Negeri Keleyan I Socah, and 2) the effect of puzzle learning media on understanding of the circle of third grade students of SD Negeri Keleyan I Socah. The researcher used a quantitative research approach with the type of experimental research, namely one group pretest-posttest design. The research instrument used was a questionnaire and test questions on the research sample of 22 third grade students of SD Negeri Keleyan I Socah. Researchers used paired sample t test analysis to obtain research conclusions. The conclusions in this study are: 1) there is an influence of puzzle learning media on the learning independence of third grade students of SD Negeri Keleyan I Socah, and 2) there is an influence of puzzle learning media on the understanding of circles of third grade students of SD Negeri Keleyan I Socah.

Keywords: Puzzle, Independence, Circle Understanding

INTRODUCTION

Mathematics is one of the main subjects taught in elementary schools. Mathematics is an abstract subject that requires innovation and creativity from elementary school teachers in order to make abstract subjects into concrete subjects that are easily understood by students (Kusmaryono et al., 2020; Pandra et al., 2021).

Mathematics is a subject that is considered the most difficult to learn in elementary schools, this is because learning mathematics in elementary schools is not adjusted to the level of learning development of elementary school students(Fredy et al., 2021; Setiawan & Soeharto, 2020). A mistake that often occurs is when teachers assume elementary school students are adults in the physical form of children. Physically and psychologically, elementary school-age children are very different from adults. Understanding the characteristics of student development can make it easier for teachers to manage learning, especially learning mathematics in elementary schools(Meilantifa et al., 2019).

Mathematics has various topics that are studied by students from grade 1 to grade 6 elementary school. One of the topics of learning mathematics in grade 3 elementary school is the environment. Based on the results of observations and interviews with teachers and third grade students of SD Negeri Keleyan I Socah, information was obtained that circle learning uses lecture and assignment learning models and does not use concrete media. The teacher becomes more dominant in all circle learning activities because the teacher has to explain a lot about the topic of circle learning. Students become passive and only listen to the teacher's explanation so that the teacher's role becomes central and dependence on the teacher in the learning process becomes high. Students have difficulty if they have to study independently and these conditions have an impact on student circle learning outcomes. From a total of 22 students, only 8 students or 36.36% met the minimum completeness criteria (KKM), where the KKM for mathematics was 75. While the remaining 12 students or 63.64% did not meet the KKM.

Problems that occur in learning circles in mathematics in grade 3 elementary schools need to find solutions so that students can learn independently and improve students' understanding of circle lessons. The innovation that can be done by teachers is to use puzzle learning media in order to increase learning independence and understanding of the circle of third grade students of SD Negeri Keleyan I Socah. Puzzle is a game that is usually done by children by arranging several separate materials into a whole series and forming a pattern or shape. The use of puzzles is in accordance with the developmental characteristics of elementary school students, where students like to play and learn while playing using concrete objects that make it easier for students to understand circle learning. The puzzle media used by students is a circular puzzle consisting of parts of a circle that can be disassembled and reassembled, making it easier for students to recognize the parts of a circle. The objectives of this study include: 1) the effect of puzzle learning media on the learning independence of third grade students of SD Negeri Keleyan I Socah, and 2) the effect of puzzle learning media on the understanding of circles of third grade students of SD Negeri Keleyan I Socah.

Mathematics is an abstract subject. Because they find it difficult to think abstractly, are limited in vocabulary and require concrete or real objects in learning,

the researchers provide material using puzzle media (Elfawati, 2012). Puzzle media is a tool for educational games that resemble imitation model objects that can stimulate students' fine motor skills and are played by disassembling pairs of puzzle pieces based on their partners (Bahar & Risnawati, 2019). Geometry puzzle media are teaching aids or tools to support the learning process using puzzle pieces with geometric shapes (Elan et al, 2017). Geometry puzzle is a puzzle that can develop children's skills to recognize geometric shapes (triangles, circles, squares, rectangles, etc.) (Bahar & Risnawati, 2019). The purpose of the puzzle is to improve children's thinking skills, train eye and hand coordination to match puzzle pieces, improve children's cognitive skills, train children's reasoning, and make children sensitive to their environment (Bahar & Risnawati, 2019). The rules for playing puzzles are: 1) Participants are divided into groups, each group has 2 children. 2) Each group gets puzzle pieces. 3) Each group must complete the pieces of the shape into a whole. 4) The group that finishes first will receive congratulations and thanks (Pangastuti, 2019).

Learners succeed in solving certain problems, but fail if the context of the problem is slightly changed. That means that students do not yet have good learning independence (Diana et al, 2020). Learning independence is the ability of a student to work independently in digging learning information from learning sources other than the teacher so it needs to be developed because student learning independence is something that determines student learning success (Fajriyah et al, 2019). Independent nature in learning is needed by students so that they will not feel hopeless in dealing with problems and encourage students to choose suitable strategies to solve these problems (Sugandi, 2013). The condition of independent learning activities is not dependent on others and has the will and is responsible for completing their own learning (Aslamiyah, 2019). indicators of learning independence are: 1) have initiative and motivation to learn, 2) diagnose learning needs, 3) view difficulties as challenges, 4) set learning goals/targets, 5) select, implement learning strategies, 6) monitor, regulate, and control learning, 7) utilizing and finding relevant sources, 8) evaluating learning processes and outcomes, 9) self-concept/self-ability (Fajriyah et al, 2019).

METHOD

The approach used in this research is quantitative where the researcher uses an experimental research type with a one group pretest-posttest design. The researcher gave treatment in the form of a trial using puzzle learning media to determine its effect on learning independence and understanding of the circle of third grade students of SD Keleyan 1 Socah. Researchers proved the effect of using puzzle learning media by looking for a different test between independence data and students' circle understanding before and after using puzzle learning media. The population in this study was the third grade students of SD Negeri Keleyan 1 Socah,

totaling 22 students. Because the population is relatively small, the researcher uses a saturated sample technique by setting all members of the population as the research sample. The research sample was the third grade students of SD Negeri Keleyan 1 Socah, totaling 22 students.

The research instrument used to collect research data is a learning independence questionnaire and student circle understanding test questions. The questionnaire instrument consists of 18 questionnaire statements which were developed from indicators of student learning independence. The students' circle understanding test questions consist of 20 multiple choice questions which include information about the circle material in elementary school. Questionnaire sheets and test questions before being used as data collection tools were tested on a test sample of 10 students to determine the validity and reliability of the research instrument. to determine the validity of the instrument is if the results of the analysis of the test data using the SPSS 21 application obtain a value (r) equal to or greater than 0.632 then the questionnaire instrument and test items are declared valid. On the other hand, if the results of the analysis of the test data using the SPSS 21 application obtain a value (r) of 0.632, the questionnaire instrument and test items are declared invalid.

After the research instrument was declared valid, the researcher conducted an analysis of the reliability of the instrument by calculating the Cronbach's alpha analysis score. If alpha > 0.90 then the reliability is perfect. If the alpha is between 0.70 – 0.90 then the reliability is high. If the alpha is 0.50 – 0.70 then the reliability is moderate. If alpha < 0.50 then the reliability is low. If the alpha is low, it is possible that one or more items are not reliable.

Questionnaire sheets and test questions that have been declared valid and reliable are given in two stages, namely before learning circles using puzzle learning media begins and after learning circles using puzzle learning media is complete. The two data used and analyzed using paired sample t test analysis assisted by the SPSS 21 application. If the results of the paired sample t test analysis obtain a significance score below or equal to 0.05, it can be concluded that there is an effect of using puzzle learning media on independence and student circle understanding. However, if the results of the paired sample t test analysis obtained a significance score above 0.05, it can be concluded that there is no effect of using puzzle learning media on students' independence and understanding of the circle.

RESULT AND DISCUSSION

Results

The results of the study are a collection of data collected using research data collection tools that have been declared valid and reliable based on statistical analysis using SPSS 21. The results include the results of testing research instruments and the results of collecting data on students' independence and

understanding of the circle. The results of the instrument trial are data collected when the questionnaire instrument and test questions were tested on 10 students who were not the research sample. The results of the first instrument trial were learning independence questionnaire test data consisting of 18 statements describing indicators of learning independence. Students are asked to fill out a questionnaire based on the condition of student learning independence during learning. Based on the test activities of the questionnaire instrument, the results of the student learning independence questionnaire test are described in the table below:

Table 1 – Test data of learning independence questionnaire

Test Sample	Trial Score
1	56
2	38
3	42
4	57
5	57
6	54
7	62
8	36
9	54
10	36

The results of the second instrument trial were test test data consisting of 20 multiple choice questions related to the elementary school circle material. Students are asked to work on problems based on their knowledge of circles. Based on the test activity of the test instrument, the results of the student test questions are described in the table below:

Table 2 – Test data on the circle understanding test questions

Test Sample	Trial Score
1	65
2	5
3	5
4	100
1	100
6	80
7	80

8	100
9	100
10	30

The results of the study are data collected by researchers using research instruments that have been declared valid and reliable. The data collected in this study are between learning independence data and students' circle understanding data as described in the table below:

Table 3 – Data on student learning creativity

Test Sample	Final learning creativity	Early learning creativity
1	17	13
2	15	10
3	15	9
4	17	13
5	16	12
6	18	15
7	20	16
8	17	13
9	19	16
10	16	10
11	17	13
12	16	10
13	18	9
14	20	13
15	17	15
16	17	16
17	15	13
18	17	16
19	17	13
20	16	12
21	19	15
22	16	16

Table 4 – Students' circle understanding data

Test Sample	Final Students' circle understanding	Early Students' circle understanding data
1	85	65
2	75	50
3	75	45
4	85	65
5	80	60

6	90	75
7	100	80
8	85	65
9	95	80
10	80	50
11	85	65
12	80	50
13	90	45
14	100	65
15	85	75
16	85	80
17	75	65
18	85	80
19	85	65
20	80	60
21	95	75
22	80	80

Analysis Results

The first research analysis is the analysis of the validity and reliability of the instrument. To determine the validity of the questionnaire instrument for student learning independence using SPSS 21. If the results of the analysis obtained a score (.) equal to or above 0.632 for the number of test samples of 10 students, all items of the student learning independence questionnaire were declared valid. On the other hand, if the results of the analysis obtained a score (.) below 0.632 for the number of test samples of 10 students, then all items of the student learning independence questionnaire were declared invalid. Analysis of the validity of the student learning independence questionnaire using SPSS 21 is described as follows.

Table 5 – Data on the validity of the learning independence questionnaire instrument

Correlations

		x14	x15	x16	x17	x18	total	Keterangan
x1	Pearson Correlation	.918	.885**	.469**	.494**	1.000	.946	Valid
	Sig. (2-tailed)	.000	.001	.172	.147	.000	.000	
	N	10	10	10	10	10	10	
x2	Pearson Correlation	.873**	.748	.816**	.645*	.893**	.962*	Valid
	Sig. (2-tailed)	.001	.013	.004	.044	.001	.000	
	N	10	10	10	10	10	10	
x3	Pearson Correlation	1.000**	.802**	.535	.423**	.918	.919	Valid
	Sig. (2-tailed)	.000	.005	.111	.224	.000	.000	
	N	10	10	10	10	10	10	
x4	Pearson Correlation	.802**	1.000*	.333**	.527	.885	.884	Valid
	Sig. (2-tailed)	.005	.000	.347	.117	.001	.001	
	N	10	10	10	10	10	10	

x5	Pearson Correlation	.535	.333**	1.000	.632	.469	.673*	Valid
	Sig. (2-tailed)	.111	.347	.000	.050	.172	.033	
	N	10	10	10	10	10	10	
x6	Pearson Correlation	.423	.527*	.632	1.000	.494*	.682	Valid
	Sig. (2-tailed)	.224	.117	.050	.000	.147	.030	
	N	10	10	10	10	10	10	
x7	Pearson Correlation	.918**	.885**	.469**	.494**	1.000	.946	Valid
	Sig. (2-tailed)	.000	.001	.172	.147	.000	.000	
	N	10	10	10	10	10	10	
x8	Pearson Correlation	.873**	.748**	.816**	.645*	.893**	.962*	Valid
	Sig. (2-tailed)	.001	.013	.004	.044	.001	.000	
	N	10	10	10	10	10	10	
x9	Pearson Correlation	.821**	.802**	.535**	.634**	.918	.919*	Valid
	Sig. (2-tailed)	.004	.005	.111	.049	.000	.000	
	N	10	10	10	10	10	10	
x10	Pearson Correlation	.918*	.625**	.781**	.494	.756**	.864	Valid
	Sig. (2-tailed)	.000	.053	.008	.147	.011	.001	
	N	10	10	10	10	10	10	
x11	Pearson Correlation	.535	.905	.143	.452**	.602	.649	Valid
	Sig. (2-tailed)	.111	.000	.694	.190	.065	.042	
	N	10	10	10	10	10	10	
x12	Pearson Correlation	.918**	.885**	.469**	.494**	1.000	.946	Valid
	Sig. (2-tailed)	.000	.001	.172	.147	.000	.000	
	N	10	10	10	10	10	10	
x13	Pearson Correlation	.873**	.748**	.816**	.645*	.893**	.962*	Valid
	Sig. (2-tailed)	.001	.013	.004	.044	.001	.000	
	N	10	10	10	10	10	10	
x14	Pearson Correlation	1**	.802**	.535**	.423**	.918	.919	Valid
	Sig. (2-tailed)		.005	.111	.224	.000	.000	
	N	10	10	10	10	10	10	
x15	Pearson Correlation	.802**	1*	.333**	.527**	.275	.884	Valid
	Sig. (2-tailed)	.005		.347	.117	.001	.001	
	N	10	10	10	10	10	10	
x16	Pearson Correlation	.535	.333**	1	.632	.469**	.673*	Valid
	Sig. (2-tailed)	.111	.347		.050	.172	.033	
	N	10	10	10	10	10	10	
x17	Pearson Correlation	.423	.527*	.632	1	.494*	.682**	Valid
	Sig. (2-tailed)	.224	.117	.050		.147	.030	
	N	10	10	10	10	10	10	
x18	Pearson Correlation	.918**	.885**	.469**	.494**	1	.946	Valid
	Sig. (2-tailed)	.000	.001	.172	.147		.000	
	N	10	10	10	10	10	10	
total	Pearson Correlation	.919**	.884**	.673**	.682**	.946*	1*	
	Sig. (2-tailed)	.000	.001	.033	.030	.000		
	N	10	10	10	10	10	10	

Based on the results of the validity analysis above, it was concluded that all student learning independence questionnaire items were declared valid because they obtained a score (r) above 0.632. After the student learning independence questionnaire was declared valid, the researchers conducted a reliability analysis of the student learning independence questionnaire instrument as described below:

Table 6 – Data on the reliability of the learning independence questionnaire instrument

Reliability Statistics

Cronbach's Alpha	N of Items
.977	18

Based on the guidelines for the results of Cronbach's alpha analysis, a score of 0.977 states that the student learning independence questionnaire instrument is declared reliable.

The researcher also conducted a validity analysis of the students' circle understanding test instrument using SPSS 21 as described below.

Table 7 – Data validity of test questions

Correlations

		x16	x17	x18	x19	x20	total	Keterangan
x1	Pearson Correlation	1.000	.524**	.524**	.535	.764*	.939*	Valid
	Sig. (2-tailed)	.000	.120	.120	.111	.010	.000	
	N	10	10	10	10	10	10	
x2	Pearson Correlation	1.000**	.524	.524**	.535	.764*	.939*	Valid
	Sig. (2-tailed)	.000	.120	.120	.111	.010	.000	
	N	10	10	10	10	10	10	
x3	Pearson Correlation	1.000**	.524**	.524	.535	.764*	.939*	Valid
	Sig. (2-tailed)	.000	.120	.120	.111	.010	.000	
	N	10	10	10	10	10	10	
x4	Pearson Correlation	.535	.535	.535	1.000	.408	.738	Valid
	Sig. (2-tailed)	.111	.111	.111	.000	.242	.015	
	N	10	10	10	10	10	10	
x5	Pearson Correlation	.764*	.218*	.218*	.408	.375	.661	Valid
	Sig. (2-tailed)	.010	.545	.545	.242	.286	.038	
	N	10	10	10	10	10	10	
x6	Pearson Correlation	.764*	.764*	.764*	.408	1.000	.829	Valid
	Sig. (2-tailed)	.010	.010	.010	.242	.000	.003	
	N	10	10	10	10	10	10	
x7	Pearson Correlation	.764*	.218*	.218*	.408	.375	.661	Valid
	Sig. (2-tailed)	.010	.545	.545	.242	.286	.038	
	N	10	10	10	10	10	10	
x8	Pearson Correlation	1.000**	.524**	.524**	.535	.764*	.939*	Valid
	Sig. (2-tailed)	.000	.120	.120	.111	.010	.000	
	N	10	10	10	10	10	10	
x9	Pearson Correlation	.524	1.000	1.000	.535	.764	.733*	Valid
	Sig. (2-tailed)	.120	.000	.000	.111	.010	.016	
	N	10	10	10	10	10	10	
x10	Pearson Correlation	.535	.535	.535	1.000**	.408	.738	Valid
	Sig. (2-tailed)	.111	.111	.111	.000	.242	.015	
	N	10	10	10	10	10	10	
x11	Pearson Correlation	.764*	.764*	.764*	.408	1.000	.829**	Valid
	Sig. (2-tailed)	.010	.010	.010	.242	.000	.003	
	N	10	10	10	10	10	10	
x12	Pearson Correlation	1.000**	.524**	.524**	.535	.764*	.939*	Valid
	Sig. (2-tailed)	.000	.120	.120	.111	.010	.000	
	N	10	10	10	10	10	10	
x13	Pearson Correlation	.535	.535	.535	1.000**	.408	.738	Valid
	Sig. (2-tailed)	.111	.111	.111	.000	.242	.015	
	N	10	10	10	10	10	10	
x14	Pearson Correlation	1.000**	.524**	.524**	.535	.764*	.939*	Valid
	Sig. (2-tailed)	.000	.120	.120	.111	.010	.000	
	N	10	10	10	10	10	10	
x15	Pearson Correlation	1.000**	.524**	.524**	.535	.764*	.939*	Valid
	Sig. (2-tailed)	.000	.120	.120	.111	.010	.000	

	N	10	10	10	10	10	10	
x16	Pearson Correlation	1**	.524**	.524**	.535	.764*	.939*	Valid
	Sig. (2-tailed)		.120	.120	.111	.010	.000	
	N	10	10	10	10	10	10	
x17	Pearson Correlation	.524	1	1.000	.535	.764	.733*	Valid
	Sig. (2-tailed)	.120		.000	.111	.010	.016	
	N	10	10	10	10	10	10	
x18	Pearson Correlation	.524	1.000	1	.535	.764	.733*	Valid
	Sig. (2-tailed)	.120	.000		.111	.010	.016	
	N	10	10	10	10	10	10	
x19	Pearson Correlation	.535	.535	.535	1**	.408	.738	Valid
	Sig. (2-tailed)	.111	.111	.111		.242	.015	
	N	10	10	10	10	10	10	
x20	Pearson Correlation	.764*	.764*	.764*	.408	1	.829**	Valid
	Sig. (2-tailed)	.010	.010	.010	.242		.003	
	N	10	10	10	10	10	10	
total	Pearson Correlation	.939**	.733**	.733**	.738*	.829*	1**	
	Sig. (2-tailed)	.000	.016	.016	.015	.003		
	N	10	10	10	10	10	10	

Based on the results of the validity analysis above, it was concluded that all items about students' circle understanding were declared valid because they obtained a score (r) above 0.632. After the students' circle understanding test questions were declared valid, the researchers conducted an analysis of the reliability of the students' circle understanding test questions as described below:

Table 8 – Reliability data on test questions

Reliability Statistics	
Cronbach's Alpha	N of Items
.975	20

Based on the guidelines for the results of Cronbach's alpha analysis, a score of 0.975 states that the student's circle understanding test question instrument is declared reliable.

The second research analysis is research data analysis which aims to determine the effect of puzzle learning media on independent learning and circle understanding of third grade students of SD Negeri Keleyan 1 Socah. The researcher used paired sample t test to determine the effect of puzzle learning media on students' independence and understanding of the circle. The purpose of the first research study was to determine the effect of puzzle learning media on the learning independence of third grade students of SD Negeri Keleyan 1 Socah. Analysis of paired sample t test on early and late student learning independence using the SPSS 21 application is described as follows.

Table 9 – Analysis of paired sample t test students' learning independence

Paired Samples Test					
		Paired Differences 95% Confidence Interval of the Difference Upper	t	df	Sig. (2-tailed)
Pair 1	early learning independence - late learning independence	22.95911	8.011	21	.000

Based on the analysis of the paired sample t test on the students' early and late learning independence, the results obtained a significance of 0.000 or less than 0.05. Thus it can be stated that there is an influence of puzzle learning media on the learning independence of third grade students of SD Negeri Keleyan 1 Socah.
The purpose of the second research study was to determine the effect of puzzle learning media on the circle understanding of third grade students of SD Negeri Keleyan 1 Socah. The analysis of paired sample t test on students' circle understanding of early and late students using the SPSS 21 application is described as follows.

Table 10 – Analysis of paired sample t test students' circle understanding

Paired Samples Test					
		Paired Differences 95% Confidence Interval of the Difference Upper	t	df	Sig. (2-tailed)
Pair 1	Final circle understanding – Early circle understanding	4.87727	8.913	21	.000

Based on the analysis of the paired sample t test on the understanding of the circle of early and late students, the results obtained a significance of 0.000 or less than 0.05. Thus, it can be stated that there is an influence of puzzle learning media on the circle understanding of third grade students of SD Negeri Keleyan 1 Socah.

Discussion

Learning media serves as a means of conveying learning information so that it is easily understood by students. In learning mathematics, the media serves as a means of explaining abstract mathematical material into concrete. With the media, it makes learning mathematics easier for students to understand so that students can learn independently at school and outside of school. The use of puzzle learning media in studying the circle material is expected to increase student learning independence. The first objective in the implementation of this research is to determine the effect of puzzle learning media on the learning independence of third grade students of third grade elementary school students Keleyan 1 Socah. In conducting the research, the researcher used a research instrument in the form of a questionnaire containing statements which were indicators of student learning independence. The data obtained using the instrument were analyzed by paired sample t test. Based on the analysis of the paired sample t test on the students' early and late learning independence, the results obtained a significance of 0.000 or less than 0.05. Thus it can be stated that there is an influence of puzzle learning media on the learning independence of third grade students of SD Negeri Keleyan 1 Socah.

The use of puzzle learning media in circle learning in elementary schools is not only expected to increase students' learning independence, but is also expected to increase students' understanding of circles. To collect data on students' understanding of circles, the researcher used test questions consisting of 20 multiple choice questions about circles. Students are asked to work on the problem before and after using the puzzle learning media. The data obtained using the instrument were analyzed using paired sample t test analysis. Based on the analysis of the paired sample t test on the understanding of the circle of early and late students, the results obtained a significance of 0.000 or less than 0.05. Thus, it can be stated that there is an influence of puzzle learning media on the circle understanding of third grade students of SD Negeri Keleyan 1 Socah.

CONCLUSION

Based on the results of the analysis and discussion using paired sample t test analysis on students' independence and understanding of the circle, the conclusions of the research are:

1. There is an influence of puzzle learning media on the learning independence of third grade students of SD Negeri Keleyan I Socah.
2. There is an influence of puzzle learning media on the circle understanding of third grade students of SD Negeri Keleyan I Socah.

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