THE EFFECT OF CROSSWORD PUZZLE LEARNING MEDIA ON STUDENTS' SCIENCE LEARNING OUTCOMES IN FIFTH-GRADE SDN 28 SINGKAWANG

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Article Information

ABSTRACT

The purpose of this study was to describe whether there is a difference in learning outcomes between students who are taught using crossword puzzle media and those who do not use crossword puzzle media in the science subject of grade V students of SDN 28 Singkawang and to describe how much influence the crossword puzzle learning media has on students' learning outcomes in the science subject of grade V SDN 28 Singkawang . The data in this study are the learning outcomes of the control class and the learning outcomes of the experimental class. The data source is grade V students of SDN 28 Singkawang. The sampling technique used in this study is *non-probability* . The data collection technique used is an essay test technique . Based on the results of the study, 26 students from class A were obtained as the control class and 26 students from class B as the experimental class. The control class obtained the highest score in *the pre-test, which was 90, and the post -test* class was 95. The lowest score in *the pre-test* was 43 and *the post-test* was 43. The experimental class obtained the highest score in *the pre-test,* which was 90, and the *post-test* was 95. The lowest score in *the pre-test* was 43 and *the post-test* was 60. The results of this study can be assumed in the 2013 curriculum in learning Natural Sciences.

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1. INTRODUCTION

Science learning in Elementary School (SD) is one of the subjects that is close to everyday life, starting from opening the eyes in the morning until resting at night. That is why science is one of the important subjects taught in elementary school. According to (Wangid et al., 2021) science learning is not only the delivery of a collection of knowledge in the form of facts, concepts, principles or delivery of abstract material, but science learning is a process of discovering knowledge, forming scientific attitudes, and the ability to apply the principles of science itself into everyday life. Seeing the importance of science education, a good teacher is needed in teaching science concepts to children, especially students at elementary school level (Arini, 2019; Mahardika et al., 2017). The role of the teacher is very important in efforts to optimize science learning in elementary school. Teachers usually explain science learning materials from beginning to end using the lecture method (Artha & Setyasto, 2024). The use of inappropriate or monotonous learning models and media and lack of variety which causes low student interest in science learning activities, thus affecting learning outcomes (Elma et al., 2024).

Learning outcomes are the results obtained by students after the learning process which is indicated by a test given by the teacher after each completion of providing learning material on a topic. According to Hopmann (2007) learning outcomes are the result of an interaction between learning and teaching activities. From the teacher's perspective, teaching activities end with an evaluation of learning outcomes. From the student's perspective, learning outcomes are the end of teaching from the peak of the learning process. Learning outcomes are the abilities possessed by students after receiving their learning experiences. These abilities include cognitive, affective, and psychomotor aspects (Arends & Kilcher, 2010; Demitriadou et al., 2020). Learning outcomes in cognitive domain research are domains that include children's mental activities (brains). According to Anderson, all efforts related to brain activity are included in the cognitive domain, in the cognitive domain there are six thinking processes starting from the lowest to the highest, namely: 1. Remembering, 2. Understanding, 3. Applying, 4. Analyzing, 5. Evaluating, and 6. Creating.

In the process of teaching and learning activities, the role of teachers is very important in efforts to optimize learning. Teachers must be able to create an interesting learning atmosphere and in accordance with the characteristics of elementary school students, efforts that teachers can make to create interesting learning are by using learning media. The use of effective learning media will make it easier for students to understand and explore the material presented so that it will have an impact on student learning outcomes (Berry et al., 2010).

Based on the results of pre-research conducted at SDN 28 Singkawang through interviews, it shows that in the learning process, teachers deliver science materials to students in the classroom, the learning media used are still printed books for the material on the form and properties of objects. However, students pay less attention to the teacher's explanation, students do not understand the learning material delivered and the learning material absorbed by students enters short-term memory and the limited science learning media, resulting in many students' test scores still below the KKM, which can be seen from the average test score only reaching 50%. KKM in science subjects is 65, out of 28 students only 10 students reach KKM and 18 students do not reach KKM. From the context of the problems found above, an appropriate learning media is needed so that students can easily understand and remember learning materials and make students more interested in paying attention to the teacher's explanation in science learning (Kurniawan et al., 2024).

Based on these findings, it is necessary to improve learning for meningkatkan student learning outcomes, make students interested in paying attention to the teacher's explanation and make it easy for students to understand the learning material presented. The use of varied media is one alternative to improving learning. The use of media is a part that must receive attention in every learning activity. However, in reality, this part is still often neglected for various reasons. The reasons that often arise include limited time to prepare for teaching, difficulty in finding the right media, unavailability of fund (Djoeaeriah & Sofyan Iskandar, 2024). In fact, there are many types of media that can be selected, developed and utilized according to the conditions, time, costs or desired learning objectives. One of the learning media that can be applied is crossword puzzle media. Media used to support the teaching and learning process in science subjects. In this case, crossword puzzles are puzzles filled with letters that form words in empty boxes and the words are based on the sentence instructions provided either in the form of complete sentences, phrases or words (Maulyda et al., 2020). Crossword puzzles are educational games that can train patience and sharpen students' brains and can improve students' learning outcomes. Crossword puzzles can help students remember the material they have learned during the learning process.

This crossword puzzle learning media is very suitable to be applied to theoretical material because in this learning, students are trained to remember, understand, and match the right words - not only those that match the answers, but also the number of boxes and letters provided. The success of using crossword puzzle media can be seen from the research conducted by Kanastren et al. (2023) the results of this study indicate that there is a significant influence on the use of crossword puzzle learning media on student learning outcomes in thematic learning in class IV SDN 38 Mataram, which is evidenced by the results of the hypothesis test where t count <t table is 8.661 <2.048 H_0 is rejected Ha is accepted. This means that there is a significant influence of the use of crossword puzzle media on the learning outcomes of class IV students at SDN 38 Mataram. This data is supported by a comparison of the average value of the learning outcomes of students in the experimental class which is greater than the control class, namely 83.53> 65.33. The similarity of this study is using crossword puzzle media learning and knowing the learning outcomes. However, the difference is that the material and class are different. Based on these findings, the researcher is interested in conducting a study entitled **"The influence of crossword puzzle learning media on science learning outcomes of grade V students at SDN 28 Singkawang".**

2.   RESEARCH METHODS

The type of research used in this study is quantitative research. The method used is a *quasi-experimental experiment*. Creswell (2014) states that *quasi-experimental* is basically the same as a pure experiment, the difference is in controlling the variables. Control is only carried out on one variable, namely the most dominant variable. Q*uasi-experimental* has a control group but cannot fully control external variables that affect the influence of crossword puzzle media on students' science knowledge (cognitive) learning outcomes.

The design in this study is *a nonequivalent control group design* where the experimental group and the control group are not selected randomly. This study uses two classes, namely the control class and the experimental class. The control class is a class that is not given treatment and the experimental class is a class that is given treatment using crossword puzzle media. As a guideline so that the research does not deviate from the objectives that have been applied, the researcher created the following research design:

Table 1. Research Design

Group	*Pre-test*	Treatment	*Post test*
Experiment	O_1	X	O_2
Control	O_1	-	O_2

Information:

O_1 = *Pre-test*

O_2 = Post test

X = Treatment with crossword puzzle learning media

Place and time of research are important things in conducting research. Suprayitno (2020:200) stated that the place and time of research are the places used by research to obtain data. The research location was conducted at SDN 28 Singkawang, Jalan Kridasana No.03, West Singkawang. SDN 28 Singkawang Fifth Grades has two classrooms, namely Fifth-GradesA and Fifth-Grades B. The time of this research was conducted in the even semester of the 2021/2022 academic year. The research time is as follows.

Table 2. Research Time

No	Day/Date	Type of activity
1	Monday, February 25, 2022	Trial questions at SDN 88 Singkawang
2	Tuesday, March 1, 2022	Meeting 1 material on the form and properties of objects
3	Wednesday, March 2, 2022	*Pre-test for* control and experimental classes, meeting 1, material on the form and properties of objects
4	Thursday, March 3, 2022	*Post test* of experimental class
5	Friday, March 4, 2022	*Post test* of control class

Population is a generalization area consisting of objects/subjects that have certain qualities and characteristics determined by researchers to be studied and then conclusions drawn (Heale & Twycross, 2015). Population is the object to be studied and is a source of data in a quantitative study. Based on the explanation above, it can be concluded that the population is part of the subject or object that has characteristics that have been determined by the researcher. The population in this study was all fifth grade students of SDN 28 Singkawang in the 2021/2022 academic year, totaling 52 people. Research samples according to Widyaningtyas & Farid (2014) are parts that provide a general picture of the population. Creswell states that samples are parts and the number of characteristics possessed by the population. Creswell samples are elements taken from the population.

Based on the explanation above, it can be concluded that the sample is what provides a general picture of part of the population, so that the sample used can represent the population. A relatively small population (less than 100) then all populations should be used as samples.

According to Krishnaswamy et al. (2012) saturated sampling (total sampling) is the determination of the number of samples by taking or using all populations to be used as samples, with the note that the population is less than 100. The reason for using this technique is because it is assumed that the population is homogeneous based on the characteristics that the population has are relatively the same, namely students receive the same curriculum, students who are the objects of research sit in the same class and the study time for students is also the same. The sample to be studied in this study is Fifth-Grades A and B SDN 28 Singkawang with a total of 52 students.

Table 3 Research sample of SDN 28 Singkawang

No	Class	Number of Students
1	VA (experimental)	26
2	VB (control)	26
	Amount	52

The data collection technique in this study is the test technique. The test technique in this study is by providing an *essay test* given during *the pre-test* and *post-test* in the experimental class and control class. The *pre-test* and *post-test questions* in this study aim to determine the learning outcomes of the knowledge aspect (cognitive). Data collection instruments are tools used to collect data in a study. The data collection instrument in this study is a test sheet. The test sheet is in the form of a *pre-test* and *post-test question sheet*. Data analysis is an activity after data from respondents or other data sources are collected. The data analysis technique in this study is quantitative using statistics. Therefore, the research conducted must pay attention to the steps of data analysis obtained from the *pre-test* and *post-test.*

To answer the first sub-problem, there is a difference in the learning outcomes of science aspects of knowledge (cognitive) of classes that use crossword puzzle media with classes that do not use crossword puzzle media. The steps are as follows: Normality test is a procedure used to find out whether data from a population that is normally distributed or not so that the next step does not deviate from the truth and can be accounted. Homogeneity test is carried out to compare two groups of data or must first carry out a diversity similarity test or a test of variance similarity of data groups. Hypothesis testing is a statistical question to receive a conclusion whether the question is accepted or rejected (Krishnaswamy et al., 2012).

To answer the second sub-problem regarding how much influence the crossword puzzle learning media has on the science learning outcomes of the knowledge aspect of grade V students of SDN 28 Singkawang. The formula used for *effect size* is as follows:

$$E_s = \frac{\bar{x}_e - \bar{x}_k}{sc}$$

Information:
E_s = *effect size*
$\bar{x}_e$ = average value of the experimental group score
$\bar{x}_k$ = average value of comparison group (control)
S_c = standard deviation of the comparison group (control)

The large positive effect indicates that there is a greater influence of the variables studied in the experimental group compared to the control class. The criteria for the large *effect size* are clarified with the provisions shown in the table below as follows:

Table 4. *Effect size* criteria

Effect size	Criteria
$E_s < 0.2$	Low
$0.2 < E_s \leq 0.8$	Currently
$E_s > 0.8$	Tall

In this study, crossword puzzle learning media had a major influence on students' science learning outcomes if their knowledge aspects were in the medium and high criteria.

3. RESULTS AND DISCUSSION
Results

Study This done in SDN 2 8 Singapore. Study This aiming for examine the influence of crossword puzzle media on science learning outcomes of Fifth-Grades students of SDN 28 Singkawang. Fifth-Grades SDN 28 Singkawang has two classrooms, namely class A (control class that uses direct learning without crossword puzzle media) consisting of 26 students and class B (the experimental class which was given treatment) use media crossword puzzle) totaling 26 student people.

Implementation study started with give question *pre test* Forto know the initial abilities of students in science lessons on the material of the form and properties of objects. After *the pre-test* was carried out, students were given treatment, to the experimental class was given treatment with using crossword puzzles and media class control given learning direct (without use media crossword puzzle). This research ended

with the implementation of *a post-test* . This *post-test was carried out* For knowing the final capability student after being given treatment.

The data in this study were obtained by giving questions or tests to 52 students. The 52 students came from different classes, 26 students as the experimental class and 26 students as the control class. Each class was given 2 tests in the form of *a pre-test* and *a post-test* . *The pre-test* was conducted before providing the crossword puzzle media, while *the post-test* was given after providing the crossword puzzle media. The test was in the form of 10 essay questions. The score obtained if the answer is correct is 100. The results of this study are in the form of differences and influences between the experimental and control classes. For more complete data, see the explanation below.

1. Difference Results Study Student Class Control and Class Experiment
  a. Normality Test

The normality test is carried out to determine whether the *post-test data* is has been collected from a normally distributed population or not so that the next step does not deviate from the truth and can be accounted for. The results of the *post-test data normality test* results Study student class experiment and class control can seenon Table 5 is as follows.

Table 5. Data Normality Test Calculation ResultsClass statistics

Statistics	Experiment	Control
x^2 count	-37.57	-35.08
Amount Student (n)	26	26
Level Difficulty (α)	5%	5%
x^2 tables	7,815	7,815
Decision	*Ha* accepted	*Ha* accepted
Conclusion	Normal	Normal

Based on the table above, the results of the calculation of the data normality test in the experimental class can be seen. Obtained $x^2 h\ itung$ namely -37.57 and $x^2 tabel$ is 7.815. Since $x^2 h\ itung \leq x^2 tabel$ that is $37.57 \leq 7.815$ then data is normally distributed. While the results of the normality test calculation data in the control class obtained $x^2 h\ itung$ namely -35.06 and $x^2 tabel$ is 7.815. Since $x^2 h\ itung \leq x^2 tabel$ namely $-35.08 \leq 7.815$ then data is normally distributed. It can be concluded that the experimental class data andclass control distributed normal, so For determine homogeneity data using the formula f.
  b. Homogeneity Test

 Homogeneity test is performed to compare two groups. data or must first carry out a diversity equality test or test similarity Variants group data. After data *post test* class experiment And class control counted And the data was obtained distributed normal, furthermore will do test homogeneity data using formula *f.* As for results calculation test homogeneity dataas following.

Table 6. Results of Class Statistical Homogeneity Test Calculation

Statistics	Experiment	Control
Variance (S²)	68.23	157.64
$f\ h\ itung$	1.82	1.04
Amount Student (n)	26	26
Level Difficulty (α)	5%	5%
$ftabel$	1.96	
Decision	*Huh* accepted	
Conclusion	Homogeneous	

Based on Table on seen that calculation datause formula f . It is known variance class experiment that is 68.23 and is the smallest variance, while the control Fifth-Gradesariance is 157.64 and is the largest variance. It can be seen that the $h\ itung$ of the experimental class is 1.82. From $f\ tabel$ with $\alpha = 5\%$ and dk numerator 25 and dk denominator 25 obtained $ftabel$ = 1.96. Because $f\ h\ itung < ftabel$ that is $1.82 < 1.96$. In addition, it is known that the $h\ itung$ of the control class is 1.04 From $f\ tabel$ with $\alpha = 5\%$ and dk numerator 25 and dk denominator 25 obtained $f\ tabel$ = 1.96. Can concluded class experiment And class control have the same variance or are homogeneous. Because the value data on the experimental and control classes are normally distributed and homogeneous, then furthermore done test t two sample for know whether There is

an influence on class learning outcomes that use crossword puzzles with classes given direct learning in science lessonsmaterial form and nature of Fifth-Grades SDN 28 Singkawang.

c. Hypothesis Testing

Based on calculation test normality And test homogeneity it was obtained that the *post-test data* for the experimental class and the control class normally distributed and has the same or homogeneous variance. So furthermore test similarity average second class using test t two samples. The results of the test calculations t two sample can be seen in Table 7 as follows.

Table 7. Results Calculation Test T Two Sample

Class	dk	α	t count	t table	Decision
Experiment and Control	50	5%	2.16	2,000	Ha accepted

Based on Table above is known $t_{h\,itung}$ = 2.16 And t_{tabel} = 2,000, obtained $t_{h\,itung} > ttabel$ that is 2.16 > 2.06 so Ha accepted, Ho rejected. So that can conclude there is difference results student learning taught using crossword puzzle media with learning direct on lesson Science student Fifth-Grades SDN 2 8 Singkawang in form and nature. Next For know how much big influence use media crossword puzzle to learning outcomes, so used formula *effect size (ice).*

2. Test of the Effect of Using Crossword Puzzle Media on Students' Cognitive Domain Learning Outcomes in Science Subjects for Fifth Grades of SDN 28 Singkawang

For know how much big influence use media crossword puzzles on student learning outcomes, then use the *effect size formula (ice).* As for results from calculation *effect size (ice)* can seen in Table 4.6 as follows.

Table 8. Results Test *Effect Size (ICE)*

Information	Experiment	Control
Average (X)	81.42	75.04
Class Standard Deviation control (Sc)		12.56
Effect size (ice)		0.508
Criteria		Currently

From the table above it can be seen that $e\ s$ = 0.508 and the criteria are moderate because 0.508 is at $0.2 < ES < 0.8$ then Ha accepted Ho rejected. Can It be concluded that the use of crossword media in learning had an influence on results Study cognitive eye lesson Science shape and properties of Fifth-Grades objects at SDN 28 Singkawang.

Discussion

1. Difference in Results Study Student Class Control And Class Experiment

Based on research result in class control, obtained on average *pre test* score which is 68.35 and the average *post-test score* is 75.04. At the time of the *pre- test* , 9 students completed and 17 students failed. students who did not complete the course with the highest score of 90 and the lowest score of 43. Matter This is because when *the pretest was given* , they were not ready and did not fully understand the material. nature and form of objects so that the *pretest* value students below average.

Then When giving *posttest* 15 students were obtained who completed and 11 students who did not complete with a score of the highest is 95 and the lowest value is 43. This is because at the time process Study not using interesting media so that students tend to get bored and not focus on the ongoing learning. This greatly affects the results of the grades that students get. Like Which expressed Lu (2020) that Crossword Puzzle media can influence the social studies learning achievement of fifth grade students.

Based on research result in class experiment obtained average mark *pretest* which is 66.81 and the average *posttest score* is 81.42. At the time of giving *the pretest* 7 students were obtained who completed and 19 students who did not complete with a score of highest 90 And mark lowest 43. Matter This because of that on at the time of giving *pretest,* students are still busy with their own things and do not listen to the material presented by the teacher and the teacher still carries out monotonous learning and does not involve students in learning so that the students' *pretest scores* are below average (Ningsih et al., 2024). Then, when

the posttest was given, 23 students completed it and 5 students who No finished with mark highest 95 And mark lowestis 60.

For the experimental class, the learning outcomes of students using media crossword puzzles experienced a higher increase compared to the classroom control Which not using media. Improvement results This student learning is because it has the advantage of attracting students' attention where Teacher Using crossword puzzle media allows students to actively participate in the learning process. This is also in line with Kanastren et al. (2023) opinion say that the benefits of crossword puzzles are that they can sharpen memory, learn classification, develop analytical skills, entertain and stimulate creativity.

Based on data analysis carried out using the test statistics parametric that is with test t, $t_{h\,itung} > tabel$ Which can conclude that there is difference results Study class who use crossword puzzle media with classes that do not use learning media in lessons Science material properties and forms of objects. The difference in *posttest scores* between the control and experimental classes due to Because treatment Which given experimental and control classes are different. The experimental class is a class that uses learning media while the control class is a class that does not use any learning media.

2.   Full Use Media Crossword Puzzle to Results Study Realm Cognitive

Based on results calculation data *post test* student to results The study obtained an *effect size value* of 0.58 which is in the medium criteria. This is show that use media crossword puzzle in learning have an influence on students' cognitive learning outcomes in the science subject of the material on the form and properties of objects. This because when teachers use crossword puzzle media, students can be actively involved in the learning process, thus increasing student outcomes. Based on this statement, it can be interpreted that crossword puzzle media has a good influence on student learning outcomes. This is in line with research conducted by Lu (2020) which states that there is an influence on student learning outcomes taught using crossword puzzle media. This is shown from the results of *the effect size* , which is 1.34. These results are included in the high category, because *the effect size* is more than 0.8. It can be concluded that science learning assisted by crossword puzzle media has an influence on student learning outcomes.

4.   CONCLUSION

Based on the results of the research and general discussion, it can be concluded that the use of crossword puzzle media in the learning process can influence students' cognitive learning outcomes in the science subject of grade V students of SDN 28 Singkawang. Specifically, several things can be concluded as follows:
1. There is a difference in the learning outcomes of the cognitive domain of students who are taught using crossword puzzle media and those who do not use crossword puzzle media in the science subject of Fifth-Grades SDN 28 Singkawang. This is indicated by the calculation of the two-sample *t -test* obtained $t_{count} > t_{table}$, namely 2.16 > 2.06.
2. Crossword puzzle media has a moderate effect on students' cognitive learning outcomes in the science subject of grade V of SDN 28 Singkawang. This is indicated by the results of the *Effect Size test* , which is 0.508 in the moderate category.

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