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The Influence of STEAM Learning Model on Students' Learning Outcomes in the IPAS Subject of Fourth Grade of SDN 3 Mojosari, Tulungagung Regency

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ABSTRACT-The STEAM learning model is designed to provide an engaging learning experience and support children's basic development. This approach combines practical activities with games, encouraging children to ask questions, trying new things, and interacting with their friends. At the elementary school level, students' learning outcomes in IPAS subject are often influenced by the type of learning model applied. The purpose of this study was to determine the effect of the STEAM learning model on students' learning outcomes in IPAS subjects in fourth grade of elementary school. This study used a quantitative research type with an experimental method. The design applied in this study was Pre-Experimental Design. The results showed that through the paired t-test, it was found that the results of the hypothesis test showed a significance value <.001, so Ha was accepted. Thus, in this study the accepted hypothesis is that there is a significant influence on students' learning outcome tests using the STEAM learning model in IPAS subjects in fourth grade of elementary school. This result is indicated by the average value of students' learning outcomes before the implementation of STEAM of 42.8. After students were given treatment by applying the STEAM learning model, the average value of student learning outcomes increased to 73.7. This shows that the application of the STEAM learning model in the fourth grade in IPAS (Natural Sciences and Social Sciences Integration) subjects has a significant effect on improving students' learning outcomes.

KEYWORDS: *Learning Outcomes*, *IPAS (Natural Sciences and Social Sciences Integration)*, STEAM.

I. INTRODUCTION

Learning is the support provided by education so that students gain knowledge skills and habits, as well as the formation of attitude and self-confidence [16]. Education can be the main key in achieving achievement and a bright future. In the education process, a learning model is needed to support teaching and learning activities so that students are active in learning.

A learning model is a design or pattern that is applied as a reference in structuring learning activities in the classroom or learning through tutorials, as well as for determining learning tools that include books, films, computers, curriculum and so on [15]. The selection of the right learning model must pay attention to the characteristics and abilities of student, as well as what you want to achieve in the learning process. One of the innovative learning model is the STEAM learning model which forms students to have critical thinking, creativity, collaboration and communication skills.

The STEAM learning model is an acronym for Science, Technology, Engineering, Art and Mathematics [6]. This learning model integrates practical activities with games, thus encouraging children to ask questions, try new things and interact whit their friends. STEAM stimulates children to increase their curiosity and broaden their experiences [14]. This model was created to improv 21st-century skills such as critical thinking, collaboration and idea presentation, with a focus on solving real-world problems. STEAM is a learning model that comprehensively integrates the five disciplines of science, technology, engineering, art and mathematics in an interrelated manner as a way to solve [3]. The main objective of STEAM learning is to improve students critical thinking skills.

The ability possessed by learners from learning activities should be able to produce something. In addition, this can also be achieved though individual creativity without interference from others as educators [11]. These results can be in the from of learning outcomes obtained in the learning process. Learning outcomes are related of changes that arise in cognitive, affective and psychomotor aspects going through the learning stages [1]. In connection with that, education can use IPAS subjects as a means to measure student learning outcomes.

Stated that students experience various challenges when learning IPAS subjects, in the from of difficulty in understanding unfamiliar concepts and difficulty memorizing [5]. At the elementary school level, students' learning outcomes in IPAS (Natural Sciences and Social Sciences Integration) subject are often influenced by the learning model used. Overall, the implementation of IPAS subject in fourth grade elementary school learning has a signification impact on improving learning outcomes and student engagement [9]. The IPAS learning process for fourth grade students supports them in understanding and relating natural and social science concepts to everyday life.

The result of observations show that fourth grade students of SD Negeri 3 Mojosari Tulungagung tend to be less active in learning in IPAS subject. This is due to the lack of understanding of students about the material contained in the IPAS subject. This condition is caused by the learning process that still uses conventional teacher-centered learning models, so that students do not understand the material being taught.

II. RESEARCH METHODS

A. Type of Research

This study uses a type of quantitative research that uses experimental methods. In this study, researchers proposed one or more hypotheses that explain the characteristics of the expected variable relationship [4]. In this study using the pre-experimental research design.

Pre-experimental design is a research design that observes one or more groups after they receive treatment [13]. Pre-experimental design has several types, namely: one-shot case study, one-group pretest-posttest and intact-group comparison. In this study using one-group pretest-posttest design.

In this experimental research using one class, where in one class is given treatment then observation is made to get the desired result. In this study, the class was treated with the STEAM learning model and then the learning outcomes were observed.

B. Research Variables

In this study using independent variable and dependent variable. The independent variable of this study is STEAM learning model and dependent variable is learning outcomes. In quantitative research, variable are the main components that are measured, regulated, or modified to understand the relationship or influence between one component and another.

C. Population, Sample and Research Sampling

The population of this study were fourth grade students at SDN 3 Mojosari. While the sample in this study were fourth grade students totaling seventeen people. In this study the sampling technique used was saturated sample.

D. Data Collection Techniques

- Test

  Tests are instruments used to obtain data or information about a person's knowledge and skills. Knowledge tests are conducted in written and oral formats [2]. The test was carried out in two ways, namely the pretest which was carried out before getting the material and the posttest which was carried out after getting material.

- Documentation

  Documentation is a recording of events that have occurred. Documentation can be in the form of text, photographs or historical works [4]. Documentation is a data collection method carried out by collecting and analyzing documents related to the research.

E. Research Procedure

In this study using the following implementation procedures:

1. Pretest

   Students are given pretest questions to find out their initial abilities before participating in the learning process.

2. Treatment

   Learners are given treatment using the STEAM model with the following steps:

   1. Reflection

      Educators provide real problems or challenges that are in accordance with everyday life about energy changes experience by students. Students integrate their experience with things that will be developed about energy changes.

   2. Research

      Educators provide material about energy changes. Educators divide students into four groups, each group is given different material student search for and collect data needed in making energy change props from used goods.

   3. Discovery

      Educators tell the students to make a design to complete the manufacture of energy change props from used goods according to the material taught. Students discuss with the group to design steps to complete the manufacture of energy change props from used goods in accordance with the instructions given by the educator. Then the educator distribute worksheet to students and the educator monitor students who are discussing and asks if there are any obstacles in completing worksheet.

   4. Application

      Students design and revise the project of making energy chance props that have been done. Educators monitor student who are designing the manufacture of energy change props whether there are difficulties or not.

   5. Communication

      The students deliver presentation about projects that have been done. Each treatment in the learning process.

3. Posttest

   The students are given posttest question to determine the final ability being given treatment in the learning process.

F. Data Analysis Technique

Data analysis technique are carried out to make data clearer, so that a conclusion can be drawn [8]. In this study using data analysis techniques as follows:

1. Research Instrument Test
   a. Instrument Validity Test

      In this study, the determination of validity was carried out through Explanatory Factor Analysis (EFA) by identifying the factors structure that emerged from the data [10]. The result of the instrument validity test of this study were carried out by applying the Kaiser-Mayer-Olkin Measure of Sampling Adequacy (KMO MSA) test and the Bartlett of Sphericity test which was carried out through the Jamovi 2.3.28 application. This signification criteria for the Kaiser-Mayer-Olkin Measure of Sampling Adequacy test must be greater than 0.50, while the signification Bartlett of Sphericity value is less than 0.001 for the instrument to be declared valid, so that the study can continue.

   b. Instrument Reliability Test

      Reliability refers to the extent to which consistency exists between two scores from measurements on the same object, despite using different measurement instruments and scales that are not the same. Reliability can be determined using the Jamovi 2.3.28 application as indicated by Cronbach's Alpha Coefficient in according with the Cronbach's Alpha Coefficient table which includes:

      Table 1. Cronbach's Alpha Coefficient

Cronbach's Alpha Coefficient	Interpretation Cronbach's Alpha Coefficient
0,40 – 0,69	Moderate Reliability
0,70 – 0,89	High Reliability
0,90 – 1,00	Very High Reliability

2. Data Prerequisite Test
   - Normality Test

     Parametric statistical analysis acts as a way to test population parameters using parametric methods. However, to use valid parametric statistical analysis, the data needs to follow a normal distribution. Data normality checking is done through a normality test [12]. The normality test was carried out using a data program on learning outcomes (pretest and posttest), which was treated to one class and then statistically tested using Jamovi 2.3.28 Shapiro-Wilk Multivariate Normality Test to see the prerequisites of normality. If the signification value is less than 0.05, then the data is not normally distributed. Conversely, if the signification value is greater than 0.05, the data is normally distributed.

3. Hypothesis Testing
   - Paired T-Test

     Paired T-Test is a statistical technique used for hypothesis testing where the data analyzed is interrelated data [7]. A paired t-test was conducted to measured the effect between the conditions before and after the treatment was given. The paired t-test in this study used the Jamovi 2.3.28 program.

     The following is the hypothesis proposed in this study:

     Ho: There is no significant effect on the student learning outcomes test using the STEAM learning model in IPAS subject of fourth grade elementary school.

     Ha: There is a significant effect on the test of student learning outcomes by using the STEAM learning model in IPAS subject of fourth grade elementary school.

     Criteria for accepting or rejecting Ho at a significance level of 5% based on the significance value, with the provision that if the significance value is greater than 0.05, the Ho is accepted. Conversely, if the significance is less than 0.05, then Ho is rejected.

III. RESULTS AND DISCUSSION

This research was conducted in April 2025 at SDN 3 Mojosari Tulungagung Regency. This study involved fourth grade students with a total of seventeen students. In this class the research used the application of the STEAM learning model. This study examines the effect of the STEAM learning model on student learning outcomes in the IPAS subject of fourth grade at SDN 3 Mojosari.

The data obtained from this study are in accordance with the variables studied. Fundamentally, before getting the pretest and posttest results, this research process involves testing the research instruments. The research instrument test was carried out by testing question to thirty students in the fourth grade from different schools. Then after obtaining the data, the data was processed using JAMOVI 2.3.28 to test the validity, reliability, normality and hypothesis of the data.

The following are the result of the research than has been done:

1. Research Instrument Test
   a. Validity Test
      - Pretest Question Validity Test

      Validity testing was conducted using Bartlett's Test of Sphericity with the following results:

      Table 2. Bartlett's Test of Sphericity

χ^2	df	p
200	105	< .001

In this study, the measurement of validity pretest question was carried out through EFA. The analysis conducted shows the Bartlett's Test of Sphericity is at < .001. The results of Kaiser-Meyer-Olkin Measure of Sampling Adequacy test (KMO MSA test) showed the KMO value was 0.658. This value is greater than 0.50 as the KMO value signification criteria. This states that the sample size used is sufficient.

- Posttest Question Validity Test
  Validity testing was conducted using Bartlett's Test of Sphericity with the following results:

Table 3. Bartlett's Test of Sphericity

χ^2	df	p
246	105	< .001

In this study, the measurement of validity pretest question was carried out through EFA. The analysis conducted shows the Bartlett's Test of Sphericity is at < .001. The results of Kaiser-Meyer-Olkin Measure of Sampling Adequacy test (KMO MSA test) showed the KMO value was 0.663. This value is greater than 0.50 as the KMO value signification criteria. This states that the sample size used is sufficient.

b. Reliability Test
- Pretest Question Reliability Test
  The reliability test result are as follows:

Table 4. Cronbach's Alpha

			Statistic	df	p	*Mean difference*	*SE difference*
Pretest	*Posttest*	*Student's*	-20.3	16.0	< .001	-30.9	1.53

Note. H_a $\mu_{\text{Measure 1 - Measure 2}} \neq 0$

- Posttest Question Reliability Test
  The reliability test result are as follows:

Table 5. Cronbach's Alpha

	Mean	Cronbach's α
scale	0.741	0.845

The results of the reliability test show the Cronbach's Alpha Value of 0.845. This shows the reliability value in the high coefficient category.

Data analysis of the improvement of student learning outcomes shows that there is a difference in the value of learning outcomes for pretest question and posttest question. This shown in the following table:

Table 6. Data of Improvement in Student Learning Outcomes

Mean	Median	SD	SE
42.8	40	16.1	3.90
73.7	73	11.5	2.78

The results of the data show the pretest value of seventeen students averaged 42.8, while for the posttest value the average was 73.7. This shows that there is an effect of the STEAM learning model on the learning outcomes of students in the IPAS subject of fourth grade at SDN 3 Mojosari. After knowing the results of the data, the next step is to conduct data prerequisite testing through data normality test and hypothesis testing using paired t-test.

2. Data Prerequisite Test
- Data Normality Test
  The result of the data normality test are as follows:

Table 7. Normality Test (Shapiro-Wilk)

	W	p
Pretest - Posttest	0.912	0.107

The data shows a Shapiro-Wilk value of 0.912 and a p value of 0.107. This indicates that the data has a normal distribution and Ho is accepted. Because the p value is greater than 0.05 as the normality significance level. The results of the normality test show that the data has a normal distribution, meaning that the normality assumption for the parametric test has been met. So it can continue with hypothesis testing.

3. Hypothesis Testing
- Paired T-Test
  In this study, the hypothesis test used the paired t-test. Paired t-test was conducted to measure the effect between the conditions before and after the treatment was given. The result of the paired t-test are shown below:

Table 8. Paired Sample T-Test

The results of hypothesis test show a significance value of < .001, so Ha is accepted. Because the criteria used Ha is accepted if the significance < 0.05. This states that there is an effect of student learning outcomes using the STEAM learning model.

IV. CONCLUSION

Based on the result of the research obtained, it can be concluded that the application of the STEAM learning model in IPAS subject of fourth grade is greatly affects the improvement of student learning outcomes.

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