The Effectiveness of Implementing STEAM Method With Loose Parts Media Learning in Kindergarten at Pamotan District

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Abstract: The aim of this research is to describe the planning, implementation and learning outcomes of children from the application of the STEAM method with loose parts media in learning in Kindergartens in Pamotan District, Rembang Regency. This type of research method is an applied research method with a mix-method type which has an exploratory design variant. The data collection techniques used are interviews, questionnaires and observation. The analysis used in this research is qualitative and quantitative analysis. The data sources in this research are teachers, parents and group B students in Kindergartens in Pamotan District, Rembang Regency. The research results show that the effectiveness of the STEAM learning model with loose part media can be used to increase effectiveness from an early age. This is based on test results that children who are given learning using the STEAM method development with loose part media have better creative abilities compared to children who are given conventional learning. This shows that learning using the development of the STEAM method with loose parts media for effectiveness in Pamotan sub-district kindergartens is more effective than conventional learning.

Keywords: STEAM, loose parts, collaborative learning

1. Introduction

Education services for early childhood focus on the basic foundations that greatly influence the child's subsequent development into adulthood. The early childhood education paradigm focuses on multidimensional, multidisciplinary and multifunctional abilities in an effort to make individuals able to understand various socio-cultural phenomena (Veraksa, 2014; Sommer et al., 2013). The early childhood knowledge stage is interpreted as the right time to carry out the process of self-experience until it develops according to its potential. The growth and development of early childhood is influenced by an educator optimizing his personal character, having good cognitive aspects in the form of knowledge of language, art, social, emotional, spiritual and independence. Furthermore, early childhood education has the function of developing all children's potential, instilling values and norms of life, forming and getting used to expected behavior, developing basic knowledge and skills, developing motivation and positive learning attitudes (Yusup et al., 2023).

The implementation of early childhood learning cannot be separated from various contributions related to the quality of educators, parental understanding and self-motivation in individual children (Aboud & Prado, 2018). The educational approach is a pattern of synergy in the role of adults to develop sustainable methods in the learning system (Hedefalk et al., 2015). It is very important to develop children's education that emphasizes abilities at different socio-cultural levels. Teachers and parents are required to have skills and be professional in carrying out the learning process, must be able to work together with children, of course they need to use interesting and fun learning methods and media that are easily available in the surrounding environment. The ever-changing development of learning methods really attracts children's interest in participating in learning (Prince & Felder, 2006). However, in reality, most people still use conventional learning in the field. Children are asked to follow the teacher's wishes and only use worksheets without media.

The problem of gaps between theoretical concepts and social reality that occurs in kindergarten level educational institutions is because learning phenomena are generally the same as events in various educational institutions globally. Learning problems that have only been felt to be a burden for parents in educating their children in the learning process at home. For this reason, teachers need to innovate learning through socializing the development of the STEAM method using loose parts media for families as an implementation of social empowerment in the field of early childhood education. Key to future world progress and likely the foundation of some of the highest-growing businesses from manufacturing to the arts of STEAM-filled learning, children are encouraged to learn while playing with meaningful games (Saadah et al., 2023; Jesionkowska et al., 2020).

The educational approach from various scientific disciplines is a dual view in which the subject of education is given a scientific dimension in a complex activity. In line with underlining that children's education is an educator's treatment that summarizes playing and learning activities in a single knowledge (Chekour et al., 2018). One learning method that can be used in early childhood learning is by applying the STEAM (Science, Technology, Engineering, Art, Mathematics) method (Manera, 2020). Furthermore, Rahma et al. (2023) argue that the STEAM method is a comprehensive combination of various subjects such as science, engineering, art and mathematics as a problem solving pattern.

One of the learning process media that can be used in early childhood is loose parts learning media. Ifrochah and Mustadji (2021) states that loose parts or loose parts are all forms of objects that can be played with, examined and manipulated by children that children obtain from the surrounding environment. The choice of free media is also media that comes from the child's immediate environment. This statement is supported by Haryanto and Twiningsih (2024) who states that open-ended loose items are very easy to find in the natural environment without incurring costs but provide a platform for children to express their creativity in using free material objects so that children have the freedom to experiment and express themselves. This research was conducted to determine the effectiveness of developing the STEAM model with loose parts media on the effectiveness of early childhood in Kindergartens throughout Pamotan District. This research used paired sample t-tests, independent sample t-tests and gain index calculations. However, before carrying out the test, prerequisite tests are first carried out, namely the normality test, homogeneity test and average similarity test.

2.   Methodology

This research uses the methodapplied research with a mix-method type that has an exploratory design variant. The research method paradigm used is applied research with a mix method type which has an exploratory design variant. The total population of children consisting of kindergarten students in Pamotan Rembang District is 143 students consisting of 67 boys and 76 girls. The samples taken were 84 children consisting of 43 boys and 41 girls and parents with various cultural and economic differences. The development research model developed by McKenney and Reeves (2014) has three stages, namely: preliminary study stage, development stage and validation stage. Data collection methods include interview methods, observation methods and questionnaire methods. The data analysis technique for this research uses qualitative descriptive analysis techniques and descriptive statistical analysis. To determine the effectiveness of developing the STEAM model with loose parts media on the creativity of early childhood in Kindergartens throughout Pamotan District, this research used paired sample T tests, independent sample T tests and gain index calculations. However, before carrying out the test, prerequisite tests are first carried out, namely the normality test, homogeneity test and average similarity test.

3.   Results and Discussion

The normality test is used to determine whether the data to be analyzed is normally distributed or not. Normality test uses the normality test formula. The next step is to make a decision if the sig value > 0.05 is normal and if the sig < 0.05 then it can be said to be abnormal. The results of the data normality test above show a significance value greater than the significance level of 5% or 0.05, so it can be concluded that the data in each class is normally distributed. This normality assumption is necessary because if normality is not met then the hypothesis test decision (t test) obtained will be invalid.

Table 1. Normality test

Class		Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistics	df	Sig.	Statistics	df	Sig.
Early Childhood Effectiveness	Pretest Experiment 1	.140	15	.200	.957	15	.646
	Posttest Experiment 1	.113	15	.206	.959	15	.684
	Pretest Experiment 2	.110	15	.219	.983	15	.986
	Posttest Experiment 2	.159	15	.308	.916	15	.168
	Pretest Experiment 3	.129	15	.216	.938	15	.360
	Posttest Experiment 3	.102	15	.325	.954	15	.582
	Pretest Control	.097	15	.241	.966	15	.794
	Posttest Control	.114	15	.211	.962	15	.728

The effectiveness in children is then seen for homogeneity. The homogeneity test is used to measure whether the control class and experimental class come from a homogeneous population. The results obtained from the homogeneity test calculation data are according to the Table 2. Based on the homogeneity test results, it is known that the Based on Mean (sig) significance value is 0.894 > 0.05 at the 5% level so it can be concluded that the data variance in the control and experimental classes is homogeneous.

Table 2. Homogeneity test

		Levene Statistics	df1	df2	Sig.
Early Childhood Effectiveness	Based on Average	.202	3	56	.894
	Based on Median	.171	3	56	.915
	Based on Median and with adjusted df	.171	3	53.825	.915
	Based on trimmed mean	.196	3	56	.899

The mean similarity test aims to find out whether the samples have the same/balanced average or not. The data obtained is said to have the same or unequal average, this can be seen from the sig value. in the SPSS ANOVA output table. The decision rule is if sig. > 0.05, then the data tested has the same average and vice versa. Based on the results of the analysis of the average similarity test, a significance value of 1,000 > 0.05 was obtained, so it can be concluded that both classes (experimental and control) have the same average value or initial creativity ability of the experimental class. and control group children were the same or balanced.

Table 3. Average similarity test of children's initial effectiveness (pretest)

	Sum of Squares	df	Means Square	F	Sig.
Between Groups	.313	3	.104	.001	1.000
In Groups	4180.000	56	74.643		
Total	4180.313	59			

It is known that the initial creative abilities of children in the experimental and control groups are the same or balanced, so that the sample meets the requirements to be given treatment, namely providing learning by developing the STEAM model with loose part media in the experimental group, while for the experimental group the control group is providing learning using conventional methods. The results of the balance test on the posttest can be seen in Table 4. Based on the results of the balance test analysis of the posttest scores, a significance value of 0.000 <0.05 was obtained, so it can be concluded that the two classes (experimental and control) had unequal or unbalanced averages after being given different treatments.

Table 4. Average similarity test of children's initial effectiveness ability (posttest)

	Sum of Squares	df	Means square	f	Sig.
Between Groups	3043.333	3	1014.444	9.553	.000
In Groups	5946.667	56	106.190		
Total	8990,000	59			

After the prerequisite analysis consisting of a normality test, homogeneity test and average similarity were met, an effectiveness test was then carried out using a paired sample t test to find out whether there were differences in the creativity of kindergarten children in Pamotan District before and after using STEAM model development with loosepart media. The results of the paired sample t test analysis can be seen in Table 5.

Based on the results of the paired sample test above, it can be concluded that 1) experimental class 1 obtained a Sig value. (2-tailed) 0.000 < 0.05 and Tcount 49.512 > Ttable 2.14479. Experimental class 2 obtained a value (2-tailed) of 0.000 < 0.05 and Tcount 26.045 > Ttable 2.14479. Experimental class 3 obtained a value (2-tailed) of 0.000 < 0.05 and tcount 29.3641 > Ttable 2.14479. From these results it can be concluded that there is a difference in the average creativity of children before and after learning is carried out using the STEAM model development with loosepart media. These results mean that the development of the STEAM model with loosepart media has an influence on children's creativity in experimental classes, namely TK N Pembina, TK Pertiwi and TK Aisyiah Bustanul Athfal; and 2) the control class obtained a Sig value. (2-tailed) 0.000 < 0.05 and Tcount 12.048 > Table 2.14479, so it can be concluded that there is a difference in the average creativity of children before and after conventional learning is implemented. These results mean that conventional learning has an influence on the creativity of children in the control group, namely Bangunjaya Pamotan Kindergarten.

Table 5. Test Up to T Paired

	Pair Differences					Q	df	Sig. (2-tailed)
	Means	Std. Deviation	Std. Meaning of Error	95% Confidence Interval of the Difference				
				Lower	On			
Post_Ex1	31.5000	2.4640	0.6362	32.8645	30.1355	49.512	14	.000
Post_Ex2	31.0000	4.6098	1.1902	33.5528	28.4472	26.045	14	.000
Post_Ex3	31.1667	3.2550	0.8404	32.9692	29.3641	37.083	14	.000
Post_Con	14.8333	4.7684	1.2312	17.4740	12.1927	12.048	14	.000

The gain index calculation is carried out as a supporting test to determine the level of learning effectivenessclasscontrol using conventional learning methods with experimental classes using STEAM model development with loose part media. The results of the Gain-index calculation for each group can be summarized in Table 6.

Table 6. Recapitulation of increasing the effectiveness of kindergarten children in Pamotan district

Criterion C	Experiment 1		Experiment 2		Experiment 3		Control	
	F	%	F	%	F	%	F	%
Tall	8	53.3	8	53.3	8	53.3	-	-
Currently	7	46.7	7	46.7	7	46.7	10	66.7
Low	-	-	-	-	-	-	5	33.3

Fig. 1 shows the results of data collection in determining scientific knowledge and learning process skills in Pamotan sub-district kindergartens. Based on Fig. 1, it explains that learning using the STEAM development model with loose part media is more capable of increasing the creativity of early childhood in kindergartens in Pamotan District, Rembang Regency compared to conventional learning.
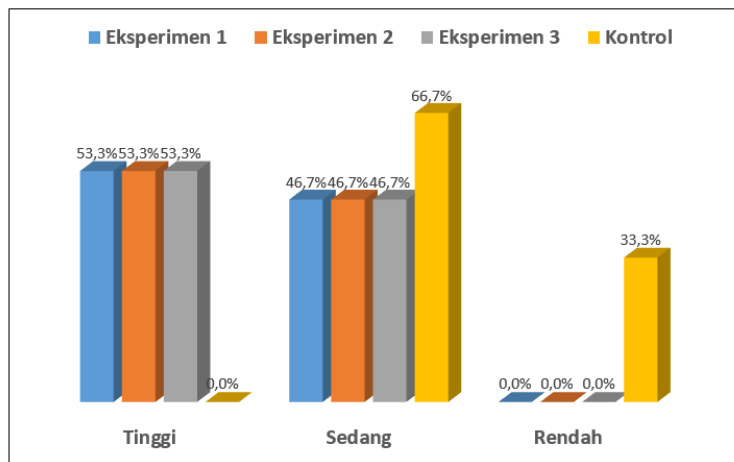

Fig. 1. Effectiveness of kindergarten children in Pamotan district

To find out the effectiveness of developing the STEAM model with loosepart media on early childhood creativity, it can be seen from the differences in creativity of early childhood in kindergartens throughout Pamotan District, Rembang Regency between the experimental group using the STEAM model development assisted with loosepart media and the control group using conventional learning. . The results of the independent sample t test analysis can be seen in Table 7.

Based on the results of the Independent Sample t Test above, it can be concluded that 1) The creativity of children in experimental class 1 and experimental class 2 obtained a T value of 0.094 < T table 2.04841 and a sig value of 0.926 > 0.05. The creativity of children in experimental class 1 and experimental class 3 obtained a Tcount value of 0.092 < Ttable 2.04841 and a sig value of 0.927 > 0.05. The creativity of children in experimental class 2 and experimental class 3 obtained a Tcount value of 0.000 < Ttable 2.04841 and a sig value of 1.000 > 0.05. From these results it can be concluded that there is no difference in the average of children's creativity between experimental 1, experimental 2 and experimental 3 classes, both of which use the STEAM model development with loose part media; and 2) The effectiveness of children in experimental class 1 and control class obtained a Tcount value of 4.349 > Ttable 2.04841

and a sig value of 0.000<0.05. The effectiveness of children in experimental class 2 and control class obtained a Tcount value of 0.4.177 > Ttable 2.04841 and a sig value of 0.000<0.05. The creativity of children in experimental class 3 and control class obtained a Tcount value of 4.121 > Ttable 2.04841 and a sig value of 0.000<0.05. These results can be concluded that there is a difference in the average creativity of children between experimental class 1, experimental 2 and experimental 3 which uses the STEAM model development with loose part media and the control class which uses conventional learning.

Table 7. Independent t sample

Early childhood creativity	t-test for Equality of Means						
	Q	df	Sig. (2-tailed)	Meaningful Differences	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	On
Example1 – Example2	.094	28	.926	.3333	3.5512	6.9410	7.6077
Example 1 – Example 3	.092	28	.927	.3333	3.6094	7.0602	7.7269
Example 2 – Example 3	.000	28	1.000	.0000	3.6920	7.5627	7.5627
Example 1 – Cons	4.349	28	.000	16.6667	3.8323	8.8166	24.5168
Ex 2 – Con	4.177	28	.000	16.3333	3.9102	8.3236	24.3430
Ex 3 – Con	4.121	28	.000	16.3333	3.9631	8.2152	24.4514

Based on Table 8, the average effectiveness score for children taught using the STEAM model development with loose part media is 82.8 in experimental class 1; 82.5 in experimental class 2 and 82.5 in experimental class 3, while the average effectiveness score for children given conventional learning was 66.2. These results mean that the average effectiveness of children who are given learning using the STEAM model development with loose part media is better than children who are given conventional learning (Muntomimah & Wijayanti, 2021). This shows that learning using the development of the STEAM model with loose part media on the effectiveness of children in Pamotan District Kindergarten is more effective compared to the control class.

Table 8. Creativity statistics group of children in experiment class and control class

	Class	N	Means	Std. Deviation
Early childhood creativity	Posttest Experiment t 1	15	82.833	9.4900
	Posttest Experiment t 2	15	82.500	9.9553
	Posttest Experiment t 3	15	82.500	10.2644
	Post-Test Control	15	66.167	11.4122

4.   Conclusion

Based on the description of the background of the problem and the research results above, it can be concluded that the STEAM learning model with loose part media can be used to increase the effectiveness of learning in early childhood. This is based on the results of learning carried out by children who were given learning using the development of the STEAM model with loose parts media which was carried out at the Pamotan District Kindergarten, who had better abilities compared to children who were given conventional learning. For this reason, teachers must always innovate to stimulate children's interest using the STEAM method with loose part media so that children have wider imagination.

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