The Influence of Melodical and Rhythmic Music on Critical Creative Thinking Ability in STEAM Learning Early Children

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Abstract. This study aims to determine (1) the ability to use melodic and rhythmic musical instruments partially affects the critical creative thinking abilities of early childhood; and the ability to use melodic and rhythmic musical instruments simultaneously influences the critical creative thinking abilities of early childhood. The research method uses *a true experiment* with *pretest-posttest control group design*. The study population was Kindergarten/PAUD students in Tanjung Morawa and the samples used in this study were Tanjung Morawa State Kindergarten and Al Mirah Tanjung Morawa Kindergarten. The data analysis technique used in this study uses multiple linear regression analysis. The results of the study show that (1) there is a partial effect of the ability to use melodic and rhythmic musical instruments on the critical creative thinking abilities of early childhood; (2) there is an effect of the ability to use melodic and rhythmic musical instruments simultaneously on the critical creative thinking skills of early childhood. It is hoped that this research can become a reference in learning plans that use melodic and rhythmic musical instruments with the STEAM learning model for PAUD.

Keywords: Melodic and rhythmic music, critical creative, early childhood

1 Introduction

Music is a medium of human expression through the strains of tones. Real music can be enjoyed by everyone. In its development, music has been used from children in the womb to adults. Music has great benefits for humans if they can enjoy it. It is said that [1], music is the science and art of the rhythmic combination of tones, both vocal and instrumental, which includes melody and harmony as an expression of everything you want to express, especially the emotional aspect. That is, music can be in the form of strains of notes emitted through voice or vocals which are commonly referred to as singing, or music in the use of instruments that produce harmonious tones that blend into a work that can be enjoyed by many people. Music can change the human mood, both cheerfully, sadly and happily. One of the elements of connoisseurs of music is early childhood. It is known that, one element of the aspect of child development is art. Whether it's music, dance and fine arts. Music can be a way to develop children's artistic aspects. In addition, music can be a tool to see and improve children's cognitive, social and motor development.

Music learning is basically specifically able to develop the level of creativity of children. One of them is early childhood or *Golden age* golden age is the age when children learn while

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playing. Early childhood will get to know what they see through many activities, one of which is through music. For children at an early age, music can also be a bridge of knowledge for other disciplines [2]. In music art learning activities, for example in singing activities with animal themes besides children being taught the development of musical arts through sound art, children are also introduced to the names of animals. In general, music playing activities are good using melodic musical instruments such as pianos, angklung which are generally used in schools as well as rhythmic music playing activities such as simple percussion. The musical instruments above are musical instruments that are commonly used in schools. Besides that, in addition to learning the art of music, it also requires a learning model approach to learning in class. STEAM approach become one of the learning models that can be integrated in learning melodic and rhythmic music [3]. The use of melodic and rhythmic music in steam learning in early childhood will be more innovative. Basically, children are introduced to playing melodic and rhythmic musical instruments using goods with the STEAM approach, meaning that early childhood does not only develop artistic abilities but also in learning steam. based on field data, that early childhood teachers have not yet developed the concept of steam learning which is integrated by the use of melodic and rhythmic musical instruments. In fact, providing a stimulus using steam learning with an emphasis on music media does not only play an important role in the development of children's art but also the level of children's critical thinking. Therefore, researchers are interested in seeing the effect of using melodic and rhythmic music on critical creative thinking skills in *steam* early childhood

1.1 Melodic Instruments and Rhythmic

Instruments Music can be a medium of human expression. Music is the strains of harmonious tones. It is said that music is a form of sound art in the form of a song or musical composition that expresses the thoughts and feelings of the creator through musical elements, namely melodic rhythm, harmony, form, and song structure and expression as a whole [5]. The form of various musical elements in it is like vocal and instrumental music. Music also has many genres or streams such as pop music, dangdut music, jazz music and others. The formation of harmonious tones, one of which is from playing instrumental music. Instrumental musical instruments also have functions such as melodic music, rhythmic music and others. A melodic musical instrument is a pitched instrument, meaning that this instrument emits harmonic tones when played. Like pianica, recorder, piano, flute, angklung, flute, glockenspiel and others. while rhythmic instruments are musical instruments which in their playing provide a certain rhythm (rhythm) in musical performances [6]. Furthermore, it is said that the melody is a sequential and rhythmic arrangement of a series of tones (sounds with regular sequences), and expresses an idea, thought and feeling [8]. Both melodic and rhythmic instruments can be enjoyed by people of all ages. In general, in early childhood, playing melodic and rhythmic musical instruments is also often used to stimulate children's development not only in the arts but also in the cognitive, motoric and social-emotional development of children. The melodic musical instruments that are commonly used in early childhood/kindergarten are angklung, pianica, glockenspiel and others. While the rhythmic musical instruments that they can use are simple percussion. It is said that, Percussion is basically any object that can produce sound either because it is hit, shaken, rubbed, complained of, or in any way that can make the object vibrate [10]. One example is maracas. The maracas musical instrument is a musical instrument that functions rhythmically as an accompaniment to setting the tempo and giving beats to songs [11]. The series of melodic

and rhythmic musical instruments above are often used in learning in PAUD/Kindergarten. Then, in the use of melodic and rhythmic musical instruments, you can also use used instruments. In rhythmic musical instruments, it can be used like maracas. Maracas is a simple percussion instrument that can be played by children. The maracas musical instrument is a musical instrument that functions rhythmically as accompaniment for setting the tempo and giving a beat to the song. Such as glass bottles filled with water, used buckets as percussion, tin bottle caps as percussion instruments and so on.

1.2 Creative Critical Thinking Ability

Creative forms the word creativity which means creating new things or without combining something that already exists. Creativity can also be said of the process of creative thinking where creativity is the product. Creativity is a person's ability to create something new in the form of an idea or real work, such as a free drawing activity. Creative thinking is the ability to understand problems and show what is known and answer questions, have fluency in solving problems with various answers logically [3]**.** Understanding and planning problem solving requires the ability to think creatively [4].

This critical creative thinking ability is basically a manifestation of the concept of higher thinking. This means that there is innovation from the concept of someone's thinking ability that is born from high creativity.

STEAM Learning Model Learning, is an information delivery activity created to facilitate the achievement of specific goals. STEAM (Science, Technology, Engineering, Arts, and Mathematics) learning is an integration of various disciplines, namely science, technology, engineering, art and mathematics which are in one unified learning approach [7]. STEAM is a meta-discipline that integrates science, technology, engineering, art and mathematics into an integrated approach that can be implemented in school learning. STEAM was born and emerged after the addition of an integrated art discipline to STEM.

Referring to the 21st century learning process, the development of soft skills related to holistic understanding can be linked to the fields of science, technology, technology, art, and mathematics which is called the STEAM model. This is in line with According to Yakman, 2012 that STEAM learning is a contextual learning in which children will explore events that are close to themselves. Furthermore, the STEAM Learning model will foster a creative attitude in children. Because in STEAM learning children will produce a product or work according to their imagination [9]. Therefore, STEAM learning can improve children's ability to think creatively and critically.

2 Research Methods

This research was conducted using a quantitative approach. The research method used is *true experimental* with *pretest-posttest control group design*. In this study, 2 classes were used, namely, one class as the experimental group and one class as the control group. The experimental class was given treatment, namely STEAM learning using pitched musical instruments and the control class was given treatment using non-pitched musical instruments in the learning process.

Data collection techniques were carried out using literature, observation and interviews. This research is answered by using multiple linear regression analysis.

3 Results and Discussion

3.1 Instrument Validity Test Validity

Test is used to determine the validity or validity of an instrument. In this study, researchers conducted a validity test using 3 experts and 12 items were analyzed using the Aiken's V formula. Items were declared content valid with criteria 0.97 > 0.3. This is in line with research conducted by Mardapi [2] which states that if the validity coefficient <0.3 means the item is said to be inadequate (invalid) conversely if the validity coefficient is > 0.3 it means the item is said to be adequate (valid). The results of the instrument content validity in Table 1.

Table 1. Content Validity Test Results

Item No	Expert Judgment			Number of raters	Max Category	Subject 1	Subject 2	Subject 3	∑S	V	Conclusion	
	1	2	3								≥0.3	Criteria
1	5	5	5	3	5	4	4	4	12	1.00	valid	high
2	5	5	4	3	5	4	4	3	11	0.92	valid	high
3	5	5	5	3	5	4	4	4	12	1.00	valid	high
4	5	5	5	3	5	4	4	4	12	1.00	valid	high
5	5	5	5	3	5	4	4	4	12	1.00	valid	high
6	4	4	4	3	5	3	3	3	9	0.75	valid	medium
7	5	5	5	3	5	4	4	4	12	1.00	valid	high
8	5	5	4	3	5	4	4	3	11	0.92	valid	high
9	5	5	5	3	5	4	4	4	12	1.00	valid	high
10	5	5	5	3	5	4	4	4	12	1.00	valid	high
11	5	5	5	3	5	4	4	4	12	1.00	valid	high
12	5	5	5	3	5	4	4	4	12	1.00	valid	high
Total	59	59	57			47	47	45	139	0.97	valid	high

Based on Table 1, there are 12 items that serve as benchmarks for testing the validity of instrument data. From this table, it explains that of the 3 validation experts who gave an assessment, it shows that the number of each validation expert did not choose the distance of the assessment that was too far away, this can be seen from validation expert 1 giving a value of 59, validation expert 59 and validation expert 57. From the third result critical creative thinking skills in early childhood is valid so that it can be used in research

3.2 Instrument Reliability Test

Reliability tests conducted with raters of more than 2 people were analyzed by correlation coefficients between classes or Interclass Correlation Coefficients (ICC). ICC is an expert feasibility test in providing an assessment when compared to other experts. ICC analysis can be carried out using the help of the SPSS program and the results of the Interclass Correlation

Coefficients (ICC) can be known by observing the value of a single measurement. The ICC was declared an expert in providing a good assessment with the criterion value of Single measures > 0.5 (Mardapi, 2008). In addition, the reliability value of the instrument can be seen from Crobach's Alpha with > 0.6 (Hair et al., 2010). The results of instrument reliability in Table 2.

Table 2. Reliability Test Results

Intraclass Correlation Coefficient						
	95% Confidence Interval			F Test with True Value 0		
	Intraclass Correlation	Lower Bound	Upper Bound	Value	df1	df2
Single Measures	.592[a]	.254	.843	5.350	11	22
Single Measures	.592[a]	.254	.843	5.350	11	22
Average Measures	.813[c]	.505	.942	5.350	11	22

Table 3. Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.813	.865	3

Based on Table 2 it shows that the ICC value in Single measures gets a value of 0.592 > 0.5 so that it can be stated that the expert has given an appropriate assessment reliability value *Cronbach's Alpha* of 0.813 is in the very reliable category (Hair *et al.*2010). So, it can be concluded that the reliability of the instrument for measuring critical creative thinking skills in early childhood can be used in research.

3.3 Classical Assumption Test

3.3.1 Normality test

Test Normality test is conducted to find out whether the dependent variable and the dependent variable are normally distributed or not by looking at the value of Shapiro-Wilk. If the p value > 0.05 then the data is normally distributed. From the results the statistical value of the Shapiro-Wilk test is 0.963 and 0.936. If a significance level of 0.05 is chosen, then p-value = 0.963 > 0.05 and 0.936 > 0.05, it can be concluded that the data is normally distributed.

3.3.2 Multicollinearity test

Test The multicollinearity test aims to test whether the regression model found a correlation between independent variables. Multicollinearity test can be done by knowing the tolerance and VIF values. The results of the multicollinearity analysis between variables show that there is no multicollinearity between the variables because the tolerance value is far from 0 (Suyono, 2015) and a VIF value of less than 10 means that all independent variables have a VIF value <10 and a *tolerance* > 0. So it can be concluded that all independent variables in this study did not have multicollinearity.

3.3.3 Heteroscedasticity test

Test The heteroscedasticity test aims to test whether the variance of the residuals is similar to one another in the regression. The heteroscedasticity test was tested using a scatter plot graph with the criteria if the dots spread above and below the number 0 on the Y axis without forming a certain pattern then heteroscedasticity does not occur, in summary can be seen in Figure 1.

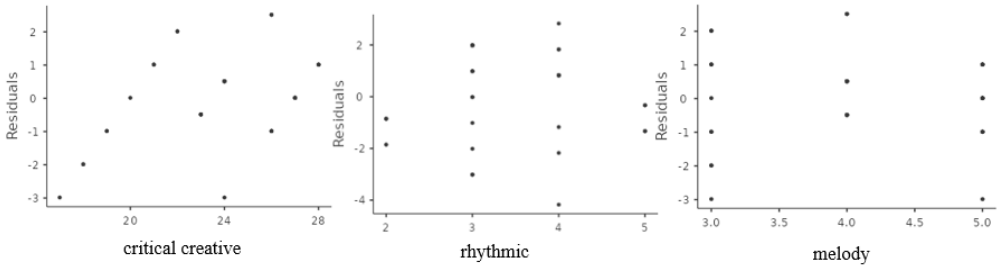

Fig. 1. Heteroscedasticity Test Results

Based on Figure 1 the points on the *scatterplot* dots spread above and below the number 0 on the Y axis without forming a specific pattern. This shows that there is no heteroscedasticity disorder in the regression model.

3.3.4 Hypothesis Test

Partial test, t-test (partial) aims to determine whether the independent variables (melodic and rhythmic music) partially (alone) affect the dependent variable (critical creative skills). The results of the calculation of hypothesis 1 can be seen in Table 4 below.

Table 4 Hypothesis 1 Calculation Results

Model Coefficients - Creative Critical							
			95% Confidence Interval				
Predictor	**Estimate**	**SE**	**Lower**	**Upper**	**t**	**p**	**Stand. Estimate**
Intercept	9.48	1.256	6.92	12.05	7.55	< .001	
Melodic	3.50	0.306	2.88	4.12	11.46	< .001	0.902

Based on Table 4 between the ability to use melodic musical instruments with students' critical creative thinking abilities, the following equation is obtained.

$$Y = 9.48 + 3.50\ X_1$$

Based on the regression equation, it can be concluded that the melodic coefficient value is 3.50 which is positive. So the higher the melodic ability, the higher the students' critical creative thinking ability. Statistical t test results for the melodic variable obtained a significance value of 0.001 which means it is smaller than the value of 0.05 so that it can be concluded that Ho is accepted. This means that there is an influence of the ability to use melodic musical instruments

on students' critical creative thinking abilities. The results of the calculation of hypothesis 2 can be seen in Table 5 below.

Table 5. Hypothesis 2 Calculation Results

Model Coefficients - Critical Creativity							
			95% Confidence Interval				
Predictor	**Estimate**	**SE**	**Lower**	**Upper**	**t**	**p**	**Stand. Estimate**
Intercept	12.54	1.373	9.73	15.34	9.13	< .001	
Rhythm	3.16	0.382	2.38	3.94	8.28	< .001	0.834

Based on Table 5 between the ability to use rhythmic musical instruments with students' critical creative thinking abilities, the following equation is obtained.

$$Y = 12.54 + 3.16\ X_2$$

Based on the regression equation, it can be concluded that the rhythmic coefficient value is 3.16 which is positive. So the higher the rhythmic ability, the higher the students' critical creative thinking ability. The results of the statistical t test for the rhythmic variable obtained a p-value of 0.001 which means it is smaller than the value of 0.05 so that it can be concluded that Ho is accepted. This means that there is an influence of the ability to use rhythmic musical instruments on students' critical creative thinking abilities.

3.3.5 F Test (Simultaneous)

F test (simultaneous) aims to determine whether the independent variables (melodic and rhythmic music) simultaneously affect the dependent variable (critical creative skills).

Table 6. Hypothesis 2 Calculation Results

Model	**Sum of Squares**	**Df**	**Mean Square**	**F**	**p**
1 Regression residual	219.6 96.2	1 30	219.56 3.21	68.5	.001
Total	315.8	31			

Based on Table 6 in the study, the results of the F-test of rhythmic and melodic statistics obtained a p-value of 0.001, which means it is smaller than the value of 0.05 so that it can be concluded that Ho is accepted. This means that there is an influence of the ability to use melodic and rhythmic musical instruments simultaneously (together) on students' critical creative thinking abilities.

The results of the partial t-test on hypothesis 1 show that the p-value is <0.05. This means that the ability to use melodic musical instruments influences critical creative thinking skills in STEAM learning in early childhood. This is because during the learning process in the experimental class that uses melodic musical instruments they are also given Rpph and

guidebooks. In addition, the learning process also uses used goods in the STEAM application which can be turned into a simple melodic and rhythmic musical instrument which provides a more interesting learning atmosphere, such as playing melodic music using unused glass bottles guided by teacher. The STEAM learning stages that can be carried out by teachers and researchers using used glass bottles that are turned into melodic musical instruments, namely:

a. *Science*, the teacher can invite children to observe 7 glass bottles filled with water of different sizes, then the bottles 7 pieces of glass that have been filled with water are introduced to the child how to be able to produce sound, namely by hitting each bottle in order from the one with the most water size to the one that does not contain water, from these 7 used glass bottles it will produce a sound that different songs composed by the tone Do Re Mi Fa Sol La Si Do so that children will be able to develop creativity assisted by the teacher with *Science*; (2) *Technology*, this process can be done by the teacher inviting children to make melodic musical instruments with glass bottles filled with water, with the following steps: prepare 7 glass bottles of the same size, prepare water in a bucket, fill the water into glass bottles of various sizes, make attractive markings with watercolors or on templates with origami each tone on glass bottles with this process can develop children's abilities not only through art in particular but introduce basic technology to early childhood;
b. *Engineering*, the teacher invites children to know how to play melodic musical instruments with glass bottles. As with hitting with a technique that has been taught by the teacher, this stage is the teaching process, the technique of playing by hitting is part of the basic technique, meaning that children can operate or use a glass bottle filled with water with the correct hitting technique so as to produce tones;
c. *Art,* this stage is a key part related to the development of children's art, especially in the art of music.
d. *Math,* the teacher can invite children to count the number of glass bottles and sort them from the glass bottles filled with the least to the most water. *From* all the stages above, this stage is an audio-visual stage from the results of engineering ideas that are poured into children's songs.
e. The teacher can invite children to play children's songs with the glass bottle musical instrument. The learning process above will give birth to the ability to interact, namely in the form of communication between peers and teachers, collaborate in opinions, exchange ideas, explain what is seen and practiced with the facts that are experienced and provide extraordinary responses to enthusiasm in discussions, meaning that children are very enthusiastic in learning activities this. This is what attracts students, encourages students to be able to think critically and creatively. In addition, STEAM learning does not only focus on artistic development in children but also has an impact on other aspects of child development, such as name, cognitive, motor, language, and social-emotional.

The results of the partial t-test on hypothesis 2 show that the p-value is <0.05. That is, the ability to use rhythmic musical instruments affects the ability to think creatively critically in STEAM learning in early childhood. As for the form of the learning process in the control class that uses rhythmic musical instruments, namely the Maracas Music Game using plastic bottles filled with rice. As for the stages. (1) *Science*, the teacher can explain how maracas can sound. It's like the sound of maracas created by the impact or friction between the two materials, namely the bottle and the rice in the bottle. (2) *Technology* The teacher can explain and invite children to make maracas. following steps, Fill the bottle with rice. The teacher invites the children to do

an experiment by pouring rice with different weights to each other. After getting the sound that is considered right, put the tip of a plastic spoon on the mouth of the bottle using tape, attach all parts of the bottle to the stem of the plastic spoon, Maracas musical instrument is ready child played. (3) *Engineering*, the teacher can introduce to children how to adjust the maracas tone so that it fits. Like introducing a child how to play maracas by shaking it, so that the rice in it will hit the wall of the bottle and it will produce a sound and when the maracas is shaken it must also match the rhythm in the beat. (4) *Art*, the teacher can explain how to make maracas so that you can hear it pleasantly. Like inviting children to make maracas by decorating bottles using colored paper or using markers. (5) *Math*, the teacher can invite children to calculate what materials are needed to make maracas, such as in making a maracas musical instrument it takes used bottles, rice, large tape, plastic spoon tips, markers, and colored paper and see the difference in the weight of the rice. will be poured into the bottle.

This learning can make students feel enthusiastic, fun and make students able to develop children's abilities to be creative and critical thinking levels in steam learning collaborations in the field of music. Furthermore, the results of the rhythmic and melodic statistic F test obtained a p-value of 0.001, which means it is smaller than the value of 0.05 so that it can be concluded that Ho is accepted. That is, the use of musical and melodic instruments simultaneously using STEAM learning affects children's critical thinking abilities. Early childhood does not only recognize used goods around them with the STEAM concept, but *art* or art in children can develop with simple songs through melodic and rhythmic instruments.

4 Conclusion

Based on the results of the analysis carried out, it can be concluded that the use of melodic and rhythmic music on the level of critical creative thinking in early childhood STEAM learning has a positive impact on early childhood, meaning that there is an influence of the ability to use melodic musical instruments partially on the ability to think critically creatively on deep STEAM learning for early childhood partially and simultaneously and there is an effect of the ability to use rhythmic musical instruments together on critical creative thinking skills in STEAM learning for early childhood.

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