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Effect of Bamboo Dance Learning Model and Early Ability Against Habit of Mind Mathematical Students

Waryadi[(1)], Kadir[(2)], Wardani Rahayu[(3)]

Department of Education Research and Evaluation, Universitas Negeri Jakarta, Indonesia

E-mail: [(1)]waryadipep@mahasiswa.unj.ac.id

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Abstrack

Based on the results of the preliminary study, Mathematical habits of mind (MHoM) mathematics students are generally still weak.Therefor, efforts are needed to overcome them. One way is to choose and apply the appropriate learning model. This study aims to determine whether the Bamboo Dance learning model and Early Mathematical Ability of Students can significantly influence the mathematics MHoM of students. This research is using the experimental method. Involving VII grade students of junior high school, with experimental classes and control classes as many as 36 student samples. The experimental class was given learning by applying the Bamboo Dance learning model, while the control class with conventional learning. The results of the study showed that the MHoM mathematics of experimental class students as a whole was better than the control class with a significance level of 0.023. Likewise, for groups of students with high and moderate initial abilities in the experimental class it is better than the group of students with high and moderate initial abilities in the control class, with a significance level of 0.011 and 0.025 respectively. Whereas for the group of students with low initial abilities there was no significant effect of the Bamboo Dance learning model on the ability of the MHoM students with a significance level of 0.775.

Keywords: Habits of Mind, Bamboo Dance Learning Model, Early Ability

Introduction

The habit of mind is a form of the highest outcomes (fifth dimension) of the world of education (Marzano, 1992). Unfortunately, based on the results of preliminary studies, habit of mind (HOM) students are generally not good. Especially for mathematics, preliminary research involving 120 respondents of class VII MTs students produced an average score of 2.67 from a maximum score of 5. Even though based on the results of research by Ritchart & Tishman in (Costa, Kallick, & Development, 2009) showing mathematical habits of mind (MHoM) is needed as a thinking transition to studying higher-level material.

The fact that is not encouraging above raises the question, is the cause of MHoM not good? MHoM can develop through the learning process (Setiawati, 2014). What kind of learning can improve student MHoM? This habit is not about certain definitions, theorems, or algorithms that might be found in textbooks. Conversely, mathematical thinking habits (MHoM) are about thinking, mental habits, and research techniques used by mathematicians to develop these definitions, theorems, or algorithms (Matsuura, Sword, Piecham, Stevens, & Cuoco, 2013). The strategy to grow MHoM consists of six components, namely: exploring mathematical ideas, reflecting the suitability or correctness of answers, identifying problem solving strategies to be applied on a broader scale, asking oneself about the mathematical activities that have been carried out, formulating questions, and constructing examples (Jacobbe & Millman, 2010). The teacher's job now is how to implement learning strategies that contain the six components.

The Bamboo Dance Learning Model developed by Anita Lie (2002) is suitable for

material that requires the exchange of information and thoughts of thoughts between students (Yuniari, Wibawa, & Japa, 2017). Broadly speaking the Bamboo Dance learning model has the steps: 1) The introduction of the topic by the teacher; 2) Division of large groups; (3) Group placement; (4) Division of tasks; (5) Substitution of partners, (6) group presentations (Tibahary & Muliana, 2018). The core difference of the Bamboo Dance learning model with other learning models lies in step 4 (division of tasks) and step 5 (change of partners). In the division of tasks, each group member who has discussed is given the responsibility to convey one of the answers to the problem given to other groups. So that what is conveyed can be well received by the recipient of the message, then there are at least two things that must be considered by each student, namely the truth of the material to be delivered, and how to convey it. That way the MHoM development strategy by exploring mathematical ideas, reflecting on the suitability or correctness of answers, identifying problem solving strategies to be applied on a broader scale has been carried out. While step 5 (change of partners) is the practice of how each group member explains the answer (conveying information) to other group members in turn. In this step, the strategy of asking yourself questions about mathematical activities that have been carried out, formulating questions, and constructing examples will be done by students. Thus the application of the Bamboo Dance learning model fulfills the entire Mathematic Habit of Mind growth strategy.

Material and Methods

The study was conducted with an experimental method involving one class (student group) as an experimental class and one class as a control class. The experimental class was given learning by applying the Bamboo Dance model, while the control class was given a conventional learning approach, which is the usual mathematics teacher. Before treatment is given, students' initial mathematical abilities are measured. Based on the results of the initial ability test each class was categorized into three groups, namely low, medium, and high initial abilities. So that this research will be based on the hypothesis: 1) Mathematical habits of mind behavior of students who follow the Bamboo Dance learning model is better than students who take conventional learning; 2) The mathematical habits of mind behavior of students who take part in the Bamboo Dance learning model is better, if viewed from the initial ability category of students (high, medium, low); 3) There is an interaction between the applied learning model and the students 'initial ability to improve students' mathematical habits of mind behaviour.

The full research design is presented in the research methodology as follows:

Table 1. Research design

LM / IA	Bamboo Dance	Konventional
High	A_1B_1	A_1B_2
Middle	A_2B_1	A_2B_2
Low	A_3B_1	A_3B_2

Information:
LM: Learning Model
IA: Initial Ability
A1B1: Students with high initial abilities are taught using the Bamboo Dance model.
A1B2: Students with high initial abilities are taught with conventional models.
A2B1: Students with initial abilities are being taught using the Bamboo Dance model.
A2B2: Students with initial abilities are being taught with conventional models.
A3B1: Students with low initial abilities are taught using the Bamboo Dance model.
A3B2: Students with low initial abilities are taught with conventional models.

Class VIIa 34 N SMP Jakarta (control class), number of respondents 36 students class VIIb SMP N 34 Jakarta (Experiment class), the number of respondents was 36 students. The sample distribution of the experimental and control classes based on high, medium, and low initial abilities is presented in Table 2, as follows: Time: 1 April 20, 2019, Principal Discussion: Roving and Wide Build Flat.

Treatment I, Material: Round and square area and rectangle. Experiment Class:

1. Students are divided into 4 groups and each group is given the task to discuss the circumference and the area of a square and a long distance.
2. Division of tasks determines who is responsible for explaining each problem given.
3. Two groups face each other and pair up (the same number of representatives). For

mathematics, you can use a table.
4. One group plays a role in explaining the formulas and examples of circumference and area of square and square (one student is one problem), the other group is listening and can straighten if wrong.
5. Change partners, and continue to run out.
6. Return to each group
7. The discussion makes the final conclusion
8. Presentation

Table 2. Distribution of Research Samples

Ability Beginning	Experiment Class	Control Class
High	7	6
Middle	23	23
Low	6	6
Total	36	36

Treatment II
Material: Roving and Width of Space and Trapezoid and Step Activity: (same as the treatment I)

Treatment III
Material: Roving and Area of Cleavage an Kites
Step Activity: (same as the treatment I)

Treatment IV
Material: Circumference and Area of Segitaga
Step Activity: (same as the treatment I)

Treatment V
Material: Circumference and Area of Circles
Step Activity: (same as the treatment I)

Instrument

For the initial ability data, the pure mathematical values are used as the results of the Final Semester I. While to measure MHoM students have used instruments whose indicators are derived from 16 habits of thought according to Costa and Kallick. These indicators are the habit of thinking flexibly, managing impulsively, listening with empathy, asking questions, solving problems effectively, using prior knowledge for the current situation, the ability to communicate, thinking clearly and precisely, using all senses in gathering information, trying different ways and produce new ideas, habit of responding, dare to take risks, be responsible, have a sense of humor, think interactively with other people, be open and try continuously (Costa et al., 2009). MHOM students' instruments amounted to 30 items and have been validated with reliability levels = 0.878 (high category). The thirty items of the MHOM instrument with Vo answer choices (very often, scores = 5 for positive statements and 1 for negative), Ot (often, scores = 4 for positive statements and 2 for negative), St (Sometimes, scores = 3) , Rr (Rarely, score = 2 for positive statements and 4 for negative), and Vr (Very rare, score = 1 for positive statements and 5 for negative). The complete instrument is presented in the Appendix

Results and Discussion

Data collected in both the initial abilities and behavior of MHoM students is presented as follows:

Initial Mathematical Ability (IMA)

The value of the initial mathematical ability is used to determine the mathematical abilities of

Table 3. Initial Capability Data Based on Experiment Class and Control Class

Class	N	Scor		avg	Std
		Min	Max		
experiment	36	63,75	83,75	73,59	5,53
Konvetional	36	63,75	88,75	74,44	6,36

Table 4. Average Data and Standard Deviation of Each Initial Ability Level Based on Experiment Class and Control Class

Class	Types of Learning	High Ability Beginning			Middle Ability Beginning			Low Ability Beginning		
		n	average	Sb.	n	average	Sb.	n	average	Sb.
experiment	Bamboo Dance	7	81,96	1,13	23	73,24	3,17	6	66,36	1,29
Konvetional	Konvetional	6	85,0	2,70	24	73,80	3,78	6	66,46	1,33

students before getting treatment, besides that it is also used to find out the equality of the research samples. The categorization of IMA into high, medium, and low is based on criteria: high IMA ≥ (average value + standard deviation), (average value - standard deviation) <medium IMA <(average value + standard deviation), and Low IMA ≤ (average value - standard deviation). (Ruseffendi, 1993). Data on the initial ability scores of students in the experimental class and the control class are presented in Table 3, while the average data and standard deviations for each initial ability level are presented in Table.

Mathematical Habits of Mind (MHoM)

MHoM behavioral score data in both the experimental and control classes were also categorized into three groups, high, medium and low. For MHoM categorization data using the criteria: MHoM high ≥ 75% ideal score, 55% ≤ MHoM medium <75%, and MHoM low <55% (Mahmudi in Setiawati 2016). Ideal score = maximum score per item multiplied by the number of items = 5 x 30 = 150. So the MHoM categorization criteria become:

MHoM height ≥ 112.5
82.5 ≤ MHoM medium <112.5
MHoM low <82.5

Based on the above criteria, the mathematics habit of mind score data for the experimental class and the control class are presented in Table 5. While the mathematics habit of mind score data for each of the initial ability categories is presented in Table 6.

Test Requirements Analysis

Before the research data are analyzed first, the analysis requirements test is performed, namely the data normality test and the data homogeneity test. Kolmogorov Smirnov residual normality test between initial ability data and habit of mind behavior both control class and experiment produce the following data:

Table 7. Residual Normality Test Initial Ability and Habit of Mind Control Class

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		36
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	7.99801475
Most Extreme Differences	Absolute	.118
	Positive	.118
	Negative	-.090
Kolmogorov-Smirnov Z		.705
Asymp. Sig. (2-tailed)		.702

a. Test distribution is Normal.
b. Calculated from data.

Based on the data from the normality test results above the significance value = 0.702. Because 0.702> 0.05 means normal distribution

Table 8. Residual Normality Test Initial Ability and Habit of Mind Experimental Class

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		36
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	7.59284011
Most Extreme Differences	Absolute	.118
	Positive	.072
	Negative	-.118
Kolmogorov-Smirnov Z		.706
Asymp. Sig. (2-tailed)		.701

a. Test distribution is Normal.
b. Calculated from data.

Table 5. Mathematics Data Habit of Mind Based on Types of Learning

Types of Learning	N	Scor		average	Standard Deviation
		Min	Max		
Bamboo Dance	36	90	147	121,06	5,53
Konvetional	36	101	127	116,33	5,37

Table 6. Average and Standard Deviation of Mathematical Habit of Mind Based on Initial Capability Classification

Types of Learning	High Ability Beginning			Middle Ability Beginning			Low Ability Beginning		
	n	average	Sb.	n	average	Sb.	n	average	Sb.
Bamboo Dance	7	134,87	10,11	23	119,74	6,27	6	111.71	10.49
Konvetional	6	120,83	4,45	24	116.00	4.62	6	113.17	7,27

Based on the data from the normality test results above the significance value = 0.701

The homogeneity test of the initial ability and habit of mind data for the experimental and control classes with the Levene test is presented as follows:

Table 9. Initial Mathematical Ability (IMA) Data Homogeneity Test

LaveneStatistic	df1	df2	df3
.740	1	70	.393

Table 10. Homogeneity Test of MHoM Data

LaveneStatistic	df1	df2	df3
.023	1	70	.880

From the two data above, it is known that thesignificance level of IMA data is 0.393 and MHoM = 0.880. Both of these values are greater than ά = 0.05, so it can be concluded that all groups of samples are homogeneous. The IMA Level Difference Test was tested by t-test statistics, using SPSS 21 data obtained:

Table 11. Average Difference Test

	class	N	Mean	Std. Deviation	Std. Error Mean
Initial Ability	A	36	74.4444	6.45344	1.07557
	B	36	73.5972	5.60939	.93490

The value of t-test calculation with a significance level of 0.05: 2 = 0.025 (two-sided test) with degrees of freedom (df) = n-2 = 72 - 2 = 70, obtained t table = 1.994.

Because - t table ≤ t count ≤ t table in this case -1.994 ≤ 0.595 95 1.994, with a significance level of 0.554> 0.05 means that there is no difference in the average Initial Ability of groups of students who get Bamboo Dance learning and conventional learning.

Hypothesis 1
Research problems 1

Are MHoM students who follow the Bamboo Dance learning model better than students who take conventional learning? to answer research problems 1, a test of the difference between the average value of the MHoM group of students taking the Bamboo Dance model and the group of students who followed conventional learning was tested. The statistical test used is the t-test, as follows:

Table 13. Average Difference Test for hypothesis 1

	class	N	Mean	Std. Deviation	Std. Error Mean
MHoM Score	A	36	116.333	5.44584	.90764
	B	36	121.0	10.78079	1.79680

With a significance level of 0.05: 2 = 0.025 (two-way test), the table above shows the following conditions: df = n - 2 = 72 - 2 = 70
obtained t table = 1.994.

With a significance level of 0.023 <0.05, it means

Table 12. Independent Sample Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		f	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
IMA	Equal Variances assumed	.785	.379	.595	70	.554	.84722	1.42509	-1.9950	3.6895
	Equal Variances not assumed			.595	68.668	.554	.84722	1.42509	-1.9960	3.6905

Table 14. Independent Sample Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		f	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Up-
HoM Score	Equal Variances assumed	6.004	.016	-2.346	70	.554	.022	-4.7222	-8.7371	-.707 36
	Equal Variances not assumed			-2.346	51.770	.554	.023	-4.7222	-8.7621	-.682 35

that there are differences in the average MHoM group of students who get Bamboo Dance learning and conventional learning. With the MHoM average of students participating in the Bambu Dance learning model of 121.06 and the average MHoM of students following the conventional learning model of 116.33 this means MHoM mathematically students who follow the Bamboo Dance learning model are better than students who follow conventional learning

Hypothesis 2
Research problems 2

Is MHoM mathematically a student who follows the Bamboo Dance learning model better, if viewed from the category of students' initial abilities (high, medium, low)?
In the same way the significance level for groups of students with high, medium and low initial abilities is obtained as follows:

Table 15. MHoM Average Difference Test for Student Groups with High Early Capabilities

	class	N	Mean	Std. Deviation	Std. Error Mean
MHoM High IMA	A	6	120.833	4.44597	1.81506
	B	7	134.571	10.11364	3.82260

Table 17. MHoM Average Difference Test for Groups of Students with Early Moderate Ability

	class	N	Mean	Std. Deviation	Std. Error Mean
MHoM Middle IMA	A	24	116.000	4.61566	. 94217
	B	23	119.739	6.26837	1.30705

Table 18. MHoM Average Difference Test for Groups of Students with Early Moderate Ability

	class	N	Mean	Std. Deviation	Std. Error Mean
MHoM Low IMA	A	6	113.167	7.27782	2.97116
	B	7	111.714	10.49943	3.96841

From the data of Table 21, it can be translated that for groups of students with early mathematical abilities, the average MHoM score has a significant difference. Because the mean means MHoM students who follow the Bamboo Dance learning model are better, if viewed from the initial high ability category. With the MHoM average of students participating in the Bamboo Dance learning model of 134.87 and the average MHoM of students following the conventional learning model of 120.83 this means MHoM mathematically students who follow the Bamboo Dance learning model are better than students who follow conventional learning. Something

Table 16. Independent Sample Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		f	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
									Lower	Upper	
HoM High IMA	Equal Variances assumed	3.197	.101	-3.068	11	.011	-13.7381	4.47773	-23.59351	-3.89268	
	Equal Variances not assumed			-3.247	8.492	.011	-13.7381	4.23163	-23.39863	-4.07756	

Table 19. Independent Sample Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		f	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
HoM Middle IMA	Equal Variances assumed	1.312	.258	-2.336	45	.024	-3.73913	1.60086	-6.96342	.51484
	Equal Variances not assumed			-2.321	40.375	.025	-3.73913	1.61183	-6.99460	.48366

Table 20. Independent Sample Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		f	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
HoM Low IMA	Equal Variances assumed	.311	.588	.284	11	.781	1.45238	5.10526	-9.78421	12.68898
	Equal Variances not assumed			.293	10.611	.775	1.45238	4.95743	-9.50785	12.41261

similar happened to groups of students with moderate math skills. With a mean of 119.74> 116.00 means for groups of students with moderate initial abilities MHoM mathematically students who follow the Bamboo Dance learning model are better than students who take conventional learning.

Table 21. Three Average Ability Categories of the Average MHoM Test Results

KAM Category Level	Significance	Consclution
high	0,011	< 0,05 (different)
middle	0,025	< 0,05 (different)
low	0,775	> 0,05 (no different)

Different conclusions occurred in groups of students with low initial ability, there was no significant difference between students who followed the Bamboo Dance learning model and students who attended conventional learning.

Table 22. Chi-square test results ($\chi 2$) : Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Initial Ability * Habit of Mind	72	100.0 %	0	0.0%	72	100.0 %

Table 23. Chi-square test results ($\chi 2$) : Initial Ability * Habit of Mind Cross Tabulation

		Habit of Mind			Total
		Low	Middle	High	
Initial Ability	Low	3	10	0	13
	Middle	3	40	1	44
	High	0	10	5	15
Total		6	60	6	72

Table 23. Chi-square test results ($\chi 2$) : Chi-square Test

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.902[a]	4	.001
Likelihood Ratio	17.069	4	.002
Linear-by-Linear Association	13.551	1	.000
N of Valid Cases	72		

Hypothesis 3

Research Problems 3

Are there interactions between the learning models that are applied and the students' initial abilities in improving MHoM behavior mathematically students? To answer the problem, Chi-square test ($\chi 2$) was used. With the help of SPSS 21 the results are as Table 22,23,24. The table above shows that for students with low initial ability, MHoM is low, medium and high, 3 peo-

ple, 10 people, and 0 people. For students with moderate initial abilities, respectively, MHoM is low, medium and high. There are 3 people, 40 people, and 1 person. Whereas for students with high initial ability, MHoM low, medium and high respectively have 0 people, 10 people, and 5 people. The hypothesis was tested with a significance level of 0.05. Because the value of Asymp. Sig. = 0.001 <0.05, it can be concluded that there is an association relationship between the initial ability variable and the habit of mind of the students.

The results of this study prove that MHoM groups of students who get Bamboo Dance learning are better than the group of students who get conventional learning, especially in groups of students with high and moderate initial abilities. Based on the results of the analysis, the MHoM indicators included in the high category are flexible, manage empulsively, listen empathetically, ask questions, complete, use prior knowledge for the current situation, communication skills, habit of responding, risk taking, responsibility, and have a sense of humor. While included in the medium category is thinking clearly and precisely, using all senses in gathering information, being brave, being open and trying continuously. While indicators try different ways and generate new ideas, and think interactively with others included in the low category. This reinforces the results of previous studies which concluded that almost all the habit of mind indicators of students increased significantly after getting STM learning (Nurmaulita, 2017). In addition, the results of this study also confirm that the initial ability of mathematics also had a significant effect on mathematics learning outcomes (Hevriansyah & Megawanti, 2017), even associated with or influencing each other with MHoM students.

Conclusion

For the whole study sample it can be concluded that students who take part in the Bamboo Dance study have the behavior of the Mathematical Habits of Mind (MHoM) students better than the group of students who follow conventional learning. The same thing happened in groups of students with high and moderate initial abilities. Whereas for groups of students with low initial abilities, the learning of Bamboo Dance does not have a significant impact. In addition, students' initial mathematical abilities are also significantly associated with the behavior of the MHoM.

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