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# Analysis of Mathematical Problem Solving Capabilities : Impact of Improve and Osborn Learning Models on Management Education

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## ABSTRACT

Objectives The ability to solve problems is to gain knowledge and motivation in the problem solving process of students. The researcher used the Improve and Osborn learning models to improve problem solving skills. The Improve and Osborn learning models emphasize the development of optimal mathematical skills and generate new ideas in the process of problem solving. This research is used to see the impact of the Improve learning model and Osborn learning model which is better in mathematical problem solving abilities. This research uses the Quasy Experimental Design method. Hypothesis testing uses an independent sample test. The conclusion of the study is the mathematical problem solving ability of students who use the Improve learning model is better than the mathematical problem solving abilities of students who use the Osborn learning model.

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## INTRODUCTION

Mathematical learning model is very important to be used to improve students' abilities (Nasution, Eka, Rangkuti, & Al-washliyah, 2019). Models that can be used to improve students'

abilities, for example, the IMPROVE learning model and the OSBORN learning model. One of the goals of the learning model is to have students' mathematical problem solving abilities (Purba, Surya, Syahputra, & Masalah, 2018). Mathematics learning must always be improved,

because as the development of science (Huda, Tsani, Syazali, Umam, & Jermisittiparsert, 2020).

To help improve and develop problem solving skills, it must use the right learning model, because in the IMPROVE learning model and the OSBORN learning model, it is considered appropriate to improve students' mathematical problem solving abilities (Nurafifah, Nurlaelah, & Usdiyana, 2016). Students who use IMPROVE learning are expected to be more active in improving problem solving skills (Rosiani, Anggo, & Sudia, 2019). The IMPROVE learning model has a good effect compared to conventional learning on students' problem solving (Huda et al., 2019). While the OSBORN learning model enhances imagination in the creative problem-solving process that leads to an integrative understanding of concepts is a major component in OSBORN learning. The quality of ideas produced by the OSBORN model can focus attention. The aim is to build students' thinking processes to be more active so that they can increase students' understanding and increase self-confidence (Haeruman, Rahayu, & Ambarwati, 2017).

Problem solving ability as an aspect in mathematics (Akbar, Hamid, Bernard, & Sugandi, 2018). Problem solving ability is considered important because it is a basic solution in learning mathematics (Purba et al., 2018). In fact the problem solving ability of students is still quite low (Rahmawati et al., 2019). There are several learning models that can be applied to develop mathematical problem solving abilities (Putra, 2018).

Based on previous research, research on problem solving skills using the SAVI, PBL, cooperative discourse, means-End learning model has been carried out (Gunawan et al., 2019; Lintang & Wardani, 2017; Prabowo, 2016; Putri,

Suryani, & Jufri, 2019; Tristiyanti & Afriansyah, 2016; Ulvah & Afriansyah, 2016). There are also studies that use the IMPROVE learning model on the ability to understand concepts, think critically, and study outcomes (Aningsih & Sari, 2013; Liberna, 2015; Millah, Purnomo, & Faizin, 2017; Mujib, 2016; Risma Yunita & Menrisal Menrisal, 2017; Suciati, 2018). Previous researchers also examined the OSBORN learning model on the ability to think creatively, learning outcomes, learning achievement (Alfianitasari & Hidayati, 2018; Ardana, 2019; Aziz & Wijayanti, 2015; Diantari & Hasan, 2016; Liyawati & Sulistyaningrum, 2019; Nurafifah et al., 2016; Sari, Rosmeri, & Izzati, 2019)

Previous studies have also been conducted on the IMPROVE model and the OSBORN model on students' mathematical problem solving abilities (Jayanti, Ardana, & Suryawan, 2019; Oktavianti, Farida, & Putra, 2018). Based on this research the researcher is interested in comparing the IMPROVE learning model and the OSBORN learning model with the problem solving ability of students (Diani et al., 2019), because in previous studies no one has examined which is better between the IMPROVE learning model and the OSBORN learning model.

## **METHOD**

The research method can be said as a way to get data with specific uses and purposes. This research is an experimental research with quasy experimental design, this design has a control group but does not fully function to control the external variables that influence the implementation of the experiment. The research design used is post-only control design. This study has two variables, namely the independent variable and the dependent variable. The independent variables in this study are the IMPROVE

and OSBORN learning models. While the dependent variable in this study is the ability to solve mathematical problems (Wicaksono, 2018). The study population was all junior high school students. The researcher used random sampling

techniques in sampling. The sample taken is two classes, the first class is the first experimental class using the IMPROVE learning model. The second class is the second experimental class using the OSBORN learning model.

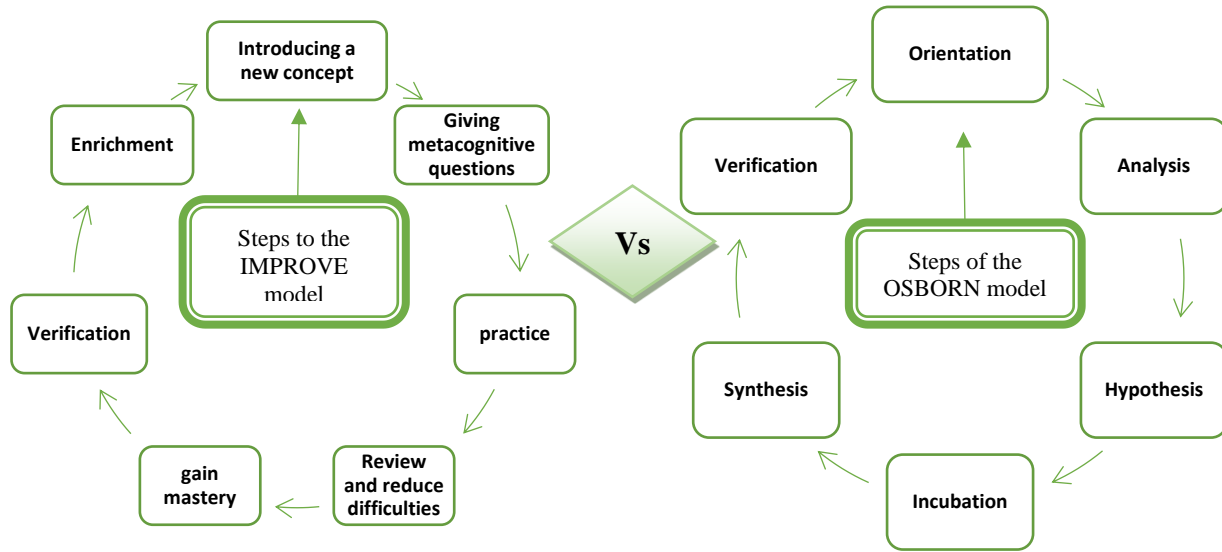


Figure 1. Research Design

Researchers use written tests in data collection techniques in the form of problem descriptions to measure students' mathematical problem solving abilities (Indra Puspita Dewi, Wisna Ariawan, & Gita, 2019). Stages before the test instrument is used in carrying out research among them, compiling material that will be used in the questions, making a lattice of questions, compiling questions and their keys and conducting test questions about the test. The instrument was tested on the participation of students to determine the validity, reliability, level of difficulty, and distinguishing problems. After obtaining the test result data the test

is then analyzed descriptively to describe the data in general. Researchers conduct normality tests and homogeneity tests as a pre-requisite test to test the hypothesis. The hypothesis test that will be carried out in this research is the t test.

**RESULTS AND DISCUSSION**

Based on the description above, the following is the descriptive test results of the test data for mathematical problem solving abilities.

Table 1. Descriptive Test Results for Test Data for Mathematical Problem Solving Ability

Model	Mean	Median	Varians	Standard deviation	Min	Max	Range
IMPROVE	74.9500	74.0000	88.366	9.40031	60.00	92.00	32.00
OSBORN	65.2000	62.0000	105.853	10.28847	52.00	90.00	38.00

Based on Table 1, it can be seen about the data overview in general, that the average value for the IMPROVE learning model is 74.9500, while the average value for the OSBORN learning model is 65.2000. IMPROVE model obtained the middle value, the lowest and highest value is 74.0000, 60.00 and 92.00. Then the acquisition value of 88366 variance and the standard deviation of 9,40031. The OSBORN model is obtained the middle value, the lowest and highest values are 62.0000, 52.00 and 90.00. Then the acquisition value of 105,853 variance and the standard deviation of 10.28847.

Based on the results of the data analysis, the researcher will conduct a T

test, before the T test the researcher conducts a normality and homogeneity test as a pre-requisite test. Normality test is used to find out whether the data is normally distributed or not, while the homogeneity test is used to find out whether the data is homogeneous or not. This pre-requisite test uses a significance level  $\alpha = 0.05$ .

$H_0$  = Data is normally distributed

$H_1$  = Data not normally distributed

Conclusion if  $p \text{ value} > \alpha$  SO  $H_0$  accepted, rejected  $H_1$ , while if  $p \text{ value} < \alpha$  so  $H_0$  rejected, accepted  $H_1$ . Following are the results of the normality test for mathematical problem solving abilities.

Tabel 2. Hasil Uji Normalitas Kemampuan Pemecahan Masalah Matematis

Model	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	Df	P value	Statistic	Df	P value
IMPROVE	.136	20	.200*	.954	20	.427
OSBORN	.117	20	.200*	.969	20	.738

Based on Table 2 the normality test results with a significant level  $\alpha = 0.05$  shows that the application of the OSBORN learning model and the IMPROVE learning model to the mathematical problem solving ability shows the p value of the OSBORN learning model is 0.200 and the IMPROVE learning model is 0.200 for the Kolmogorov-Smirnov learning

probability. Because the values of p value  $> \alpha$ , both data are normally distributed.

Homogeneity test with hypothesis  $H_0$  = Homogeneous data,  $H_1$  = Data are not homogeneous.  $H_0$  is accepted if p value  $> \alpha$ . The following table homogeneity test results:

Table 3. Homogeneity Test Results

Levene			
Statistic	df1	df2	P value
.494	1	38	.487

Based on Table 3 homogeneity test results with a significant level of 0.05, it can be seen that the p value is 0.487 greater than 0.05, so it can be concluded that both homogeneous data. After pre-

test, the normality test and homogeneity test, the data is normally distributed and homogeneous, so the researcher will conduct an independent samples test.

Table 4. Independent samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	p-value	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower Upper	
Mathematical Problem Solving Ability	Equal variances assumed	.272	.60	3.129	38	.003	9.75	3.11	3.4415	16.0584
	Equal Variances not assumed			3.129	37.69	.003	9.75	3.11	3.4398	16.0601

Based on Table 4 independent sample test results test whether the two models have the same average.

$H_0$  = both models have the same problem solving average.

$H_1$  = Both models do not have the same problem solving average.

T count (3.129) > t table is 1.72472 so  $H_0$  rejected. So both models do not have the same average problem solving. In the descriptive table the average for the IMPROVE learning model is 74.9500, while for the OSBORN learning model is 65.2000. It means that the IMPROVE learning model has an average value higher than the OSBORN learning model.

The IMPROVE learning model is an abbreviation of all steps in teaching, namely: Introducing the new concepts (introducing new concepts), Metacognitive questioning (giving metacognitive questions), Practicing (exercises), Reviewing and Reducing Difficulties (reviewing and reducing difficulties), Obtaining mastery (gaining mastery), Verification (verification), Enrichment (enrichment). While the steps of the OSBORN learning model, namely: Orientation (providing information and motivation), Analysis (solving a problem), Hypothesis (provisional estimation),

completion process, Synthesis (merging of results), Verification (the process of determining the truth).

From the steps of the learning model there are differences between the two, in the IMPROVE model there is Enrichment or enrichment, which is to provide opportunities for students who have not mastered the material to deepen the mastery of the material optimally, while in the OSBOR model only until verification is the process of determining the truth of a problem. From these differences it can be seen that the IMPROVE learning model is better than the OSBORN learning model. This is in line with the results of previous studies in which the IMPROVE model is better than conventional models in improving problem solving abilities (Jayanti et al., 2019). Besides being able to improve the problem-solving ability of the IMPROVE model, it can also improve critical thinking skills, understanding concepts and learning outcomes (Liberna, 2015; Millah et al., 2017; Mujib, 2016; Risma Yunita & Menrisal Menrisal, 2017). On the other hand the OSBORN learning model is also better than the conventional model in improving problem solving skills. Besides

being able to improve problem solving the OSBORN model can also improve learning achievement, understanding concepts and creative thinking (Alfianitasari & Hidayati, 2018; Ardana, 2019; Aziz & Wijayanti, 2015; Liyawati & Sulistyaningrum, 2019; Sari et al., 2019). However in terms of problem solving ability IMPROVE learning models have a better impact than OSBORN learning models.

### CONCLUSIONS AND SUGGESTIONS

Based on the whole series, the researcher can conclude that there is an influence of the OSBORN learning model and the IMPROVE learning model on the students' mathematical problem solving abilities. However, according to the data that has been obtained shows that the IMPROVE learning model is better than the OSBORN learning model for students' mathematical problem solving abilities. The IMPROVE learning model encourages students to be active and get to know a new concept in problem solving, so that educational goals can be achieved to the maximum. Based on research that has been done is expected to be a reference for further research. Further research is suggested, emphasizing the activeness of students. learning by forming groups does not look conducive but if it is managed well, it will make students more active and can be effective learning models. Added interesting media so that students are more interested in participating in learning activities.

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