

# Hybrid Learning in Mathematics Learning: Experimental Study in SMA Negeri 1 Pekanbaru

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## ABSTRACT

The Indonesian government is trying to implement a learning process based on information and communication technology. However, there are still weaknesses in the use of the internet in the learning process among students. Therefore, this article aims to describe the activities of students during the implementation of hybrid learning in mathematics learning and find out the results of student learning in mathematics through the application of Hybrid Learning. The research method used in this article is a true experimental design with a research sample of SMA Negeri 1 Pekanbaru students, whose schools have easy internet access. To obtain primary data from the field, tests are used to measure student mathematics learning outcomes. After each data is collected and tabulated, the data will be analyzed using statistical parametric analysis with the t test using the help of SPSS Version 18.00. The results showed that there were differences in student learning outcomes between those studying with the Hybrid Cooperative Learning method and students learning with conventional methods in SMA Negeri 1 Pekanbaru. The difference is confirmed again by the mean value of the experimental class 34.55 while the mean control class is 31.35. The results of this calculation indicate that the ability of the experimental class students is better than the control class students. This means that the value of the experimental class is better.

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## 1. INTRODUCTION

Today, information technology has become a trend or a tendency as one of the learning media for students. One subject that utilizes this trend is mathematics. Mathematics is one of the important aspects in creating a superior generation of nation, but in reality the mathematical abilities of students in Indonesia are still far from expected. This shows that the students' mathematical abilities and the learning process implemented have not been able to provide the expected results. One effort that can be done to improve mathematics skills is educators through strategies, teaching methods and learning models (M. Asyrofi, 2016). Learning strategies are a series of planned activities that include the use of methods and the use of various resources or strengths in a learning. Learning strategies are arranged to achieve a certain goal. Learning strategies in it include approaches, models, methods and specific learning techniques that are appropriate to technological developments.

The development of information technology has encouraged the emergence of various learning models of innovation in the -

field of education, especially in learning systems that have changed conventional learning systems into modern learning systems based on information and communication technology. One of them is computer media with the internet which eventually led to e-learning. E-learning is very utilized by most educational institutions to support the learning process (Heru Suhartanto, 2009). Many argue that e-learning is not intended to replace the entire learning process, but can partially replace or support it. Especially the ability of the system to provide access to the learning process without the constraints of time and place.

This is reinforced by the opinion of Lohr and Suhartanto in (Heru Suhartanto, 2009) that online studies can be better than traditional model studies and are able to improve the ability of students, especially students from disadvantaged schools. By using Edmodo online learning media, interaction and communication in the classroom can be established as in conventional classrooms, where each student can freely communicate and share with teachers and classmates, to respond to the material presented (Putranti, 2013). Online learning will be able to improve the quality, efficiency and

effectiveness of learning of home school organizers and participants (Yudie Irawan, Nanik Susanti, 2015). Based on some results of these studies indicate that online learning can support the learning process and sharing learning resources.

But in reality, the average ability in SMAN 1 Pekanbaru in using information and communication technology in learning mathematics is still lacking so that it is difficult to interact with technology, both in material search and processing activities. Some teachers of SMAN 1 Pekanbaru have tried to use the internet in improving material and learning, but this is still partial and individual. This results in gaps and uneven distribution of quality of learning between one student and other students. In addition, the weaknesses of the use of the internet in learning so far are: 1) Lack of interaction between the teacher and students or even between students themselves; 2) Tendency to ignore the academic aspects; 3) The learning process that tends to lead to training; 4) The changing role of the teacher; 5) Students who do not have high learning motivation tend to fail (Zulkifli Nelson, Musa Thahir, 2016).

Seeing the above phenomenon, of course the role of the use of technology to the maximum in the learning process will certainly greatly help students in understanding mathematics subject matter. In addition, it is also able to provide provisions for students to face the industrial era 4.0. The learning model that develops and combines face-to-face learning and E-learning is Hybrid Learning. Hybrid learning is a pedagogical approach that combines face-to-face (F2F) instruction with computer-mediated instruction (R. Ferdig, 2012). Hybrid learning models are expanding as many educators, like Tim, are creating online environments for their students. Although this model is relatively new, the goal is similar to other educational innovations: "for helping teachers achieve what they strive to do every day—deeply understand and enable each student they work with to reach the very highest levels of educational mastery" (A. Powell, B. Rabbitt, 2014). Yet, researchers tout that hybrid learning has the potential to provide a transformative experience in which new modes of education can challenge teachers to consider the best ways to educate students. Much of the power in hybrid learning comes from modification or manipulation of time, space, and place (W. Ian O'Byrne & Kristine E. Pytash, 2015). Hybrid in learning can be interpreted as a combination of several methods / models / approaches to learning to achieve the same learning objectives (Yoni Sunaryo, Ida Nuraida, 2018).

The concept of learning, at least has become an interesting study material and shows better results compared to other methods. For example, the results of research conducted by (Putri Milanda Bainamus & Abdullah, 2017) that there is a significant effect of hybrid learning models on the mathematics communication of junior high school students. Meanwhile, research (M. Asyofi, 2016) states that the quality of Hybrid Learning based on constructivism in the category is good, the mathematical representation ability of the experimental class students is better than the control class. Furthermore, (Anwar Mutaqin, Indiana Marethi, 2016) that blended learning class learning outcomes are better than ordinary classes. In addition, blended learning students are more active working on assignments than ordinary classes. In addition, other studies also say that there is an influence of Hybrid Learning-based Think-Pair Share-Write learning on meta-cognitive skills, creative thinking skills, and student cognitive learning outcomes (Siregar, Ika Yulianti, Herawati Susilo, 2017).

Based on some results of these studies provide information that hybrid learning is able to provide better student learning

outcomes because students more easily access learning material online than looking for material without a teacher's instructions. The application of hybrid learning certainly does not just happen, but requires consideration of the characteristics of learning objectives, the subject and selecting and determining which activities are relevant for conventional learning and which activities are relevant for online learning.

Based on the background above, this article aims to describe student activities during the implementation of hybrid learning in mathematics learning and find out the results of student mathematics learning through the application of Hybrid Learning.

## 2. RESEARCH METHODS

This research uses experimental research. The form of experiments in this study is true experimental design that is by testing the learning approach studied and testing its effect on learning outcomes by comparing learning outcomes in the treatment group with the control group. The population in this study is basically all high school students in Riau. However, due to the vast area and the large number of population, the sample taken in writing this article is SMA Negeri 1 Pekanbaru to represent areas categorized as cities and schools that have easy internet access and have a living environment that is not difficult to get access to the internet.

To obtain primary data from the field, in accordance with the design of the study, tests were used to measure student learning outcomes from each treatment group and the control group. To obtain certainty of data about the exact treatment of an experiment an observation technique will be used where the researcher will prepare an observation form that will be used in the experimental research. After each data is collected and tabulated, the data will be analyzed using a parametric statistical analysis using the t test of SPSS Version 18.00. Before conducting the t-test, the analysis requirements were tested beforehand, but the data distribution was normal and homogeneous.

## 3. RESULTS AND DISCUSSION

As stated earlier, this study aims to describe the activities of students during the implementation of hybrid learning in mathematics learning and find out the results of student mathematics learning through the application of Hybrid Learning.

### 3.1. Description of Student Activities During Implementation of Learning with Hybrid Learning

This research was conducted by experimenting with Hybrid Learning methods in class XI Science students in SMA Negeri 1 Pekanbaru. In accordance with the design and conditions of the school, this experiment was carried out for one month where previously the approach had been carried out, the conditioning of the computer laboratory that would be used as a place of experimentation, appointment and training of subject teachers who would carry out the method. At the end of the conditioning, tests were conducted in each school for about two weeks for the purposes of determining the experimental class and the control class, then the two research groups were given different treatments, namely the experimental group received Hybrid Learning and the control group with conventional learning.

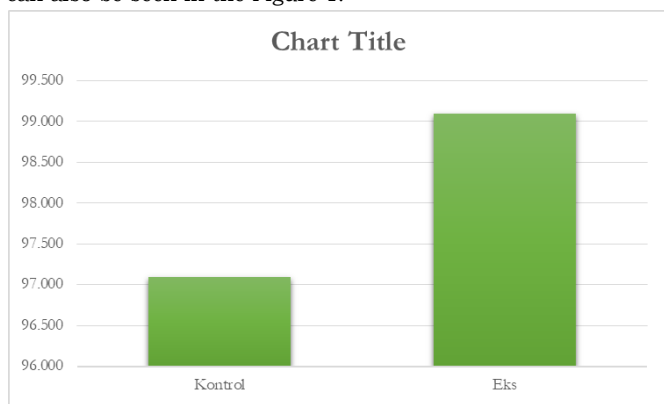
Then at the end of the study a post-test was conducted on the two groups. In the control group, learning is done conventionally, but researchers still give direction to the teacher who teaches and controls the implementation of learning. This is done so that learning in the control group does not deviate from the research objectives, for example in terms of the material being taught must be adapted to the material in the experimental group and the learning time must also be adjusted so that it is completed relatively simultaneously with the learning time in the experimental class, so that the posttest can be done at the same time.

Student activity in undergoing the learning process is one of the keys to success in achieving educational goals. Activity is the most important principle of didactic principles because self-study is an activity and without an activity it is impossible for a person to learn. The activity itself is not only physical activity but also the mental psychic activity of the learner who is involved together in a learning process. Therefore, learning activities that are capable of involving these two types of activities will be able to determine the level of student learning outcomes. Based on the results of research conducted on students in Pekanbaru 1 different high schools that were used as the subject of this study obtained the fact that student learning activities using Hybrid Learning can be seen in Table 1.

**Table 1.** Recapitulation of Hybrid Learning Implementation Results

No.	Class	Score
1	Experiment	99.097
2	Control	97.097

Based on table 1 above, it can be seen that Hybrid learning activities in mathematics in the experimental and control classes are in the high category. For the experimental class is in the high category with an average of 99.097 and the control class is also in the high category with an average of 97.097. Thus, it can be said that there are differences in Hybrid Learning activities for each group and seen from the category of student activities consisting of high categories. For more details, can also be seen in the Figure 1.



**Fig 1.** Student Activity Diagram Through Hybrid Learning

### 3.2. Student Mathematics Learning Outcomes Using Hybrid Learning

The data to be analyzed is data from student learning outcomes by applying hybrid learning and comparing the learning outcomes with the control class using conventional strategies. Data analysis was performed using the t test. But in conducting the t test there are two conditions that must be met, namely the

normality and homogeneity test.

#### 3.2.1. Normality Test

The results of normality test data on the results of mathematics learning outcomes are summarized in the table 2

**Table 2.** Normality Test

Class	Asymp. Sig. (2-tailed)	$\alpha$	Criteria
Experiment	0.205	0.05	Normal
Control	0.814	0.05	Normal

The calculation results are contained in Table 2 that at the significant value of each group, namely the experimental class is 0.205; and the control class is 0.814. Considering the significance value of the two groups is greater than 0.05, it is concluded that the experimental class and control class data are normally distributed. In connection with these results, then to test the research hypothesis.

#### 3.2.2. Homogeneity Test

The homogeneity test that researchers do is a variant test, homogeneity testing that researchers do is testing with learning outcomes test data. Homogeneity test results of mathematics learning outcomes are summarized in the following table 3.

**Table 3.** Homogeneity Test

Levene Statistic	df1	df2	Sig.
2.581	1	60	.113

The calculation results contained in Table 3 show that the significance value of the posttest data of the learning outcomes of the experimental class and the control class of each group is 0.113, which is greater than 0.05. Thus, it was concluded that the posttest data were mathematical learning outcomes of students in the experimental class and homogeneous control class. In connection with that, to test the differences in students' mathematical learning outcomes the t test was used through the SPSS 18.00 program.

#### 3.2.3. Hypothesis Test

The hypothesis being tested is:

- H<sub>0</sub>: There are differences in mathematical learning outcomes between students whose learning uses hybrid learning and conventional learning.
- H<sub>1</sub>: There is no difference in mathematical learning outcomes between students whose learning uses hybrid learning and conventional learning.

In this case, H<sub>0</sub> will be rejected if the level of significance > 0.05. The results of the calculation of the above hypothesis test are briefly contained in Table 4.

**Table 4.** Hypothesis Test

Class	N	Mean	Std. Deviasi	$\alpha$ Sig.	Information
Experiment	31	34.55	3.414	.003	H <sub>0</sub> be accepted
Control	31	31.35	4.565		

The calculation results contained in Table 4 show that the significance value of the posttest data test in mathematical learning outcomes between students whose learning uses hybrid learning and conventional learning is smaller than 0.05 (0.003 < 0.05). This means that H<sub>0</sub> is accepted, so it can be

concluded that there are differences in mathematical learning outcomes between students whose learning uses hybrid learning and conventional learning. In other words, students' mathematical learning outcomes are better at using hybrid learning than using conventional learning.

The results of hypothesis testing conclude that there are differences in mathematical learning outcomes between students whose learning uses hybrid learning and conventional learning. The learning outcomes of students who get hybrid learning are higher than students who get conventional learning. Learning through the e-learning system (hybrid learning) is expected to facilitate students in utilizing technology, with the convenience of the panel provided will reduce the introduction of the elearning system itself, so that student learning time can be streamlined for the learning process itself and not on learning to use the elearning system -his. Therefore, the role of the teacher in this case is required to master the technique of finding information on the internet, guiding students to find and find sites that are relevant to learning material, present material on the web that is interesting and desirable, serving guidance and communication via the internet, and skills other needed. Based on these explanations that learning that utilizes technology helps students be more efficient in learning.

Nevertheless, the use of technology (e-learning) by students is still not optimal because students consider e-learning to be new to them. In other words, it is still in the initial stages of implementing hybrid learning. However, some students have begun to actively use discussion forums and ask teachers via email, although not all students do it. Existing facilities on the website and the presence of feedback makes students motivated to use it. In the quiz, students are motivated to try again until they get the right answer. Website facilities that are felt to be less optimal are chat. Students find it difficult to find a suitable time with the teacher in chatting. Online learning that utilizes chatting through a Facebook account can be done by students anytime, anywhere. This online learning will help students if students still have difficulties in the material explained by the teacher when face to face learning. This communication is balanced with learning resources that can be accessed by students.

These results are relevant to the results of research conducted (Sjukur, 2012) and (Mehmet Sahin, 2010) in the form of improved learning outcomes in mathematics using hybrid learning and increased mastery of student material as well as improving the quality of student thinking. This is also in line with the statement (Yaniawati, 2012) that there are significant differences in mathematical power between student teacher candidates who learn through hybrid learning, and conventional learning. When viewed from the aspect of initial knowledge, both superior and asor students, the hybrid learning model develops more student mathematical power compared to other learning. Furthermore, (Rizqi, Afria Alfitri, Hardi Suyitno, 2016) that students' mathematical communication skills in hybrid (blended) learning are good. Offline and online learning which is carried out alternately can express students' mathematical ideas through oral and written correctly. This shows that students are able to understand and write what is information from the problem, write down what is asked and can find ideas to solve the given problem. Furthermore, students can describe these mathematical ideas into visual form precisely and completely, and students are able to use mathematical terms and notations correctly to present mathematical ideas.

Based on the results of research on student learning outcomes, it can generally be said that students whose learning with Hybrid Learning shows improved results better than conventional learning. This is possible because learning has changed from the teacher-centered learning paradigm to learning that emphasizes the activeness of students to construct their own knowledge through problem challenges, discovery activities, and work in small groups or class discussions. It is recognized by the teacher that this method is something new for them, so that in the beginning of learning students and even teachers are still confused in practicing it. This can be seen from the first meeting that has not been going well, but at the next meeting learning begins to run well as expected, and student activities have shown progress starting from the discovery activity until finally students can present their findings in front of the class.

#### 4. CONCLUSION

Based on the results of the study, it can be concluded as follows:

1) student activities in learning Hybrid Learning in SMA Negeri 1 Pekanbaru are classified as good; 2) there are differences in student learning outcomes between those who study using Hybrid Learning and students who study with conventional learning in SMA Negeri 1 Pekanbaru. The difference is reinforced by the mean value of the experimental class 34.55 while the mean control class is 31.35. The results of this calculation indicate that the ability of the experimental class students is better than the control class students. This means that the value of experimental classes that use Hybrid Learning is better.

Based on the results of research showing the significance level of influence of the application of Hybrid Learning to the learning outcomes of students of SMA Negeri 1 Pekanbaru, certain efforts and policies are needed to socialize and apply this learning model to classes at SMA Negeri 1 Pekanbaru, especially at Pekanbaru High School to improve the quality of results student learning. However, for the perfection of the development of the implementation procedure of this learning model and its "packaging" it is necessary to first conduct a similar study of variables that simultaneously have a relationship with learning and learning outcomes. Intensive training is needed for teachers in implementing this learning model and similar training that allows teachers to be able to develop and modify variations and arrangement of materials or teaching materials in Pekanbaru high school which will be beneficial for the perfection of the implementation of this learning model.

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