

The Effectiveness of Inquiry-Group Based Blended Learning Management System on High School Physics of High School Students of North Sumatera-Indonesia

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ABSTRACT

The merging of these systems is based on the effectiveness and efficiency of the learning and teaching processes. Offline teaching which is combined with online makes the teaching and learning processes more effective in the way the students have more effective discussions and enable students to collaborate to present the few topics being discussed. This type of learning and teaching will provide flexibility for schools to adapt to government policies to prevent students from being too crowded by dividing students into offline and online groups. Blended learning will also make learning more effective and efficient where students can study more independently as well as have access to learning material resources. This system can deepen the mastery of material through more exercise by exposing to learning resources that are available on the internet which are unlimited. Misunderstood blended learning and teaching models and they think of blended learning as a model of learning. Several studies use blended learning with conventional teaching methods. Some works have also combined blended learning with various models of teaching. A choice of a suitable model of learning on a specific topic is also required. It depends on the learning outcomes. Different models of learning have different direct and nurturant effects. This work tries to look at A compact blended learning mode that was used in this work the Flip model with 50% Face to Face and 50% online alternating. This is required to split the students into two groups by reducing the number of students present at school at the same time. The target of this research is to see the effectiveness of an inquiry-group based blended learning management system (IGBLMS). Analysis of the results of the study was carried out using N-gain analysis and non-parametric statistics. Non-parametric statistics are used to analyze in detail the specific effects of processes and outcomes. This analysis will show in detail the direct impact of the research design. The conclusion that can be reached is that the effectiveness of blended learning carried out in supporting learning activities is effective learning even with moderate criteria. This makes a breakthrough in learning to be able to support learning activities without reducing the existence of learning with pre-existing systems.

Keywords: Blended Learning; Learning Outcomes; Management Systems; Inquiry Group.

INTRODUCTION

Physics is one of the compulsory subjects at senior high school in Indonesia that until recently still lags among other South East Asian countries [1], [2]. This problem may be due to some aspects such as teacher quality, less effective curriculum, insufficient facility, lack of student motivation in learning Physics [3]–[5], and less suitable learning strategy. Research shows the paradigm shift from teacher center to the student center and therefore to select teaching as well as learning models to facilitate student center learning. Due to Covid 19 Pandemic, during these two year student sent active learning mode has been disrupted.

Since the start of the Covid 19 pandemic over the world the teaching and learning system has been shifted from partial nominally online mode. This situation has caused problems in all areas of school management. Many countries, especially developing and developing countries, did not prepare due to a lack of facilities, funds and human resources. In most cases teachers and students were not ready to adapt to this new era. Many countries have experienced learning loss [6], [7].

The learning loss has been highly recognized by developing countries including Indonesia [8]–[10]. In order to meet the need for a learning management system (LMS). In Indonesia, most schools are using available open-source LMS such as google classroom, Schoology, Moodle, latitude, etc. These LMS can somehow be controlled and solely depend on the platform available on each LMS. In order to suit the needs of each school, many schools have tried to build their own LMS but mostly in big cities. The decrease in the infection of the Covid 19 virus gradually schools have provided alternating face-to-face and online classes. The mix of the two modes of class management is known as Blended Learning.

In the early stages, blended learning was in the form of hybrid, which is a combination of face-to-face, online and offline learning [11], [12]. Blended learning is a combination of traditional offline (face-to-face) and online. The merging of these systems is based on the effectiveness and efficiency of the learning and teaching processes. Offline teaching which is combined with online makes the teaching and learning processes more effective in the way the students have more effective discussions and enable students to collaborate to present the few topics being discussed [13]–[16]. This type of learning and teaching will provide flexibility for schools to adapt to government policies to prevent students from being too crowded by dividing students into offline and online groups. Blended learning will also make learning more effective and efficient where students can study more independently as well as have access to learning material resources [10], [17]–[19]. This system can deepen the mastery of material through more exercise by exposing to learning resources that are available on the internet which are unlimited. Blended learning can also increase teacher skills in digital technology regarding teaching media. Blended learning also increases the nature of student learning centers which are supported by several theories of learning such as constructivism individual learning by Piaget, cognitive by Brunner, Gagne & Bloom, social constructivism where the learner studies from the environment by Vygotsky, Behaviorism by Thorndike, Pavlov & Skinner, and connectivism by Siemens & Downes.

There are still many perceptions regarding blended learning. Some researchers used face-to-face classes in teaching and learning processes and used online applications for assignment delivery, and some used both face-to-face and online classes with various proportions. Many

people also misunderstood blended learning and teaching models and they think of blended learning as a model of learning. Several studies use blended learning with conventional teaching methods. Some works have also combined blended learning with various models of teaching. A choice of a suitable model of learning on a specific topic is also required. It depends on the learning outcomes. Different models of learning have different direct and nurturant effects. This work tries to look at A compact blended learning mode that was used in this work the Flip model with 50% Face to Face and 50% online alternating. This is required to split the students into two groups by reducing the number of students present at school at the same time. The blended LMS was support a suitable learning strategy in the form of a learning model is required. Several studies have used several models of learning in teaching high school physics with different outcomes.

Inquiry is a multifaceted activity that involves making observations; posing questions; examining books and other sources of information to see what is already known; planning investigations; reviewing what is already known in the light of experimental evidence; using tools to gather, analyze, and interpret data; proposing answers, explanations, and predictions; and communicating the results. Inquiry groups mean grouping students to search, analyze, apply, reflect upon, and share new learning. The teacher serves as a facilitator, working with student groups if they need help and addressing class-wide problems when necessary [8], [20]–[22]. Inquiry-group-based blended LMS is a teaching process that uses an Inquiry Group learning model with the delivery system using both face-to-face mode and online mode.

METHODS

The study design was a one-group pre-test and post-test design that was grounded in the experimental quantitative research tradition. A post-test is a measure of some attribute or characteristic that is assessed for participants in an experiment after a treatment has been provided. The test items were validated by an expert panel. The authors examined comments and suggestions and made corrections suggested by the content review experts. A high level of content validity was assured. Identical versions of the 10-item test were presented at the pre-test and post-test. This research is the second year of three years of research. The locations of this research are Medan State University and several high schools which are located in North Sumatra Province. The school samples consist of 16 schools both public and private schools of 6 Regencies. The target of this research is to see the effectiveness of an inquiry-group based blended learning management system (IGBLMS). The research design used in this research is R&D developed by Borg & Gall (1989). Analysis of the results of the study was carried out using N-gain analysis and non-parametric statistics. Non-parametric statistics are used to analyze in detail the specific effects of processes and outcomes. This analysis will show in detail the direct impact of the research design.

RESULTS AND DISCUSSION

Based on the learning outcomes data on the test sample, the test results are obtained as shown in Figure 1. Figure 1 shows the results obtained during the pretest and posttest through a percentage picture that looks very far away. In terms of percentage, the two tests have an achievement of around 90%. This achievement can be seen through the average value of the learning test results. This difference in learning outcomes illustrates the increase in achievement in the assessment test. This proves that there is an improvement in the knowledge possessed by students in learning. In learning, there is always a difference between before and

after learning. This proves that this learning is a step to increase students' knowledge and abilities in learning [2], [12], [14], [23]. Learning activities that direct students in achieving learning success, proves that students have experienced an increase in learning.

In the blended learning that was carried out, it can be seen from Table 1 that with an increase in the Mean of around 90%, the increase that occurs is 0.41 in the Moderate category. With the achievement of the Mean reaching 90%, the effectiveness of the applied learning has an interpretation of effectiveness with effective criteria. Based on Table 2 on the non-parametric hypothesis testing, explains that there is no difference between the application of blended learning and conventional learning for the presentation of learning material (Table 3). Learning activities applied to students do not have a major influence on the delivery of learning. This shows that there is no gap between the two systems applied.

Table 1. Descriptive N-Gain

Pretest	39.83	Mean
Posttest	64.75	Mean
N-Gain	0.41	

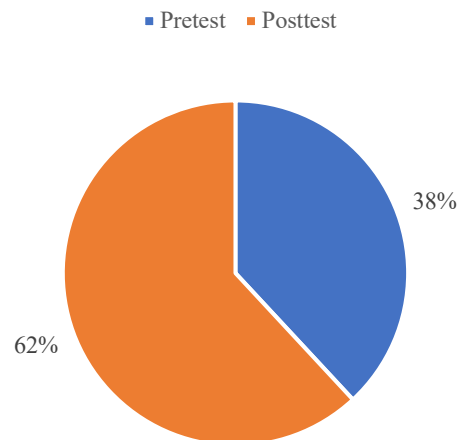


Figure 1. Percentage of Learning Outcomes

However, things are different with the achievement of learning outcomes. Learning outcomes with these different conditions show differences and influence the achievement of student learning outcomes (Table 4). The differences shown in student learning outcomes can occur because the impact of activities on treatment with blended learning has an attraction that can foster interest in independent learning [6], [7], [9], [20]. With an interest in independent learning, students will be driven with a very high curiosity to be able to achieve better learning outcomes.

The curiosity that is raised through the treatment that students go through in learning also has a dominant influence in media-based learning and computer-centered activities. In current learning, students are more dominant in liking related learning and interacting with technological objects. This learning media is directed as a support for student learning, without

just being considered as a place for collecting assignments [10], [17], [19]. Thus, students become more focused on carrying out activities according to the stages available on the blended learning page.

Table 2. Hypothesis Test Summary

	Null Hypothesis	Test	Sig. ^a	Decision
1	The categories defined by Periods = Pretest and Posttest occur with probabilities .500 and .500.	One-Sample Binomial Test	1.000	Retain the null hypothesis.
2	The distribution of Scores is normal with a mean 52.29 and standard deviation of 13.98479.	One-Sample Kolmogorov-Smirnov Test	.000 ^b	Reject the null hypothesis.

a. The significance level is .050.

b. Lilliefors Corrected. Asymptotic significance is displayed.

Table 3. One-Sample Binomial Test Summary

Total N	118
Test Statistic	59.000
Standard Error	5.431
Standardized Test Statistic	.000
Asymptotic Sig.(2-sided test)	1.000

Table 4. One-Sample Kolmogorov-Smirnov Normal Test Summary

Total N		118
Most Extreme Differences	Absolute	.209
	Positive	.183
	Negative	-.209
Test Statistic		.209
Asymptotic Sig.(2-sided test) ^a		.000

a. Lilliefors Corrected

Based on the results of the distribution test, it shows that the test results appear to be normally distributed according to Figure 2. This shows that the distribution of the sample test for conformity to the variable test is correct. It also shows the description of the state of the sample used in this study. From the data analysis, it can be seen that the blended learning that is carried out will not be a problem but rather a learning solution with several special stages that need to be made for adjustments [7], [14], [16], [17], [21]. This adjustment was made to optimize learning activities. This adjustment is also made so that student activities become meaningful with the help of technology. This meaningfulness is used as a basic foundation in developing students' skills which are innate in the use of technological advances as a medium to attract students' interest in learning.

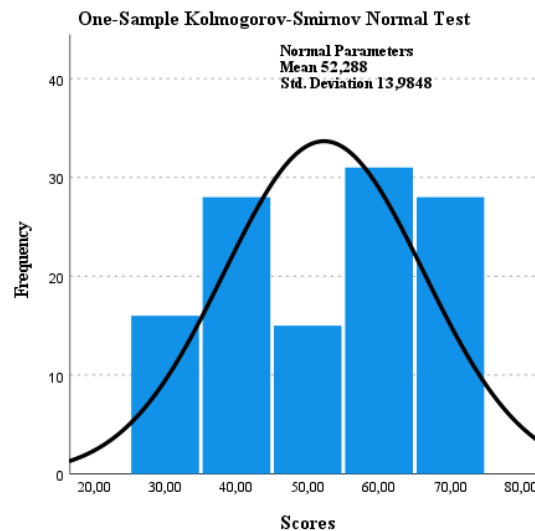


Figure 1. Normality Distribution

The use of technology as well as digital teaching media has helped student attention become more focused on the application of electronic devices and in catching up with the development of science and technology [9], [24], [25]. The skill in the use of technology is also one of the important factors in speeding up obtaining recent developments. The assessment level towards the information that is served becomes more specific and real shown by several references [26], [27]. The skill of finding relevant and good-quality references is something we cannot find in an offline class. In a full offline class, teachers sometimes feel not have enough time to give useful information due to the lack of allotted time. In full online teaching and learning, however, frequently students just upload their works without clear understanding. Students who have kinesthetic and audio learning styles will have difficulties since these types of students further direct explanations from their teachers.

CONCLUSION

The conclusion that can be reached is that the effectiveness of blended learning carried out in supporting learning activities is effective learning even with moderate criteria. This makes a breakthrough in learning to be able to support learning activities without reducing the existence of learning with pre-existing systems. The application and adjustment of learning methods or models need to be considered in achieving learning success. Various learning support media are also needed to continuously increase students' motivation and curiosity.

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