The Effectiveness of Blended Learning Models toward The Motivation and Learning Outcomes of High School Students in Ecological Materials

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Article Info	Abstract
	Technological advancement is one aspect that can be used to support the learning process. Through the use of technology, one of them is by applying blended learning models' students get new experiences that will help them in understanding the material. This study aims to examine the effectiveness of blended learning models on the motivation and learning outcomes of Don Bosko High School students on ecological materials. This research is an experimental research using quasi experiment nonequivalent control group design. Population of students in grade X MIPA at Don Bosko High School. The samples used were class X MIPA 2 as experimental class and X MIPA 3 as control class. Sampling using purposive random sampling. The independent variable in this study is the model of blended learning of ecological material, the dependent variables are the motivation of learning and learning outcomes. The results showed that the percentage of students' learning motivation in the experimental class was 96% while in the control class 84.62% were in a very good and good category. Cognitive learning outcomes in the experimental class were higher than the control class with 84% of students achieving the established KKM. Improved learning outcomes in the experimental class showed moderate categories, while in the control class was in the low category. These results were reinforced by a questionnaire of student responses that gave a positive response to the blended learning model. Based on the results of the study, it was concluded that the blended learning model of ecological material is effective against the motivation of learning and student learning outcomes.

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INTRODUCTION

Initial observations were made by researchers during the PPL Program at Don Bosko High School, from the observations obtained the results of the learning process dominated by one-way learning with conventional methods. However, on several occasions students are actively involved through discussion activities between groups. Understanding of ecological material in the National Examination from 2017 to 2019 decreased. In 2017 the understanding of Don Bosko High School students was 50.72, in 2018 it was 75% and 2019 was 73.33%. Students tend to get low understanding results on indicators of sub-material energy flow and biogeochemical cycles.

Both sub-materials have characteristics of learning materials that cannot be observed directly in the environment so they require illustrations in the form of images, videos, or animations that can help students make it easier to understand the material. One of them is through the use of technology with the application of blended learning. SMA Don Bosko has supporting facilities such as internet networks, computers, laboratory, and libraries that are adequate for the implementation of blended learning, but so far the learning model has never been applied. Blended learning is one of the alternative learning models that can be applied to close the weaknesses of conventional learning models. Blended learning is a combination of e-learning models using information and communication technology with face-to-face learning (Husamah, 2014).

In the process of learning motivation becomes one of the causative factors for learning activities to occur in students, facilitate the learning process, and influence learning outcomes. The learning model applied in the classroom is one of the things that can affect students' learning motivation. Teachers can motivate students to learn through several ways such as generating interest in learning, encouraging curiosity, assisting students in formulating learning objectives, and using a variety of interesting presentation methods (Rifa'i and Anni, 2016). Blended learning model becomes one of the alternative variations of learning models that present material interestingly.

From the initial observations through the dissemination of questionnaires 85.3% of students showed the response of the need to apply different variations of biology learning models than usual, from this it is also known if students tend to experience boredom if the learning model used in the classroom does not vary. 50% of students have not done their work independently and still copy a friend's work if given an assignment by the teacher.

Blended learning implementation utilizes the Schoology platform, where the evaluation process can be done online, teachers can provide a variety of practice questions that students can do during or outside of lesson hours, teaching materials can be accessed by students anywhere and anytime. This will give students the opportunity to learn more deeply so that it is expected to attract students in learning.

Syarif (2012) examined the influence of blended learning models on the motivation and learning achievements of vocational school students showing the results of significant differences between motivation and learning outcomes of students who apply blended learning models, there is a significant increase in student motivation and learning achievement in learning by applying a blended learning model.

Based on the description that has been submitted by researchers, it is necessary to implement learning that utilizes the development of advances in information and communication technology using the internet, so that it is expected to increase the motivation of students' learning and learning outcomes. Therefore, the research was conducted under the title "The Effectiveness of Blended Learning Model toward Motivation and Learning Outcomes of High School Students in Ecological Material."

RESEARCH METHODS

The research was conducted at SMA Don Bosko Semarang. The population in this study was the X-MIPA class of SMA Don Bosko which consisted of three classes. the samples used were students of grades X-MIPA 2 and X-MIPA 3 taken using purposive random sampling techniques. Research instruments used in the form of pretest and posttest questions. Learning motivation questionnaire, student response questionnaire given at the end of learning. Observation of learning motivation is carried out during the learning process. Data analysis using SPSS 24 and Ms. Excel applications.

RESULTS AND DISCUSSIONS

This study aims to examine the effectiveness of blended learning models on the motivation and learning outcomes of SMA Don Bosko students. Blended learning is said to be effective when fulfilling the following indicators, (1) the percentage of student learning motivation $\geq 75\%$ achieves a good to excellent category, (2) there is a difference in learning outcomes between the experimental class and the control class (the results of the experimental class learning are better than the control class), (3) the completed learning outcomes of students at least 80% of the number of students achieved the minimum completeness (KKM) that has been determined, that is 70, (4) the improvement of students' cognitive learning outcomes in blended learning reaches a moderate to very high category with a large g factor of between $0.3 \leq g \leq 0.7$ and $g > 0.7$.

Student Learning Motivation

The main data used for learning motivation analysis is questionnaires, while observation sheets are used as supporting data. The results of the student's learning motivation calculation from the questionnaire are presented in table 1, the results of the student's learning motivation calculation from the observation results are presented in table 2, and the results of the learning motivation calculation are reviewed from each indicator presented in table 3.

Table 1 Percentage of students' learning motivation from questionnaires

	Treatment class		Control class	
Category	Number of students	Percentage (%)	Number of students	Percentage (%)
Very good	18	72	11	42,31
Good	6	24	11	42,31
Good enough	1	4	2	7,69
Less	0	0	2	7,69

Based on the results of the calculation of learning motivation from the questionnaire that has been filled students obtained the results of the experimental class has a higher percentage in the category of excellent and good than the control class. Learning by applying blended learning models is said to be effective against learning motivation because it has met the effectiveness indicator that is >75% of students are in a very good and good category.

Table 2 Percentage of learning motivation from observations

	Treatment class		Control class	
Category	Number of students	Percentage (%)	Number of students	Percentage (%)
Very good	12	48	9	34,62
Good	9	36	1	3,85
Good enough	1	4	9	34,61
Less	3	12	7	26,92

Based on the observation calculation, the experiment class has a higher percentage in terms of learning motivation than the control class, which is 84% of students achieved a very good and good category, while in the control class by 38.47%. This is in line with the poll data which showed that the experimental class had a higher percentage of motivation than the control class.

Table 3 Percentage of learning motivation in each indicator

No	Indicator	Treatment class		Control class	
		P (%)	Category	P (%)	Category
1	There is encouragement and need in learning	70	Good	69	Good
2	There is a desire to succeed	81,80	Very good	68,46	Good
3	The existence of future hopes and aspirations	75	Very good	73,08	Good
4	The existence of interesting activities in learning	81,40	Very good	70,58	Good
5	The existence of appreciation in learning	79	Very good	74,0	Good
6	The existence of a conducive learning environment,	78,50	Very good	76,44	Very good

thus allowing students to learn in a good situation

Based on the calculation of learning motivation reviewed from each indicator, the results of learning motivation in the experiment class showed a higher percentage of the control class. Learning motivation is influenced by factors from inside and outside or known as intrinsic and extrinsic factors. Learning motivation can be observed from various indicators, according to Uno (2009) intrinsic motivation has indicators of the existence of encouragement and need in learning, the presence of desire, desire for success and the expectation of future ideals; while extrinsic motivation can arise because of interesting activities in learning, the existence of appreciation in learning, the existence of a conducive learning environment that allows students learn in a good situation.

The application of blended learning is carried out as a way to generate extrinsic motivation with the presence of interesting activities in the learning process. Students consider this learning to be something new and interesting as presented in the student response questionnaire and the motivational questionnaire of learning each indicator.

Extrinsic motivation can also arise if students receive some kind of award or when studying under pressure and coercion. The awarding of each student in this case is done through blended learning media used by LMS Schoology. Schoology provides special features for teachers to reward as the most active students, the most diligent students collect assignments, the most diligent students attend meetings, students with the highest grades, and various other categories. These forms of appreciation are given to students to increase students' motivation in learning. According to Bear et. al., (2017) motivation can be extrinsically instilled at the beginning of stages and turn into intrinsic motivation during the learning process lasts longer. Flexible learning time is one of the characteristics of blended learning model.

The practice of questions provided at LMS Schoology provides opportunities for students to learn more outside the lesson hours, students can conduct self-evaluation to the extent that understanding the material studied and indirectly this becomes the motivation, challenge or even pressure for students to do the practice of the available questions. The definition of motivational work is a persuasive feeling that always encourages students to complete tasks or activities to the end and succeed no matter how hard and difficult the job is. Motivation as an encouragement to always find a way out and cultivate the anxiety that is in him and deep thinking, with a positive motivation we can receive positive energy and apply it in the work of the task (Cook & Artino, 2016). Although not all students in the experiment class completed the various practice questions given, 80% of the students successfully completed them.

This is in line with research conducted by Serio et.al., (2013) which stated that students' willingness to have an effect on student learning activities, in the process of research shows the application of technology-based learning in visual arts classes, students will continue to use technology outside of lesson hours even though the learning process has ended.

In addition to various practice questions, students were also given assignments in the form of making video presentations of biogeochemical cycles and LDS. From the assignment collection, students in the experimental class collected more biogeochemical cycle videos, which as many as 19 students out of 25 students had gathered while in the control class only 9 students collected from 26 existing students. The LDS that students collected in the experiment class showed a higher percentage than the control class. This suggests the average intrinsic motivation in experimental class students tends to be higher than the control class. This statement is supported by the biology teacher's statement in the initial observation process which says that students are most likely unable to be forced to complete a given assignment. Based on her teaching experience for one semester, she cannot force more if the student does not want to do the assignment, the student will do the assignment given if the student really has the will to do it. Moreover, in online learning where students and teachers are in different places.

According to Ross et.al., (2016) highly motivated individuals can always find drive and willpower without expecting the insistence of the external environment to complete the task even though the task given is challenging, in the sense that they voluntarily perform the given task even though there is no insistence from the outside environment.

From the description that has been conveyed it can be known if blended learning provides different experiences to students and can increase student learning motivation, this experience is shown by the presence of higher learning activities in the experimental class. The poll results showed >75% of students in the experimental class achieved a good and excellent category so as to meet the established indicators of effectiveness.

This is in line with Hima (2015) in his research concluded that learning that applies blended learning has a positive effect on students' motivation on relational materials and mathematical functions. In addition, Harahap (2014) stated that there is a positive relationship between student motivation and student learning activities towards cognitive learning outcomes in ecosystem concepts. Students with high learning motivation have a passion and seriousness in following the learning process and vice versa.

Cognitive Learning Outcomes

Posttest value data used for hypothesis test, previously conducted prerequisite test normality One-Sample Kolmorogov Smirnov and homogeneity test with significance value ($\alpha = 0.05$). Obtained data results are not distributed normal and homogeneous. So, the next test used the Mann-Whitney non-parametric test to test the difference between the average experiment class and control class. Mann-Whitney test results show asymmetric values. Sig (2-tailed) of 0.000 which means there is a significant difference between the average cognitive learning outcomes of experimental classes and control classes. The differences in learning outcomes are presented in table 4.

Table 4 Pretest and posttest values

Information	Treatment class		Control class	
	Pretest score	Posttest score	Pretest score	Posttest score
Highest score	96	100	84	92
Lowest score	16	8	16	16
Average learning outcomes	52	82,96	45,38	56,31

Based on the table above it is known that the average experiment class is 82.96 and the control class is 56.31. So, it can be concluded that the average experiment class is better than the control class.

Improved Cognitive Learning Outcomes

Improved student learning outcomes were analyzed using N-Gain with the help of SPSS from pretest and posttest grades. N-Gain calculation results in experiment class and control class presented in table 5.

Table 5 Improvement of learning outcomes (N-Gain) in experiment classes and control classes

Class	Number of students	*N-Gain*	Category
Treatment class	25	0,6219	Moderate
Control class	26	0,1784	Low

Based on table 5, it can be determined that the increase in student learning outcomes (N-Gain) of experimental class students by applying blended learning model is 0.6219 in the medium category. Learning is said to be effective because it meets the indicator of effectiveness that is N-Gain obtained that is reaching the medium category.

Classical learning completeness

Results of classical learning completeness calculation in experimental class with learning using blended learning model and control class on ecological material presented in table 6

Table 6 Results of classical completeness calculations in experimental classes and control classes

Class	Students that pass (%)	Students that do not pass (%)	Classical completeness criteria
Treatment class	84	16	Pass
Control class	15,32	84,62	Do not pass

Based on the calculation of classical completeness it can be known that the classical completeness of learning in the experimental class is higher than the control class. Learning in experimental classes is said to be successful because more than 80% of students meet the minimum set of achievements. This positive result is reinforced from the student response data in table 7.

Table 7 Student response data

No	Statement	Average score (%)	Category
1	In the study of Ecological materials that have been implemented the atmosphere is pleasant	79	Good
2	Through learning activities with blended learning models, I more easily understand the content of the subject matter	71	Good
3	The learning activities that have been implemented make my learning interest increase	79	Good
4	From the learning activities that have been done makes me more courageous to express ideas or opinions	72	Good
5	From the learning activities that have been implemented encourage me to increase cooperation with the group through discussion activities and completion of tasks	85	Good
6	Learning activities with blended learning model make me to be able to make the most of advances in information and communication technology in the field of education, especially	79	Good
7	I hope that other materials can apply blended learning models such as ecological materials	67	Good enough

Learning by applying blended learning is one of the variations in the learning model that combines face to face learning and online learning or ICT learning that can make students active and help make it easier for students to understand the material. In the blended learning media research used is LMS Schoology, this becomes the distinguishing factor between the experiment class and the control class. Experimental classes conduct face-to-face learning and online learning assisted by LMS Schoology, while in the control class they fully learn face-to-face. Based on the results of the study, it is known that learning that applies blended learning can improve student learning outcomes, result in average differences in experimental classes and control classes, and result in higher learning completeness in experimental classes. In this case the student's learning outcomes are represented by the student's posttest grades.

Face-to-face learning using group discussion methods is carried out to solve the problems listed in the LDS. In this process, cooperation between students is seen, each student is given the responsibility to seek answers and then presented to his group to reach a mutual agreement. Not all students are active in the group discussion process. However, the problems given were successfully solved by each group. While searching for answers students are allowed access to various learning resources such as the internet, reference books, article journals or others to support their answers. The results of the study response questionnaire showed that 85% of students in the experimental class were encouraged to increase cooperation with the group through discussion and completion activities.

Online self-learning is carried out through LMS Schoology. LMS Schoology is included in practical media that can be accessed using PC or smartphone, students can freely access this LMS wherever and whenever. Utilization of the internet in the learning process using both PC and smartphone is characteristic of new millennium learners. This is as told by Menon & Alamelu (2018) that new millennium learners have characteristics very familiar with the use of technology, they rely on the ability to master information and communication technology in their learning style. The match between the student's learning style and the use of blended learning media supports the psychological condition of the student to be ready to learn. This is in line with a statement in the student response questionnaire which states that 79% of students admit that the learning carried out increases their learning interest.

In blended learning materials are presented in LMS with images, videos, and animations that students can access at all times, helping students understand the material and reduce saturation in learning. However, in its implementation students need time to adapt to the LMS Schoology media used. According to Brame (2016) the use of learning videos is effective to maximize the learning process by paying attention to

video content, video duration and student engagement by providing feedback from videos that students watch.

In the process of self-learning (online), students are given an overview of the material and then given an independent LKS to find solutions to the problem. In addition to LKS, students are given the opportunity to do exercises related to ecological material. The results of LKS collection showed that 72% of students collected LKS. During this learning process students can ask the teacher if there are things they do not understand through the chat rooms available in Schoology. The level of attendance of students in doing LKS and the practice of questions provided contributed to the students' learning outcomes in the experimental class. Students who did LKS and practice problems tend to get better posttest grades than students who did not do.

The available question exercises display the score automatically after the student collects the answer. In addition, the researchers provided feedback on the answers given by students, by commenting on the students' answers. These exercises can be done outside of lesson hours to increase students' knowledge as well as become one of the tools of self-evaluation to the extent that students already understand the material. This indicates the addition of learning time by students. The results showed that most students tend to do exercises outside of learning hours. From the study response questionnaire, 71% of students admitted that it is easier to understand the learning material by applying blended learning.

This is in line with research conducted by Yapici and Akbayin (2012) which observed 107 students in Turkey in biology subjects for 11 weeks, during which time students participated in a variety of activities including watching videos and animations, participating in online discussions, completing home assignments and online quiz. These varied activities can increase students' attachment to the material being studied and can have an impact on high scores of learning outcomes. Shivam & Singh (2015) states that flexible learning time is an advantage in blended learning. In the process students are given assistance to learn independently and at the time they wish, students have the freedom to learn and feedback is provided by the teacher from time to time which is the best way to connect teachers and students.

CONCLUSION

Based on the results of the research and the description of the discussion, it can be concluded that the blended learning model of ecological material is effective against the learning motivation and learning outcomes of SMA Don Bosko students. This is demonstrated by: (1) the percentage of student learning motivation 96% achieves a good to excellent category, (2) the results of the experimental class study are better than the control class, (3) 84% of students achieve the minimum completion (KKM) that has been set at 70, 4) improved cognitive learning outcomes of students reaching moderate categories.

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