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Application of Discovery Learning Model Based on Blended Learning to Activities and Learning Outcomes

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Abstract: This study aims to apply the Discovery Learning learning model based on Blended Learning to students' chemistry learning activities and outcomes. This research was conducted at SMA Negeri 5 Bengkulu City using the Classroom Action Research method. The implementation is carried out to find out problems in the learning process and steps that teachers can use to improve the quality of learning during the COVID-19 pandemic. The data collection technique in this study was a observation, interview, and test. The research shows that the activity and student learning outcomes increased, where the results of the proportion of student activity, teacher activity and the average student learning outcomes increased from cycle I to cycle II. Therefore, it can be concluded that the use of Discovery learning model based on blended learning can increase students' chemistry learning activities and results.

Keywords: Activities; Learning model; Learning outcomes

Introduction

World is currently being shocked by the spread of a virus known as the coronavirus or COVID-19. The COVID-19 pandemic, as it is today, requires all people to be more careful in their activities. Various efforts have been made to prevent the spread of COVID-19, one of the efforts made is to comply with health protocols, such as washing hands after doing activities, wearing masks when leaving the room, not crowding, and maintaining a minimum distance of 1 meter between individuals (R. Siregar et al., 2020). Because of this policy, community activities are limited and have an impact on various fields, one of which is the field of education. Where education is a structured effort in the learning process for individuals so that they can develop and grow into creative, knowledgeable, and noble human beings.

The COVID-19 pandemic has forced teaching and learning activities that were initially carried out face-to-face to turn into distance learning which is carried out online (in a network) to break the chain of transmission of COVID-19 (Hariani, 2020). With online teaching and learning activities, teachers are required to be able to master technology. However, digital devices are limited and the teacher's lack of ability to utilize online learning media makes distance learning uneven and not optimal. In general, teachers use online learning media in the form of Whatsapp Groups. Where the media is only used to send reading material and assignments to students so that students are dominant in carrying out independent learning and not a few students experience problems because they do not understand and are confused about the teaching material delivered. As a result of this, many students feel bored which causes a decrease in learning outcomes.

Learning media that does not involve students makes students less optimal in understanding the material (Supriono et al., 2018). One of them is in chemistry subject. Chemistry lessons in high school contain many concepts that are quite difficult for students to understand, because they involve chemical reactions, calculations and involve abstract concepts (Jaya, 2016). The chemical material which is quite difficult in understanding the concept is chemical equilibrium material. Based on the research results of Indriani et al. (2017) stated that students had difficulty

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describing dynamic equilibrium. This is because students assume that in an equilibrium reaction, the reactants are used up and at the end of the reaction there are only products. In addition, in the concept of an equilibrium constant, students' difficulties were caused because students did not understand writing and calculating K_c. The lack of understanding of the concept in this chemical equilibrium material will also affect the understanding of subsequent material related to the concept of equilibrium. In addition, in learning chemistry, choosing the right learning model will be very helpful and support the teaching and learning process to run well and efficiently.

In this case, the teacher's role is very important in determining the quality and lesson plan that will be carried out when teaching by selecting the appropriate learning model. By choosing the right learning model will make teaching and learning activities more meaningful. One learning model that is considered effective for increasing student activity is the Discovery Learning model. Discovery learning model is a type of learning model that can encourage students to be active and find information independently, actively ask questions and draw conclusions from general principles (Mutmainna et al., 2018). The advantages of the Discovery Learning model are that it can add to students' experience in learning, explore student creativity because students are required to be independent, able to increase self-confidence, and increase cooperation between students.

Meanwhile, the weakness of the Discovery Learning model is that it requires a long time, so the teacher often has difficulty completing the material within a predetermined study time (Sibuea et al., 2019). There are weaknesses in the Discovery Learning model, a solution is needed so that the application of the Discovery Learning model becomes more optimal, one of which is combining the Discovery Learning model with the Blended Learning model. The concept of Blended Learning is a combination of conventional learning methods and online learning so that teachers and students can discuss both directly and virtually (Hermawanto et al., 2020; Kholifah et al., 2020). The blended learning model involves a lot of planning and future goals. In blended learning, it does not mean combining various technologies for certain learning, but utilizing several tools effectively to achieve quality in teaching, learning, and learning management (Serrano et al., 2019). Thus, learning that is felt unfinished during in-person learning can be discussed virtually with flexible time. It is hoped that students are always active and can find a way of learning that suits them so that distance learning becomes more optimal.

Based on the results of an interview with one of the Chemistry teachers at SMA Negeri 5 Bengkulu City, during online learning, there were still many students who were less active and less enthusiastic in the learning process, so student learning outcomes decreased. This statement is also supported based on the results of observations of data on students' daily chemistry test scores which show the results that the grades of chemistry subjects, especially on chemical equilibrium material, are still below the Minimum Completeness Criteria (KKM), namely 75. Based on the results of Suttrisno's research (2021), states that students' learning motivation during online learning is declining and many student scores are below the KKM. In line with the results of research by Suswandari et al. (2022) which states that when online learning seems monotonous, it makes students bored and bored when learning from home, this raises low student motivation which impacts student learning outcomes to decrease.

Method

The method used in this research is Classroom Action Research. This study aims to increase the activity and learning outcomes of class XI MIPA 8 on chemical equilibrium material at SMA Negeri 5 Bengkulu City. The research was carried out from November 2020 to December 2020. The sample used in this study was 36 students consisting of 15 male students and 21 female students. Data analysis techniques through student activity observation sheets, teacher activity observation sheets, and written test questions to measure student learning outcomes. Classroom action research is carried out at least in two cycles which include four steps which include planning, implementing, observing, and reflecting in each cycle. Data analysis techniques through student activity observation sheets, teacher activity observation sheets, and written test questions to measure student learning outcomes. This research procedure can be seen in Figure 1.

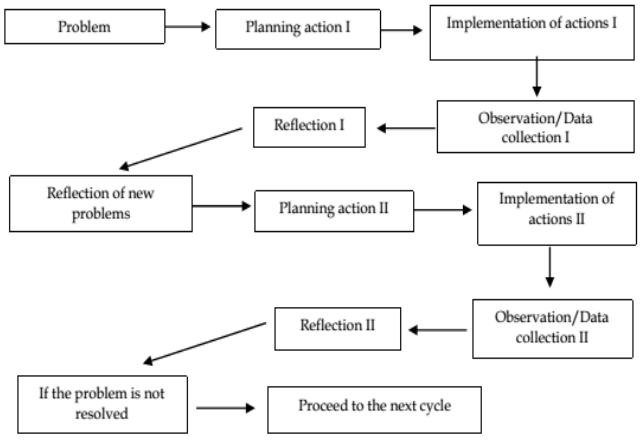

Figure 1. Research procedure

Student Activities

To find out how active students are in participating in the Chemistry learning process, this analysis is carried out based on observational data on student learning activities with the following formula:

$$P = \frac{f}{N} \times 100\% \quad (1)$$

Information:
P : Percentage of student activity scores
f : Total score obtained
N : Total maximum score

Based on the percentage of activity, the following criteria will be obtained according to Trianto (2011):

Table 1. Student Activity Criteria

Activity (%)	Criteria
76-100	Very good
51-75	Good
26-50	Medium
≤ 25	Less

Teacher Activity

The formula for calculating the percentage of observations of teacher activity is as follows:

$$S = \frac{R}{N} \times 100\% \quad (2)$$

Information:
S : The percent value sought
R : Total score of teacher activity
N : Maximum score obtained

Based on the percentage of activity, the criteria according to Purwanto (2010) will be obtained as follows:

Table 2. Teacher Activity Criteria

Activity (%)	Criteria
86-100	Very good
76-85	Good
60-75	Medium
55-59	Less
≤ 54	Very less

Student Learning Outcomes

Analysis of student learning outcomes is done by looking at the number of completeness, both individually and classically. The formula for individual student completeness is as follows:

$$KI = \frac{SS}{SM} \times 100\% \quad (3)$$

Information:
KI : Individual Mastery
SS : Student Score
SM : Maximum Score

Meanwhile, to find out the percentage value of classical completeness can be analyzed using the following equation:

$$KS = \frac{ST}{N} \times 100\% \quad (4)$$

Information:
KS : Classical Mastery
ST : Number of Completed Students
N : Number of Students

Criteria for student learning completeness according to Arikunto (2009) are as follows:

Table 3. Learning Completeness Criteria

Activity (%)	Criteria
80-100	Very good
66-79	Good
56-65	Medium
40-55	Less
≤ 40	Very less

Result and Discussion

Student Activity

The implementation of research aims to increase the activity and student learning outcomes. After the teaching and learning process took place in the RPP cycle I online, the teacher gave written test questions which were followed by 36 students to find out students' conceptual understanding of the material that had been studied with a minimum of 75 completeness criteria. The results of research in cycle I and cycle II on student activity can be seen in the Table 4.

Table 4. Student Activity Cycles I and II

Cycle	Information	Point	Percentage
Cycle I	Observer I	53	77.94
	Observer II	48	70.58
Cycle II	Observer I	60	88.23
	Observer II	62	91.17

Based on Table 4 above, the results of observations of student activity in cycle I obtained the % results of the observer I of 77.94% and observer II of 70.58% so the average % of the two observers was calculated by adding up the results of the two observers, then it was obtained that the average percentage of student activity in cycle I was 74.26%. From the percentage results above, the results of observing student activity in cycle I during the teaching and learning process using the Discovery Learning model based on Blended Learning show that student activity with a percentage of 74.26% belongs to the good category, this shows that students are active and paying

attention to the teacher in conducting group discussions in the learning process.

However, there were still some students who did not pay attention to the teacher's explanation and did not even read the learning material that the teacher had provided, were less enthusiastic and some did not participate in group discussions online. In line with the above, based on the results of Sari et al. (2021), data was obtained that out of 11 students only 27.27% were active while 72.73% were in the quite active, less active and inactive categories. As explained by Mulyasa (2013) states that a learning is said to be successful if there is a positive change in behavior in all students or at least most (75%) of all students in the class can achieve learning objectives in the active category.

Based on the results of analysis and reflection in cycle I through the application of the Discovery Learning model based on Blended Learning, the actions taken were said to be successful but not yet achieving maximum results. In student learning activities are already in the good category, but the average value of learning activities has not reached the predetermined target of 75%. Therefore, it is necessary to make improvements and changes in the learning process so that student learning activities can be increased and achieve the expected results. Therefore, cycle II was carried out as a step to improve the learning process in cycle I.

Based on the results of observations of student activities in cycle II above, it was obtained that percentage of the observer I was 88.23% and that of observer II was 91.17% so the average percentage of the two observers was calculated by adding up the results of the two observers, then the average was obtained -the average percentage of student activity in cycle II was 89.70%. From the results of these percentages, it was found that the results of observations of student activity in cycle II during the teaching and learning process using the Discovery Learning model based on Blended Learning showed that student activity with a percentage of 89.70% was classified into the very good category, this indicated an increase in the percentage student activity in following the learning process.

Teacher Activity

The completeness of student learning activities is inseparable from the teacher's role in the learning process. Therefore, the teacher's activities also need to be assessed to what extent the teacher can apply and carry out learning activities by applying the Discovery Learning model based on Blended Learning. The results of research in cycle I and cycle II on teacher activity can be seen in the Table 5. Based on Table 5 above, the results of observations of teacher activity in cycle I above obtained the percentage results of observer I of 82.69% and that of observer II of 86.53%, so the average of the two observers was calculated by adding up the results of the two observers, then the average percentage of teacher activity results in cycle I was 84.61%. From the results of the percentages above, the results of observing teacher activity in cycle I during the teaching and learning process using the Discovery Learning model based on Blended Learning model show that teacher activity with a percentage of 85.57% is classified into the good category, this shows that the teacher can teach and control the class well.

Table 5. Teacher Activities Cycles I and II

Cycle	Information	Point	Percentage
Cycle I	Observer I	43	82.69
	Observer II	45	86.53
Cycle II	Observer I	47	90.38
	Observer II	48	92.30

In cycle II, the results of observations of teacher activity obtained percentage results from observer I of 90.38% and from observer II of 92.30%, so the calculated average of the two observers was 91.34%. From the results of these percentages, it was obtained that the percentage of teacher activity in cycle II was 91.34%, which was classified into the very good category. This shows an increase in teacher activity in the process of teaching and learning activities by applying the Discovery Learning model based on Blended Learning. The increase in the percentage of student activity and teacher activity can be seen in the Figure 2.

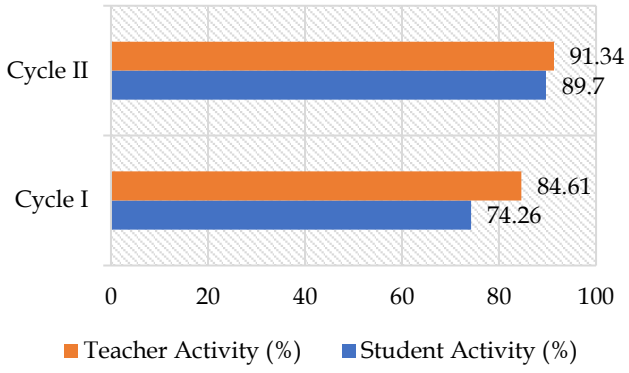

Figure 2. Graph of the percentage of student activity and teacher activity

Student Learning Outcomes

Student learning outcomes are obtained by using the percentage formula. The data were obtained from the results of the tests given in each cycle consisting of cycle I and cycle II. The test results achieved in each test were carried out by a completeness analysis both individually and classically. The Minimum

Completeness Criteria (KKM) score at SMA Negeri 5 Bengkulu City for the chemistry lesson that has been determined is 75. If the score or score obtained meets the KKM then the lesson is categorized as complete. The average achieved from cycle test I was 79.02 and in cycle II was 82.22. This shows an increase in learning outcomes after participating in the learning process by applying the Discovery Learning model based on Blended Learning.

The results of this study are supported by the results of Sari's research (2014) which shows the results that the implementation of learning using the Discovery Learning model shows there is an increase in the process of implementing learning and student learning outcomes, where in cycle I the average mastery of learning outcomes reaches 79.36 with the percentage of classical completeness is 73.07%. Whereas in the first cycle, the average completeness was 84.09 with 84.61% classical completeness, so it can be seen that the increase in student learning outcomes from cycle I and cycle II was 11.54%.

The student learning outcomes in cycle I and cycle II in this study can be seen in the Table 6. Based on the results of the analysis, student learning outcomes were obtained in cycle I with very good criteria totaling 28 students (77.77%), good criteria totaling 7 students (19.44%), and sufficient criteria amounting to 1 student (2.27%), with the achievement of classical student learning completeness of 77.77% with the number of students who achieved KKM scores of 28 students, while 8 students did not achieve KKM scores, this acquisition still has not reached classical student learning completeness. Learning activities can be seen in the figure 3.

Figure 3. Online learning activities

This is caused by several obstacles, namely teachers are still not able to guide students to discuss online, teachers are not able to motivate students to study online and some students are still not brave enough to express opinions. In the online learning process, students must actively summarize what they have learned, establish good communication with friends, and exchange learning experiences so that students can learn together. High student learning motivation can improve student learning outcomes and increase the effectiveness of online learning (Hongsuchon et al., 2022). In line with the results of Lasmini's research (2019) which states that the increase in understanding and student learning outcomes is influenced by the teacher's activities in managing the learning model used during the learning process.

Table 6. Student Learning Outcomes

Initial Name	Cycle 1	Cycle II
ADF	70 (Not pass)	80 (Passed)
ARM	80 (Passed)	80 (Passed)
APY	85 (Passed)	90 (Passed)
CI	85 (Passed)	85 (Passed)
DF	80 (Passed)	85 (Passed)
DE	80 (Passed)	95 (Passed)
DRAR	80 (Passed)	80 (Passed)
DNF	80 (Passed)	85 (Passed)
FTR	80 (Passed)	80 (Passed)
FFS	90 (Passed)	90 (Passed)
FARA	85 (Passed)	90 (Passed)
ISH	70 (Not pass)	80 (Passed)
IN	80 (Passed)	80 (Passed)
JJ	85 (Passed)	80 (Passed)
KK	85 (Passed)	90 (Passed)
MO	80 (Passed)	80 (Passed)
MAD	80 (Passed)	80 (Passed)
MF	85 (Passed)	80 (Passed)
MTK	85 (Passed)	80 (Passed)
NAS	80 (Passed)	80 (Passed)
NDZ	80 (Passed)	80 (Passed)
NE	80 (Passed)	80 (Passed)
NA	85 (Passed)	80 (Passed)
RHA	70 (Not pass)	70 (Not pass)
REP	70 (Not pass)	70 (Not pass)
RG	60 (Not pass)	80 (Passed)
RFM	80 (Passed)	80 (Passed)
RAWP	80 (Passed)	80 (Passed)
STW	75 (Passed)	80 (Passed)
STAFY	70 (Not pass)	80 (Passed)
SC	70 (Not pass)	80 (Passed)
TJK	80 (Passed)	80 (Passed)
TDA	70 (Not pass)	80 (Passed)
TBP	80 (Passed)	85 (Passed)
WDN	85 (Passed)	95 (Passed)
YNF	85 (Passed)	90 (Passed)
Amount	2845	2960
Average	79.02	82.22

After reflecting and analyzing for improvement on student learning test results in cycle I and making improvements in cycle II, student learning outcomes in cycle II with very good criteria were 34 students (94.44%), and in the good category were 2 students (5.55%). With the achievement of classical completeness

of 94.44% and the number of students who achieved the KKM score was 34 students, while only 2 students did not reach the KKM score. This shows that the use of the Discovery Learning model based on Blended Learning on chemical equilibrium material can improve student learning outcomes in class XI MIPA 8 SMA Negeri 5 Bengkulu City.

According to Putra et al. (2022) choosing a learning model can be used as a solution to solving the problem of how to determine the right learning process in conveying material to students so that the concept of delivering material can also be directed and students can easily understand the material which is expected to improve learning outcomes. The data on the frequency of student learning outcomes in each cycle can be seen in the Table 7.

Table 7. Distribution of Results of Cycle I and Cycle II Frequency

Value	Criteria	Frequency		Percentage	
		Cycle I	Cycle II	Cycle I	Cycle II
80-100	Very good	28	34	77.77	94.44
66-79	Good	7	2	19.44	5.55
56-65	Medium	1	0	2.77	0
40-55	Less	0	0	0	0
30-39	Very less	0	0	0	0

The increase in the average grades and classical completeness of student learning outcomes in cycle I to cycle II can be seen in the Figure 4. Based on the Figure 4, it can be seen that the application of the Discovery Learning model based on Blended learning in the learning process on chemical equilibrium material at SMAN 5 Bengkulu City can improve student learning outcomes. This is supported by the Discovery Learning model and the Blended Learning, in which with the Discovery Learning model, students are required to play an active role and think critically to find answers to a given problem in the learning process. Meanwhile, using the Blended Learning model makes the interaction between teachers and students easier, where students can discuss directly with the teacher virtually or directly at school, so students don't feel bored and are more enthusiastic.

This is in line with the results of Siregar's research (2019) which states that the better the application of Blended Learning in learning activities, the better it is in improving student learning outcomes. According to In'am et al. (2017) the discovery learning model consists of methods designed to make process-oriented students become active: lead themselves, find themselves, and make themselves during the reflection of learning activities. Based on the results of the research as a whole, it can be seen that the application of the Discovery Learning model based on Blended Learning makes student learning activities and outcomes increase. This is also supported by the results of research by Wijaya et al. (2016) which explains that there is a significant influence in the application of the Blended Learning learning model as evidenced by increased motivation and student learning outcomes when compared to students who only use conventional learning models.

The results of this study are supported by the results of Mubarok et al. (2014) which shows that the Discovery Learning model has a positive effect on student learning outcomes, where the learning outcomes of students who use the Discovery Learning model are higher than the learning outcomes of students who use direct learning models. The results of this study are also supported by the results of Abdjul (2022) which shows that the application of the Discovery Learning model can increase student activity and learning outcomes, where the number of students who achieve a minimum mastery score increases and the learning process becomes more active.

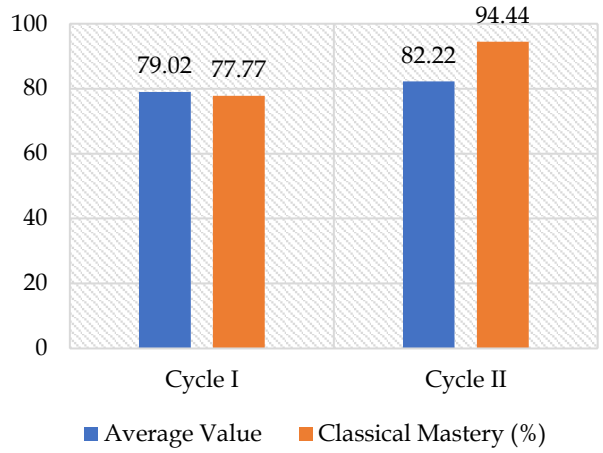

Figure 4. Graph of increasing student learning outcomes for each cycle

This is also in line with the results of Prasetya et al. (2020) which states that the Discovery Learning model can increase student activity and learning outcomes in learning. Based on the results of Rachman et al. (2019) shows that the application of the Blended Learning can improve student learning outcomes at each meeting. In line with the results of Fitriyana et al. (2020) states that the use of games based on blended learning can increase student achievement. Blended Learning model can help students improve interaction, communication skills, self-confidence, self-awareness, and encourage discussion and collaboration not only with their teachers but also with classmates and create a more interesting learning process (Bouilheres et al., 2020; Kharb et al., 2016).

Conclusion

Selection of the right learning model in the learning process can affect the increase in activity and student learning outcomes. As student activity increases, it cannot be separated from the teacher's role in teaching. When teacher activity is high, student activity also increases. Student learning activities and results increased after learning variations were carried out using the discovery learning model based on blended learning, where student activity during the learning process using the Discovery Learning model based on Blended Learning on chemical equilibrium material was very good and experienced an increase.

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Author Contributions
The main author, Rifki Nomizar Khairani, contributed to designing research, conducting research, writing research articles, preparing the research instruments used in data collection, and data collection process. The second author, AK. Prodjosantoso, played a role in guiding, reviewing and editing articles.

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Conflicts of Interest
The authors declare no conflict of interest.

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