

Implementation of Project-Based Learning Model with Edmodo Application in the Capita Selecta Chemistry Course

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ABSTRACT

This research is to precieve the learning outcomes and student responses to the applied models and applications. The type of research carried out was experimental research using a one group pretest-posttest design with the research subjects were 29 students of the fifth semester of 2019/2020 academic year who took Capita Selecta Chemistry Course. The data collection technique was carried out by means of test techniques, namely learning outcomes as seen from the pretest and posttest scores, as well as non-test techniques as seen from observation, interview and student response questionnaires to the application used via google form. The t test was carried out with the help of the SPSS 23 program. Based on the research conducted, there was an increase in student learning outcomes from a value of 65.172 (pretest average score) to 84.586 (posttest average score). The N-Gain score of 0.557 is included in the moderate category, indicating that there is a significant increase in student's critical thinking skills using the PjBL model and the Edmodo application. The results of the student response questionnaire stated that only 48.28% of students liked learning using the online/edmodo application. 51.72% of students still like direct/face-to-face learning. As many as 96.55% of students considered the Edmodo application to provide a new atmosphere in capita selecta lectures. The response to the edmodo application and the project model used was very good. Students are enthusiastic about the edmodo application because it has complete, interesting and easy to learn features. Project Based Learning (PjBL) learning model using the Edmodo application can be recommended to be applied by the lecture.

INTRODUCTION

Capita selecta in chemistry is a compulsory subject that must be taken by Chemistry Education students of Bengkulu University. This course as musch as 2 credits, with the aim of discussing specific topics in the study of Chemistry and Chemistry Education based on the latest scientific developments, in order to increase student's scientific insight. Some of the educational topics discussed include 21st century learning; Science, Technology, Engineering and Mathematics (STEM); High Orders Thingking Skills (HOTS); Learning models; Electronic-based learning media. The 21st century education paradigm requires students to have academic skills, literacy and communication skills, critical and creative thinking (Jang, H. 2016).

Based on observations of lecturers and students in the previous year. Capita selecta lectures are conducted using lectures, group discussions and assignments to students. The specific learning models and applications have not been tried in lectures. The model applied in this research is the Project Based Learning (PjBL) model. PjBL is a learning model that requires students to produce a real product (Rahman, MK, et al. 2019). In this PjBL model the role of the lecturer as a facilitator directs students to daily

problems that are solved in groups. Lecturers provide opportunities for students to find /raise problem topics. The lecturer directs the problems that exist in the field of chemistry and chemistry education related to the latest and most recent research. Projects resulting from the PjBL model can enable students to, (1) solve real problems or current issues; (2) students can be actively involved in their learning activities and are able to find things that are considered important in the project they are undertaking; (3) students are able to show that they have mastered concepts and skills. The results of project work prove that students are able to work and learn independently. With the application of the PjBL learning model, it is hoped that the quality of learning that achieved in the curriculum can be achieved.

The PjBL model is based on previous research and the results are effective when compared to conventional methods. The results of research by Mergendoller, Maxwell, and Bellisimo (2006) and Almes Gangga (2013) indicate that PjBL improves student's macroeconomic competence compared to traditional methods. Furthermore, the results showed that the verbal ability, motivation and learning outcomes of PjBL class students were higher than those in lecture or discussion classes. Other research results indicate positive changes in attitudes and higher levels of performance in design skills among PjBL students (Mioduser & Betzer, 2008). PjBL is also considered to be able to develop student's cognitive, affective and psychomotor (Safitri, et al., 2020; Umi, U., 2015). Alacapinar (2008) used both qualitative and quantitative analyzes including semi-structured video-recorded interviews to study PjBL students versus control group students. The results showed that the PjBL students had higher cognitive abilities than the control class.

The evaluation questions used in this study use the criteria for student's critical thinking skills. Critical thinking is a technique in making rational decisions (Purwati et al., 2016). Problem-based learning models are able to improve students' critical thinking skill, to make students more actively in the class (Devy Alvionita et al., 2020). The criteria seen are focus, reason, inference, situation, clarity, overview. Critical thinking is the goal of the contemporary curriculum, where students are able to make wise decisions, are able to make, implement, analyze, synthesize and evaluate concepts and information that have been collected through the process of observation, experience, reflection and communication (Facione, 2011; Scriven & Paul, 1996).

In implementation, the PjBL model also supports the edmodo application. The edmodo application is used with the consideration that the features presented are simple, easy for students to understand and the features in the application are also complete. There is a library feature for storing course material, assignment features, quizzes, and discussion forums. Almost all social media users have a Facebook account. This edmodo application looks similar to Facebook. Most students also think that they do not have technical problems in doing the exercises and assignments on Edmodo (Handayani, et al. 2019).

Edmodo is a school environment-based social network. Platforms are often described as facebook for schools and function to share ideas, files, agenda of activities and assignments (Prasetiyono, S & Sondang, M., 2014; Putranti, N, 2013; Yesi Syofiarni, 2014). Edmodo can be used as a place for lecturers and students to discuss and share lecture materials in digital form and help in the learning process from a distance without having to meet face to face. Subject materials that can be posted by lecturers in

edmodo include videos, ebooks, pictures, documents, presentations, and blogs. The advantage of Edmodo compared to other learning applications is that parents can find out and monitor the progress of their children's activities (Zakaria, 2020). In a pandemic era and online learning like this time, the use of the edmodo application in learning is helpful for controlling student's learning activities.

Research Aim

The team of authors wanted to know how the role of using the Edmodo application-based Project Based Learning (PjBL) learning model on learning outcomes and student responses to the learning applications used.

RESEARCH METHOD

The type of this research is an experimental research, using One Group Pretest-Posttest Design, namely using one class by first being given a preliminary test before doing the experiment. (Ihsan, et al. 2019; Ghufroni, et al. 2020). This research does not use a random sample to determine the changes caused by the treatment (Sugiyono, 2010). The research subjects consisted of 29 students in the fifth semester of the 2019/2020 academic year who took capita selecta chemistry courses.

Instrument and Procedure

The application of the PjBL model is carried out for half a semester (8 meetings) and it is limited to the latest issues regarding the latest educational research. Students are divided into 7 groups with different topics for each group. One group consists of 4-5 students.

The data collection technique was carried out by using test techniques, where learning outcomes seen from the pretest and posttest scores, as well as non-test techniques seen from observations, interviews and student response questionnaires to the Edmodo application which was distributed via google form. The data collected in this study were analyzed with the reliability and validity test. The test instrument used in this study refers to the indicator of critical thinking skills. The critical thinking ability test instrument was developed in the form of description questions with the criteria of focus, reason, inference, situation, clarity, overview (Table 1).

Table 1. Critical thinking ability test instrument.

Criteria	Indicator
Focus	Students can understand problems related to course material about the latest developments in educational science
Reason	Students can argue and be able to relate problems to facts in solving problems
Inference	Students are able to make decisions and make conclusions based on existing evidence
Situation	Students are able to find, collect and answer all problems that arise
Clarity	Students can provide examples of issues related to current education developments, be able to make and decide the final result in the form of a report
Overview	Students review all problems, look for sources / references until the final report from beginning to end.

Data Analysis

The average value of student learning outcomes, calculated by :

$$\bar{x} = \frac{\sum x}{n}$$

Information:

\bar{x} : Mean

$\sum x$: Sum Score of Students

n : The number of students who have score (Arikunto, 2013)

Data analysis was performed using independent sample t-test. which is done with the SPSS 23.0. The test is carried out at a significant level of 5%, meaning that to determine the t-Table statistical value, the significant level is used $\alpha = 0.05$ with degrees of freedom $dk = (nk-1)$, with the testing criteria accepted H_0 If $t < t$ Table, and accepted H_a if t count $\geq t$ Table. N-gain calculated using a formula :

$$\text{Normalized Gain (N-gain)} = \frac{\text{Posttest score} - \text{Pretest score}}{\text{Maximal score} - \text{Pretest score}} \text{ (Hake, 1999)}$$

Table 2. N-gain criteria.

Interval	Interprestasi
$g \geq 0,7$	High
$0,3 \leq g < 0,7$	Moderate
$g < 0,3$	Low

The normality test is used to determine the normality of data distribution using the Kolmogrov Smirnov test with the IBM SPSS statistics 23 application. Data is declared to be normally distributed if the significance value > 0.05 (Kadir, 2016). Analysis of the effectiveness of the PjBL learning model with the Edmodo application on student learning outcomes is calculated using the N-Gain score. Student response questionnaires to the models and applications used by looking at the percentage of student positive responses to the questionnaire given.

RESULTS AND DISCUSSION

The research was conducted on students in Semester V who took the Capita Selecta Chemistry course. As for the number of students who took is 29 people, consisting of 5 students who were male, and 24 students who were female. Students in the learning process are given project assignments using the Project Based Learning (PjBL) model. The learning activities carried out can be seen in Figure 1.

In its implementation, this PjBL model is supported by the Edmodo application. Student learning outcomes are based on the criteria for the level of critical thinking skills, i.e:

Table 3. Average Pretest Score, Posttest Score, Gain and N-Gain

Criteria	Average Value				Significant
	Pretest	Posttest	Gain	N-gain	
Focus	69,23	88,62	19,39	0,630	Sig. (2-tailed)= 0,000
Reason	63,22	84,70	21,48	0,584	

Criteria	Average Value				Significant
	Pretest	Posttest	Gain	N-gain	
Inference	68,23	87,90	19,67	0,619	0,000 < 0,05 Real different
Situation	67,61	83,87	16,26	0,502	
Clarity	68,20	81,88	13,68	0,430	
Overview	54,54	80,55	26,01	0,572	
Total	391,03	507,52			
Overall average	65,172	84,586	19,414	0,557 (Moderate Category)	

From Table 3 it can be observed that the results of the pretest mean score of students is 65.172 and the average posttest score is 84.586, these results indicate an increase in student learning outcomes after the implementation of the PjBL model assisted by the Edmodo application. The sig (2-tailed) value is 0,000, which means less than 0.05. So it can be concluded that there is a significant difference between the pretest and posttest scores (after being given treatment). Then determine the N-Gain score based on the results of the pretest and posttest. Analysis using N-Gain was carried out to determine the effectiveness of the PjBL and Edmodo learning models on student learning outcomes. N-Gain shows the differences in student's mastery of concepts before and after being given treatment (Amrullah, et al. 2017). Based on the results of the pretest and posttest, the N-Gain score was obtained at 0.557. The N-Gain score is in the moderate category, indicating that the application of the PjBL model using edmodo in the learning process is effective enough to improve student learning outcomes. Based on the results of the normality test, a significance value of $0.703 > 0.05$ was obtained. This means that the score data is normally distributed. Graphs of student's pretest and posttest scores in class using the PjBL model and the Edmodo application can be seen in the Figure 1:

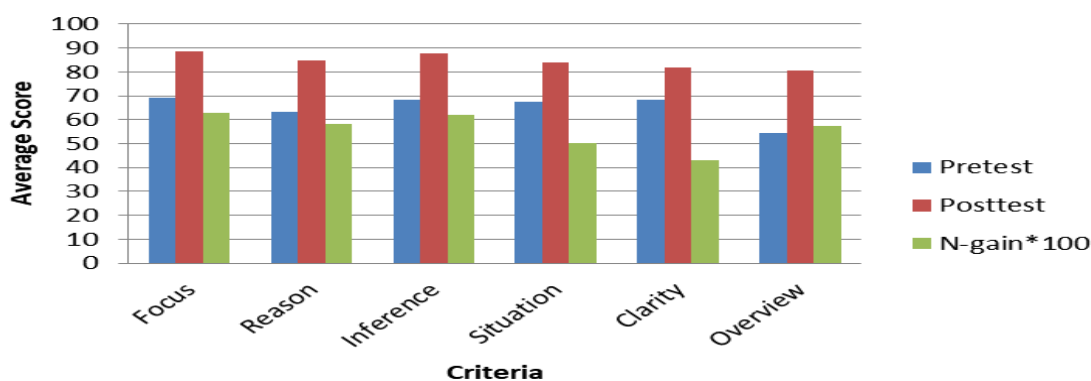


Figure 1. Graph of student's critical thinking skills from several indicators.

Several studies on PjBL show that PjBL can have a positive effect on learning and increase student motivation, emphasizing a student-centered and experiential approach to comprehensive learning. Student's critical thinking skills improve in completing given project assignments and are able to help students to develop collaborative skills (Dole, et.al. 2017). Activities in learning through problems that are packaged in the form of project work also provide an interesting learning experience, have a significant effect on the achievement of learning outcomes and are able to improve student's thinking skills in solving problems (Rahmazatullaili, et al. 2017; Rahardjanto, et al. 2019). In

integrated science learning, the PjBL strategy is able to improve learning outcomes, understanding and applying the concept of developing integrated science learning media (Safaruddin, et al. 2020; Safaruddin, Ibrahim, et al., 2020). Problem-based learning is able to improve student's thinking skills (Handayani, D., Alperi, M., 2021).

the implementation in the field, students are divided into 7 groups. Then each group designed a different project task. The project that made is to make articles based on literature studies of journals obtained at least the literature used in the last 3 years. Each group looks for the latest journals related to the latest educational issues. From the results of the student groups, the topics of each article project were obtained as follows: (1). STEM, (2). Cooperative Learning Model (3). Audio visual media, (4). Google classroom, (5). Zoom cloud meeting application, (6). Problem Based Learning, (7). HOTS capabilities. After getting supporting references, in groups of students work on articles as the final product of the Capita Selecta Course project. The draft of the article is checked and its progress is reported to the lecturer in 2 meetings. Then input from the lecturer, revised again by the group. And when the assignment is good, a presentation is made to other student groups. Discuss and provide input on project tasks that have been worked on. Final project assignments are collected into one, and good articles will be processed into journals through OJS. The application of the PjBL model is able to produce a project in the form of a product, namely in the form of a written report, a presentation in the form of a power point, recommendations and a ready-to-publish article.

The learning process besides using the PjBL model is also assisted by the edmodo application. The use of this application begins with the creation of student learning accounts using the official edmodo website, namely www.edmodo.com. The lecturer provides a learning code that will be used by students to enter the Edmodo class. On accounts owned by students, students can comment on discussions or announcements given by the lecturer. Students send group assignments to class groups. Other friends discuss in the forum that has been created. From the discussion, it will be seen which students are active and passive. Edmodo display of the Capita Selecta Course can be seen in Figure 2.

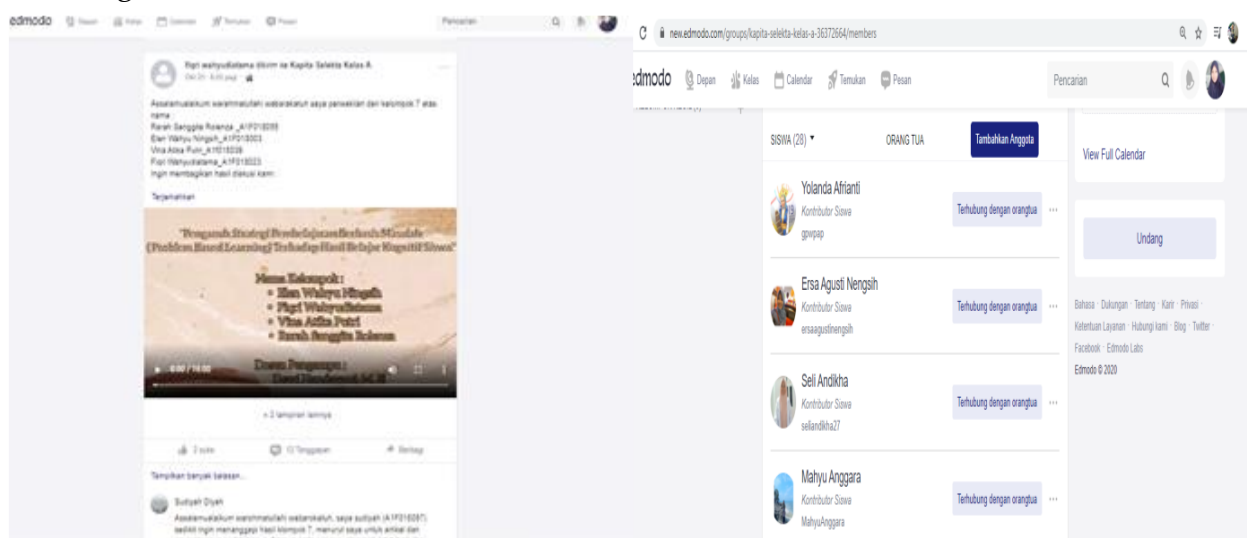


Figure 2. Edmodo class display.

In learning using the PjBL model, it is carried out through six stages of project-based activities. The scheme for implementing the PjBL model can be seen in Figure 3. Based on Figure 3, it is known that there are 6 stages of the PjBL model, namely providing essential questions, making project planning, compiling a project schedule, monitoring students and project development, assessing or testing results, and evaluating experiences (Lucas in Apriliana, et al. 2018).

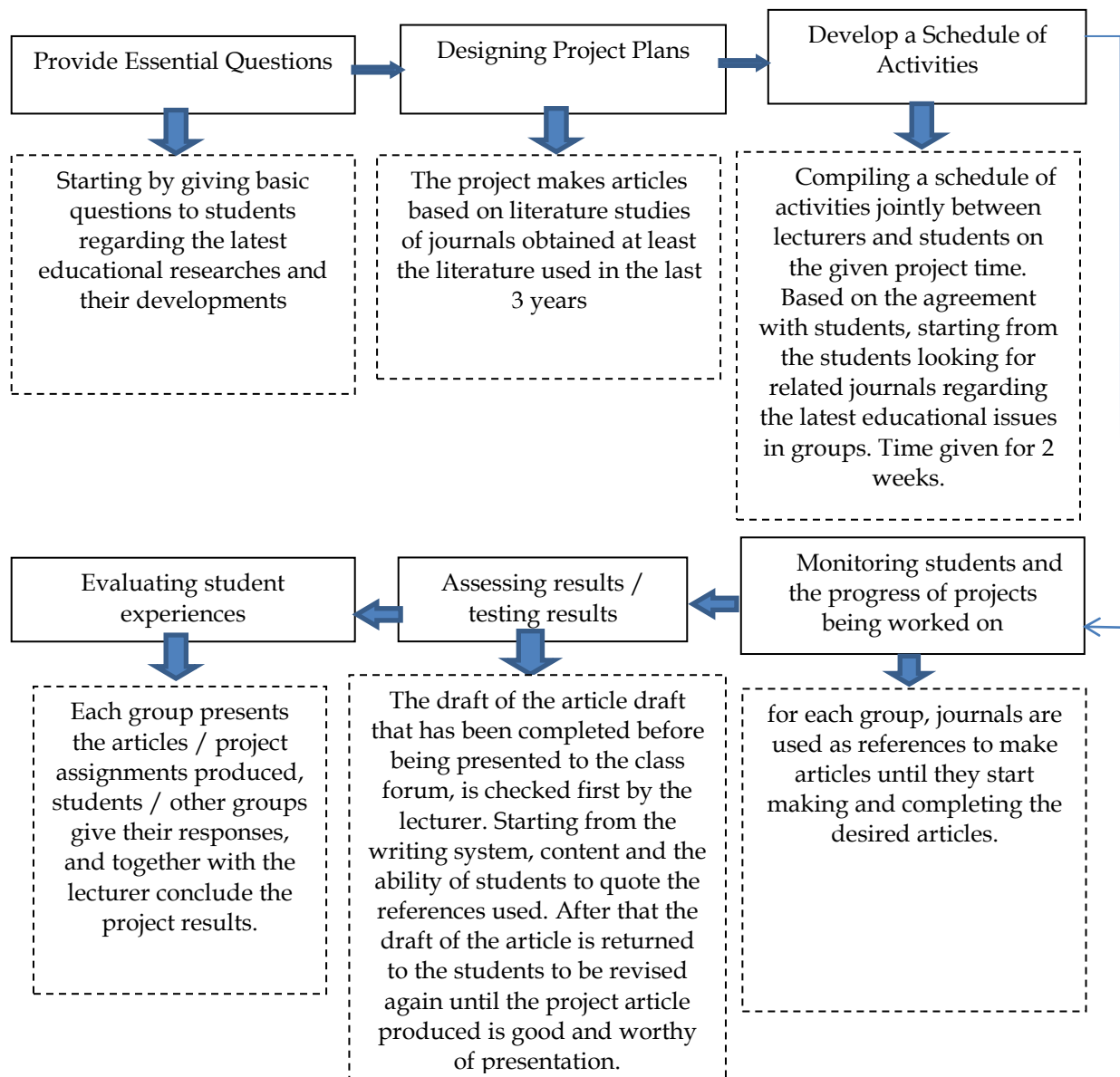


Figure 3. Project-based learning implementation schematic.

Based on interviews conducted directly with students, on average they enjoy learning using this edmodo, here are some interview results quoted from several students:

"Using Edmodo, in my opinion, is very effective as an effort to replace face-to-face learning, although this application cannot replace the full effectiveness of face-to-face learning. In the application, you can send assignments, discuss both groups and individually, you can take quizzes "(Student 3).

"Edmodo is an interesting application and can comment, like messages like Facebook. There is a place to collect assignments, then all forums in the class can immediately respond to it so this is very good "(Student 15).

"I think online learning like this is very helpful with the edmodo application, because edmodo has provided a place to collect assignments, such as assignments that we have completed in the form of articles, video presentations, and PPT, so that the collection of assignments is more flexible, then for the implementation of learning more efficiently. because there has been direct notification so that it makes it easier to access and deliver the material it will not be drowned because of the many comments because there is already a separate comment column, indeed the learning process will be more meaningful if it is done face-to-face only now conditions are not possible, but capita learning is selective as well It is as meaningful as face-to-face because it is facilitated by the supporting features of Edmodo, so that the selective capita learning process can be fully understood by students. So I conclude that the selective capita learning process using the Edmodo application is very effective and efficient so that it helps students understand the explanation about making good and correct articles "(Student 27).

The edmodo application has many features that can be used for the implementation of learning. These features can be used and developed by the teacher based on the needs of each teacher and student who has different characteristics. Edmodo is increasingly being used in learning because it can help lecturers to share learning materials and communicate more effectively, poll, assign assignments, share ideas and save time (Ryane, I., & El Faddouli, NE 2020; Al-Said, KM, 2015; Ompusunggu, VDK, & Sari, N., 2019). The edmodo application is currently becoming popular because it is able to strengthen the role of teachers, students and connect directly with parents so that the learning process becomes better and controlled (Sumardi, S., & Muamaroh, M., 2020).

Edmodo features include: 1) Groups, which are used by lecturers to create classes in Edmodo. The class made in edmodo is the Capita Seleka Class. Students can be added by the lecturer to the class that has been made, that is also possible students join directly to the class using class code. 2) Note, is a feature that functions to take notes and can be sent in the form of word, pdf and other files. 3) Alert, a feature whose purpose is the same as notes, but cannot be attached files. 4) Assignment, a feature used to assign assignments to students, both in the form of short questions and descriptions. 5) Quiz, is a feature to provide weekly quizzes or final exams, which can be written directly or sent as a file. 6) Polling, whose function is to poll students on course material or other important matters. 7) Library, used to store all the documents needed and can be directly connected to Google Drive. 8) Progress, serves to see the development of student learning. 9) Edmodo Planner, its function is to record the agenda of scheduled activities/ projects.

Below is a summary of the advantages and disadvantages of the Edmodo application, based on the results of the research that has been done :

Table 4. Strengths and weaknesses of the Edmodo application.

Edmodo application
Strengths
For student assignments, a deadline for assignment can be arranged.
The assignment feature appears, a notification appears and a column where students upload their assignments
Student assignments in the form of word / pdf files, photos, videos can be sent without memory limitations

lecturers can comment on assignments performed by students individually / in groups in the comments column, which can be in the form of input, reinforcement, and other communication.

Assessment of assignments collected by students can be directly given by the lecturer.

Applications can be opened using a laptop, it can also be via Android / HP

Weaknesses

Not all students know the edmodo application, and some have difficulty using the features in it.

There is no video conference yet. So there is no direct interaction between lecturers and students.

In research conducted by Aulia, et al (2019), one of the advantages of Edmodo is that this application can be accessed via a smartphone, so it can be more flexible in learning activities. In this study, the students' responses to the use of the Edmodo application in learning were also seen in Table 5.

Table 5. Percentage of student responses to the edmodo application

Information	Perscentage (%)
I like to learn capita selectivity by using an online learning system like edmodo rather than learning directly / face-to-face with lecturers.	48,28
Edmodo is an interesting application in selective capita learning and its features are complete	89,66
Edmodo makes me more responsible and disciplined in collecting assignments.	93,10
Edmodo gave me new experiences / nuances in capita selecta learning	96,55
Assignment through edmodo is fast and practical	89,66
Edmodo application makes it easier for me to access lecture materials and project assignments that are presented per group.	93,10
I can improve my understanding of the development of Capita selecta through learning videos / group presentations uploaded through edmodo	86,21
I prefer to collect assignments by uploading videos / presentations on edmodo rather than appearing directly in class during lectures face to face with lecturers	58,62

Questionnaire modified from research by Agustiani, et al. (2019).

From Table 5 above, students prefer face-to-face learning rather than using the Edmodo application. Only 48.28% of students like learning through the edmodo application. This is because so far students learn face-to-face. So students are not familiar with online learning patterns. In the current pandemic era, Edmodo is very helpful in the learning process because it makes students more active, independent and responsible for their duties. As many as 96.55% of students think that the Edmodo application provides new nuances in capita selecta lectures. Because this is the first time they use it in learning. As many as 93.10% of students also became more

responsible, disciplined in collecting assignments and students found it easier to access lecture materials.

CONCLUSIONS

Based on the research conducted, it can be concluded that there is an increase in student learning outcomes scores from 65.172 (pre-test average score) to 84.586 (average post-test score) with an N-Gain score of 0.557 which is included in the moderate category. This shows that there has been a significant increase in student learning outcomes using the PjBL model and the edmodo application. The results of the student response questionnaire to the learning used were very positive. As many as 96.55% of students think that the Edmodo application provides new nuances in selective capita lectures. Students also become more responsible, disciplined in collecting assignments and students find it easier to access lecture material. Therefore, Project Based Learning (PjBL) learning model using the Edmodo application can be recommended to be applied by the lecture. In learning it would be better if digital-based learning media were added.

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