The Use of The Edmodo Application in Blended Learning to Improve Cognitive Abilities of Senior High School Students

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Abstract. This study aims to improve the cognitive abilities of students of High School 3 Merauke through the use of the Edmodo application in blended learning on the learning of hydrocarbon material chemistry. This research is a classroom action research. The object in this study is the students' cognitive abilities. The research subjects were students of class XI MIPA 7 High School 3 Merauke. The results showed that the use of Edmodo applications in blended learning on the learning of hydrocarbon chemistry material can improve students' cognitive abilities with the percentage of classical completeness of students' cognitive abilities reaching 76.47% in cycle I and 85.29% in cycle II.

1. Introduction
School is a formal educational institution organized by the government under the auspices of the Ministry of Education and Culture. One of the lessons taught in high school is chemistry. Chemistry is a science in which learning about matter includes composition, structure, properties, changes in matter and energy that accompany changes in matter. Chemistry is one of the difficult lessons for most high school students. This difficulty can be interpreted as a condition in the learning process which is characterized by the presence of certain obstacles faced by students. One indicator of student learning difficulties is low cognitive chemistry. Learning that is applied to the 2018 revised Curriculum 2013 requires students to be able to think higher or referred to as High Order Thinking Skill (HOTS). The learning system is required to follow the development of the 21st-century era where students must have 4C competencies, namely critical thinking, collaboration, communication, and creativity. Based on the 2015 PISA data, Indonesia was ranked 62 out of 70 participating countries, the results showed that the ability of students in Indonesia was still at a low cognitive level [1]. Cognitive abilities are the abilities to carry out brain activity (thinking activity) to gain knowledge [2]. According to [3], Students’ cognitive abilities became an important factor in determining the success of students in their studies.

Based on the pre-cycle observation results, researchers found that the chemistry learning outcomes of students in the cognitive aspects of class XI MIPA 7 in High School 3 Merauke were still low, with only 3 students or 8.82% achieving the minimum completeness criteria (KKM) of 34 students. The KKM set in High School 3 Merauke for class XI chemistry subjects is 68. Based on the results of interviews with teachers, the available time allocation is never enough to complete the material. Upon entering the final semester examination, the material for the semester is not yet finished. This has an impact on the previous material completion at the beginning of the new semester. This situation
always recurs in every semester, causing students' cognitive abilities to be low because students do not study the material carefully.

At present, the industry 4.0 era has begun. Education is one of the efforts to improve the quality of human resources and national development goals in the field of education is an effort to educate the nation's life by improving the quality of Indonesian people [4]. In the education sector, to face the industrial era 4.0 changes in the field of literacy are needed. In Indonesia, the government has a program to strengthen old literacy programs (reading, writing, and mathematics) with new literacy. The three new literacies are data literacy, technology literacy, and human literacy [5]. With these three skills, it is expected that graduates will be able to be competitive in the industrial 4.0 era.

Adaptation of the new literacy movement can be integrated by adjusting the curriculum and learning system in response to the industrial era 4.0 [6]. Learning that can be developed to address the challenges of the industrial era 4.0 is 21st-century learning. The use of information and communication technology (ICT) in all life, including in the learning process is one sign of change in the development of the 21st century. ICT enables communication to be easier, besides ICT also makes it easy for users to access various information quickly, anytime, anywhere. The use of ICT in the learning process will help the learning process become more innovative. This is in line with the statement [7] which says that the use of technology with new teaching methods can create an innovative learning environment, which allows teachers to organize learning more efficiently.

The implementation of 21st-century learning is e-learning. E-learning is the delivery of learning and training through ICT specifically designed to support individual learning or improve organizational quality [8]. E-learning allows distance learning to take place with ICT help such as computers and internet networks. By utilizing ICT, E-learning distributes learning materials, so students can access from anywhere [9]. That way, instructors and students can interact with each other by using computers bridged by the internet network.

Cost is one of the things that hinders institutions in building e-learning systems. In the manufacture and development of e-learning, it takes a lot of money to produce an e-learning system that is in line with expectations. Edmodo is one of the popular LMS [10] [11]. Edmodo is one of the unique and different LMS from other LMS. Compared to other LMS, Edmodo has several advantages, one of which is the system has been provided by the developer so that users (instructors & students) just use it without having to bother thinking about the development & maintenance of server devices and security systems used. This is in contrast to LMS moodle, claroline, dokeos, and docebo were to be able to use it must have its server device and have experts to maintain the hardware used, and to develop and maintain the system that is used regularly. With the advantages possessed by Edmodo, this LMS is one of the choices that can be used in the use of e-learning especially in schools that have limitations in terms of financing the creation and development of e-learning.

The use of ICTs is a central part of 21st-century education that must be optimized to create sophisticated learning and maximize the quality of students in the future [12]. The development of ICTs will affect the learning process which initially is face-to-face learning that is done conventionally, will shift to be more open by utilizing ICT as a learning media. The results of the study [13] show that in the past 20 years there has been a shift in the development of education towards ICT as one of the 21st-century management strategies which include institutional governance and human resources. Learning developed in the 21st century tends to combine conventional learning with ICT-based learning or better known as blended learning. The 21st century will be remembered in the history of education as the beginning of blended learning [14]. Blended learning is a flexible approach to designing programs that support a mixture of different times and places to learn [15].

Blended learning is learning that combines face-to-face and online learning [16]. In the research conducted by [9], it was found that blended learning can maximize the instructor's time in planning and conducting learning, as well as being able to provide data about the activities carried out by students in detail. The combination of face-to-face learning in the classroom with e-learning using the Edmodo application is expected to be able to answer the challenges of 21st-century learning [17]. Edmodo will make learning more innovative, so learning will run flexibly. With blended learning, the
instructor will be easier to organize and plan learning, so that learning will be more efficient. The use of the Edmodo application in blended learning will have a positive impact on learning.

2. Method
This research is classroom action research (CAR) conducted in the classroom through learning activities by applying blended learning using the Edmodo application on hydrocarbon material. CAR is action research carried out in the classroom when learning takes place [18]. The class action research model was adopted from the Kemmis and McTaggart models. This study consisted of 2 cycles, in which each cycle consisted of four activities, namely planning, action, observation, and reflection. Learning that is applied is blended learning between discovery learning and the application of Edmodo applications.

The location of this study is in High School 3 Merauke. The time of the study is conducted in the odd semester of the 2018/2019 academic year. The subjects in this study were all students of class XI MIPA 7, amounting to 35 students consisting of 13 male students and 22 female students. The object of this research is the students' cognitive abilities. Classical completeness Cognitive Ability is set at more than 80% of students achieving KKM (KKM value of chemistry class XI subjects is 68). Data collection techniques use the method of observation, tests, and interviews. The data analysis technique uses descriptive quantitative, namely by analyzing data with descriptive statistics then presented in the form of tables, graphs, and diagrams.

3. Result and Discussion
The application of blended learning is still rare in schools in Merauke. This is constrained due to the inadequate internet network facilities and infrastructure to implement the learning. Based on research conducted by [19], schools in Merauke District have installed wifi facilities, but the wifi signal coverage is not yet wide and cannot reach all existing classes. This situation prevents teachers from implementing blended learning. This also happens in High School 3 Merauke, there is already a wifi network that can be utilized by students. However, the facilities at the school still have weaknesses, namely the uneven distribution of wifi to reach each class.

The use of the Edmodo application in blended learning to improve the cognitive abilities of students of High School 3 Merauke is by mixing discovery learning models for face-to-face learning and Edmodo applications for online learning. In the pre-cycle stage, there were only 3 out of 34 students whose cognitive abilities were complete. This completeness is seen from the KKM value for chemistry in class XI which is 68. This is because learning, which is mostly teacher-centered and the time allocation in completing learning is always not enough so students are not always mature in learning the material. Data on completeness of cognitive abilities of students on pre-cycle can be seen in table 1.

| Chemical Value | Total students | Total students (%) | Conclusion |
|----------------|---------------|--------------------|------------|
| < 68           | 31            | 91.18              | Incomplete |
| > 68           | 3             | 8.82               | Complete   |

Table 1. Data on completeness of cognitive abilities of students on pre-cycle

After applying blended learning, namely mixed learning between discovery learning and the use of Edmodo applications on hydrocarbon material in the first cycle, students' cognitive abilities showed
that there was not yet complete classical completeness of students' cognitive abilities, namely only 25 students or 76.47% of 34 students who completed. This is because the enthusiasm of students still looks lacking, students are still confused in using the Edmodo application. Students are still not used to using e-learning media to be used in learning. In the implementation of discovery learning students have not been seen actively in group work and during the discovery process to find answers, students still rely on each other's friends who are smarter in their groups. Data on completeness of cognitive abilities of students in the first cycle can be seen in table 2.

Table 2. Data on completeness of cognitive abilities of students in the first cycle

| Chemical Value | Total students | Total students (%) | Conclusion |
|----------------|----------------|--------------------|------------|
| < 68           | 6              | 23.53              | Incomplete |
| > 68           | 26             | 76.47              | Complete   |

The implementation of the action on cycle II researchers used blended learning between discovery learning models and Edmodo applications that have been improved based on reflection in cycle I. The cognitive abilities of students based on the results of the second cycle test revealed 29 students or 85.29% of 34 students had achieved completeness. So it can be concluded that classical completeness of more than 80% of students achieving KKM has been achieved by applying blended learning. Data on completeness of cognitive abilities of students in the second cycle can be seen in table 3. The second cycle of learning has gone well. Students understand that learning using blended learning helps them learn more about the material and can understand the material well. In terms of the use of Edmodo, students have been very enthusiastic because Edmodo is very interesting to use in learning. They like playing social media while learning. With blended learning, student literacy skills will also be more honed and students will not miss the material or study the material incompletely.

Table 3. Data on completeness of cognitive abilities of students in the second cycle

| Chemical Value | Total students | Total students (%) | Conclusion |
|----------------|----------------|--------------------|------------|
| < 68           | 5              | 14.71              | Incomplete |
| > 68           | 29             | 85.29              | Complete   |

Based on the results of students' cognitive abilities in the pre-cycle, cycle I and cycle II as shown in figure 1, it can be concluded that students' cognitive abilities increase. In the first cycle, the cognitive abilities of students have increased but have not yet achieved the classical completeness that has been set which is at least 80%. So it is necessary to continue the action in cycle II. The results of the analysis of cognitive abilities in the second cycle showed that the increase in cognitive ability was greater than the first cycle and the percentage of classical completeness had reached the set target, therefore the action was stopped in cycle II.
Figure 1. The results of students' cognitive abilities in the pre-cycle, first cycle and second cycle

The results of this study are consistent with research conducted by [20] that cognitive abilities including learning outcomes can be increased by the use of Edmodo electronic media in blended learning. Through mixed learning, students not only learn when face to face in class but learning is continued with an online system through the Edmodo application. So that the little time allocation problems available in the class can be overcome by learning wherever and whenever using the Edmodo application. Some screenshots of the Edmodo application used in this study can be seen in Figure 2.

Figure 2. Some screenshots of the Edmodo application used in this study
During the implementation of this research, researchers found constraints during the use of the Edmodo application in blended learning High School 3 Merauke, so the researcher gave several suggestions, namely, the application of blended learning with the Edmodo application would run well if the facilities in the school supported these learning activities, the teacher must pay attention to the level of ability of students when forming groups so that heterogeneous groups are formed so that discussion activities can run smoothly, the use of time in applying blended learning must be considered so that learning can run well.

4. Conclusion

Based on the results and discussion that has been described, it can be concluded that the use of the Edmodo application in blended learning on the learning of hydrocarbon chemistry material can improve the chemical cognitive abilities of class XI students of Mipa 7 Merauke 3 High School. This is evidenced by the increase in the percentage of classical completeness from pre-cycle 8.82% to the first cycle of 76.47% and the second cycle 85.29%.

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