Analysis of Physics Learning Outcomes in Eleventh Grade Natural Science Students of Public Senior High School in Palembang After Using E-Learning During COVID-19 Pandemic

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Abstract. The purpose of this study was to determine the comparison of student learning outcomes after carrying out Physics learning activities using e-learning during COVID-19 pandemic. This type of research is descriptive qualitative with a comparative method. The sampling technique was simple random sampling with three public senior high schools in Palembang, as many as 360 eleventh grade natural science students in two classes of the first semester in the academic year 2019/2020 and 2020/2021. The instruments used are interview guides and documentation studies. Analytical techniques using a review of the study documentation assessment of each basic competence of Physics in the first semester of eleventh grade natural science and interviews with same Physics teacher in different academic years. From the results of documentation studies in three public senior high schools equally have significant differences in minimum competency standards for Physics material of elasticity from different academic year, also the results of interviews with the teacher this result happened because many students did not understand and had problems working on the assignment, besides that there were more obstacles in online learning compared to offline learning.

1. Introduction

The COVID-19 pandemic has resulted in extraordinary changes, including education. All levels of education are adapting to online learning from home. The problem in the world of education is that the learning process is not yet uniform, both the standards and the quality of the desired learning outcomes. Various learning media applications are also available. The government of Indonesia issued a circular letter from the Minister of Education and Culture number 9/2018 regarding the use of learning from home. These accesses can be used to develop knowledge and insights that are indispensable in improving student learning outcomes.

With the decision to study at home by the government, children do not have the concentration of learning like school. The development currently experienced by children has limitations due to lack of training in the form of repetition of activities as is usually done at school. Current development experienced by children has limitations due to lack of training in the form of repetition of activities as is usually done in schools [1].

The implementation of online learning in Indonesia, which was carried out, suddenly caused several problems. Online learning is followed by good technology and good human resource readiness. Online learning makes excellent use of the internet network. Meanwhile, in Indonesia, there
is no internet network evenly, especially in rural areas. This factor is what disrupts the online learning process. The ability of teachers and students to take advantage of technology is also not optimal, causing learning to sometimes not run smoothly. Such a situation opens the opportunity to research online learning to be more effectively applied in times of a pandemic [2].

The government of Indonesia has implemented the national curriculum since July 2016. The K-13 curriculum has an assessment aspect, namely skills, knowledge, social and spiritual, with the COVID-19 pandemic an emergency curriculum is applied. This COVID-19 emergency curriculum is implemented to ease teachers in fulfilling the national curriculum as well as for students in relation to the determination of grade promotion and graduation, where the COVID-19 emergency curriculum with online learning that can be measured is the aspect of knowledge and skills only. Online learning is one of the essential things in the era of the industrial revolution of 4.0 [3]. It is necessary to evaluate student Physics learning outcomes after using e-learning during the COVID-19 pandemic by comparing it with learning before the pandemic, to independently see the impact of both planned and unplanned programs and recommendations on whether to continue, improve, or stop.

Researchers want to know how learning activities after using e-learning during the pandemic, student learning outcomes after using e-learning during the pandemic compared to before the pandemic and analysis of the factors that affect student learning outcomes after using e-learning during the pandemic. The purpose of the study was to analyze the results student learning after carrying out Physics learning activities using e-learning during the COVID-19 pandemic. This research is expected to be a teacher's description of student learning outcomes in Physics material after carrying out learning activities using e-learning during the COVID-19 pandemic.

2. Method

This research is shown to obtain accurate data or information based on an empirical description of the Physics learning outcomes of eleventh grade natural science students of public senior high school in Palembang after using e-learning during the pandemic and comparing student learning outcomes before the COVID-19 pandemic, so this study uses a comparative method with one shot case design and qualitative descriptive research type. The instruments used are listed in table 1 below:

| Aspect                        | Indicator                                                                 | Source Data   | Instruments                      |
|-------------------------------|---------------------------------------------------------------------------|---------------|----------------------------------|
| School Profile                | Name of school, availability of learning media                           | Teacher       | Interview guidelines             |
| Student, teacher              | Number of students, curriculum used, lesson plans                        | Teacher       | Documentation study              |
| Implementation and learning activities | Learning activities, use of learning media, student assignments       | Teacher       | Interview guidelines             |
| Student learning outcomes     | Student learning outcomes for each class of each competence Physics material in first semester | Teacher       | Documentation study              |

Data collection techniques using interviews and documentation studies, the researcher needs to start with basics with the interviews. There are main aspects that include appropriate personal and topic introduction, coupled with the construction of a good rapport to underline the efficiency of the entire process. This means that researcher will begin by easy questions moving towards the complex ones. With all important factors under consideration, the interview should not be long. The interviewer should assert some authority, but not so much that it makes the participant tense [4].

There are seven interview questions made by researchers to obtain information about schools and student learning activities using e-learning during the pandemic and learning activities before the COVID-19 pandemic. This question was given to Physics teachers who teach from three different schools. The question can be seen from table 2 below:
Table 2. List of interview questions

| No | Questions                                                                 |
|----|---------------------------------------------------------------------------|
| 1  | What media are used when carrying out Physics learning activities before and after the pandemic? |
| 2  | What strategies are applied in learning before and after the pandemic?    |
| 3  | What learning models in the lesson plans were applied before and after the pandemic? |
| 4  | How to assess student learning outcomes before and after the pandemic?   |
| 5  | What types of assignments were given to students before and after the pandemic? |
| 6  | What obstacles did teachers experience when teaching Physics before and after the pandemic? |
| 7  | How do teachers monitor students during learning before and after the pandemic? |

Document analysis is a systematic procedure for reviewing or evaluating documents both printed and electronic (computer-based and Internet-transmitted) material. Like other analytical methods in qualitative research, document analysis requires that data be examined and interpreted in order to gain understanding, and develop empirical knowledge [5]. Researchers use documentation studies as useful data to increase knowledge including student learning outcomes after using e-learning during the COVID-19 pandemic and as a comparison researchers also take student learning outcomes before the COVID-19 pandemic. Documentation consists of learning activities that have been carried out, teacher lesson plans, list of grades for first semester eleventh grade natural science Students at 2019/2020 school year and first semester at 2020/2021 school year.

Physics is a subject that is rich in knowledge, and the laws of physics always expressed in the form of mathematical equations [3], mathematical physics is a tool for students in analyzing various physics problems through accurate calculations [3]. Basic competencies based on Physics material for first semester eleventh grade natural science, the basic competencies used in the study can be seen from table 3 below:

Table 3. Basic competencies of Physics materials in research

| No | Materials                                         |
|----|---------------------------------------------------|
| 1  | Rotational Dynamics and Equilibrium of Rigid Body |
| 2  | Elasticity                                        |
| 3  | Static Fluid                                     |
| 4  | Dynamic Fluid                                    |
| 5  | Temperature and Heat                              |

The following is the category of the percentage of student learning outcomes according to table 4 [2] as follows:

Table 4. Rating of class completion percentage

| Success Interval | Category     |
|------------------|--------------|
| 76-100%          | Very good    |
| 51-75%           | Good         |
| 26-50%           | Good enough  |
| 0-25%            | Less         |

The population in this study were 26 public high schools in Palembang and the samples in this study were 3 public high schools in different sub-districts in Palembang with simple random sampling technique, these three high schools were high school A in Seberang Ulu 2 District, high school B in Gandus District and high school C in Seberang Ulu 1 District. The sample used in the study can be seen in the following table:
Table 5. The number of students for the sample in the academic year 2019/2020

| High School | Male | Female |
|-------------|------|--------|
| A           | 20   | 40     |
| B           | 15   | 45     |
| C           | 25   | 35     |

Table 6. The number of students for the sample in the academic year 2020/2021

| High School | Male | Female |
|-------------|------|--------|
| A           | 15   | 45     |
| B           | 17   | 43     |
| C           | 21   | 39     |

Data analysis used qualitative descriptive according to Miles and Huberman model [6], which can be described as follows:

Figure 1. Qualitative descriptive data analysis

Figure 1 is qualitative descriptive method in this research. The first process is data collection from documentation study of student learning outcome, and interview from teacher for each school. Second process is data reduction that researcher can get rid of unnecessary parts and organize data to get the final conclusions that can be drawn and verified. Third process is data display which is an organized, compressed assembly of information that permits conclusion drawing and action, and the fourth process is draw conclusions it must go back to see the data to be verified. The conclusions do not only occur at the time of the data collection process, but need to be verified.

3. Result and Discussion

3.1 Interview Results

Starting from the first question, three schools, namely high school A, high school B and high school C have the same media used, books and student worksheets, and a science laboratory room, the media was used when there was no pandemic. When there was a COVID-19 pandemic, the media used by the three schools had something in common, namely e-learning and assisted by WhatsApp, then there were differences in the e-learning used by these three schools. High school A uses Zoom Meeting and Google Classroom. High school B uses an e-learning application that is used on mobile phones, High school C uses an existing e-learning website from the school.

Question two, before the pandemic, the Physics teachers in the three schools had something in common, namely doing practicum at school, the difference was that teachers who taught at high school A used discussion, question and answer, and assignment learning strategies. Physics teachers who teach at high school B often use discussion and assignment learning strategies. The Physics teacher who teaches at high school C uses a strategy where the Physics material adjusts the teacher's learning strategy. After the pandemic, teachers from each school were more likely to rely on e-learning because it was very difficult for teachers to meet directly with students. The learning strategies in the three high schools when using e-learning are the same, assignments and Physics materials are delivered directly via whatsapp or learning videos.
Question three, before the pandemic, the learning model of three schools referred to the lesson plans that already existed in their school respectively. Physics teachers at high school A prefer to use the learning models that are already used in the lesson plans but are not always used, the learning model is discovery learning. The Physics teacher at high school B adapts the material to the learning model, the learning model is also the same as in high school A, namely discovery learning. The Physics teacher at high school C has the same learning model as high school A and high school B, but the discovery learning model is used in all Physics materials. After the pandemic, teachers switched to using online lesson plans by using e-learning at each school, there was no fixed learning model in online lesson plans from three schools in learning activities during the COVID-19 pandemic.

Question four. Before the pandemic, the teachers in the three schools assessed students by giving practice questions after learning took place in class. This assessment is used to see student learning outcomes for each basic competency in Physics material. After the pandemic, teachers in three schools conducted various assessments through e-learning. Teachers from each school consistently conduct computer based test assessments, and see the condition of students first, there are those who conduct assessments at school directly, using computer based tests and via whatsapp.

Question five. Before the pandemic, Physics teachers in high school A, high school B and high school C often did assignments in the form of group assignments, namely making tools or practicums and individual assignments in the form of practice questions that were collected at the next meeting. After the pandemic, Physics teachers from each school through e-learning gave almost the same assignments like before the pandemic, except that group assignments were abolished. Individual assignments in the form of practice questions are collected through e-learning in the form of certain files with a predetermined time.

Question six. Before the pandemic, teachers in three different schools had the same obstacles during learning before the pandemic, namely the delay of students collecting assignments, students who did not listen to teacher when explaining the Physics material, students understanding of initial concepts was lacking when given practice questions. After the COVID-19 pandemic, teacher obstacles increased, namely it was very difficult for teachers to monitor students because distance learning used e-learning from each school. The teacher can explain directly through the Zoom Meeting or Google Classroom, it's just that only a few students use it because of the lack of student media in the form of laptops or cellphones, and students who live in areas that low internet signals have more difficulty listening to Physics material when learning takes place at the Zoom Meeting or Google Classroom.

The limitation of e-learning such as access through a wired or wireless device system or a modem, all users must be connected to the network. The computer must have the appropriate software and hardware installed in order to access the internet. In a wireless system, the user must have the necessary permissions to use the system. Signal strength is also an issue in wireless connections. The weaker the signal, the less likely it is that will be able to send and receive data [7].

Question seven. Teachers in three different schools before the COVID-19 pandemic monitored students in the classroom during learning. After the pandemic, teachers in three different schools monitored students through their respective e-learning, assisted by using the Zoom meeting application or Google Classroom, but it was still very difficult to know what students were doing during the learning process because of the obstacles mentioned in the question six.

From these seven questions, it can be concluded that each school carried out learning activities using e-learning during the COVID-19 pandemic, but many obstacles were experienced by students during learning using e-learning. According to Matthew Comerchero [8], e-learning is an educational tool that includes self-motivation, communication, efficiency, and technology, because there are limitations in social interaction, students must keep themselves motivated.

3.2 Documentation Results
Documentation was collected through teacher assessment journals from each of three different schools, students were taken from three public senior high schools in Palembang as many as 60 students of class eleventh grade natural science in two different academic years, namely the 2019/2020 school year and the 2020/2021 school year. The total number of students in this study was 360 students. Documentation studies are used to see student learning outcomes through e-learning during the COVID-19 pandemic through teacher assessments of each basic competency in Physics material and comparing it with student learning outcomes before the pandemic, the minimum
competency standard has been determined by each teacher from three schools which is 70. The percentage of student learning outcomes can be seen from table 7 and table 8 as follows:

Table 7. Percentage of students who reach minimum competency standards (70) Physics materials for the 2019/2020 academic year

| School | 1 M | 2 F | 3 M | 4 F | 5 M | 6 F | 7 M | 8 F | 9 M | 10 F | Average |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|---------|
| A      | 100% | 96% | 100% | 93% | 91% | 97% | 100% | 93% | 98% | 95% | 97% |
| B      | 95% | 93% | 98% | 91% | 97% | 99% | 100% | 100% | 93% | 99% | 97% |
| C      | 100% | 100% | 94% | 100% | 98% | 98% | 96% | 98% | 95% | 90% | 97% |

Table 8. Percentage of students who reach minimum competency standards (70) Physics materials for the 2020/2021 academic year

| School | 1 M | 2 F | 3 M | 4 F | 5 M | 6 F | 7 M | 8 F | 9 M | 10 F | Average |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|---------|
| A      | 70% | 70% | 52% | 60% | 76% | 74% | 71% | 69% | 71% | 73% | 69% |
| B      | 80% | 76% | 62% | 54% | 73% | 77% | 70% | 70% | 71% | 75% | 71% |
| C      | 70% | 74% | 54% | 52% | 75% | 75% | 72% | 74% | 76% | 74% | 70% |

Based on table 5 and table 6, namely the percentage of student learning outcomes from each school, it can be seen that the use of e-learning is still not optimal and there are many obstacles. All basic competencies when compared to first semester of the 2020/2021 academic year experienced a significant decrease seen from the average minimum competency standard.

Students experienced the lowest decrease in the achievement of learning outcomes on Elasticity material basic competence from all basic competencies studied in the 2020/2021 school year where public senior high school A male 52% female 60%, high school B male 62% female 54% and high school C male 54% female 52%, these three schools were in good category. Students in the 2019/2020 academic year on the basic competencies of elasticity material where public senior high school A male 100% female 100%, high school B male 98% female 91% and high school C male 94% female 100%, in very good category, because teachers can provide assessments and monitor student activities directly so that if students have obstacles the teacher can help these students.

3.3 Factors of Decreasing Student Learning Outcomes After Using E-Learning

From the results of the study, all basic competencies for student learning outcomes experienced a significant decrease after using e-learning, where using an emergency education curriculum that was undertaken with distance learning the results were not effective, learning was carried out by students independently because the teacher could not directly guide students during the activity. learning, it is one of the factors that causes the decline in student learning outcomes while using e-learning, from the results of teacher interviews they can use zoom meetings or google classroom to monitor students while using e-learning but many other obstacles such as low internet signal there are students who cannot use the application because of the media that does not support it, so the teacher can only give individual assignments to students and videos of Physics learning materials so that some students still do not understand the concepts in Physics material.

Another factor is the lack of discipline of students during studying Physics using e-learning. Based on interviews, many students are still late in collecting assignments, while students do not listen to the Physics material. The curriculum is also one of the factors that causes the decline in student learning outcomes while using e-learning. The national curriculum, namely the K-13 curriculum, has assessment aspects, namely skills, knowledge, social and spiritual. All of these aspects can be done by teachers during learning before the pandemic, because teachers can do it directly in the classroom. Due to the COVID-19 pandemic, an emergency curriculum was implemented to ease teachers. This emergency curriculum applies online learning and the assessment aspect is limited such as the skills and knowledge aspects so that students when doing Physics lessons cannot be seen directly by the teacher.
The data on student learning outcomes before and after the COVID-19 pandemic is in line with the results of interviews with teachers, the results of the study before the pandemic students who achieved very good minimum competency standards when linked to the results of interviews because teachers can monitor students so that if students have problems the teacher can help them directly. Meanwhile, after the COVID-19 pandemic, student learning outcomes that reached the minimum competency standard decreased significantly and this is in line with the results of teacher interviews due to the lack of student media in using e-learning, low internet signal, difficulty for teachers to monitor students during study with e-learning. Students do not understand concepts and misconceptions often occur, find it difficult to understand concepts and prefer memorizing rather than prioritizing understanding [9].

The research from this study is also in line with what other researchers do [10], students consider that the online educational process has less value than the traditional process, students believe the process of learning is poor with the online learning and could result in poorer learning outcomes. online learning will affect students' performance especially when attending more difficult courses in which professors did not have well adapted methods of teaching, a student-focused educational process involves assigning more responsibilities to students and more tasks, but unfortunately, because students were not accustomed to this type of learning they felt pressured, thus being more prone to develop negative attitudes towards online teaching and learning. Teachers used diverse tools while delivering courses online in order to make the course more attractive and teachers often failed to express clearly their expectations.

4. Conclusion
From the results of interviews, the three schools have conducted learning activities using e-learning during the COVID-19 pandemic, but students experience many obstacles when using e-learning. Learning outcomes data also shows that students experience is decrease in learning outcomes while using e-learning in first semester of the 2020/2021 academic year, compared to first semester of the 2019/2020 academic year, the achievement of student learning outcomes is very high. The influencing factors are that teachers and students can interact during Physics learning activities in the classroom before the pandemic, in addition to that which causes a decrease in student learning outcomes while using e-learning such as the lack of student media and low internet signal, as well as the difficulty of teachers monitoring students who are using e-learning.

5. Acknowledgement
The author would like to thank the lecturers at the Departemen Pendidikan Fisika, Universitas Pendidikan Indonesia who have guided and various parties who have assisted in the preparation of this research journal.

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