The effect of Learning Starts with a Question (LSQ) through WhatsApp media in the COVID-19 pandemic era in the mastery of Differential Equations

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Abstract. This research aims to prove the effectiveness of learning with LSQ during the COVID-19 pandemic. The research method used is a quasi experiment by comparing face-to-face learning and LSQ learning using WhatsApp. The instrument used is a differential equation test. The results is online LSQ using WhatApps can improve student learning outcomes compared to face-to-face learning. Interaction between students and lecturers during online learning occurs interactively so that student motivation to learn also increases. Furthermore, the application of LSQ needs to be developed in other courses and different engineering fields. The results of this study indicate that LSQ learning with WhatApps Media can be used as an alternative solution in learning in the COVID-19 Pandemic Era.

1. Introduction
The challenge in education during the COVID-19 pandemic is learning activities [1]. In accordance with health protocols, teachers and students cannot carry out face-to-face learning in class. One solution to keep learning going, one of which is online learning [2]. Students and teachers in Indonesia are not used to doing full online learning. Of course, there are many obstacles, including the Electrical Engineering students of UNISNU Jepara. Various applications supporting online learning, such as teleconferences, are used as a substitute for direct face-to-face learning [3]. However, in Indonesia, this is a privilege if used at any time because it requires a sufficiently strong quota and signal, while in some regions in Indonesia, it has not supported this [4].

Based on this background, researchers are trying to find learning solutions that are considered more effective, both for teachers and students. It is hoped that the learning will run smoothly even though it is done online, and the learning objectives are also achieved. The learning offered is Learning Starts with a Question (LSQ). This learning allows students to be able to ask questions during learning actively. By asking questions during learning will encourage students to think critically during learning related to the concepts being studied [5]. Several experts have researched LSQ and the results can have a positive influence on student learning outcomes [6][7][8][9][10][11][12].

Learning activities in LSQ are divided into three stages, namely initial activities, core activities, and final activities [14]. In the initial activity, the teacher explains the learning objectives and provides perceptions and motivation to students. In the core activity, the teacher divides the class into 7 groups, consisting of 4 students. The teacher allows each group member to submit questions that have been
made at least 1 question. Next, the teacher asks students to discuss the questions that have been presented in the group. Then, students present their discussion results. In the final activity, the teacher and the students summarize the material that students have learned. The teacher reflects on the activities that have been carried out. The teacher gives a quiz to find out students’ understanding, the teacher tells the material to be discussed at the next meeting, and asks students to make questions based on the material they have read. At the end of the lesson, the teacher closes the learning activities.

In LSQ, students are emphasized to make at least 1 question [14]. Asking questions is important because asking questions is a way of expressing curiosity about unknown or previously unknown answers. This curiosity is an effective encouragement or stimulation in the learning process or seeking an answer. The quality of the learning process that occurs can be seen from the quality of the questions asked by students. By getting students to ask questions, students will be encouraged to experience a better learning process than before [15]. Before asking questions, students must study at home first. When studying, students will try to understand the material being studied. Only things that were not understood he would ask as a question. Over time, students will only ask questions that are really important to ask because they may feel embarrassed if they ask trivial questions in class forums.

In this time of the COVID-19 pandemic, more students will study independently at home. By asking students to ask questions related to the material, students will be encouraged to maintain the quality of their learning at home, even if they are not facing to face with the teacher. Based on the above background, this study aims to prove the effectiveness of learning with LSQ during the COVID-19 pandemic.

2. Methods

2.1. Research sample
The research was conducted in the even semester of the 2019/2020 academic year in the range of February-April 2020. The research sample was selected by providing equal opportunities to a group of students in the class so that the sampling technique used was cluster random sampling. The sample of this research is the fourth-semester students of Electrical Engineering UNISNU Jepara, who are studying differential equations course. Before doing the research, the normality test using the Lilliefors method was carried out first to find out whether the sample came from a normally distributed population [13]. The results show that the sample comes from a normally distributed population.

2.2. Instrument and procedure
The learning strategy is carried out online using WhatApps media by implementing Learning Starts with a Question (LSQ) learning during the COVID-19 pandemic. At this stage, the learning device has been validated by two validators and gives the conclusion that the learning tools in the form of lesson plans, lecture teaching materials, and learning media are suitable for use. The test questions were arranged according to the syllabus used in the Electrical Engineering study program, UNISNU Jepara. The test questions were first validated by two experts, then tested to determine the reliability, difficulty level, and distinguishing power of the items. The results of the trial analysis of the test instrument showed that there were items made that could be used as questions in the study.

2.3. Data Analysis

2.3.1. Statistic T-test. The t-test was used to measure differences in student learning outcomes before the COVID-19 pandemic (face to face) and during the COVID-19 pandemic (LSQ online learning using WhatApps). The t-test result data follows the following hypothesis:

- $H_0: \mu_1 = \mu_2$ (learning outcomes of online LSQ using WhatApps are the same with face-to-face learning)
- $H_a: \mu_1 \neq \mu_2$ (learning outcomes of online LSQ using WhatApps are different from face-to-face learning)
2.3.2. **Mastery learning.** Students who take online LSQ using WhatApps are said to be mastery learning if they get a score of 70, and classically mastery learning is fulfilled if at least 85% of students who take online LSQ using WhatApps finish the class [16]. A value of 70 is the minimum learning completeness criteria set by the Electrical Engineering study program, UNISNU Jepara.

3. **Result and discussion**

3.1. **Prerequisites test**

The results of the normality test using the Lilliefors method showed that $L_{obs} = 0.107 < L_{table} = 0.206$, with $p = 5\%$ and $n = 17$. It can be concluded that the research sample applied to LSQ online learning using WhatApps came from a normally distributed population.

3.2. **Test research data**

After the prerequisite test was fulfilled, a two-party t-test was carried out to determine the differences in learning outcomes of Electrical Engineering students of UNISNU Jepara from the application of face-to-face learning and LSQ online learning using WhatApps. It is presented in Table 5 that $t_{obs} = -3.241$, with a value of $v = 17 - 1 = 16$ and $p = 0.025$, the obtained $t_{table} = 2.120$.

It can be concluded that the learning outcomes of online LSQ using WhatApps are different from the learning outcomes of face-to-face learning. Table 1 clearly shows that the mean difference in each learning activity is to conclude that the online LSQ using WhatApps provides better learning outcomes than face-to-face learning.

| Table 1. The results from the $t$-test. |
|----------------------------------------|
| n | mean | Standard Deviasi | $t_{obs}$ | $t_{table}$ | Hypothesis | Remark |
|---|------|------------------|----------|-------------|-------------|--------|
| Online LSQ using WhatApps | 17 | 94.118 | 5.57 | -3.241 | 2.120 | $H_0$ reject |
| Face-to-face learning | 17 | 76.471 | 6.17 |

Table 2 shows the scores of the research class, where the scores were taken before and after learning online LSQ using WhatApps during the COVID-19 pandemic. The achievement of student learning completeness during face-to-face learning shows that ten students have completed their studies or the equivalent of 58.823%. While the achievement of student learning completeness during LSQ online learning using WhatApps was obtained that 16 students completed their studies. This shows that almost all students have completed the standard; in Indonesian, it is said as KKM.

| Table 2. Mean and Mastery Learning Percentage. |
|-----------------------------------------------|
| Mean | Mastery learning Percentage |
|------|-----------------------------|
| Online LSQ using WhatApps | 94.118 | 94.117% |
| Face-to-Face learning | 76.471 | 58.823% |

It is clear that student learning outcomes during online learning LSQ using WhatApps are better than student learning outcomes during face-to-face learning. This shows that during the COVID-19 pandemic, the efforts of Electrical Engineering students at UNISNU Jepara to study differential equations were powerful. Interaction for discussions between lecturers and students is not only limited to lecture hours but can be done all the time because it uses WhatApps as a learning medium [6][7][12][17][18]. In implementing LSQ, the lecturer starts learning by giving questions asked by students. Students are grouped into several WhatApps Groups to encourage students to ask questions.
and understand the concept of the material provided by the teacher so that students can solve problems. The use of LSQ in learning is needed because students independently understand the lecture material before the lecturer delivers the material [9][17][19].

This study also shows that there is a strong correlation (correlation 0.686) between face-to-face learning and LSQ online learning using WhatApps. The difference in student learning activeness also looks significant during online LSQ using WhatApps. It happens because the implementation of LSQ using WhatApps is very attractive to students. After all, students are allowed to ask questions actively during learning activities [8][10][11][19]. Furthermore, lecturer creativity is also an important factor in learning activities so that it is more enjoyable. The LSQ learning process using WhatApps as described by [9][10][12][20] can increase student activity and motivation, and this learning also helps students to construct their understanding independently. It is very important because it will increase students’ confidence to study harder [21][22][23].

4. Conclusion
Online LSQ using WhatApps can improve student learning outcomes compared to face-to-face learning. Interaction between students and lecturers during online learning occurs interactively so that student motivation to learn also increases. Furthermore, the application of LSQ needs to be developed in other courses and different engineering fields. The results of this study indicate that LSQ learning with WhatApps Media can be used as an alternative solution in learning in the COVID-19 Pandemic Era.

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