Emergency remote teaching experiences of mathematics education lectures to address COVID-19 pandemic

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Emergency remote teaching experiences of mathematics education lectures to address COVID-19 pandemic

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Abstract. The Covid-19 pandemic has had an impact on change in various fields, including in higher education. This study provides an overview of the survey result of the experience of 14 lecturers of the Mathematics Education Study Program at the University of Sanata Dharma towards learning in responding to Pandemic Covid-19. The intended experience includes the strategies and technologies used in learning, learning success in terms of the achievement of objectives and student involvement, and planning for future learning. The results showed that (1) all lecturers conducted distance learning by utilizing various kinds of technology both synchronous and asynchronous as a form of learning adjustment to face a pandemic. (2) Although there was an adjustment in learning, most mathematics learning can run according to learning achievements. (3) The Mathematics Education lecturer will implement an improvement in learning that must be carried out online. The improvement is in the form of preparation and planning of learning, the use of more varied technologies, the use of more innovative methods of delivering material, adjustment of learning in terms of learning achievement and evaluation while still focusing on developing student experience.

1. Introduction

The world is currently experiencing an emergency due to COVID-19. On March 11, 2020, the World Health Organization (WHO) declared that COVID-19 is a global pandemic[1]. This pandemic has had a remarkable impact on change in various sectors, including in the field of education. In the same month, UNESCO estimated that within two months, 850 million people had switched to alternative forms of teaching and learning throughout the world [2].

In Indonesia, the government responded by issuing policies to conduct the learning process at home through online distance learning [3]. The policy applies to schools and colleges in Indonesia. Teaching and learning activities in schools stopped. 45.5 million school students and 3.1 million teachers depend on online teaching and learning that they have never experienced before. Teachers, schools, curriculum, and students experience obstacles in the process of adjusting. Of the four aspects, students experience the greatest obstacles in the process of adjusting to online distance learning [4].

Universities in Indonesia think hard to continue the learning process while still paying attention to health protocols amid a health emergency like this. Many universities do not continue their face-to-face learning and turn activities on campus into online activities, as well as Sanata Dharma University (USD), Yogyakarta. Since March 2020, the USD Director has adopted a policy of implementing online distance learning. The terms of distance learning and online learning itself are not new, but this term is not appropriate when used in responding to the intended learning conditions.

Emergency remote teaching (ERT) is a temporary shift of instructional delivery to an alternate delivery model due to crisis circumstances. It involves the use of fully remote teaching solutions for instruction or education that would otherwise be delivered face-to-face or as blended or hybrid courses and that will return to that format once the crisis or emergency has abated. The primary objective in these circumstances is not to re-create a robust educational ecosystem but rather to provide temporary access to instruction and instructional supports in a manner that is quick to set up and is reliably available during an emergency or crisis [5]. Henceforth, this study will use the term emergency remote teaching.

Many researchers research learning in the COVID-19 Pandemic situation at the college level. For example, [6] researched the impact of learning changes for teachers of higher education institutions in the Ghaziabad region, India. The Researchers [7] investigating education in the Pandemic Period in Indonesia. Both studies have the same study, which investigates education in the pandemic period in general, not specifically in learning mathematics. Other research investigates the upheaval in higher education arising from COVID-19, its impact on institutions, faculties, and students based on experience "in the field." [8],[9],[10],[11],[12]. The research is in-depth but has not specifically studied mathematics learning. Other studies investigating mathematics learning but not as thoroughly as that of by [13]. The study compared the two technologies in online learning experimentally.

From the study of researchers, research that discusses the Emergency Remote Teaching (ERT) in learning mathematics is still small. Therefore it is important to conduct research on emergency remote teaching in mathematics learning at the college level sourced from the experience of lecturers to further enrich the findings of the application of mathematics learning in the pandemic. The purpose of this study is as follows: 1) describe the implementation of an Emergency remote teaching in mathematics learning based on the learning strategies and technologies used, 2) describe the success of the Emergency remote teaching process based on student involvement and achievement of learning objectives, and 3) find out the follow-up to future learning. The third goal is very important as a reference in designing future mathematics learning because it is still implemented online.

2. Methods

This research is a descriptive study with the subject of 14 lecturers of Mathematics Education Study Program at Sanata Dharma University. All participants were certain to carry out the design of emergency remote teaching according to the policy and focus of this study. Data in this study were obtained from survey results. The survey instrument consisted of 5 reflective questions on the lecturers' experience with open answers that led to 1) the implementation of Emergency remote teaching, 2) the successful implementation, and 3) the improvement for further learning. The survey items have been validated peer and declared valid before being used in research. The research was conducted in April - June 2020. Survey results were analyzed qualitatively following the Miles and Huberman procedure [14]. The steps to analyze include 1) data reduction, 2) data presentation, and 3) drawing conclusions or verification.

3. Result and Discussion

The results of this study were obtained from a survey of 14 lecturers in the Mathematics Education study program. The initial question was completed with the lecturer's identity, one of which was about the field of study being taught. Of the 14 lecturers, 6 lecturers (42.9%) taught mathematics, 3 lecturers (21, 4%) taught mathematics education, and the remaining 5 (35.7%) taught both fields. There are 13 lecturers who do emergency remote teaching design and 1 remaining lecturer combines emergency remote teaching design with face-to-face learning by observing health protocols. Thus all respondents certainly have implemented an emergency remote teaching design.

3.1. implementation of mathematics learning process

The survey results show that all respondents experienced a change in learning design from face-to-face learning to emergency remote teaching that had never been applied before. This supports research conducted by [15]. In the new design, respondents change learning strategies and learning technologies

that are adapted to emergency remote teaching. The strategy used is summarized from the following figure 1.

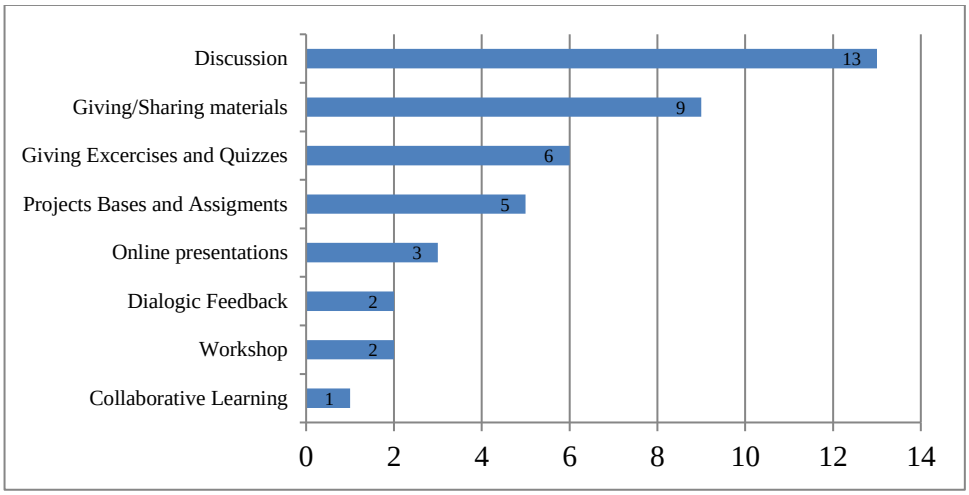

Figure 1. Quantity of Mathematics Learning Strategies applied in Emergency Remote Teaching

Figure 1 shows that there is communication (two-way relationship) in learning mathematics even though learning is not carried out face-to-face. The majority of lecturers apply discussion strategies to facilitate communication in learning. Two-way learning has a positive influence on learning success [16]. These strategies are not much different when applying face-to-face learning. Lecturers provide material, provide exercises or quizzes and assignments that are identical to the character of mathematics learning. Apart from the discussion, synchronous learning strategies occur in learning through presentations, workshops, feedback, and collaborative hearing. The implementation of the mathematics learning process with the design of emergency remote teaching is certainly supported by adequate technology. The following is a summary of the technology used in learning mathematics.

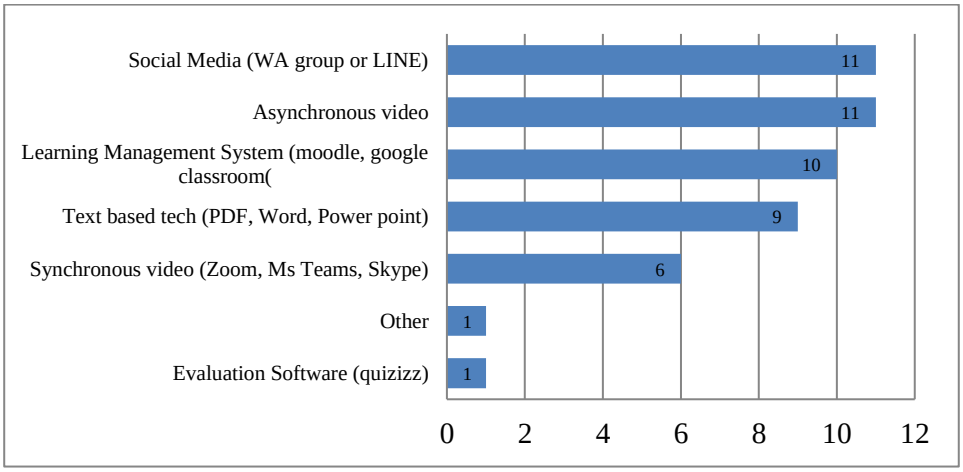

Figure 2. Quantity of technology applied in Emergency Remote Teaching

Figure 2. shows that the technology used is synchronous and asynchronous. Synchronous technology in the picture above includes social media (78.6%) and the use of LMS (71.4%) as a means of discussion, and synchronous video (42.9%). Asynchronous technology includes asynchronous video (78.6%), text-based technology (64.3%), and evaluation software (7.1%) and other technologies (7.1%).

Technology is very compatible with the strategies used by lecturers in learning. The previous results said that the discussion was the most chosen strategy in the design of emergency remote teaching.

Therefore, the use of social media such as the WA group and LINE contributes in terms of the use of technology.

3.2 successful implementation of emergency remote teaching

The survey instrument was in the form of reflection questions with open answers. As a result, there are no standard benchmarks that describe the successful application of learning. However, reflection questions guide the success of learning in terms of achievement of learning objectives and student involvement.

Table 1. Result of Goals Achievement

Goals Achievement	Quantity
Achieved without modification	11
Achieved with modification	2
Other	1

Table 1 shows that the majority of respondents (78.6%) stated that the implementation of emergency remote teaching was successful in terms of their achievement goals. 14.3% of respondents said that the learning objectives were achieved by adjusting the learning design.

The achievement of other objectives can be seen from the achievement of the learning process, such as active discussion, achievement in terms of results (students understanding), and the delivery of learning material in the majority of lectures. Thus, in terms of achieving goals, emergency remote teaching was successfully implemented. The same results were obtained from the aspects of students' involvement. A total of 13 (92.9%) respondents said that students were involved in learning, the rest (7.1%) did not take into account the success. The success of learning in terms of student involvement is expressed from the following aspects.

Table 2. Result of Students' Involvement

Aspects of involvement	Quantity
attendance	2
discussion activity	5
task collection	4
discussions are less active	2
other	1

Table 2 shows the results of learning success data seen from students' involvement. The majority of students are actively involved in learning (78.6%). Only 2 respondents stated that the involvement of students in the discussion was lacking. These results indicate that emergency remote learning is said to be successful in terms of students' involvement.

3.3 follow up learning

Future semester learning (Odd 2020/2021) must be carried out online. As a form of follow-up to future learning, lecturers in mathematics education study programs will make improvements. The improvement was made based on the results of the reflection on the implementation of emergency remote teaching.

These improvements include: 1) preparation and planning of learning that is more mature both in terms of content and time (71.4%), 2) the use of more varied technology (50%), 3) the use of more innovative and communicative material delivery methods (50%), 4) learning adjustments in terms of learning outcomes and evaluations (28.6%) but 5) remain focused on developing student experience (7.1%). Furthermore, the giving of feedback which is immediately felt is important by some lecturers because it can arouse and maintain student enthusiasm in participating in learning.

4. Conclusion

The summary of the results of the study shows that (1) all lecturers conduct emergency remote teaching by utilizing various kinds of technology both synchronous and asynchronous as a form of learning adjustment to face a pandemic. (2) Although there is an adjustment in learning, most mathematics learning can run according to learning achievements. Students quickly adjust so that the majority of students are actively involved in learning with a variety of planning changes from face-to-face learning. (3) From the results of evaluating the learning experience, the Mathematics Education lecturer will implement an improvement in learning that must be carried out online. The improvement is in the form of preparation and planning of learning that is more mature both in terms of content and time, the use of more varied technologies, the use of more innovative methods of delivering material, adjustment of learning in terms of learning achievement and evaluation while still focusing on developing student experience.

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