Online learning in higher education during the Covid-19 pandemic: A case study in the Department of Electrical Engineering, Universitas Negeri Semarang

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Abstract - The Covid-19 pandemic that hit the world has posed significant challenges for the world of higher education globally. The main challenge that is very urgent and inevitable for lecturing at the university is face-to-face in class but must be taught online. Online teaching and learning implies a certain pedagogical content knowledge, especially related to designing and organizing for a better learning experience and creating a different learning environment, and the role of information technology. This article, concludes that five things play a role in online learning, namely first, a reliable information technology facility to support access to online learning; Second, the need for teachers to make variations and innovations to deliver teaching material so that it attracts students; Third, it needs an in-depth study in practicum lectures; Lecturers can do a practicum with simulations. Fourth, there is a need for material to be delivered based on light, clear, concise and interactive principles. Fifth, there is an increase in student participation in online learning.

1. Introduction
Spread of Covid-19 worldwide, starting 13 March 2020, 61 countries in Africa, Asia, Europe, the Middle East, North America and South America have announced or implemented the closure of schools and universities as well as most universities. has imposed local closures. The Covid-19 outbreak was unexpected and forced to cause changes in teaching and learning throughout Indonesian universities, thus changing the face-to-face learning model to an online learning model. Teaching staff of all backgrounds and ages must prepare and deliver their classroom learning materials from home, with all the practical and technical challenges it brings, and often without the right technical support. On the other hand, a significant challenge for university teachers is a lack of knowledge of pedagogical content required for online teaching [1-2]. Research by Ching et al. stated that some of the major difficulties reported by university teachers with regard to web-based learning arise from the complexity of the learning situation and deficiencies in planning and organization [2]. The Covid-19 pandemic crisis has produced many suggestions aimed at educators [3]. Much of this input focuses on tools and materials that teachers can use to replace their face-to-face classes. In addition, educators have been offered hundreds of 'tips and tricks', most of them without the necessary contextual knowledge to judge which teaching tactics might work. With this background, we have researched through surveys of teachers and feedback from students in the Department of Electrical Engineering, Universitas Negeri Semarang.

In early 2009, Universitas Negeri Semarang had declared a campus with a conservation perspective with one of its pillars being a paperless policy so that administration and education have used online
networks. Online learning has been pioneered by universities so far. Several learning information systems were built such as the online information system "Elena", the academic information system "Sikadu", thesis information system, thesis and dissertation "Sitedi", the online exam information system "Ujian" and others. After the pandemic there was a change which forced all learning to be done online to comply with health protocols, namely maintaining distance, not crowding, wearing masks and washing hands using soap or using hand sanitizers. Students are advised to study from home, lecturers work from home. Thus, Universitas Negeri Semarang has experience in doing two learning models, namely through face-to-face learning in class or laboratory and online learning models using information technology. The Covid-19 outbreak was unexpected and forced, especially the Department of Electrical Engineering, Universitas Negeri Semarang to carry out direct online learning programs from 3 study programs, namely the S1 Electrical Engineering Education Study Program, the Information Technology Education and Computer Study Program and the Electrical Engineering Undergraduate Study Program. The Covid-19 pandemic has resulted in such a profound change that it requires switching to existing learning models online in a short period of time. In general, complete online learning requires a complex teaching program plan (RPP) design. It takes teaching materials such as audio and video content, as well as a reliable information technology support team to ensure the success of teaching. As a result of the Covid-19 Pandemic that suddenly emerged, most of the teaching and education staff in the Departments and Faculties faced problems, namely that some teachers still lacked online teaching experience, initial preparation, and readiness for support from the information technology team.

There are two other activities by the university that are experiencing major obstacles, namely the research and community service program, which in general, the teaching team is directly involved in the field with the community. So that practically the "Tri Darma Perguruan Tinggi" activity encountered obstacles. In online learning, many students complain, in addition to frequent technical problems, weak internet access, large internet quota package funds, as well as material that cannot be understood due to limited time in online learning. Another obstacle is the lack of student self-discipline and a less supportive learning environment when learning from home.

This case study will focus on problems related to the quality of learning, the level of fluency in the delivery of course materials, and input that can increase the effectiveness of learning to maintain the quality of online learning at the University, especially in the Department of Electrical Engineering, University.

2. Literature Review

The definition of 'online learning' has been widely used but with various meanings that sometimes have different applications. In this paper, online learning means referring to learning using internet media. So that it has a broader definition of 'network learning'; while networked learning focuses on human-human relationships [4-5], online learning lacks such specificity. It is narrower than 'eLearning' and 'digital education' which includes a variety of digital tools and resources, not just the internet and a focus on developing digital competencies.

The essence of online learning is the organization of learning activities that allow students to achieve certain learning outcomes. Although there is no specific recipe, this activity or task should be based on a mix of design approaches (synchronous, asynchronous, online, offline), accurately and clearly described and communicated, having a sufficient degree of difficulty for the students' abilities and expectations.

In reality one could argue that 'online' is no longer a useful description of a student's actual experience [6], especially in cyberspace, i.e. internet-connected devices are used regularly, and the boundary between learning and other activities in daily life. the day is so close. However, the same cannot be said for 'online teaching' which consists of intentional support for another person's learning, which is mediated by the Internet.

The rapid change in face-to-face education learning, in response to the Covid-19 pandemic, is providing teachers with a solid understanding of the differences between online teaching and their other modes of operation. Experimentally, online teaching is a recognizable category of work practice for many teachers [7-8].
Online learning refers to a type of teaching-learning situation where (1) students are far from the tutor or instructor, (2) students use some form of technology to access learning material, (3) students use technology to interact with tutors or instructors and with other students and (4) some type of support provided to students [9]. Much of teaching and learning in an online environment is similar to teaching and learning in other formal educational contexts [10]. Online learning and teaching involve a variety of tools, resources, pedagogical approaches, roles, organizational arrangements and forms of interaction, monitoring and support with many possible combinations of substitution and integration [11-12].

In this multitude of options, 'the capacity to shift the time and place of educational interactions' [10] stands out as a valuable source of flexibility. From a post-digital point of view, online education has blurred. Point to the design of learning activities with certain characteristics, a combination of three types of attendance (social, cognitive and facilitator) and the need to adapt the assessment to new learning needs. We conclude with a reflection on how responding to the crisis (as best as possible) can lead to increased teaching and learning practices in the post-digital era.

3. Method and data collection techniques
The method used for this exploratory study is responses through questionnaires and open-ended questions by teaching staff and students who are doing online learning. Experts, when viewed as 'crystallization points for practical insider knowledge' [13] can provide useful insights into emerging topics: insights that are not easily or quickly gained by other means. Digitization or information technology assisted learning in teaching and learning during the Covid-19 pandemic is clearly one of the emerging topics [14]. Student samples are selected from 3 study programs in the Electrical Engineering department chosen proportionally. Teaching staff are selected randomly, consisting of elements from vocational managers, lecturers and lecturers, and young lecturers.

4. Results and discussion
The research results are grouped into 5 sections, namely: response to the reliability of online lectures, level of delivery of course materials, the smooth access to online lectures, how to improve online lectures, and what changes should be made related to online quality in the Electrical Engineering Department, FT, Universitas Negeri Semarang at this time.

The first part is related to responses to the reliability of online lectures as shown in table 1. Based on table 1, it can be seen that online lectures have reliability during the Covid-19 pandemic. This can be seen from the student’s response of 36.1 percent and the response of lecturers by 68.2 percent which stated that online lectures were very reliable. Meanwhile, only 30.6 percent of students and 1.7 percent lecturers stated that lecture online was quite reliable. Online lectures have reliability during the Covid-19 pandemic, these things are influenced by several factors namely superior human resources who manage, online lecture information system software that must be maintained and improved, adequate network capacity, and the ability of lecturers to teach online.

| Table 1. Responses to the reliability of online lectures |
|---------------------------|-------------|-------------------|
| **Students**               | **Lecturers** | **Explanations**   |
| 36.1%                     | 68.2%        | Very reliable     |
| 33.3%                     | 30.1%        | Reliable          |
| 30.6%                     | 1.7%         | Quite reliable    |

The second part is related to the level of delivery of lecture material as in Table 2. Based on table 2, it can be seen that the level of delivery of lecture material to students is quite good, seen from the student response of 58.3 percent and the lecturer response of 50 percent which stated respectable. The smoothness of the lecture material that can be conveyed to students is an important thing in online learning, several things that influence it are internet network that is often "unstable": Use together with limited bandwidth becomes an obstacle; and it takes a variety of information technology choices so
that course materials can be conveyed well, for example a hybrid between whatsapp group, email and Zoom meetings.

| Table 2. Responses to the level of delivery of course materials well to students |
|----------------------------------|-----------------|-----------------|
| Students | Lecturers | Explanations |
|----------|-----------|--------------|
| 16.3% | 20.2% | Very good |
| 25.4% | 29.8% | Good |
| 58.3% | 50% | Respectable |

The third part is related to the smooth access to online lecture as in table 3. Based on table 3, it can be seen that the smooth access to online lecture is in smooth criteria, seen from the student's response of 71.4 percent and the lecturer's response of 72.5 percent which stated smooth. The smooth level of access is supported by servers, helpdesk services, and support units operate smoothly; and availability of internet quota for lecturers and students, especially in meetings using Zoom meetings, MS Teams, Google meetings, etc.

| Table 3. Responses to the smooth access to online lectures |
|-----------------------------------|-----------------|-----------------|
| Students | Lecturers | Explanations |
|----------|-----------|--------------|
| 0.3% | 2.5% | Very smooth |
| 71.4% | 72.5% | Smooth |
| 28.3% | 25.0% | Pretty smooth |

The fourth part is related to question how to improve online lectures. Answers related to alternative questions that can improve online lectures in the Electrical Engineering department are as follows:

- Increasing the ability of lecturers, supporting units for the development of online teaching materials, the management's serious attention.
- Online learning workshops ranging from preparation, material content, to evaluation.
- Evaluation or sharing between lecturers related to online learning that has been running.
- Funding is given for the creation of material modules from both visual reading and video media. Because especially videos need more energy and laptop specifications. Zoom subscription is paid for each lecturer, because zoom is still the most convenient to use.
- Need content creation training, internal connection improved.

The fifth part is related to question what changes should be made related to online quality in the Electrical Engineering Department, FT, Universitas Negeri Semarang at this time

- The seriousness of management in improving the quality of online lectures
- Lecturer mindset, infrastructure supportive.
- Increasing the ability of lecturers, supporting units for the development of online teaching materials, the management's serious attention.
- Do not force the use of certain online applications only to achieve 100% of the achievement of using university applications. lecturers are given freedom of creation.
- Lecturers adapt, innovate, and update their abilities related to online classroom management.
- Changing learning media from reading media to interactive video media.
- Changes in thought patterns and learning patterns, from conventional to online
- Reproduce lectures via video conference (Google Meet or Zoom) and provide material that is more complete than offline meetings.
- Improvement can be done by improving the quality of the online learning modules of each course, especially practical courses.
- Hardware upgrade to support online infrastructure and improve online services.
- For practicum lectures for a while using simulation software

5. Conclusion
Based on theoretical studies and research results, there are five things that play a role in online learning, namely first, reliable information technology facilities to support access to online learning; Second, the need for teachers to make variations and innovations to deliver teaching material so that it attracts students; Third, it needs an in-depth study in practicum lectures; Lecturers can do a practicum with simulations. Fourth, there is a need for material to be delivered based on light, clear, concise and interactive principles. Fifth, there is an increase in student participation in online learning.

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