Design of distance lectures in mathematics education with the utilization of the integration of Zoom and YouTube application

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Abstract. Something that is considered new must meet difficulties in its implementation. Including distance lectures. The cause can come from various factors. This research development aims to produce distance lecture design by utilizing the integration of the Zoom and YouTube applications on students of the Mathematics Education Department in a private university in Bandung. The development model uses an adaptation of the Plomp development model by carrying out two phases, namely the preliminary investigation phase and the design phase. From the results of the initial research, it can be concluded that: the development of distance lecture design is very essential, design of distance lectures include: roles in lectures (lecturer, host, and student), supporting applications (Zoom, YouTube, and OBS Studio), and interaction design that connects roles in lecturer with supporting applications, and the utilization of the Zoom and YouTube application integration has the potential to be more effective and efficient.

1. Introduction
Nowadays the issue of distance learning is increasingly being discussed. This issue was reinforced by the condition of the Corona Virus Disease (COVID-19) Pandemic which encouraged distance learning to be implemented as an effort to prevent the spread of the virus [1]. In the future distance learning turned into a necessity. This statement triggers education activists in Indonesia to actively design how to model the right learning and lectures. Palvia et al estimate that in 2025 online learning will become a world trend [2].

Focusing on education at university, it is necessary to design distance lectures. Lectures that are adapted to student conditions are reviewed from various aspects. Because the facilities and infrastructure to support distance learning in Indonesia are still inadequate. One of them is the internet access readiness factor. Students have difficulty getting signals when in their respective areas, even though there are very weak signals they get [3]. Because many areas that are still difficult to get internet access.

The choice of applications to support distance lectures varies greatly. But each application has its specifications and not all can accommodate the alleviation of problems and meet the needs of lecturers. Therefore, the right election must be studied. Arkorful and Abaidoo explain that the literature has described many of the advantages and disadvantages of online learning, but it still needs to be implemented in Higher Education so that students give benefits [4].
Alternative applications that can be used are Zoom and YouTube. In general, Zoom has advantages in the display of sharp videos and supports presentations, while YouTube has advantages in the ease of access and internet quota saver control features. Cardoso and Kato explain that YouTube is an application that can be used by teachers and students cheaply [5]. Both are applications that can be integrated at the same time as a substitute for face-to-face lectures. Therefore, researchers took the title “Design of Distance Lectures with the Utilization of The Integration of Zoom and YouTube Application”.

2. Methods

This development research uses the Plomp development model. According to Arianatasari and Hakim, the Plomp model is seen as more flexible than other development models, because at each phase of its activities it can be adjusted to the characteristics of its research [6]. The following is a Plomp model consisting of: the preliminary investigation, the design phase, the realization/construction phase, and the test, evaluation and revision phase, and implementation [7]. Currently, this study just reaches two phases namely the preliminary investigation phase, and the design phase. In the investigation phase, the method used: the study of student data literature, analysis of the results of a survey of the implementation of learning from home by the Department to 43 students through Google form, analysis of internet quota consumption, and interviews. The analysis technique used is quantitative and qualitative descriptive.

3. Results and discussion

3.1. Preliminary Investigation

The preliminary investigation phase in Plomp is also known as requirements analysis or problem analysis. Plomp and van de Wolde state “in this investigation important elements are the gathering and analysis of information, the definition of the problem and the planning of the possible continuation of the project” [8].

This phase is carried out to collect and analyze student responses during online lectures. The response is based on several things such as general characteristics of students, student learning styles, and experiences of previous online lecturing methods. The variety of online lecture methods supported by technology media provided by each lecturer has advantages and disadvantages. On the other hand, lecturers have limited adjustments caused by a lack of understanding of students and difficulties in using media. Along with the number of entries/complaints related to online learning, it is necessary to organize these entries so that they can be analyzed quickly. Table 1 shows the results of the analysis of the survey questions of implementing learning from home.

| No | Questions | Result (%) | | |
|----|-----------|------------|---|---|
| 1  | Do you agree with the decision to conduct online lectures during the COVID-19 pandemic? | Yes: 83.72 | No: 16.28 |
| 2  | Does online learning make it difficult for you? | Yes: 83.72 | No: 16.28 |
| 3  | Are lecturers effective in giving lectures online? | Yes: 41.86 | No: 58.14 |
| 4  | Does the lecturer provide a good/fair assessment system? | Yes: 65.12 | No: 34.88 |
| 5  | Does the campus provide sufficient facilities to carry out lectures online? | Yes: 13.95 | No: 86.05 |

3.1.1. General characteristics of students. Students come from families with lower-middle family economic backgrounds. It is shown from the student data that 25% of students are scholarship recipients for the 2016-2020 class of Bidik Misi scholarships. Lecture from home is a new problem for students who live in areas with unstable internet access ranging from 20.93%. This makes it difficult
for students to attend lectures with video conferencing in one class at the same time. Factors in the
form of a not conducive learning environment at home can not be avoided. As stated by one of the
following students, "Sometimes the signal is bad and often asked to help the work of parents". Another
factor is that 39.53% of students explicitly complain about the availability of internet quota which
causes more expenditure.

3.1.2. Student learning styles. The government policies in the form of work from home has
implications for learning policies from home. Students who are familiar with face-to-face lectures
must adapt to these policies. Especially when dealing with difficulties in the material being studied,
students have difficulty discussing it directly both with lecturers and colleagues. The effectiveness
of online lectures in terms of student perceptions of 0.47% stated effective, 39.53% stated it might
be effective, and 60% stated ineffective. Supporting academic achievement activities that have been
running before such as peer tutors is difficult.

3.1.3. Experiences of previous online lecturing methods. It is recognized that every online lecture
media has advantages and disadvantages of each. In such conditions, it is necessary to conduct an
internal evaluation of online lecture experiences that have been carried out for one semester. Figure 1
shows the percentage of student internet quota consumption when attending online lectures.

![Figure 1](image.png)

**Figure 1.** Percentage of online media that most seized internet data according to students.

The following is the experience of previous online lectures with several media:

3.1.3.1. Lectures by WhatsApp. Figure 1 explains that the use of the WhatsApp application ranks third.
From the answers of students in table 1 point 3, it is known that WhatsApp takes a lot of internet data
to download lecture material and uploading assignments. Other findings reveal that the material is
often piled up by other messages and nonverbal explanations are less understood as in figure 2.
However, lectures with WhatsApp guided by the Lecturer were rated the best at a percentage of
46.51%. From open answers and interviews with students, the triggering factor is the style of lectures.

In online conditions, lecturers must better understand the problems and needs of students, the
efficiency of the material, the proportion of appropriate assignments, give awards/praise to each
student contribution, no matter how small, and time discipline. Lecturers also continue to guide
each student through video calls. Here is one of the expressions of students: “The discipline of time in
the sense of not exceeding lecture time and not taking a day off, making teaching materials to be easily
understood by students in delivering material, and giving grades fairly do not look at the proximity
factor, do not overload with excessive assignments, not too much media to make it easier to access,
not favouritism and understand if there are obstacles.”
3.1.3.2. Lectures by Google Classroom. Based on information from figure 1, the use of Google Classroom with 12% internet data consumption tends to be in the middle position. Recognized by students because of passive interactions with the need to open other platforms and by notification via email. There were even questions from lecturers who did not get responses from students (figure 3).
3.1.3.3. Lectures by Edmodo. The requirement to install a new application is a complaint (see figure 4) found in using the Edmodo application. In addition, there are still bugs in in-class interactions and delayed tasking. To overcome this, the lecturer also re-assigns the sending of tasks through the WhatsApp group.

![Figure 4. Complaints to use Edmodo.](image)

3.1.3.4. Lectures by Zoom. Based on information from figure 1, Zoom is in the first position to confiscate internet quota with 31%. This is because the form of information exchange is in the form of a video. Zoom limits the usage time for access without paying with more than 10 users. Of course, students with unstable internet networks have difficulty following learning.

3.1.4. Difficulties in using media. Students can easily adjust to technology as a medium for lectures. However, some senior lecturers have difficulty adapting. Digital skills are closely related to generation and age [9]. Millennials are considered to be more skilled and adaptive using digital technology than their parents’ generation is. This needs to be considered so that sufficient delivery of lecture material as a problem is borne by the lecturer. Not busy adjusting to the latest media. Therefore, it is necessary to choose an application that makes it easy for lecturers to manage to learn online.

3.2. Design phase
It seems that lecturing using WhatsApp has the potential to be applied in its entirety. The lecturer concerned provides clarification as follows: 1) There is Dissatisfaction with the use of WhatsApp, and 2) Not yet able to declare lectures using WhatsApp is the most effective and efficient because personally have never used another application.

The researcher also assessed the video call interaction with each student as having little chance to be carried out completely. Based on the findings and recommendations obtained in the initial
investigation phase the researchers chose to design lectures by utilizing the integration of the Zoom and YouTube applications by weighing the advantages of each feature that could be utilized. Distance learning design involves roles in lectures, supporting applications, and interaction design.

3.2.1. Roles in lectures. There are three roles in lectures involved in distance learning which include 1) lecturer: the lecturer acts as a presenter of lecture material and gives an explanation when there are questions raised by students. The explanation was delivered by using the Zoom application connected to the host. Lecturers can still give assignments to students to be sent via WhatsApp or email.; 2) host: the host has the role of operating the application supporting lectures and guiding the course of the lecture: starting from opening a lecture explanation session by the lecturer, opening a question session, accommodating questions that arise from students and being submitted to the lecturer, and closing the lecture. The teaching assistant or one of the students can act as a host; and 3) students: students act as subjects of lectures.

3.2.2. Supporting applications. The supporting applications consist of Zoom, YouTube, and OBS Studio. Zoom is a good application for lecturers and students to collaborate [10]. Zoom used by lecturers and hosts requires good internet access. This is intended so that students can listen to material exposure. The use of Wifi available on campus can be optimized for platform stability and efficient data quota consumption. So they can still take advantage of the sharp Zoom, but it does not burden students.

YouTube has the potential to increase student interest and learning achievement [11]. Video displayed by YouTube is divided into various resolution options include 144p, 240p, 360p, 480p, 720p (HD), 1080 (Full HD), 1440p, 2160, and 2160 (4k). The higher the number (pixel), the sharper the video displayed, but the greater the data quota used and the greater the data speed used. The variety of resolutions can be used by students to reduce the consumption rate of internet quota. The popularity of YouTube among internet users makes several Cellular Operators offer special offers. An offer in the form of a special data quota for video access from YouTube, for example, can be used by students.

OBS Studio functions as a third party application that connects Zoom with YouTube. The host operates the OBS Study so that verbal and nonverbal explanations and interactions with lecturers from Zoom can be uploaded via the Live Streaming feature on YouTube.

3.2.3. Interaction design. The host prepares a Zoom room link to be used with the lecturer. Furthermore, assisted by OBS Study, the host sends a YouTube live streaming link to students. Alternatively, students are required to prepare in the YouTube Chanel account that has been agreed upon following a predetermined lecture schedule. For students who are constrained by access, they can watch the video after it has been saved. Figure 5 shows a visual explanation of interaction design.

This design has not been realized in the lectures in the Mathematics Education Department. But getting a positive response from students seen from the enthusiasm of participation when conducting online study activities on the Teras Ramadhan of the Mathematics Education Student Association in the department. The activity is intended for students of Mathematics Education Study Program and is voluntary.
4. Conclusion
The results of preliminary research can be concluded that the development of distance lecture design is very essential. Design of distance lectures includes: roles in lectures (lecturer, host, and student), supporting applications (Zoom, YouTube, and OBS Studio), and interaction design that connects roles in lecturer with supporting applications. The results of the analysis raised the allegation of distance learning design by utilization of the Zoom and YouTube application integration has the potential to be more effective and efficient.

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