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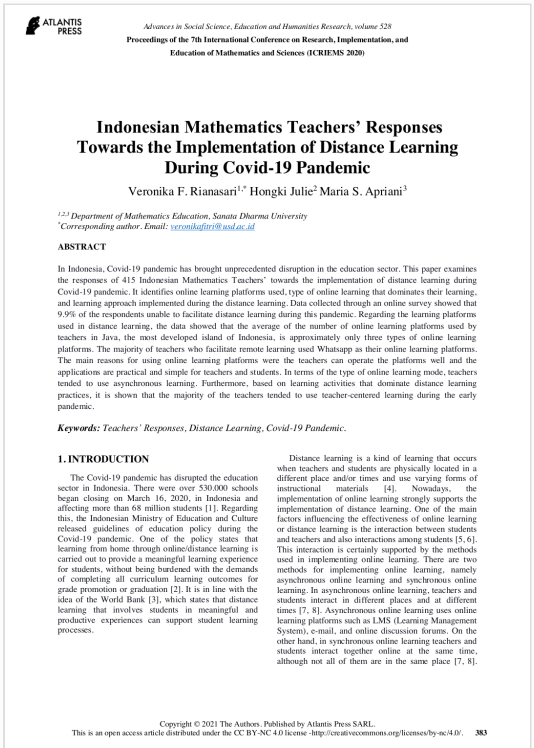

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Indonesian Mathematics Teachers' Responses Towards the Implementation of Distance Learning During Covid-19 Pandemic

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ABSTRACT

In Indonesia, Covid-19 pandemic has brought unprecedented disruption in the education sector. This paper examines the responses of 415 Indonesian Mathematics Teachers' towards the implementation of distance learning during Covid-19 pandemic. It identifies online learning platforms used, type of online learning that dominates their learning, and learning approach implemented during the distance learning. Data collected through an online survey showed that 9.9% of the respondents unable to facilitate distance learning during this pandemic. Regarding the learning platforms used in distance learning, the data showed that the average of the number of online learning platforms used by teachers in Java, the most developed island of Indonesia, is approximately only three types of online learning platforms. The majority of teachers who facilitate remote learning used Whatsapp as their online learning platforms. The main reasons for using online learning platforms were the teachers can operate the platforms well and the applications are practical and simple for teachers and students. In terms of the type of online learning mode, teachers tended to use asynchronous learning. Furthermore, based on learning activities that dominate distance learning practices, it is shown that the majority of the teachers tended to use teacher-centered learning during the early pandemic.

Keywords: *Teachers' Responses, Distance Learning, Covid-19 Pandemic.*

1. INTRODUCTION

The Covid-19 pandemic has disrupted the education sector in Indonesia. There were over 530.000 schools began closing on March 16, 2020, in Indonesia and affecting more than 68 million students [1]. Regarding this, the Indonesian Ministry of Education and Culture released guidelines of education policy during the Covid-19 pandemic. One of the policy states that learning from home through online/distance learning is carried out to provide a meaningful learning experience for students, without being burdened with the demands of completing all curriculum learning outcomes for grade promotion or graduation [2]. It is in line with the idea of the World Bank [3], which states that distance learning that involves students in meaningful and productive experiences can support student learning processes.

Distance learning is a kind of learning that occurs when teachers and students are physically located in a different place and/or times and use varying forms of instructional materials [4]. Nowadays, the implementation of online learning strongly supports the implementation of distance learning. One of the main factors influencing the effectiveness of online learning or distance learning is the interaction between students and teachers and also interactions among students [5, 6]. This interaction is certainly supported by the methods used in implementing online learning. There are two methods for implementing online learning, namely asynchronous online learning and synchronous online learning. In asynchronous online learning, teachers and students interact in different places and at different times [7, 8]. Asynchronous online learning uses online learning platforms such as LMS (Learning Management System), e-mail, and online discussion forums. On the other hand, in synchronous online learning teachers and students interact together online at the same time, although not all of them are in the same place [7, 8].

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1. INTRODUCTION

The Covid-19 pandemic has disrupted the education sector in Indonesia. There were over 530.000 schools began closing on March 16, 2020, in Indonesia and affecting more than 13 million students [1]. Regarding this, the Indonesian Ministry of Education and Culture released guidelines of education policy during the Covid-19 pandemic. One of the policy states that learning from home through online/distance learning is carried out to provide a meaningful learning experience for students, without being burdened with the demands of completing all curriculum learning outcomes for grade promotion or graduation [2]. It is in line with the idea of the World Bank [3], which states that distance learning that involves students in meaningful and productive experiences can support student learning processes.

Distance learning is a kind of learning that occurs when teachers and students are physically located in a different place and/or times and use varying forms of instructional materials [4]. Nowadays, the implementation of online learning strongly supports the implementation of distance learning. One of the main factors influencing the effectiveness of online learning or distance learning is the interaction between students and teachers and also interactions among students [5, 6]. This interaction is certainly supported by the methods used in implementing online learning. There are two methods for implementing online learning, namely asynchronous online learning and synchronous online learning. In asynchronous online learning, teachers and students interact in different places and at different times [7, 8]. Asynchronous online learning uses online learning platforms such as LMS (Learning Management System), e-mail and online discussion forums. On the other hand, in synchronous online learning teachers and students interact together online at the same time, although not all of them are in the same place [7, 8].

Synchronous online learning usually involves online learning platforms such as group chats, web seminars, video conferencing, and telephones. Both of these online learning methods have advantages and disadvantages. Furthermore, previous studies showed that asynchronous online learning and synchronous online learning can complement each other [7, 8, 9]. Therefore, it is essential for teachers who are currently doing distance learning to find the right combination of the two methods according to the resources they have.

More than a decade ago, the demand for online distance learning was already predicted to continue to grow as internet access becomes increasingly affordable for a greater community [10, 11, 12]. Therefore, teachers are required to develop computer literacy and educational skills of information and communication technology (ICT) application [13]. In Indonesia, one of the pedagogical competencies that should be mastered is the ability to utilize ICT for learning purposes [14]. However, the recent study showed that Indonesian mathematics teachers had lack knowledge and skills of ICT and also the ICT-related pedagogical content knowledge [15]. Therefore, teachers who have inadequate knowledge and skills about the integration of ICT in education might experience difficulties in conducting distance learning that runs in the form of online learning [16].

Covid-19 pandemic is forcing every country to do a sudden shift from traditional face to face learning into distance learning. This disruption has put students and also teachers from rural areas and low-income families at a disadvantage since they have lack access to technology [17]. Based on Statistics Indonesia [18], there is a very significant difference between the number of internet users in urban areas compared to those in rural areas in 2018; with percentage 69.91% in urban areas and only 30.09% in rural areas. Moreover, the quality of connections in Indonesia is poor. The average speed of mobile and fixed internet connections in Indonesia is 13.83 MBPS and 20.11 MBPS respectively while the global average speed of mobile and fixed internet connections is 32.01 MBPS and 73.58 MBPS respectively [19]. Therefore, good quality digital infrastructure in Indonesia remains a major challenge.

The fast transition from face to face learning into distance learning certainly bring a rapid and broad increase in the use of educational technology. In Indonesia, public and private sectors have developed some local online learning platforms. Some online learning platform developed by Indonesian private sector are Harukaedu (an online learning platform offering online university degrees), Ruangguru (an e-learning platform for K-12 Indonesian students) and Cakap by Squline (a tutoring platform for language learning) [20]. Meanwhile, an example of online learning platform driven by public sectors is Rumah Belajar, an online learning platform developed by the Indonesian Ministry of Education and Culture (https://bersamahadapikorona.kemdikbud.go.id/rumah-belajar/). While the educational technology has spread rapidly, it is unlikely to be able to address the issue of education inequalities in Indonesia, unless it is effective in improving students' learning outcomes [20].

In the context of Covid-19 pandemic in Indonesia, teachers have to respond to the pandemic by doing a rapid transition from traditional face-to-face learning to distance learning. Knowing the natural responses of teachers to the quick transition will give insight to educational practitioners towards several issues in the implementation of distance learning during the emergency time. In Indonesia, some researchers have investigated the implementation of distance learning during Covid-19 pandemic [21, 22, 23]. However, previous studies have left some gaps to be filled. First, the studies [21, 23] did not focus on the implementation of distance learning from teachers' perspective. Second, the study [22] that investigated mathematics teachers' views on challenges on the implementation of distance learning during the Covid-19 pandemic only focused on teachers on the secondary school level. As a result, those studies were not addressed to reveal the responses of Indonesian Mathematics teachers from elementary to secondary school level towards the implementation of distance learning during Covid-19 pandemic.

This study aims to describe the responses of Indonesian mathematics teachers' towards the implementation of distance learning during Covid-19 pandemic. Specifically, this study will investigate three questions as follows: (1) What are online learning platforms used by Indonesian mathematics teachers in distance learning during Covid-19 pandemic?; (2) What is the type of online learning that dominate the distance learning during Covid-19 pandemic?; (3) What is the learning approach implemented on the distance learning during Covid-19 pandemic?

2. METHOD

2.1. Research Design

The primary objective of this study is to describe the responses of Indonesian mathematics teachers' towards the implementation of distance learning during Covid-19 pandemic. Since we want to describe a phenomenon in education during Covid-19 pandemic, the this study employed a descriptive research design. Descriptive research aims to describe a phenomenon and its features [24].

2.2. Participants

Snowball sampling was employed in this study. The study involved 415 participants (143 male and 272 female) who were elementary teachers (10.6%), middle school (35.66%), and high school teachers (53.73%). The participants came from 27 provinces in Indonesia. The majority of the participants came from Java

(73.25%) and the rest came from Sumatera (11.33%), Bali and Nusa Tenggara (6.51%), Kalimantan (4.82%), and Sulawesi, Maluku and Papua (4.1%). Moreover, the majority of the participants had undergraduate degrees (83.13%), whilst the remaining had diploma degrees (0.24%) and post-graduate degrees (16.63%). Their ages were categorized as less than 30 years (39.76%), 30-40 years (32.77%), 41-50 years (14.22%), and more than 50 years (13.25%).

From 415 participants involved in this study, only 63.9% of them have implemented distance or online learning before the Covid-19 pandemic. Moreover, only 90.1% of the participants in this study conducted distance learning during this pandemic. The lack of ICT skills among Indonesian teachers and uneven access to the internet in Indonesia are some challenges in Indonesia's distance learning implementation. Therefore, it is unsurprising that 9.9% of the participants did not facilitate distance learning during this pandemic.

2.3. Data Collection

This study used an online questionnaire to collect data. The main reason for using an online questionnaire because it can be given easily to large numbers of people using various online platforms [25]. In this study, the online questionnaire was posted on the authors' social media. The questionnaire was open for two weeks from April 16 until April 30, 2020. To answer the research questions, data sources focused on one part of the questionnaire that used open and partially open-ended questions. The study used partially open-ended questionnaire because it provides several possible answers and then has space for other responses [26]. The focused part of the questionnaire asked for responses to the following questions: (1) What is (are) online learning platform(s) that you use during distance learning?; (2) What is (are) your reason(s) for choosing the online learning platform(s)?; (3) Give an example of the mathematics learning activity that is often implemented during distance learning!, and (4) Mention the learning steps carried out in conducting distance learning!. The third question is an open question, and the rest are partially open-ended questions.

2.4. Data Analysis

The responses to the four questions above resulted in a list of answers for the first, second, and fourth questions and also in a large amount of written text related to the third question. These responses were analyzed using the qualitative data analysis framework developed by Miles and Huberman [27]: data reduction, data display, and conclusion drawing and verification. Descriptive statistics were also performed to answer the research questions.

3. RESULT AND DISCUSSION

3.1. Result

This section consist of three main results namely online learning platforms used during distance learning, type of online learning, and learning approach implemented during distance learning.

3.1.1. Online Learning Platforms Used During Distance Learning

The participants were asked to mention online learning platforms that they used during the distance learning (Table 1). Table 1 shows that in total, there are 28 online learning platforms used during the distance learning. The most popular online learning platforms used by the teachers is Whatsapp, used by approximately 85% of the respondents. The next most used online learning platforms are Learning Management System (LMS), Youtube, Email, Zoom, and Google Classroom, used by teachers ranging approximately between 32% until 47%.

To better understand about the number of online learning platforms used in different provinces in Indonesia, then we classified the Indonesian provinces into five regions based on the classification developed by Indonesia Internet Service Provider Association [28] regarding the number of the Indonesian internet user (Table 2). Table 2 indicates that the average of the number of online learning platforms used by teachers in Java and Sumatera is approximately three platforms. Meanwhile, the average of the number of online learning platforms used by the teachers from the rest regions is approximately only two platforms.

Furthermore, to get further analysis about the type of the online learning platforms used during the distance learning, we categorized the online learning platforms by its characteristics as social media, email, educational e-learning tools, and mobile communication via traditional mobile phones. Since nowadays, social media encompasses a wide range of applications, we made the classification based on the classification developed by previous studies [29, 30] (Table 3). Table 3 indicates that most of the mathematics teachers (approximately 86%) used social media such as Whatsapp, Facebook, Twitter, Telegram, Line, Microsoft Kaizala that utilize a combination of digital content for communication among students. About 67% of the teachers used video-based social media, and only around 14% used photographs-based social media.

Table 1. Online learning platforms used (n = 374)

No	Online learning platforms	Number of participants	%	No	Online learning platforms	Number of participants	%
1	Whatsapp	311	83.16	15	*Jogja Belajar* Class	4	1.07
2	Youtube	175	46.79	16	Microsoft Office Teams	4	1.07
3	Email	150	40.11	17	Jitsi Meet	3	0.8
4	Zoom	141	37.7	18	Twitter	3	0.8
5	LMS	127	33.96	19	Blog	3	0.8
6	Google Classroom	120	32.09	20	Telegram	3	0.8
7	Instagram	52	13.90	21	Geschool	3	0.8
8	Facebook	25	6.68	22	FaceTime	1	0.27
9	Hangouts	22	5.88	23	Geogebra Classroom	1	0.27
10	Edmodo	20	5.35	24	Google DUO	1	0.27
11	Line	14	3.74	25	Google Jamboard	1	0.27
12	Google meet	10	2.67	26	Microsoft Kaizala	1	0.27
13	WebEx	6	1.6	27	TeamLink	1	0.27
14	Skype	4	1.07	28	Short Message Service (SMS) and phone calls	1	0.27

Moreover, approximately 61% of the teachers have already used educational e-learning platforms, and about 40% of the teachers used email to facilitate distance learning. Accounting for less than 1%, the teachers used writing-based social media and mobile communication via traditional mobile phones.

Table 2. The average number ($\bar{x}$) of online learning platforms in each region

Region	$\bar{x}$	Standard deviation
Jawa	3.45	1.55
Sumatera	3.17	1.48
Kalimantan	2.23	1.6
Sulawesi, Maluku, and Papua	2.08	1.38
Bali and Nusa Tenggara	2	1.3

Further analysis provided insights into the mathematics teachers' reasons for choosing the online learning platforms (Table 4). Table 4 shows that most of the teachers used the online learning platforms because they can operate it well (approximately 80%), the online learning platforms was practical and simple for students (approximately 78%), practical and simple for teachers (approximately 65%), and promoted effective communication (approximately 54%). Accounting for about 36% and 30% of the participants, respectively, the reasons were promoting students' understanding and efficient for students in terms of internet quota. Accounting for less than 30% and more than 15%, the reasons were free to access, inspired by examples availab[1] and efficient for teachers in terms of internet quota. Despite having a small group of participants referring to facilities and provisions from schools, adjustment to the facilities owned by students, interesting for students, and providing many features as their reasons for choosing the online learning platforms, it is worth noting that schools regulation, students' facilities and interest, and platforms' features can motivate teachers to explore the online learning platforms.

Table 3. Categorization of online learning platforms (n = 374)

Category	Number of participants	%	Examples
Social media outlets (utilize a combination of digital content)	321	85.83	Whatsapp, Facebook, Twitter, Telegram, Line, Microsoft Kaizala
Video-based social media	254	67.91	Youtube, Face Time, Google Duo, Zoom, WebEx, Jitsi Meet, Google Hangouts, Google Meet, TeamLink, Microsoft Teams

Educational e-learning platform	229	61.23	Learning Management System, Google Classroom, Geschool, Edmodo, *Jogja Belajar* Class, Google Jamboard from Google for Education
Email	151	40.37	
Photographs-based social media	52	13.9	Instagram
Writing-based social media	2	0.53	Blogs
Mobile communication via traditional mobile phones (without internet connection)	1	0.27	SMS (Short Message Service) and phone calls

Table 4. Reason for choosing the online learning platforms (n = 374)

Reasons	Number of participants	%
Teachers' ability to operate the platforms	298	79.68
Practical and simple for students	292	78.07
Practical and simple for teachers	243	64.97
Promoting communication	203	54.28
Promoting students' understanding	133	35.56
Efficient for students in terms of internet quota	113	30.21
Free access	104	27.81
Inspired by examples available	80	21.39
Efficient for teachers in terms of internet quota	62	16.58
Facilitated by the school	11	2.94
Provisions from the school	11	2.94
Adjusting to the facilities owned by students	6	1.6
Interesting for students	5	1.34
Providing many features	4	1.07

3.1.2. Type of Online Learning Implemented during Distance Learning

After investigating teachers' preference in using online learning platforms, the teachers were asked to give an example of mathematics instructional activities implemented during distance learning. For this purpose, we excluded participants who did not write an example of mathematics instructional activities, resulting in 262 respondents. The analysis is summarized in Table 5. The majority of the teachers (approximately 71%) used asynchronous learning to facilitate distance learning during the pandemic. Meanwhile, accounting for about 24% of the teachers used a blend of synchronous and asynchronous learning, and only about 5% of the teachers used synchronous learning.

Table 5. The type of online learning implemented (n = 262)

Type of online learning	Number of participants	%
Asynchronous learning	185	70.61
Synchronous and asynchronous learning	64	24.43
Synchronous learning	13	4.96
Total	262	

3.1.3. Learning Approach Implemented during Distance Learning

Furthermore, the teachers were asked to mention the learning steps carried out in conducting distance learning in order to reveal their learning approach. Since the question is partially open-ended, therefore the teachers choose the answers from the provided options. For this purpose, we excluded participants who only mentioned one learning step since we cannot conclude the implemented learning approach, resulting in 347 respondents. The analysis is summarized in Table 6. Table 6 indicates that among 347 teachers, approximately 73% implemented teacher-centered learning and roughly only 27% implemented students-centered learning.

Table 6. The dominant learning approach implemented (n = 347)

Learning approach	Number of participants	%
Teacher-centered learning	254	73.2
Students-centered learning	93	26.8
Total	347	

3.2. Discussion

This study examines the online learning platforms used by Indonesian mathematics teachers in distance learning, the type of online learning that dominate distance learning, and the learning approach implemented on distance learning during Covid-19 pandemic. The analysis of teachers' responses reveals three points of discussion.

First, this study confirms that most of the mathematics teachers prefer to use social media, especially social media that utilize a combination of digital content for communication among students, to facilitate distance learning during the pandemic. The majority of teachers who facilitated remote learning used Whatsapp, the most widely used messaging apps in Indonesia based on Hootsuite & We Are Social [19], as their online learning platform. The finding about the popularity of social media as an online learning platform confirms previous studies which show the opportunities to use social media for academic usage [31, 32, 33]. From table 4, we found that the ease of use of the platforms and the ease in sharing information or communicating became the main reasons for choosing the online learning platforms, as these reasons are chosen by more than 50% of the respondents. The ease of use of the platforms, especially social media, might be because many people have often used the platforms, as there are around 12 million social media users in Indonesia [19]. Meanwhile, the reason regarding the ease in sharing information & communication in line with the characteristics of social media, namely participation, openness, conversation, community, and connectedness [34]. Moreover, around 61% of the respondents have explored educational e-learning platforms to facilitate distance learning. This finding sounds promising because, at the beginning of the pandemic, there were already quite a number of teachers who were already using educational-based platforms. However, only a few of them used the local online learning platform. Furthermore, this study also reveals that the number of online learning platforms used by teachers in Java and Sumatera was higher than those in the rest regions in Indonesia. The inequality of knowledge and ability to use learning platforms among Indonesian mathematics teachers during Covid-19 pandemic might potentiate to worsen the educational inequality and digital divide [35].

Second, this study also reveals that the majority of the teachers preferred to use asynchronous learning instead of synchronous or the combination of both online learning types to facilitate distance learning during the Covid-19 pandemic. The tendency to choose asynchronous learning might be because, in the early pandemic, teachers need to upgrade their ability to remotely teach so that they work with what they know while reassure and maintain communication with their students [36]. However, if teachers rely primarily on asynchronous learning and rarely have a face-to-face meeting, then students might feel isolated [8]. Therefore, teachers must upgrade their knowledge and ability so that they can combine synchronous and asynchronous learning to optimize the benefits from both types of online learning.

Third, this study also reveals that mathematics teachers tended to use teacher-centered learning approach during distance learning. However, this finding did not imply that the teachers also used this learning approach in traditional learning before Covid-19 pandemic. The tendency to implement teacher-centered learning might happen because the teachers did the rapid transition to distance learning in the early of the pandemic. The rapid-transition to adopt new technology in learning process might lead teachers to back to the "old pedagogy" that focuses on the transmission of knowledge or unguided discovery [35].

4. CONCLUSION AND RECOMMENDATION

Overall, this study reveals that Covid-19 pandemic force Indonesian mathematics teachers to ramp up their knowledge and ability to do a quick shift from the traditional classes. This study shows that the majority of Indonesian mathematics teachers involved in this study facilitated distance learning by using social media, especially social media that utilize a combination of digital content. This study also shows that this pandemic might potentiate to worsen the educational inequality and digital divide in Indonesia since the data shows that the number of online learning platforms used by teachers in Java and Sumatera was higher than those in the rest regions in Indonesia. This study also reveals that the rapid transition during this emergency time might lead the teachers' tendency to rely on asynchronous online learning as the dominant online learning type and also to use teacher-centered learning as the learning approach. Therefore, this study gives an empirical overview about educational practices during a pandemic and thus may serve valuable information for the better improvement of distance learning during the pandemic and the benefit of future crises [35].

This study has two major limitations. First, the sampling method used in this study is snowball sampling via social media. Therefore, the result of this study cannot be generalized to the general population. Second, the majority of the respondent came from Java,

the most developed region in Indonesia, and only 26.75% of respondents come from other parts of Indonesia. The study might have different results if the number of respondents from each region in Indonesia is proportional. Nevertheless, the findings of this study may serve to alert educational practitioners of some issues regarding the teachers' responses during Covid-19 pandemic. Future research requires rigorous studies that able to in-depth capture the distance learning practices in Indonesia during the pandemic.

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