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DIFFICULTIES OF TEACHING MATHEMATICS WITH DISTANCE LEARNING APPLICATION SYSTEMS IN HIGH SCHOOLS

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ABSTRACT

All schools worldwide are rapidly entering the remote education process due to the Covid-19 outbreak. In this process, the math teacher becomes a remote math teaching partner. The teacher's experience in the remote teaching process of this mathematics subject, which is a compulsory subject in all senior secondary schools. This study aimed to see teachers' difficulties, such as problem-solving, class discussions, teaching aids, and appropriate learning methods. The participants of this study which was designed as a complex study were 15 experienced mathematics teachers in various schools in Banda Aceh. This research contributes to knowing the difficulties of mathematics teachers in teaching remotely to improve the quality of distance learning which the government is echoing in the present and future. The study results show that teachers have difficulties in remote math lessons. According to the findings of the research conducted by the participating teachers, mathematics classes should not be taught using applications for distance education; teachers have trouble interacting and communicating with students because there is limited interaction and a lack of direct feedback, and some students do not attend classes; there is a lack of information about the use of the internet and technological tools; there is a significant lack of sufficiency across the curriculum; there are some students who do not attend classes; there is a shortage of information about the use of technological tools.

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INTRODUCTION

Education is a lifelong learning process, namely learning from birth to death which takes place openly and has multiple meanings (Istiqomah & Nurulhaq, 2021). Education is essential for every human being the needs a better life. Education is a process of activities to form student personalities, carried out systematically (Putri & Sundayana, 2021; Tirtahardja & Sulo, 2005). An essential part of a series of educational processes is school learning activities (Luritawaty, 2018). Students learn and gain various knowledge at school face-to-face with teachers and friends (Yusriyah & Noordyana, 2021). However, lately, the teaching and learning process has been disrupted due to the co-19 pandemic. Indonesia and other parts of the world are also feeling the effects of the pandemic. So that resulted in changes in learning methods to get an education.

At the beginning of 2020, the Covid -19 pandemic forced significant changes that hit all countries. All activities have switched from conventional to digital, including education. Instead of studying together in class, students and teachers are suddenly separated and learning remotely (Afriansyah et al., 2020; Dilmaç, 2020). Thus, the Covid -19 pandemic has created new challenges and demands regarding the teaching and learning process on a global scale. This makes teachers at all education levels strata and inspires teachers to find solutions to problems that did not exist before (Guadalupe Lugo-Armenta & Roberto Pino-Fan, 2021). Current digital capabilities can be utilized to overcome learning problems; digital learning abilities have become competencies teachers must master during distance learning. Learning must be attractive to maintain and develop students' interest or readiness (Luritawaty, 2018). Exciting and innovative learning media are needed to assist teachers in teaching. Learning media can channel the sender's message to the recipient to stimulate students' thoughts, feelings of attention, and interest in learning. Learning media is necessary to improve student learning achievement in the learning process (Nurfadhillah et al., 2021; Tafonao, 2018). Learning with digital media during distance learning is the teacher's solution when delivering subject matter and helping students understand the material easily (Kurniawan et al., 2018). But the problem is, the lesson teacher is not used to teaching using digital technology.

Learning to teach from a distance was unfamiliar to mathematics teachers before Covid-19. Distance learning was foreign to previous teachers. But in the end, all teachers have to get used to teaching remotely or in a forced way. Teachers have to upgrade their abilities to teach remotely or online. Learning distance learning (distance learning) is carried out in an environment where teachers and students are separated in time and space (Dilmaç, 2020). Technology is significant for the smooth teaching and learning process in the current conditions. Munir (2009) said that distance learning began with a written module system. With the development of information technology, many computer-assisted learning media, audio, video, print media, multimedia, and the internet emerged (Munir & It, 2009). This learning aims to provide opportunities for students to get what they missed in the world of education. In addition, distance learning also aims to reduce costs and improve the quality of education. This distance learning aims to integrate technology with education, remove barriers to accessing information, provide continuing education and knowledge that aligns with communication technology, and help maintain a planned and systematic educational process (Chyr et al., 2017).

The teaching and learning process that took place in the context of remote education as a result of the unanticipated and unplanned co-19 epidemic is referred to as emergency distance teaching. This was triggered by a temporary shift of instructional delivery to alternative delivery modalities due to the crisis. As a result, immediately setting up interim solutions to sustain and permit teaching regardless of the spatial distance was necessary. Since it is crucial to transition from in-person to distant or online instruction, the term "panic glory" is frequently used to characterize circumstances in which both teachers and students find themselves (Barlovits et al., 2021). On the other hand, teachers all over the world are rapidly reconstructing their teaching methods, primarily through the use of digital media and the internet,

in order to discover solutions to future problems and create new ways of teaching for the purpose of maintaining the teaching and learning process in its entirety (Barlovits et al., 2021). As a result of the COVID-19 pandemic, the classroom has been replaced by the homes of the students or other locations chosen by the students themselves as suitable for learning. So, pupils are not educated in the same location at the same time simultaneously, but rather are dispersed among a number of locations (Barlovits et al., 2021). Due to the widespread pandemic, many schools have been forced to close, and different restrictions have been imposed, thus it has become increasingly crucial to be able to learn independently of time and location through distance learning. In this sense, it is thought that the most effective way to deal with Covid -19, and even the only option, is for many countries around the world to implement distance education programs (Moreno & Gortazar, 2020; Telli Yamamoto & Altun, 2020). The United Nations Educational, Scientific, and Cultural Organization (UNESCO) suggests that open educational practices and platforms be utilized in the event of the shutdown of schools (Setiawan, 2020). In addition to this, they offer ten recommendations to ensure the continuity of education, which are as follows: (1) Determine whether or not the prerequisites have been met and select the instrument that is most suited for the job, and (2) Examine and confirm that the online education course is comprehensive. (3) Keep in mind the importance of maintaining the privacy and safety of the data. (4) Place an emphasis on finding answers to psychosocial issues before beginning any teaching. (5) Establishing a timetable for the remote education program. (7) Provide assistance and support to educators and families who are utilizing digital tools. (8) Combine different strategies that are relevant and cut down on the number of applications and platforms. (9) Establish distance learning norms and monitor student learning processes. (10) The time for the distance education unit should be set according to the student's capacity for self-management. (11) Build organizations and develop ties (Unesco, 2020).

Along with the distance education process compulsorily initiated by the ministry of education, online learning and various teaching management systems were used for all schools in Indonesia. The majority of kids and teachers go through life having never experienced something like this before. Despite the fact that greater online learning alternatives have given students access to online courses, the rapid expansion that has accompanied this trend has also created quality difficulties (Ferguson, 2020; Patterson & McFadden, 2009). This is relevant to the field of mathematics education. According to Xu and Jaggars (2014), it is more difficult for students to succeed in math lessons that are conducted online than in ones that are conducted face-to-face (Xu & Xu, 2019). When the research that has been done up to now is taken into consideration, it appears that learning settings that are conducted online are at least as successful as learning environments that are conducted face-to-face. Despite the fact that there are many benefits for both students and teachers, it does not appear that this is the case for mathematical instruction (Ferguson, 2020). A qualitative study of teaching mathematics (Pramuditya & Nurlaelah, 2021) stated that distance mathematics teaching did not work effectively. The study's results revealed real difficulties in online classes especially faced by mathematics teachers. Because the process of learning mathematics is very different from the learning process with other subjects. Siagian (2016) defines mathematics as a science that discusses patterns or patterns and levels (order) (Siagian, 2016).

For this reason, mathematics teachers must provide facilities for their students in the learning process through existing patterns. This online media can be beneficial in times like today. Online learning is learning organized through a web network where a teacher provides material in video recordings or slideshows accompanied by assignments in both written and pictorial form (Djamilah & Lazwardi, 2020).
The difficulties faced by mathematics teachers are various. They start from the difficulties of accessing to teaching mathematics to learning theories that are different from face-to-face learning methods (Chin & Fu, 2021). If direct learning, the teacher can explain and demonstrate the learning process directly. However, distance learning makes teachers restructure the teaching style and delivery of mathematics. Because the difference is apparent with face-to-face teaching. Coupled with learning mathematics, the concept of delivery differs from that of other subjects. In learning mathematics, the teacher considers

several deliveries of material complicated during the distance teaching and learning process. For example, problem-solving, class discussion, use of learning materials or aids, learning applications, and learning strategies (Chin & Fu, 2021). This makes it difficult for math teachers to teach remotely compared to face-to-face learning.

Due to the ongoing pandemic and the need to maintain the mathematics teaching and learning process in the future, the process of distance education must be initiated, and it can be said that teachers and students are the most affected parties in this process. This can be said because of the description that was given above. The studies that make up this research concentrate on the challenges that are presented in teacher training programs, the educational process, and the identification of preexisting circumstances. Therefore, one of the topics that needs to be researched is how exactly this process operates within the realm of mathematics education. In addition to being the most important component of the process, the experience and observations of the instructor are equally important. As a result, the purpose of this research is to shed light on the challenges faced by educators who are required to teach remotely as a result of the epidemic. In addition, the purpose of the current research is to create a comprehensive picture, from the point of view of mathematics educators, of the method of distance education as it is practiced in this extraordinary era. In this study, the authors' goals are to investigate the mathematics teaching practices that were utilized during the distance learning phase of the process that was implemented by the ministry of education in Indonesia, as well as to investigate the experiences and difficulties of teachers who were suddenly involved in the process of distance education.

METHODOLOGY

The purpose of this study is to investigate the challenges and experiences that are faced by educators who are thrust unexpectedly into the process of distant education. Within this particular framework, the research was conceived of in accordance with the descriptive research model, which is one of the qualitative research models (Rivai, 2005). The purpose of this study is to gain a better understanding of the challenges faced by educators who participate in the process of distant education but who lack significant prior expertise and preparation. A questionnaire and a semi-structured interview form were used to acquire the data needed for this study. The data were received from 15 mathematics teachers who worked from a remote location. Interviews with all of the participating teachers were carried out. Over the course of the interview, a questionnaire was used to collect information about the experiences of distance education participant teachers during the outbreak. A voice recorder was utilized in order to capture the interviews. When conducting interviews, researchers try to follow a systematic way. Analysis of the data obtained from the interviews was processed using descriptive qualitative methodology to determine the teacher's difficulties in teaching mathematics from a distance.

RESULTS AND DISCUSSIONS

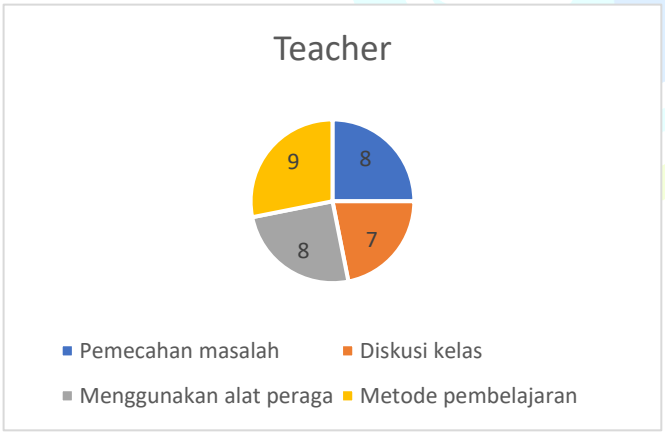
From the results of the research data analysis and interviews conducted with participating teachers, several difficulties were encountered by teachers. The difficulties encountered are distinguished by several points. The difficulties teachers face include those related to the general structure of mathematics lessons.

In this particular instance, the data presented the perspectives of the 15 participating educators. In this particular setting, the perspectives of teachers regarding the nature of the hands-on activities included in their distant education experiences were gathered. Various viewpoints are gathered, including those about problem-solving, classroom discussion, the utilization of various teaching tools, and various teaching strategies. These codes will be explained following the sequence that was presented earlier.

Table 1.1. Types of teacher difficulties in conveying mathematics subject matter

No	Teacher code	Kind of difficulty			
		Solution to problem	Class discussion	Using Props	Learning methods
1	S-1	√			√
2	S-2		√		
3	S-3	√		√	√
4	S-4		√	√	
5	S-5			√	√
6	S-6	√			√
7	S-7		√	√	
8	S-8	√	√		√
9	S-9			√	√
10	S-10	√	√		√
11	S-11	√		√	
12	S-12		√		√
13	S-13			√	
14	S-14	√	√		√
15	S-15	√		√	
Amount (∑)		**8**	**7**	**8**	**9**

Table 1.1 shows that the 15 teachers who were researched and interviewed produced several explanations about their difficulties in teaching mathematics with distance learning—data from Table 1.1. The above shows the total number of teachers who had difficulties and the difficulties encountered when teaching remotely. Complete data can be seen in the following diagram:



Kind of difficulty	Number of troubled teachers
Solution to problem	Eight people
Class Discussion	Seven people
Using Props	Eight people
Learning methods	Nine people

Figure 1. Diagram of teacher difficulties in teaching mathematics with distance learning

Solution to problem is without a doubt one of the fundamental aspects of the subject matter that needs to be taught. The instructor underlines that students' experiences in problem-solving are restricted, particularly during the process of receiving an education through distant learning. The teacher stated that there were many distractions in the teaching and learning process in all lessons delivered through interactive video or audio-visual through the Zoom application or other teleconference applications. Based on the diagram above, it can be seen that eight teachers had difficulty explaining the material when the teacher explained problem-solving in the teaching and learning process using the distance learning method. When the teacher is named and asks the teacher to comment, the teacher makes the following comment:

In mathematics, students se should have written and thought about their questions. He had to work it out and try to finish it. He had to think about it step by step. He has to discuss problems with other students and listen to other people's opinions. If necessary, we explain it step by step. But in distance learning, this does not happen in the learning process. People treat watching videos the same way they do movies. Students are required to take an active role in the process, figure out solutions, and think critically about the issues at hand. He can view videos to see the flaws, but only after he has solved the problem first. In my opinion, it is not possible to understand mathematics from the video that the teacher provides. The study of mathematics requires both mental effort and the use of a writing implement. Unlike watching films, doing math requires mental effort.

Students of mathematics are expected to experiment. They have a problem that needs to be solved. They do nothing but listen to videos throughout this procedure, especially during the sections that need learning. They are receptive learners. Even if I were to instruct them in a different area, the outcome would be the same: they would listen. Lectures are visualized, but there is no involvement of any mental processes whatsoever. Students need to dedicate significant effort to the application and problem-solving stages of their math studies. So, the kids need to be given some time, and the teacher should always be present with them. But we are unable to devote time when it comes to distant learning. Has the issue been resolved as a result of the youngster pausing the video? What is going to happen with the child? When attending school at a distance, it can be difficult to organize one's time effectively. In the context of distant education, time is more precious.

Class Discussion. The professors who participated in the interviews that were carried out claimed that they had a hard time establishing mathematical contact with their pupils, particularly during the immediate learning process in the context of distance education. The teacher emphasized that class discussions were insufficient and unproductive due to the many distractions that occur during class discussions remotely. Some difficulties experienced were students who were too active, so the audio was disturbed. Seven teachers found it difficult to teach mathematics using distance learning when the teacher conducted class discussions. When the researcher asked one of the teachers to comment, the teacher said:

Mathematics is a subject that students have opposed because it is considered a complex subject in everyday learning. We need to establish emotional contact with students. When we are face to face with them, we are able to speak their language and understand what it is that they desire. The kids provide us with feedback, and we are able to involve them in the learning process. In face-to-face learning, class discussions and communication occur. This is an essential thing in the process of learning mathematics. However, employing distance learning, students only listen in synchronous lessons application. When we allow pupils talk, it causes uncertainty among the other students in the classroom. Unfortunately, we are unable to turn on the sound for all of the kids. Some children have a lot of imagination, and all youngsters come up with unique approaches and suggestions. Sometimes it amazes me how they can look at a problem from such different angles and come up with such distinct solutions. Due to the fact that kids just listen in direct learning, there is little opportunity for engagement.

In the classroom, when we ask, "Do you guys understand?," sometimes there is no sound, but we can tell whether or not they comprehend simply from their facial expressions. We see everyone on the screen like this, but we can't see everyone; we can't focus. They, too, hesitate; no reaction. Students do not answer when I ask questions. No communication. Communication can only take place when someone is brave enough to speak; some people will react. Even when students wish

to speak, we are unable to grasp what is said or what is being said since there are so many pupils. Often, this is prevented by having their microphones set to a muted state. Math instruction strikes me as a particularly inefficient use of classroom time. If we are able to instruct each student individually, we will have a better chance of success, but it will take significantly more time.

Using props. When the teacher used visual aids in explaining mathematics material with distance learning, eight teachers experienced difficulties. When the researcher asked a teacher to comment, the teacher commented:

There are also material restrictions in distance learning. In geometry, for example, we use props. There is a subject division line, which is similar to the median line but pertains to a different sub-matter. One can participate in a game that involves folding paper to create dividing lines. I choose to participate in this activity since it is less complicated than others. I can demonstrate it through a video, but I have to watch the child fold it in person. After displaying the papers on the screen, I instructed the students to stack the two pieces of paper by saying, "Place the two pieces of paper on each other." Yet they are approaching it from the incorrect viewpoint. I instruct them to "Put another one in." But there are those who inquire, "Which one?" and it did not take place. I was able to describe the issue, but I cannot physically resolve it. It will just take less time if I am next to it, but it will take a little bit more time if I am learning it from a distance. For instance, if we were to make an object, we would run into the same issue. I would like for them to be holding flat items in their palms. It is not possible for them to sketch a shape or space that is flat when we are communicating remotely.

Different Teaching Methods. During the process of distance education, the majority of the educators reported that it was challenging for them to employ a variety of mathematical strategies with their classes of pupils. They place a strong emphasis on the fact that many of the methods (such as Drama and Gamification) that they use in the classroom cannot be utilized in distance education. When the teacher wanted to change the learning method, nine teachers experienced difficulties delivering learning material. When the teacher was asked to comment on this matter, one teacher commented:

The first time we can provide information at the level of understanding. How did students solve the question the first time (Tims's question, HOTS, Pisa)? For example, we teach integers. We move two steps forward and one step back. Sometimes we joke and play roles (Drama method). When we ask students, how did you guys manage to do this? You can't. There is no response from students, so learning does not occur.

I usually use different materials and games in class. There are many math games that we can play. I love math games, many of which are games to be played in pairs. I don't know how to do this in remote learning. I can't use a different method in this distance education. I am the only active person when the students are confused and don't know what to do. Learning doesn't happen this way.

Based on the analysis of the teacher's answers, the types of difficulties experienced by the teacher were obtained, which were classified based on criteria (Sugiono, 2016), shown in Table 1.3 below.

Table 2. teacher's difficulties in distance learning

No	Aspect	Types of Teacher Difficulties
1	Solution to problem	It is difficult for the teacher to explain the material that will be delivered online coherently
		Students sometimes do not understand the instructions given by the math teacher because of connection problems
		The teacher must often repeat the explanation of the material so that the lesson time runs out.

2	Class Discussion	The teacher's difficulties in managing students in class discussion groups
		It is difficult for the teacher to organize student work groups and provide different materials because they only display one screen
		The teacher's difficulty showing discussion groups to other students outside the group
		The teacher's difficulties made students throw comments at each other, so the discussion did not work out
3	Using Props	The difficulty of the teacher demonstrating math props in front of the screen
		Difficulties for teachers teaching the use of visual aids to students online
		The teacher's difficulty is seeing all student responses in mathematics, whether students understand or not
4	Learning methods	Difficulties for teachers applying online learning methods
		The teacher's difficulty changing learning methods because students pay less attention to the instructions given
		It is difficult for teachers to get reactions to student learning outcomes after giving different learning methods.

Based on Table 1.3 above, it can be seen that of the 15 teachers who have been asked for comments and the difficulties encountered in learning mathematics, and most teachers find distance learning difficult. Almost all teachers said they had difficulties in distance learning, but their difficulties varied.

CONCLUSIONS (12 Calibri)

In the current piece of research, the researcher made an effort to shed light on the challenges that mathematics teachers faced as a result of the unexpected implementation of the remote education process in their classrooms. According to the professors, mathematics involves lengthy mental processes and pupils need to be activated and followed in this process for it to be successful; however, this is not achievable in applications that involve distant education. It was underlined that one of the most important aspects of teaching mathematics is delivering quick feedback to students by following their actions. However, it was stated that there was not sufficient time nor the appropriate conditions to carry out this activity in the context of distance education. In addition, the instructor claims that pupils are unengaged during live video lessons, despite the fact that they should be active; consequently, many students find it easy to give up. Instructors who state that in face-to-face education, they utilize a variety of interaction-based teaching methods and resources, they are unable to take advantage of such interactions while using video classes. Furthermore, claims that the move to distant education as a result of social isolation will decrease interactions that take place in person during classes. This lends credence to the conclusions of the most recent studies. In this particular scenario, it is important to point out that instructors frequently emphasize the constraints that come with communication and engagement.

It has been noted that there are variables in online education that affect the motivation of teachers. According to the statements of one educator, the execution of the remote education process was left up to the discretion of both the school administration and the educator. As a result, many educators do not teach the courses in which they are certified. Students were hurt as a result, and despite his efforts, he became less motivated as a result of the application's lack of coherence. This statement made by a teacher demonstrates that there is neither a specific nor a typical practice in the field of distance education, and that some teachers do not carry out their responsibilities unless they are required to do so.

Concerns about the nation's health and the state of the economy were two additional issues that contributed to instructors' lack of motivation. The worry and anxiety that the teacher felt made it impossible for her to continue providing distant education after she observed people around her who were infected with the highly contagious Covid-19 pandemic virus. Another educator explained that she was

unable to concentrate on teaching owing to the financial difficulties that resulted from the termination of her husband's job during the pandemic. This demonstrates that the COVID-19 pandemic has caused harm to educators and made it more difficult for them to perform their jobs effectively.

It was determined, on the basis of the opinions expressed by the participating educators, that mathematics classes are not suited for use in conjunction with distant education programs. Because there was so little opportunity for engagement and so little immediate feedback, teachers had a difficult time interacting and communicating with their students. Some students choose not to attend classes, there is a lack of information about how to make use of the internet and other technological tools, there is a significant insufficiency across the country in terms of hardware and infrastructure, there is inequality of opportunity in the process of distance education, the Covid-19 disease causes fear and anxiety, and the motivation of both teachers and students declines.

References

Afriansyah, E. A., Sofyan, D., Puspitasasri, N., Lurytawati, I. P., Sundayana, R., Maryati, I., Noordyan, M. A., & Basuki, B. (2020). Edmodo E-learning Media Training for Learning Optimization. Pekemas: Journal of Community Service, 3(2), 33–39.

Barlovits, S., Jablonski, S., Lázaro, C., Ludwig, M., & Recio, T. (2021). Teaching from a distance—math lessons during covid-19 in germany and spain. Education Sciences, 11(8). https://doi.org/10.3390/educsci11080406

Chin, K. E., & Fu, S. H. (2021). EXPLORING the IMPLEMENTATION of AN INTERVENTION for A PUPIL with MATHEMATICAL LEARNING DIFFICULTIES: A CASE STUDY. Journal on Mathematics Education, 12(3), 531–546. https://doi.org/10.22342/jme.12.3.14473.531-546

Chyr, W.-L., Shen, P.-D., Chiang, Y.-C., Lin, J.-B., & Tsai, C.-W. (2017). Exploring the effects of online academic help-seeking and flipped learning on improving students' learning. Journal of Educational Technology & Society, 20(3), 11–23.

Dilmaç, S. (2020). Students' Opinions about the Distance Education to Art and Design Courses in the Pandemic Process. World Journal of Education, 10(3), 113–126.

Djamilah, S., & Lazwardi, A. (2020). Pembelajaran Daring Struktur Aljabar Dan Analisis Real Pada Masa Pandemi. Jurnal Riset Teknologi Dan Inovasi Pendidikan (JARTIKA), 3(2), 403–409.

Ferguson, S. (2020). Attrition in online and face-to-face calculus and precalculus courses: A comparative analysis. Journal of Educators Online, 17(1), n1.

Guadalupe Lugo-Armenta, J., & Roberto Pino-Fan, L. (2021). Inferential Statistical Reasoning of Math Teachers: Experiences in Virtual Contexts Generated by the COVID-19 Pandemic. Pandemic. Educ. Sci, 2021, 363. https://doi.org/10.3390/educsci

Istiqomah, Q., & Nurulhaq, C. (2021). Perbandingan Kemampuan Koneksi Matematis Siswa antara Model Pembelajaran Discovery Learning dan Ekspositori. Plusminus: Jurnal Pendidikan Matematika, 1(1), 135–144.

Kurniawan, D. C., Kuswandi, D., & Husna, A. (2018). Pengembangan media video pembelajaran pada mata pelajaran IPA tentang sifat dan perubahan wujud benda kelas IV SDN Merjosari 5 Malang. JINOTEP (Jurnal Inovasi Dan Teknologi Pembelajaran): Kajian Dan Riset Dalam Teknologi Pembelajaran, 4(2), 119–125.

Luritawaty, I. P. (2018). Pembelajaran take and give dalam upaya mengembangkan kemampuan pemahaman konsep matematis. Mosharafa: Jurnal Pendidikan Matematika, 7(2), 179–188.

Moreno, J. M., & Gortazar, L. (2020). Schools' readiness for digital learning in the eyes of principals. An analysis from PISA 2018 and its implications for the COVID19 (Coronavirus) crisis response. Education for Development Blog, Washington, DC: The World Bank.

Munir, D., & It, M. (2009). Pembelajaran jarak jauh berbasis teknologi informasi dan komunikasi. Bandung: Alfabeta, 24.

Núñez, J., Gula, L., Alindan, E., Colcol, C. J., Sangco, A., Taracina, J., ... & Tuscano, F. J. (2023). Continuing the Distance Learning Modality of Graduate Studies in Post-COVID Philippines: A Survey. Online. FDLA Journal, 7(1), 1-17. https://eric.ed.gov/?id=ED627482

Nurfadhillah, S., Ningsih, D. A., Ramadhania, P. R., & Sifa, U. N. (2021). Peranan media pembelajaran dalam meningkatkan minat belajar siswa SD Negeri Kohod III. PENSA, 3(2), 243–255.

Patterson, B., & McFadden, C. (2009). Attrition in online and campus degree programs. Online Journal of Distance Learning Administration, 12(2), 1–8.

Pramuditya, S. A., & Nurlaelah, E. (2021). Kemampuan Komunikasi Digital Matematis. Media Sains Indonesia.

Putri, N. I. P., & Sundayana, R. (2021). Perbandingan Kemampuan Komunikasi Matematis Siswa antara Problem Based Learning dan Inquiry Learning. PLUSMINUS: Jurnal Pendidikan Matematika, 1(1), 157–168.

Rivai, A. (2005). Media Pengajaran Bandung: Sinar Baru Algensindo.

Setiawan, A. R. (2020). Lembar kegiatan literasi saintifik untuk pembelajaran jarak jauh topik penyakit coronavirus 2019 (COVID-19). Edukatif: Jurnal Ilmu Pendidikan, 2(1), 28–37.

Siagian, M. D. (2016). Kemampuan koneksi matematik dalam pembelajaran matematika. MES: Journal of Mathematics Education and Science, 2(1).

Sugiono, S. (2016). Metode penelitian kuantitatif, kualitatif, dan r & d. Bandung: Alfabeta.

Tafonao, T. (2018). Peranan media pembelajaran dalam meningkatkan minat belajar mahasiswa. Jurnal Komunikasi Pendidikan, 2(2), 103–114.

Telli Yamamoto, G., & Altun, D. (2020). Coronavirüs ve çevrimiçi (online) eğitimin önlenemeyen yükselişi. Üniversite Araştırmaları Dergisi, 3 (1), 25-34.

Tirtahardja, U., & Sulo, S. L. (2005). Pengantar Pendidikan (Jakarta: PT Rineka Cipta).

Unesco, I. (2020). Basic texts of the 2003 convention for the safeguarding of the intangible cultural heritage.

Xu, D., & Xu, Y. (2019). The Promises and Limits of Online Higher Education: Understanding How Distance Education Affects Access, Cost, and Quality. American Enterprise Institute.

Yusriyah, Y., & Noordyana, M. A. (2021). Kemampuan Representasi Matematis Siswa SMP pada Materi Penyajian Data di Desa Bungbulang. PLUSMINUS: Jurnal Pendidikan Matematika, 1(1), 47–60.