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The Great Mathematics Teacher: Student Perspectives in Technology-Based Learning

Sumbaji Putranto[1*]
Mathematics Education Study Program, State Islamic University Sunan Kalijaga. Laksda Adisucipto Street, Caturtunggal, Depok, Sleman, Yogyakarta, Indonesia.
E-mail[1]: sumbaji.putranto@uin-suka.ac.id

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** Corresponding author*

Abstract: After the Covid-19 pandemic, the impact of life on the economic, social, health, and education sectors is still being felt. One of the changes in education is the increasing number of technology-based learning. This research aims to find out students' perspectives on online learning, the technology used by teachers in learning, and online learning strategies based on students' perspectives. Researchers use phenomenological research. Researchers began collecting data using a questionnaire followed by semi-structured interviews. Data analysis was carried out using the Bogdan & Biklen approach including data reduction, categorization of data into sub-themes and themes, deduce. The research shows that students have difficulty understanding mathematics when learning online. The use of technology that is not optimal causes impacts. Teachers do not take advantage of virtual meetings which can be a medium for meetings between students and teachers, so that both can build communication and closeness between teachers and students which will help students understand mathematics material.

Keywords: mathematics, perspective, student, technology-based learning.

Guru Matematika Hebat: Perspektif Siswa dalam Pembelajaran Berbasis Teknologi

Abstrak: Pasca pandemi Covid-19 dampak kehidupan pada sektor perekonomian, sosial, kesehatan, dan pendidikan masih dirasakan. Perubahan dalam pendidikan salah satunya dengan semakin banyak pembelajaran berbasis teknologi. Penelitian ini bertujuan untuk mengetahui cara pandang siswa terhadap pembelajaran daring, teknologi yang digunakan guru dalam pembelajaran, dan strategi pembelajaran daring menurut sudut pandang siswa. Peneliti menggunakan penelitian fenomenologis. Peneliti mengawali pengumpulan data menggunakan kuesioner dilanjutkan dengan wawancara semi terstruktur. Analisis data dilakukan dengan pendekatan Bogdan & Biklen meliputi reduksi data, kategorisasi data menjadi sub tema dan tema, penarikan kesimpulan. Hasil penelitian menunjukkan bahwa siswa mengalami kesulitan dalam memahami matematika ketika pembelajaran online. Penggunaan teknologi yang tidak optimal menjadi penyebabnya. Guru tidak memanfaatkan pertemuan virtual yang dapat menjadi media pertemuan antara siswa dan guru, sehingga keduanya dapat membangun komunikasi dan kedekatan antara guru dan siswa yang akan membantu siswa dalam memahami materi matematika.

Kata Kunci: matematika, perspektif, siswa, pembelajaran berbasis teknologi.

INTRODUCTION

The COVID-19 virus appeared in Wuhan, China in December 2019. The World Health Organization (WHO) has declared a COVID-19 pandemic since March 11, 2020. Meanwhile, the Indonesian government declared an emergency status on March 14, 2020, and in early April this prompted the government to start implementing Large-Scale Social Restrictions (PSBB). The COVID-19 pandemic had an impact on all sectors of the economy, social, health,

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and education sector, especially in the learning process (Crawford et al., 2020; Zhou et al., 2020). One of the changes felt in the education sector is the implementation of government regulations that forced to close the school a few times or replace the learning system that was originally at school to be at home.

In online learning, the government has provided solutions to utilize technology media. Teachers and students who are not ready with the new rules will experience confusion in the implementation of online learning. Moreover, the problem of geographical conditions and internet coverage became a new problem at that time. Previous research shows that there are barriers related to technology, students' personalities, and institutions in online learning that cause bad impacts (Baticulon et al., 2021; Engzell et al., 2021; Fabito et al., 2021; Flack et al., 2020; Hamilton et al., 2021; Donnelly & Patrinos, 2021).

Online learning has both positive and negative impacts. The positive aspects are time and cost-effectiveness, safety, convenience, and increased participation. Students are also free to access so they can review anytime, more relaxed and travel savings (Suyatno et al., 2022; Finlay et al., 2022). On the other hand, the negative aspects are distraction and reduced focus, workload, technology and internet connectivity problems, and lack of support from instructors and colleagues (Maqableh & Alia, 2021). The most important factors behind student dissatisfaction during online learning are distraction and reduced focus, psychological problems, and management problems (Maqableh & Alia, 2021), such as physical and mental discomfort during this difficult time affecting the learning and teaching process (Selvaraj et al., 2021). One of the impacts of the pandemic on students is mental health problems regarding daily activities of online learning through a technological environment (Raccanello et al., 2022).

Teachers as student facilitators are required to be more creative in overcoming these problems. Teachers are obliged to facilitate all needs. The existence of competent teachers determines the success of the learning program and determines student learning outcomes (Harisman et al., 2019; Osmond-Johnson, 2015; Suyatno et al., 2022). Suitable methods for online learning are different teaching techniques such as live online lectures, audio and video recorded lectures, online sharing of materials, and blended learning (Favale et al., 2020). The assessment is an online assessment, such as online quizzes, exams, and assignments (George, 2020).

According to Al-smadi et al. (2022), the school should consider efforts and approaches to improving the quality of online learning in the outcomes of such advocacy as IT infrastructure and internet access. The Covid pandemic has lasted for 3 years, there have been many methods, models, strategies, and technologies used by teachers in learning. To ensure that the teaching practice carried out by the teacher runs well and effectively, an evaluation of the teaching practice needs to be carried out. At the secondary school level, students' perceptions of teaching quality can provide valid information regarding teachers' teaching practices (Wagner et al., 2013). Student perspectives are important when new teaching approaches are used and when new technologies are introduced (Crews & Butterfield, 2014; Van Wart et al., 2019). Based on these data, this article will discuss the perspectives of students during the implementation of online learning and the technology used by teachers in learning.

METHOD

This is qualitative research using a phenomenological approach. The research was conducted in March 2022. It used purposive sampling to choose research participants. This technique is used if the researcher has certain considerations in determining the sample according to the research objectives (Sudjana & Ibrahim, 2012). The first criterion, the selection of subjects was selected based on the willingness of the subjects to complete all stages in this study, namely filling out questionnaires and interviews. The second criterion, the subject has good communication skills to answer all questions during the interview.

The questionnaire consists of 20 items that have been assessed by three experts. Participants fill out the questionnaire online using Google Forms. In this study, 100 subjects were willing to complete the questionnaire. The age range of the subjects involved was 16-19 years. All of these subjects are Public High School students in Yogyakarta. The data were analyzed to see how students responded to technology-based mathematics learning.

Twenty subjects were selected purposively to participate in the interview stage. All subjects have participated in online learning for more than two years during the COVID-19 pandemic. The selected subjects consisted of 10 male and 10 female students. Based on educational level, the research subjects consisted of 6 students in X grades, 7 students in XI grades, and 8 students in XII grades. Interviews were conducted in a semi-structured for 20 to 40 minutes for each participant. Data were analyzed using the Bogdan & Biklen approach (Bogdan & Biklen, 1982), through data reduction, categorization of data into themes and subthemes, then conclusions were drawn as a result.

This research uses triangulation methods to ensure credibility. Researchers used questionnaires and interviews to collect data. To ensure transferability and confirmability, the researcher provided a detailed description of the data collection and data analysis procedures performed (Algolaylat et al., 2023). Meanwhile, to ensure dependability provide an internal audit of the entire research process.

RESULT AND DISCUSSION

The information about student perspectives on technology-based learning was collected by the results of questionnaires and semi-structured interviews with 100 subjects. The information was collected about students' perspectives such as how to learn when learning mathematics online, online learning mathematics in class, and the media or technology used by mathematics teachers when online learning. In this research the focus of discussion will be specified into three aspects: 1) Students' perspectives on learning mathematics; 2) Students' perspectives on mathematics technology-based learning; and 3) Mathematics learning strategies based on student perspectives in technology-based learning.

1. Students' Perspectives on Online Mathematics Learning

According to the results of questionnaires, more than 86% of students stated that online mathematics learning was difficult to follow. In line with this data, based on interviews the

students explain that Online learning and explanations are fast but the tasks given are many in a short time. Besides that, teachers are less interactive and do not directly provide feedback. Completely the results of interviews about the perspective of online mathematics learning in the pandemic era are presented in Table 1. Based on the table above, students have difficulty in implementing online mathematics learning.

Table 1. Student's Perspective on Online Mathematics Learning

Theme	Interview Results
Online learning and explanations are fast but the tasks given are many in a short time	The material is not explained in detail Difficult to understand the material Faster learning The teacher's explanation is very short Too much work The teacher only gives the basic concept The deadline given is very tight
Teachers are less interactive and do not directly provide feedback	Student work is not directly assessed the teacher does not directly provide feedback Never explain through online meeting There is no discussion of the questions given Students cannot ask directly Teachers are less interactive with students because they do not meet in person Students cannot ask questions or discuss directly with the teacher No detailed explanation Difficulty asking directly and understanding the material The material presented is not detailed. Teachers do not explain in detail by showing the steps for working on the problem

Online learning begins with the teacher providing YouTube links and e-modules in Google Classroom, then students learn on their own and work on the questions given by the teacher. The deadline given by the teacher is also quite short, so for students who still understand the material, they have two choices, namely doing makeshift work without understanding or working but sending answers late. This will be a dilemma for students because if students are late, the scores will be reduced by the teacher. The teacher responded to this student's perspective about the reason why the teacher did not hold a virtual meeting. It was because the teacher had provided a YouTube link created by the teacher. The teacher also creates a WhatsApp group that students can use to convey their difficulties. However, in practice, none of the students asked the group so the teacher felt that the students did not have any difficulties. In addition, students' test scores are also in the good category, this adds to the teacher's confidence that students do not need additional assistance.

Furthermore, another cause of student difficulties in online mathematics learning is that students are not given direct feedback by the teacher. So that students do not know the truth of the work they are doing. This is recognized by the teacher as a drawback in teaching online. A difficult signal when the WFH teacher makes it take longer for the teacher to access student work. Besides that, in one day there are at least 2 classes that are taught, if the work must be given immediate feedback it will be difficult for the teacher.

2. Students' Perspectives in Mathematics Technology-Based Learning

Technology plays an important role in online learning. Based on questionnaires, in the implementation of online mathematics learning, 98% of students do not have signal problems and students also do not experience difficulties in the media used, such as having a laptop, data connection, or cellphone. The problem is the teacher has never had a virtual meeting. It caused the students difficulty in understanding mathematics. To support the learning process, the teacher has provided learning videos. Students felt quite helped by the learning videos. Complete interview results can be seen in Table 2.

Table 2. Student's Perspective on Technology-Based Learning

Theme	Interview Results
The teacher has never had a virtual meeting	Not Using Google Meet by explaining slowly Students cannot directly ask things they do not understand directly through meet/zoom Not using the online whiteboard No discussion Never a virtual meeting even once a week If you want to ask a question when you are in barriers, you have to wait for a reply from your friend/teacher as soon as they can After studying the video, there is no review of the material and discussion questions
The learning videos provided help students understand mathematics learning	The video link provided helps in understanding math learning The teacher gives the video link first Videos help understand the material Short video material The video does not discuss complex problems It takes discussion of questions via video The teacher gives an online module

Mathematics learning begins with the materials from the teacher. However, based on the table above, there are still some obstacles to using technology in learning, such as the teacher only relying on YouTube links and modules provided in Google Classroom. The teacher does not conduct virtual meetings, even though the expectations of students are teachers to use an online whiteboard to review the material in the YouTube link and the results of student

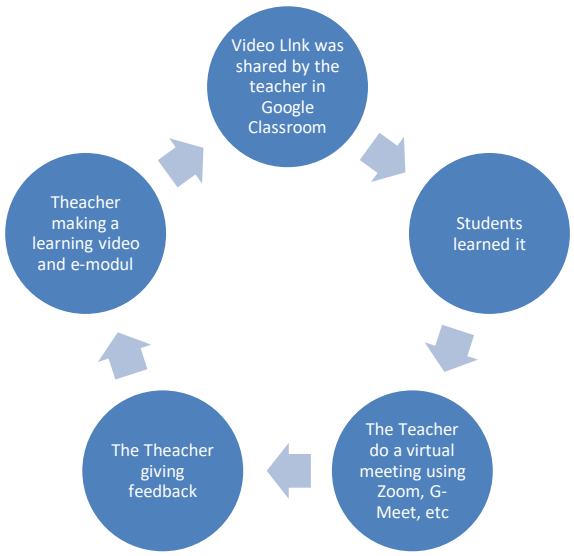
work. In online learning, students also feel that they cannot discuss directly with teachers and students, even though when teachers conduct virtual meetings, students can use break rooms such as Zoomed-in to discuss.

The results shown in Table 2 affirm previous research that said online mathematics learning reduced the ability to ask questions and the inability to interact with peers (Mali & Lim, 2021). Although the majority of students expressed difficulties when learning online, some students found it helpful when using the learning videos uploaded on YouTube. The results of this study are in line with Al-Smadi et al. (2022) that online learning during a pandemic does not satisfy students. Therefore, several strategies can be used by teachers so that students are more comfortable and understand the use of technology in learning.

3. Mathematics Learning Strategies Based on Student Perspectives in Technology-Based Learning

The research of Erna et al. (2022) shows that virtual meetings can help students understand the material. Besides that, with a virtual meeting, the learning process becomes more interesting. The strategy that can be used in online learning is to conduct the flipped classroom method (Khan & Abdou, 2021). E-learning needs to be prepared because students can be maintained in an emergency (Fauzi, 2022). One of the solutions provided by (Carpenter et al., 2021) is another digital technology helping teachers maintain social contact with students during crises like a WhatsApp Group, Discord, Google Classroom, or another else.

From the results of the questionnaire and semi-structured interviews, it can be said that the mathematics learning strategy based on the student perspective goes through 5 stages as shown in Picture 1.



Picture 1. Mathematics Learning Strategy Used Technology

The first step starts with the teacher making a learning video and e-module, this video is purely made by the teacher or teacher as a subject who explains math material. This will make students have a close relationship with their mathematics teacher, and it is hoped that

when learning is no longer online, students will be familiar with how to explain the teacher. The e-module made by the teacher is also expected to be more detailed so that students can more easily understand the material provided. After the teacher prepares the videos and e-modules, the next step is to share the video and e-module links in learning media applications such as Google Classroom. Students can learn from videos and e-modules that the teacher has provided before the teacher and students have a virtual meeting.

When conducting virtual meetings, teachers can ask about students' learning outcomes after studying the videos and e-modules provided. After that, the teacher can give assignments to find out students' understanding. The teacher does not forget to provide feedback on the students' work, to know the truth of their work. A meta-analysis study from John Hattie (2017) shows that giving feedback to students' works will have a big impact as much as 0.70. Students like the teachers' informative feedback, so it gives more deeper understanding (Ferguson, 2011; Jonsson, 2013).

CONCLUSION AND RECOMMENDATION

Online learning of mathematics using the YouTube link technology media which was made by the teacher himself. However, in practice, students assume that online learning through technology media is less effective in making students understand the material. This is because the teacher does not conduct virtual meetings and does not directly provide direct feedback on student work. The online learning that students expect is to continue to use technology but with a scheme, the teacher gives a YouTube link first, then it is reviewed in a virtual meeting. After that, students work on practice questions with a grace period that is not too short, and finally, students are given direct feedback on their work in virtual meetings.

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