

## The Effectiveness of Mathematics Learning Using Online Media During the Covid-19 Pandemic

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### ABSTRACT

The Covid-19 pandemic has caused the learning process to be hampered and cannot be carried out face-to-face. Therefore, a solution is needed for this problem. One alternative to overcome this problem is online learning. This study aims to describe the effectiveness of online learning using online media during the Covid-19 pandemic in Mathematics courses. The subjects of this study were 51 students in the Faculty of Science and Technology, Nahdlatul Ulama University, Purwokerto. They were from five different study programs, namely Agrotechnology, Mathematics, Biology, Fisheries Science, and Agricultural Biosystems Engineering, who had taken mathematics courses. This study was carried out in June – August 2021. This study used closed, semi-closed, and open-ended questionnaires as research instruments. Then, the data collection procedure was done through Google Forms. The data obtained were then selected using purposive sampling. To get valid and reliable data, triangulation was applied in this study. Triangulation was carried out through interviews with five students whose data were selected randomly. The researchers used descriptive statistics as the data analysis. The study found that the activities most often carried out by students during Study From Home (SFH) are playing on cellphones or laptops, doing assignments, working, and sleeping. Then, related to online learning, students prefer to use WhatsApp Group media and lectures. The preferred assignments or assessments are individual assignments and quizzes. Furthermore, the learning model most favored by students is the face-to-face learning model because students consider online learning ineffective. The results of this study can be used as a reference in choosing the suitable model, method, and learning media. Therefore, online learning can be held effectively and easily accepted by students during the Covid-19 pandemic.

**Keywords:** Covid-19, Effectiveness, Mathematics, Online Learning

### ABSTRAK

Pandemi Covid-19 menyebabkan proses pembelajaran menjadi terhambat dan tidak bisa dilakukan secara tatap muka. Oleh karena itu, diperlukan solusi untuk permasalahan tersebut. Salah satu alternatif untuk mengatasinya adalah melalui pembelajaran online. Penelitian ini bertujuan untuk mendeskripsikan efektivitas pembelajaran online menggunakan media online pada masa pandemi Covid-19 pada mata kuliah Matematika. Subjek penelitian ini adalah 51 mahasiswa Fakultas Sains dan Teknologi Universitas Nahdlatul Ulama Purwokerto. Mereka berasal dari lima program studi yang berbeda, yaitu Agroteknologi, Matematika, Biologi, Ilmu Perikanan, dan Teknik Biosistem Pertanian yang telah mengambil mata kuliah Matematika. Penelitian ini dilaksanakan pada bulan Juni – Agustus 2021. Penelitian ini menggunakan kuesioner dengan pertanyaan tertutup, semi tertutup, dan terbuka sebagai instrumen penelitian. Kemudian, prosedur pengumpulan data dilakukan melalui Google Form. Data yang diperoleh kemudian diseleksi dengan menggunakan purposive sampling. Untuk mendapatkan data yang valid dan reliabel, triangulasi diterapkan dalam penelitian ini. Triangulasi dilakukan melalui wawancara dengan lima siswa yang datanya dipilih secara acak. Analisis data pada penelitian ini dilakukan menggunakan statistik deskriptif. Hasil penelitian menemukan bahwa kegiatan yang paling sering dilakukan mahasiswa selama Study FromHome (SFH) adalah bermain ponsel/laptop, mengerjakan tugas, bekerja, dan tidur. Kemudian, terkait pembelajaran online, mahasiswa lebih memilih menggunakan media WhatsApp Group dan juga metode ceramah. Selanjutnya, tugas atau penilaian yang disukai adalah tugas individu dan kuis. Sedangkan untuk model pembelajaran yang paling disukai siswa adalah model pembelajaran tatap muka karena siswa menganggap pembelajaran online kurang efektif. Hasil penelitian ini dapat dijadikan acuan dalam memilih model, metode, dan media pembelajaran yang tepat. Oleh karena itu, pembelajaran online dapat terselenggara dengan efektif dan mudah diterima oleh siswa di masa pandemi Covid-19.

**Kata kunci:** Covid-19, Efektivitas, Matematika, Pembelajaran Daring

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## **Introduction**

In 2019, the coronavirus disease 2019 (Covid-19) outbreak which hit 215 countries, presented challenges for educational institutions. Around 60 million school-age children in Indonesia from 1.5 billion children in 188 countries worldwide have been affected by COVID-19 (Putria et al., 2020). The impact most felt by students is the change in services in educational institutions, such as traditional schools at all levels, non-formal schools, and universities. To anticipate the spread of the Covid-19 virus, the government has implemented several rules, such as prohibiting crowds, implementing social and physical distancing restrictions, wearing masks, and constantly washing hands. Through the Ministry of Education and Culture, the government has not permitted universities to conduct face-to-face (conventional) lectures and ordered them to hold online learning. Universities are required to be able to organize online learning (Firman et al., 2021).

One of the COVID-19 outbreak's repercussions was the existence of Study From Home (SFH), which caused learning that is usually done at school, now have to be done from home (Handarini & Wulandari, 2020). Hopefully, online learning can encourage students to be challenged with new things that can be obtained during the learning process, both interaction techniques in education and diverse learning media (Albert in Widiyanti et al., 2021). Furthermore, the selection of learning media considers several aspects, such as the goals to be achieved, the characteristics of students, environmental conditions, clear concepts, and accordance with students' learning styles (Futriani Hidayah et al., 2020).

The present issue is that many students consider mathematics a complex subject. Mathematics is abstract, logical, systematic, and full of complicated symbols and formulas (Auliya, 2016). The problems in mathematics courses challenge the lecturer to be innovative in developing their students' learning in terms of approaches and media. Using learning media at the teaching orientation stage will significantly help the effectiveness of the learning process, delivery of messages, and lesson content (Wiratmojo, P. & Sasonohardjo, in Falahudin, 2014). Students have learning difficulties using learning media used to motivate during the Covid-19 pandemic (Khaesarani, 2021).

The internet and multimedia technologies can transform how knowledge is provided and be an alternative to classroom learning (Zhang, 2004). Implementing online learning involves supporting facilities such as smartphones, computers, or tablets that can be utilized to access the material anywhere and anytime (Gikas & Grant, 2013). Online learning is held through some medias. The applications include WhatsApp, Google Classroom, Edmodo, Zoom, Google meet, Webex, Loom, Quizizz, and Duolingo (Pustikayasa, 2019). App Inventor 2 is a media developed by the author that is feasible and effective to use as teaching materials to help students in the learning process (Risma et al., 2021).

Based on education policies during the pandemic, all levels of education must implement online learning. Therefore, researchers want to see the effectiveness of online learning that has been applied in the learning process, especially at the university level. Several previous researchers

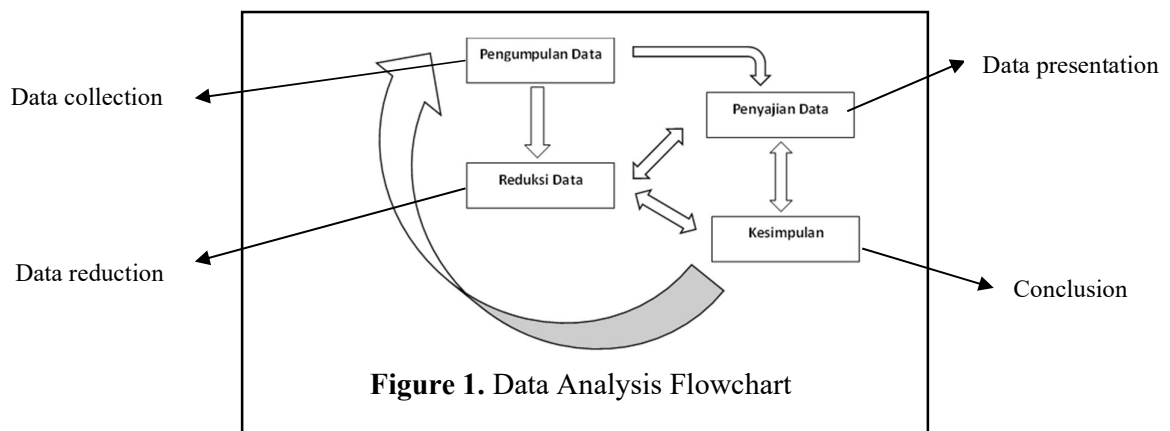
have conducted several studies on the effectiveness of online learning. Based on the latest data, there are some studies related to this (1) the effectiveness of WhatsApp as an online learning medium (Daheri et al., 2020); (2) the effectiveness of distance learning in terms of understanding the subject matter (Abidin et al., 2020); (3) the effectiveness of online learning in dealing with the COVID-19 pandemic (Baety & Munandar, 2021); (4) the problems of online learning during the Covid-19 pandemic and the solutions (Suprapmanto & Utomo, 2021). Based on this reference, a study of the activities most students do during online lectures, access to online learning support that is most widely used and preferred by students (models, methods, media, and types of assessment), as well as the effectiveness of online learning during the Covid-19 pandemic in Mathematics courses are still rarely done.

Thus, this research is expected to be a reference for teachers/lecturers to choose media that can facilitate online learning. In addition, by knowing the responses from respondents regarding models, methods, media, types of assessments, and student activities during online learning, the condition of students in the teaching and learning process during the current pandemic can be known. Thus, this can be a reference in determining new policies toward online learning in the future.

### Research Methods

This study used a descriptive quantitative method to describe the effectiveness of online learning using online media in mathematics courses. This study was conducted from June to August 2021. The research subjects were 51 students in the Faculty of Science and Technology, Nahdlatul Ulama University, Purwokerto. They were from five different study programs, namely Agrotechnology, Mathematics, Biology, Fisheries Science, and Biosystem Agricultural Engineering, who had taken mathematics courses.

Data were obtained from 51 students who filled out questionnaires in the form of closed, semi-closed, and open-ended questions distributed via Google Forms. After that, the data that has been obtained is analyzed more deeply. Then, to get valid and reliable data, researchers used triangulation by conducting interviews and questionnaire methods. The researcher conducted interviews with five randomly selected students. They are students who provide complete data and information.



This study uses descriptive statistics as a method of data analysis. The steps in data analysis are as follows: 1) reviewing all data from various sources; 2) data reduction; 3) organizing data into units, 4) categorizing; and 5) verification of data validity. The data analysis in this study is described in the flow chart in Figure 1.

**Result and Discussions**

The data for this study was obtained from 51 students from five different study programs at Nahdlatul Ulama University, Purwokerto, Agricultural Biosystem Engineering, Mathematics, Fisheries Sciences, Biology, and Agrotechnology, who took Mathematic courses in the 2020/2021 academic year. The following is an explanation of the results of data analysis related to the characteristics of respondents, an overview of online learning, and an assessment of the effectiveness of online learning.

**Characteristics of Sample/Respondent**

Based on the respondents in this study, the number of students in each study program and their gender are described in Table 1.

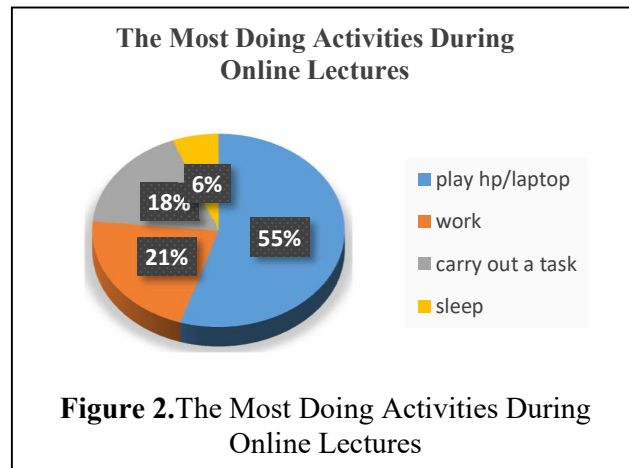
**Table 1.** Number of Students and Gender

No	Study Program	Gender		Total Students	Prosentase (%)
		Male	Female		
1	Agricultural Biosystem Engineering	13	5	18	35.29
2	Mathematics	2	5	7	13.73
3	Fisheries Science	7	1	8	15.69
4	Biology	2	5	7	13.73
5	Agrotechnology	7	4	11	21.56
	<b>Total</b>	<b>31</b>	<b>20</b>	<b>51</b>	<b>100</b>

The respondents in this study came from different study programs, meaning they have different scientific backgrounds. Students face many obstacles in online lectures, especially in understanding the material. During the implementation of Work From Home (WFH) by online learning, respondents spent most of their day doing lecture assignments for all courses. Another activity that they do is playing on mobile phones/laptops. They said they interacted or played more with their handphones/laptops during these online lectures because they used their laptops in online classes and did their homework. This result is supported by the following interview with one of the respondents.

- P : During online lectures, what activities do you often do?
- S<sub>3</sub> : Doing college assignments during online lectures, of course holding a cellphone, because all materials and lectures can be done via cellphone.
- P : Besides being used to get materials and lectures, are there other activities that use cellphones?
- S<sub>3</sub> : Yes, ma'am. In fact, I often play cellphones more than studying. For example, opening social media, playing games, and opening YouTube outside of lecture material.

In their spare time, between online lectures and college assignments, they usually play games or use social media to communicate with each other. In addition, some students are already working, so they can still work between online lectures. Based on the results of questionnaires by student respondents related to the most activities carried out during online learning, as many as three activities, four of which are mainly carried out. They play on cellphones/laptops, work, do assignments, and sleep. It can be seen in Figure 2 below:



Based on Figure 2, the activities that the students mostly do during online lectures are playing HP/laptop (54.9%) or 28 students. It is because they used HP/laptops as the online learning media. Another often-done activity is work (21.57%) or 11 students. Furthermore, the third activity that many students do is carry out a task of 17.65% or 9 students. It is because some UNU Purwokerto students are studying while working. For other activities, 3 students, or 5.88%, chose sleep

In their research, firman et al. (2021) concluded that in online learning conducted using video conferencing applications such as Zoom and Google Meet, students tend to do other activities unrelated to the lectures. These activities include: (1) eating and drinking; (2) daydreaming; (3) using social media; (4) working on assignments for other courses; (5) paying attention to the classmate's screen display.

Besides some activities that students often carry out during online lectures, students also experience psychological complaints. The most psychological complaints that the students experienced were that they felt profound boredom (94.12%), the feeling of wanting all of this to end (74.51%), fear (68.63%), worry (43.14%), and dizziness (19.61%). It can be seen in Figure 3.

Figure 3 is the result of five complaints they feel during online lectures. It was seen that some 94.12% or 48 students felt bored with the activities that had to be done at home and the classes conducted online. In addition, students also want the pandemic to end soon so they can carry out activities freely and have lectures face-to-face. Other complaints that are felt are fear, worry, and dizziness. Due to the Covid-19 pandemic, students are afraid and worried about doing

activities outside. It causes a decrease in student productivity. In addition, students also feel dizzy because many tasks must be done by students while online.

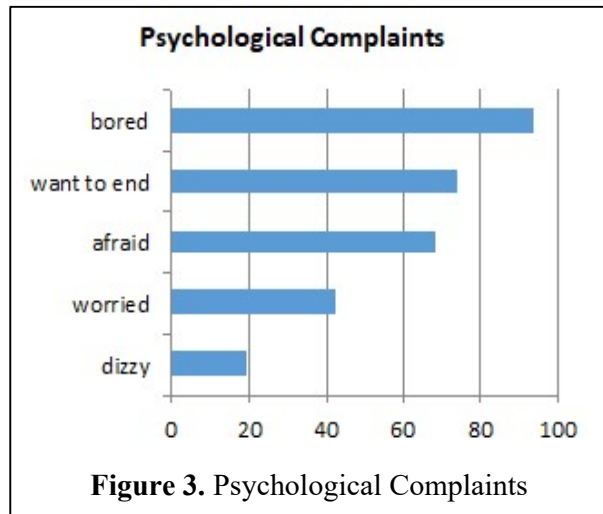


Figure 3. Psychological Complaints

#### Mathematics Course Online Learning

According to the results of the study related to the online learning model, it is found that the majority of students (50.98%) chose face-to-face learning, 29.41% chose the blended learning model (a combination of face-to-face with online), and only a small proportion of students who like online learning (19.61%). The result can be seen in Figure 4.

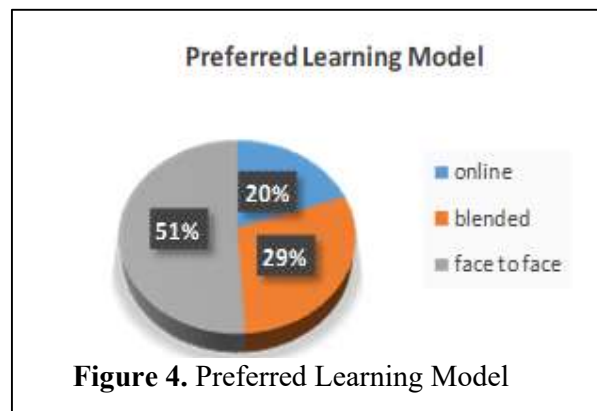


Figure 4. Preferred Learning Model

From Figure 4, it can be seen that most students prefer the face-to-face learning model because they find it easier to understand the material and have discussions with lecturers and fellow students. By having the face-to-face learning model, students can also go to campus so they will not feel bored at home. This result can be seen from the following interview with one of the respondents.

- P : Do you prefer online learning, face-to-face learning or blended learning? Blended learning means a combination of online and offline.  
S<sub>2</sub> : Face-to-face learning, as before Covid-19.  
P : Why do you prefer face-to-face learning?

S<sub>2</sub> : Because I understand more about the material being taught. If I have to learn online, I don't understand the material. In addition, online learning is often constrained by the network and internet quota. Besides that, it is also boring, because online lectures are carried out only at home.

Furthermore, 15 students (or 29.41%) prefer the blended learning model, which combines online and face-to-face instruction. It is considered more effective because it allows the students to study independently. Moreover, only 10 students like online learning because lectures can be done anywhere, and those who have already worked can learn while working. A study relevant to this study also states that around 90.9%, answered that face-to-face learning is more effective than online learning (Herwanto & Hatmo, 2020). In addition, it is also supported by the results of an interview with one of the respondents.

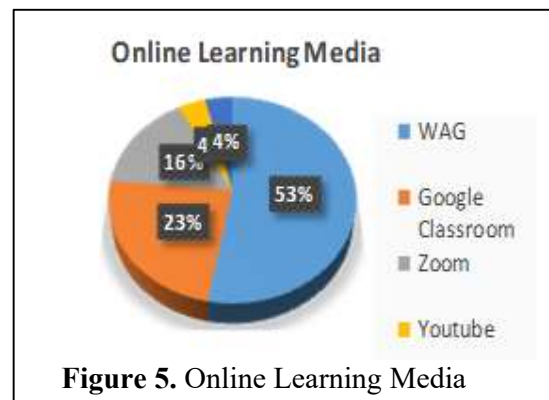
P : Which of the three types of learning do you like the most? Online learning, offline learning or blended learning?

S<sub>1</sub> : I prefer online learning because I can study while working.

P : Why do you prefer online learning?

S<sub>1</sub> : Because, online lectures can be done independently and flexibly according to my work schedule.

Besides the learning model, this study aimed to determine which online learning media the students preferred. According to the results of filling out the questionnaire, the online learning media data that students liked the most were WhatsApp Group (52.94%), Google Classroom (23.53%), Zoom (15.69%), Instagram (3.92%), and Youtube (3.92). Figure 5 depicts the findings of the research:



Based on Figure 5. above, 27 and 12 students prefer to use WhatsApp Group and Google Classroom as their learning media. It is because WhatsApp Group and Google Classroom are easy to access and do not require so much quota, even though sometimes the signal becomes an obstacle for them in accessing online media. This is also supported by the results of interviews with respondents which can be seen in the quotation below:

P : During online lectures, what learning media have you used in lectures?

S<sub>1</sub> : Whatsapp group, google meet, zoom meeting, google classroom, videos sent in WA groups and also youtube video links containing material.

- P : In your opinion, which learning media do you like the most and which makes learning easier?
- S<sub>1</sub> : I like to use Whatsapp Group the most, because it doesn't require a lot of quota, is more flexible and easy to use.
- P : Why don't you like the Google Meet or Zoom learning media, where lecturers and students can meet face-to-face virtually?
- S<sub>1</sub> : Actually the problem when using google meet or zoom is an unstable network. So, even though the lecturer explained the material, I still couldn't follow it in its entirety.

WhatsApp application can be applied in the online learning process and also found shortcomings in its application, namely the existence of obstacles regarding face-to-face implementation through the features in WhatsApp (Bhagaskara et al., 2021). However, WhatsApp also has some advantages. It is highly suited for the application of the learning process. As for online media, Zoom, Instagram, and Youtube also want face-to-face learning online. However, network and internet quotas often hinder students from accessing them. In addition, the results of the implementation of the research on students helped to obtain learning by using WhatsApp groups as the medium (Iskandar, 2020).

Furthermore, this study also took data related to the learning methods. According to the questionnaire, the online learning method that students most favored sequentially were the lecture method as much as 49% (25 students), the practice questions method as much as 23.5% (12 students), the discussion method as much as 15.7% (8 students), and the method of presentation as much as 11.8% (6 students). The data results related to the learning method can be seen in Figure 6.

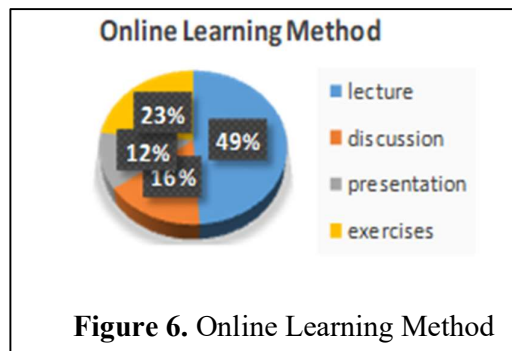


Figure 6 provides the online learning method that students most prefer. The students mostly prefer the lecture method. The lecturer's explanation regarding the material through learning videos or via Zoom/Google Meet helps students understand the Mathematic material more efficiently. Furthermore, the method of practice questions is also chosen as the second preferred method after lectures. It is because mathematics courses require a lot of practice. For the method of presentation and discussion, only a few students chose it because, according to them, online lectures made it difficult to conduct discussions and presentations due to the limitations of face-to-face meetings. It makes them less active during the lecture.

In contrast, in her study, a study found that it was adequate to use the discussion method during online learning (Nafis et al., 2021). In delivering Islamic religious education materials, the students were enthusiastic about participating in learning. When the material is provided through discussion, they are more engaged than delivered through a lecture.

Furthermore, this study also has data related to assessments/tasks that students like during online lectures. From the results of filling out the questionnaires filled out by students, it was found that the online assessments/tasks that students liked the most were individual assignments as much as 54.9% (28 students), quizzes as many as 23.5% (12 students), group assignments as many as 11.8% (6 students), and presentation of 9.8% (5 students). The data results related to the assessment/task can be seen in Figure 7.

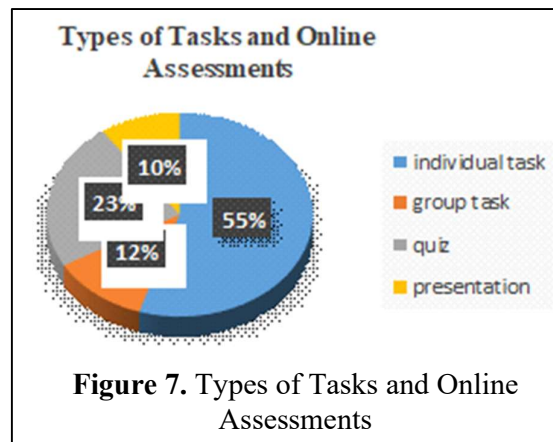


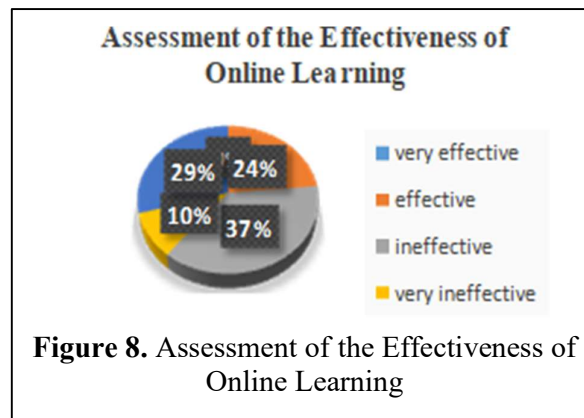
Figure 7 shows that students' most preferred online assignments and assessments are individual assignments and quizzes because they can do them alone without their friends. Online lectures make it difficult for students to work on assignments in groups because of the limitations of being able to meet face-to-face. It is why only a few students like group assignments and presentations. This agrees with a study that found the teacher's strategy in carrying out learning during the current pandemic is effective for knowing students' actual abilities (Afrilia, 2021). The teacher does not give their assignments in online learning, but students can also do them.

### Online Learning Effectiveness Assessment

Due to the Covid-19 pandemic, students have to adapt to their lecture model, which must be done online. From the results of this study, students assessed that online mathematics courses were very effective at 0%, effective as much as 23.53% (12 students), ordinary, as many as 29.41% (15 students), ineffective as much as 37.25% (19 students), and very ineffective, as many as 5 students (9.81%). Figure 10 shows the data findings related to the assessment of the effectiveness of online learning.

Based on Figure 8, the assessment results related to the effectiveness of online learning show that most students choose ineffective as much as 37.25%, followed by ordinary results as much as 29.41%. It shows that most students feel uncomfortable with online lectures. Students find it

difficult to understand the materials, especially mathematics, spend a lot of quotas, and need a good signal to attend the lectures. There are too many assignments that they have to do. A study conducted by other researchers show that 79% of students prefer face-to-face learning, whereas only 1% prefer online learning, implying that online learning is ineffective during this pandemic (Dewantara & Nurgiansah, 2021). The effectiveness of the online learning process for Mechanical Engineering Education FT-UNP class 2019 students who take metal welding technology courses can be quite effective (Ramadhan et al., 2022).



Based on the analysis and discussion above results, this research can provide an overview to teachers/lecturers. One of them is related to psychological activities and complaints experienced by students during online learning, aspects of supporting online learning (models, methods, media, and assessment), which are widely used and accepted by students. In addition, the effectiveness of online learning during the Covid-19 pandemic can also be assessed. Thus, it is hoped that ,teachers/lecturers can plan online learning that is more effective and acceptable to students in the future. So that the learning objectives can be achieved optimally.

### Conclusion

Students' activities most often carried out during Study From Home (SFH) are playing on cellphones/laptops, doing assignments, working, and sleeping. In addition,related to online learning, students prefer to use WhatsApp Group media and also lecture methods. Furthermore, the selected assignments or assessments are individual assignments and quizzes; the learning model most favoured by students is the face-to-face learning model because students consider online learning ineffective.

In contrast, the online learning process has been effective (Kusmaharti & Yustitia, 2020). Thus, the researchers suggest that the results of this study can be used as consideration for teachers/lecturers, especially in the Banyumas Regency area, so that the implementation of online learning in the future can run more effectively. In addition, teachers/lecturers are also advised to apply models, methods, media, and learning assessments that are in accordance with the needs of students during online learning.

### Acknowledgment

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