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7 The effects of covid-19 in learning: effective and efficient online learning models of mathematical statistics and real analysis from the students' perspective

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Abstract. An effective online learning model that does not burdensome students is a hot topic of discussion in the current pandemic era. This research is a qualitative descriptive study that aimed to know the online learning models of Mathematical Statistics and Real Analysis that are effective, efficient, and not burdensome from the student's perspective. The subjects of the research were all students who are studying Mathematical Statistics and / or Real Analysis, namely 63 students of Mathematical Statistics and 52 students of Real Analysis. The entire research subjects were gave a survey through the Google Form to find out online learning models that best suits students. Then the survey results were analyzed based on online learning models with the largest selection percentage. The results showed that online learning models of Mathematical Statistics and Real Analysis courses that are effective, efficient and not burdensome for students is a learning model combining YouTube and WhatsApp media. Based on follow up interviews, there are many reasons why this model was chosen from other learning models such as video conferencing, one of the reasons is because this media needs less quota and is interspersed with question and answer discussions with the media that are commonly owned by students. Even when students are faced with situations where they will be given unlimited quota, students in both classes still consider the most effective and efficient learning model is to combining YouTube and WhatsApp.

1. Introduction

A few moments ago until now, all areas of life were faced with a rogue enemy which is very difficult to defeat, namely the virus pandemic Covid-19. Although it deals directly with the health sector, its rapid spread makes the government should restrict all social activities in the community environment, no exception in the field of education. The impact of the pandemic made everything forms of learning ranging from early education, elementary, middle to college switch from being face-to-face to online learning.

Lots of researchers are trying to define learning. Behaviorists define learning as activities that produce behavioral changes while constructivists believe learning is an effort to build and reconstruct our cognitive upon receiving new material. According to King et al., [1] learning is a positive change within a certain period of time which increases cognitive and behavioral capabilities as a result of observation and interaction between experiences and situations being faced. Whereas Online Learning is an indirect form of learning and uses an internet connection as its main component. According to Bušelić [2] online learning was first used to bridge a variety of people with different characteristics



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and geographical locations but has one thing in common, namely to have an interest in learning a particular science / knowledge together. This learning is an answer to the government's command to restrict social activities. The form of online learning is very varied depending on the policies and creativity of educators.

Like coins, online learning has a positive and negative sides. Sadeghi [3] explained that with the existence of online learning can be done anywhere, more efficient in terms of cost because there is no need for living expenses in neighboring cities, or even neighboring countries, no need to form a community first, be more flexible, and save more time (no need to wait for a bus, and etc).

However learning is also not separated from the paradoxes that appear. As explained by Kiryakova[4], the weaknesses of online learning are learning to feel isolated because there is no direct contact that occurs, so that the second weakness arises a lack of motivation and self-discipline. In Indonesia, most of the learning uses online because of pandemic, giving rise to protest from students. This kind of protest emerged due to several things, among them students have been accustomed to implement the learning directly (face to face) so that when the form of learning turned into online, students were shocked and not ready to face the form of changing lessons. Not only students, from the educators in this case the lecturers also felt the difficulty, especially the lecturers who are not experts in Information Technology (IT). So the online learning models used is more haphazard.

There are several factors that affect students in receiving online learning easily or not. The first factor is the ability of educators to use IT [5]. The better educators master in IT, the more media alternatives can be selected and used in the middle of this online learning. Bušelić [2] mentions there are at least 4 options how someone wants to learn online by utilizing technology and information media, namely the print media, the voice, the computer, and the video. However the development of social media such as the internet becomes a form of revolution and can be used as an expression of some of these 4 media. The second factor is the lecturer's creativity in choosing the appropriate online learning model. This means that when educators must be able to analyze and determine online learning models that can be used. The third factor is internet access for educators and students. How can carry out an online learning if their internet access is limited even if there is no signal. The last factor is the type of course to be taught. The characteristics of a course will affect which media is most appropriate to use [6].

There are many cases in which educators with a lack of creativity add poor mastery of IT make online learning models is just an online assignments. For some courses, it is not a problem. However, given the assignment of changing from face to face, many expressions of students in various social media have stated that "now online learning, not an online assignment". Obviously this is an expression of students who are saturated and less satisfied with the use of online assignments instead of face-to-face, but too afraid to convey it to the lecturer concerned.

However it is also wrong with assuming an online assignment is a definite improper way, because it depends on the characteristics of the course. It is very possible that the assignment summarizes an effective and efficient way and does not burden students to learn the material. However this is actually less effective if it is done in several courses that really need deeper guidance from an educator. Ineffective is the provision of assignments as a substitute for learning by not observing the characteristics of the courses and the amount disproportionately.

Addressing these things is happening at various levels, the Minister of Education immediately gave a warning to be more proportional in giving assignments, even the learning was carried out through national TV stations (for early education, elementary school, and secondary education). While the colleges are considered to have competence to do better learning independently. Besides the online assignments, now there is an online learning models that are often used, these models are discussions in the form of writing media / typed media such as (WhatsApp) or video conference (Zoom, Google Meet and others).

However the problem does not stop there, many problems arise. Initially students felt objected to the continuous assignment that impressed "online assignments are not online learning", then is response to the problem appeared bid to conduct lectures using video conference. Not finished until

there arose a new problem from most students with regards to the amount of internet quota needed to follow the video conference even with the return of students to their respective residences, not a few also complained about the signal as one of the obstacles.

In response to this, educators are not unreasonable. The discussion was slightly changed using media that is more commonly used and does not spend a lot of quota ranging from google classroom to more familiar media such as Whatsapp. Not Indonesian students who cannot see the lack of discussion models using this media. For most courses the discussion model using this media becomes an effective, efficient, and not burdensome model for students. However for exact courses such as Real Analysis or Mathematical Statistics, learning by discussion using the writing media still produces obstacles that some students feel the process of transferring knowledge is still not optimal and not too understand if it conveyed by writing. This is because in understanding the exact sciences especially mathematics requires the ability of abstraction, reasoning and critical thinking as well as creative thinking which can be maximally improved with the help of explanations from educators rather than having to study independently [7, 8].

This is where the double-edged sword appears. On the one side to use video conference, the quota required is very large. Based on research's experiments, the learning media Zoom takes 2 GB within 60 minutes. However, if using WhatsApp the obstacle that arise is still a difficult for students to receive the exact material given. At this time creativity of lecturers is tested here. Addressing the matter, researchers offer a combination learning models between Youtube and WhatsApp. This model is done by making a learning video first, then uploading it on Youtube for students to learn, and then conducted a discussion through WhatsApp to discuss issues that are not understood by students.

However, it is still unclear which method of learning is most effective, efficient, and not burdensome for students especially in the exact courses in the mathematics study program. Based on this, the researcher feels that it is important to raise this title to find out which method of students choice is effective, efficient and not burdensome so that in the future if online learning is still needed, then the lecturers will not be confused anymore to try the learning model in finding the most effective and efficient model.

2. Method

This type of research used is qualitative with a descriptive approach. A Descriptive approach was chosen because researchers wanted to describe the various forms of student perspectives in looking effective, efficient, and not burdensome learning models in exact courses which in this case are courses of Real Analysis and Mathematical Statistics [9]. The research was conducted in one of the colleges in East Java Province. The research subjects are all students who are studying courses of Real Analysis and Mathematical Statistics at the college. These courses are chosen with the common course of study in mathematics study program both the college of religious and the public colleges and their learning are required considerable abstraction skills to solve problems [10–12].

At first, the researchers provided all forms of online learning models that could be used in both courses. The model in question is as follows:

1. Giving assignments to resume material
2. Conducting video conference through Zoom's Media
3. Discussions through the Learning Management System (LMS)
4. Conduct discussion through WhatsApp
5. Conduct discussions through google classroom
6. Making a learning videos on YouTube
7. Create a video on YouTube channel then discuss it on WhatsApp is guided by the lecturer
8. The Classes are divided into groups, then every week 1 group of expert makes a video on YouTube then guides the course of discussion on WhatsApp and at the end of the discussion, the lecturer gives a conclusion.

The data has collect with surveys and interviews. The first is a survey was conducted on which learning models are most effective, efficient, and not burdensome for students. Subsequently, the data was analyzed and randomly selected several subjects to interview on the reason why it chose a particular learning model. The interviews are conducted to dig deeper the reasons a situation could occur.

As for the questions given on the survey instruments are to dig up the data as follows:

1. Internet quota issued by students before and during the pandemic.
2. The intensity of students before and during the pandemic.
3. Online learning models of Real Analysis that are effective, efficient, and not burdensome from the students
4. Online learning models of Mathematical Statistics that are effective, efficient, and not burdensome from the students

3. Results

The learning models tested in this study has been accepted by students so that students can feel and determine which online learning model is suitable for a particular course. Determination of the learning model to be tested, also consider the opinion of the students. So in this research many of the online learning models are imposed on students.

This research is a qualitative approach in which the data presented will be discussed descriptively instead of using a quantitative statistical analysis approach. At first, from 63 students in Mathematical Statistics class and 52 students in Real Analysis class were given a survey on how many quotas were used for one week before and during the pandemic. The following results are obtained based on research surveys.

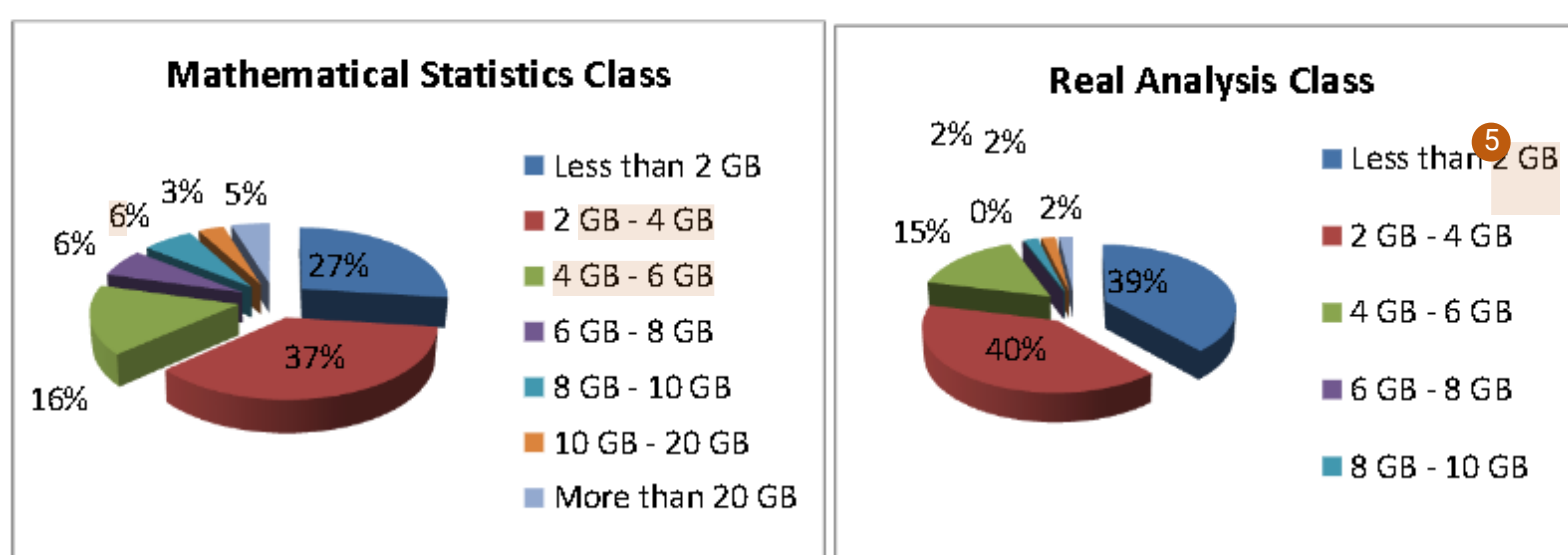


Figure 1. Quota is needed a week before the pandemic occurred in Mathematical Statistics Class.

Figure 2. Quota is needed a week before the pandemic occurred in Real Analysis Class.

Based on Figures 1 and 2, it is known that the data mode 'quotas required by students before the pandemic' is in 2GB - 4GB class either in the Mathematical Statistics Class or the Real Analysis Class.

Meanwhile, the following shows the results of many internet quota that students need during the pandemic.

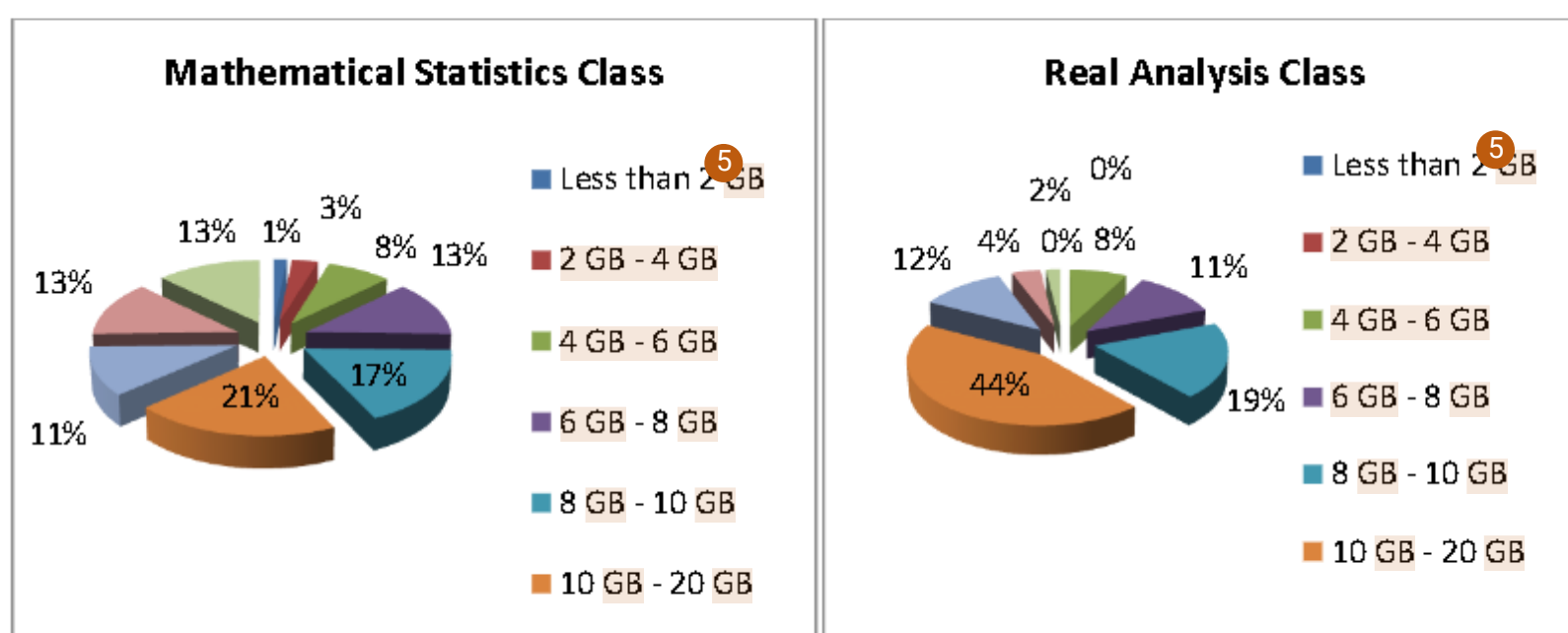


Figure 3. Quota is needed a week during the pandemic in Mathematical Statistics Class.

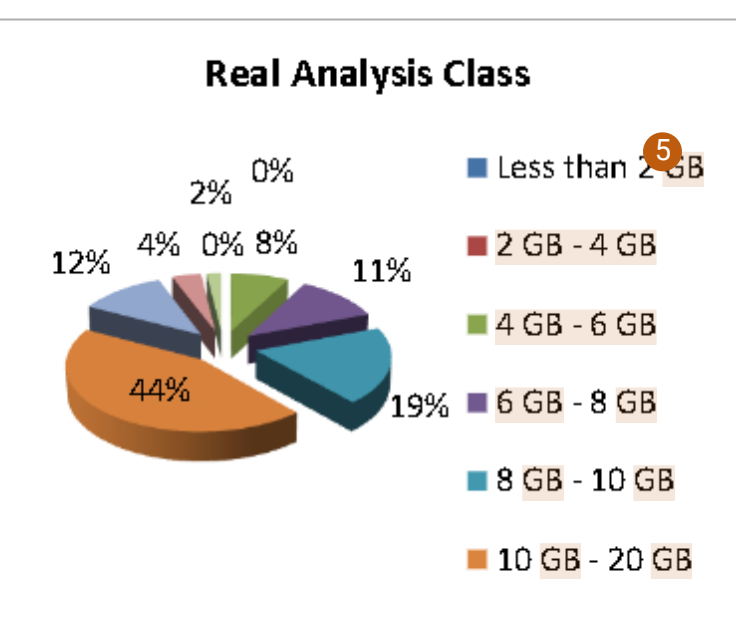


Figure 4. Quota is needed a week during the pandemic in Real Analysis Class.

Based on Figures 3 and 4, it is known that the data mode 'quotas required by students during the pandemic' is in 10GB - 4GB class either in the Mathematical Statistics Class or the Real Analysis Class.

Furthermore, students in both classes are given questions about the differences in the intensity of learning before and when the pandemic occurs. The following results are obtained.

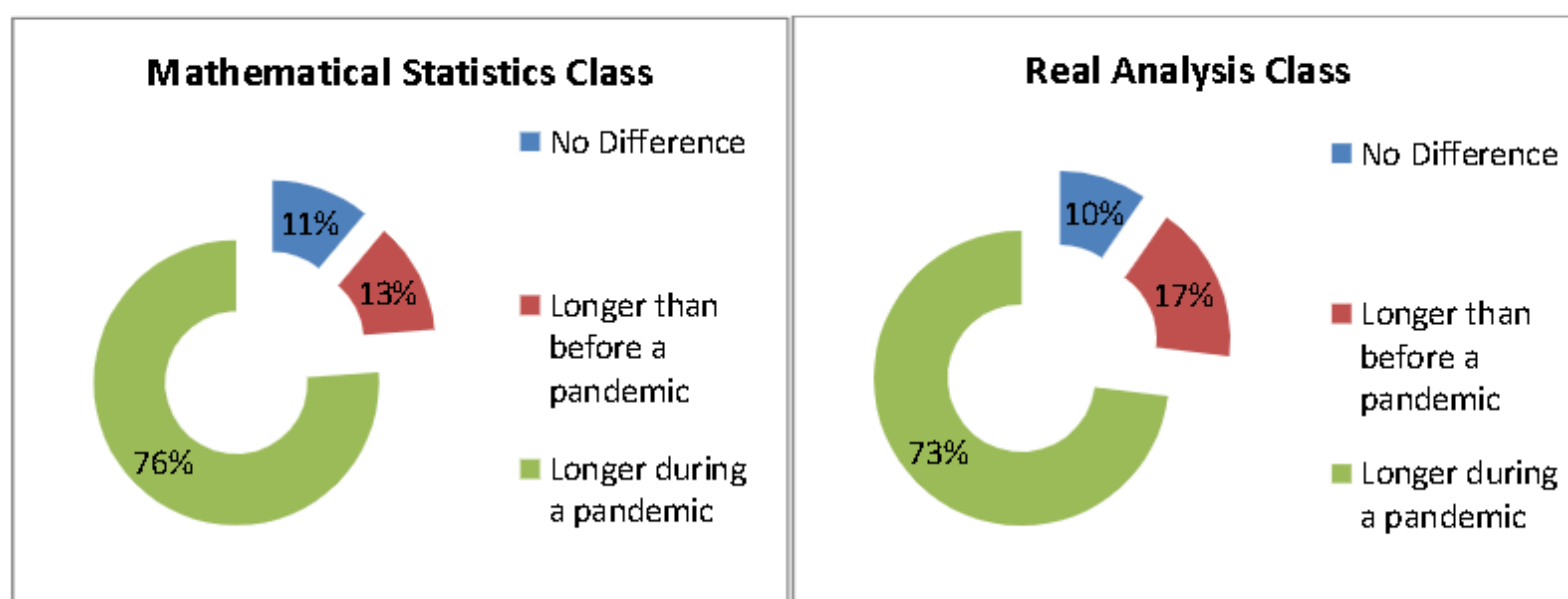


Figure 5. Differences in learning intensity before and when the pandemic occurs in Mathematical Statistics Class.

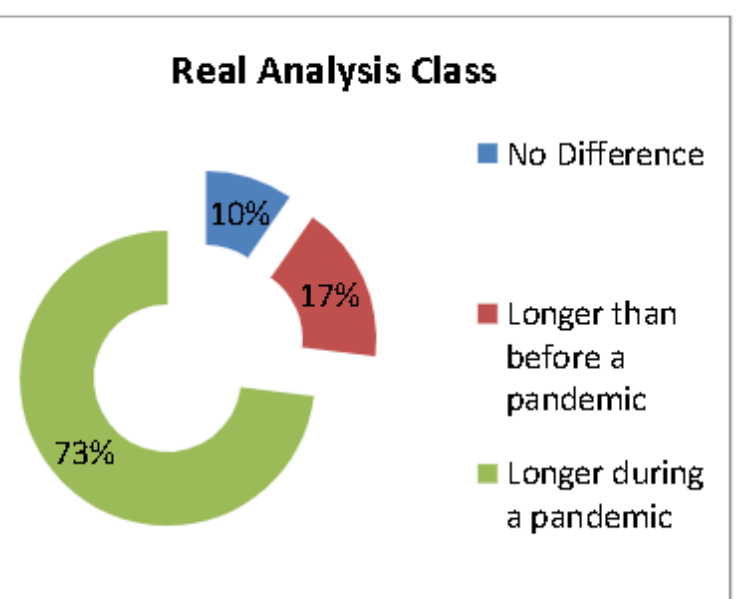


Figure 6. Differences in learning intensity before and when the pandemic occurs in Real Analysis Class.

Based on Figures 5 and 6, it can be seen that the data mode 'Differences in learning intensity before and when the pandemic occurs' is in 2GB-4GB class either in the Mathematical Statistics Class or the Real Analysis Class.

The data obtained from Figure 1 to Figure 4, shows significant increases in the use of quotas before and during the pandemic. This is because all of the learning is centered on an online system[13]. Moreover, some classes require students to look for their own learning materials to be presented and discuss using zoom or other media. On the other hand, it makes the students more independent in constructing their understanding even though the time needed is getting longer (Figure 5 dan 6)[14].

Furthermore, in exploring core data about the learning model which according to the student's perspective is an effective, efficient and not burdensome for students, the researcher divides the question into 2 conditions. The condition in question is when the students are given unlimited internet access and when not given unlimited internet access (according to the real conditions of the students). The results obtained at the first condition are as follows

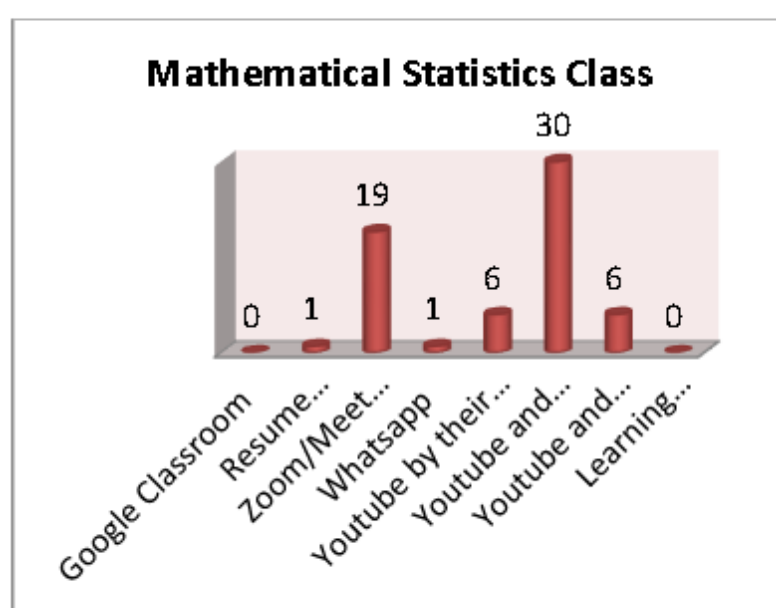


Figure 7. Survey selection of online learning models if students are given unlimited internet access in Mathematical Statistics Class.

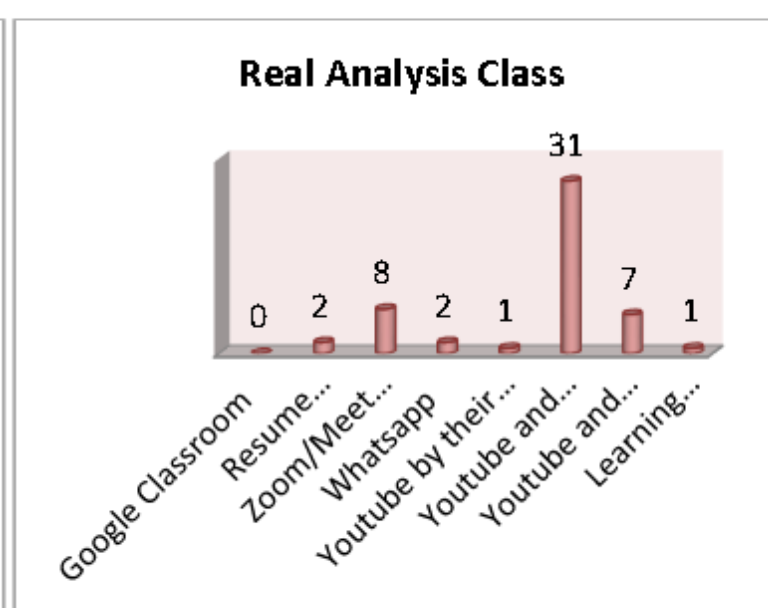


Figure 8. Survey selection of online learning models if students are given unlimited internet access in Real Analysis Class.

While the online learning model is selected with the real conditions experienced by current students (no unlimited internet access) is as follows.

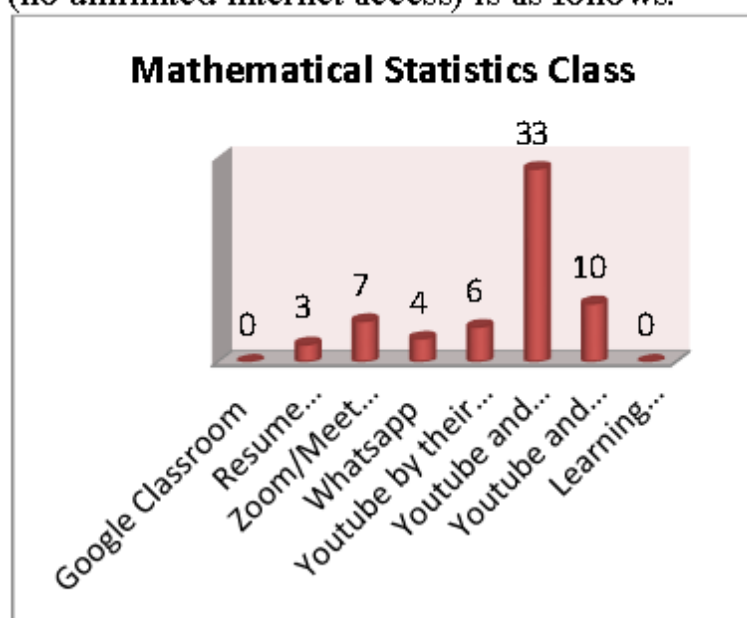


Figure 9. The selection survey of online learning models with the real conditions of students (no unlimited internet access) in Mathematical Statistics Class.

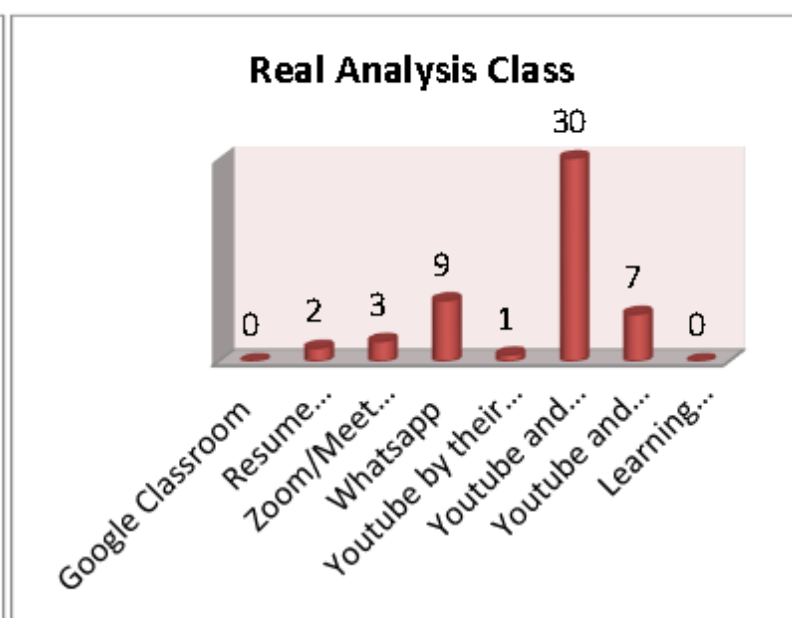


Figure 10. The selection survey of online learning models with the real conditions of students (no unlimited internet access) in Real Analysis Class.

Based on Figures 7 to Figure 10, it can be seen that the data mode 'The selection survey of online learning models' on both conditions is the YouTube-based learning model and continues the via WhatsApp discussion with the lecturer's guide. The results have also shown that students prefer to

understand material from YouTube videos created by their lecturers. This is because, when using video conference media, students need a larger quotas and a mobile phones which is compatible with a stable network. While the students presentation of a particular lesson topic raises suspicion on validating the truth of the material being presented [15–17].

4. Discussion

4.1. Many quotas are needed before the pandemic occurs

From the prior research, it has been obtained that both in the Mathematical Statistics class containing 63 students and a Real Analysis class containing 52 students spread almost the same before the pandemic occurred in both classes of the largest percentage spread to students who spent less than 2 GB quotas and between 2 GB to 4GB quotas every week.

The accumulation of 2 groups of students spending less than 2 GB quotas a week and between 2 GB - 4 GB quotas a week in the Mathematical Statistics class and Real Analysis class, respectively 64% and 79% of all research subjects. This indicates that more than half of the population in both classes would have a quota of less than 4 GB before the pandemic occurred.

4.2. Many quotas are needed when the pandemic occurs

While the results of research presented in the previous section on the internet data quota needed when the pandemic has occurred in the Mathematical Statistics class and Real Analysis class again shows quite identical data. The two biggest percentages of the two classes are in the group of students who claim to need internet data quotas of 8-10 GB and 10-20 GB.

If accumulated both in class of Mathematical Statistics and Real Analysis, the percentage of students who need a quota of between 8GB to 20GB reached 38% and 63% of the total research subjects. Although the total accumulated in both groups is slightly different by 25%, in both classes the group holds the biggest percentage of its class.

If the need for this quota is compared with the time before the pandemic occurred, it will be an extremely rapid increase. By looking at the biggest percentage in these two conditions, researchers can compare at the time before the existence of the Covid-19 attack, the quota needed by students is less than 4 GB. As for the time occurred pandemic the biggest percentage of students stated that it needs internet data quota of about 8 to 20 GB. This indicates an increase of 4 to 5 times the original state.

This increase occurred because all learning activities switched to using online learning systems, so inevitably students are needed to have an internet quota in order to follow the learning, even though the process and model of learning in every course was different, so that the quota needed also different. This is in line with the one presented by Kiryakova [4, 18] that online learning can be a lot more cost than usual because it requires new facilities such as the internet.

4.3. Student learning intensity before and when the pandemic occurs

In his research Traxler[5] states that online learning has a shorter period. So the next question arises, how is online learning about the intensity of students in learning? Is it also with the amount of internet quota that has been discussed earlier and the use of online learning models that do make the intensity of learning is high, low, or just no effect?

The results shown in figure 5 and 6 show data that more than 70% of students in two classes claimed to spend more time studying, both in Mathematical Statistics and Real Analysis or other courses during the pandemic.

This happens because when the pandemic occurs, all courses no longer use direct learning, so not a few courses that require students to have a guided group discussion at each meeting so that group members on duty to the presentation need to learn more to prepare discussion materials. Not only that, with online learning, sometimes students are experiencing problems and not able to directly understand the material that is delivered, so it is necessary to repeat the material discussed earlier [19]. This is an example of the cause of student's learning intensity to increase during the pandemic.

Another case is because at the time of the pandemic there is a course that gave the assignments instead face-to-face, so it required a thorough review of the materials first, and then arrange the necessary assignments.

Based on these two cases, students claim to be more frequent or intense in self learning if compared before the pandemic occurs.

4.4. Learning model students selected if given unlimited internet access

The learning model really determines how the material is received by students. This includes the inside and the course of their understanding of the material, fast or slow the material that can be absorbed, even far from it, satisfied and enjoy or not the students during the knowledge transfer process.

After students have been given the material of Mathematical Statistics learning and / or Real Analysis using various of learning models as described in the research methods section. Furthermore, students are made to think and feel which methods they think are quite effective and efficient. To avoid other factors such as economic factors, the question "What do you think is an effective and efficient learning model if students are given unlimited internet access?"

The data obtained on the results of research is surprised the researcher. The assumption of researchers, students will choose video conferencing media such as zoom, google meet, and the like. But the results shows 30 of the 63 students of the Mathematical Statistics class and 31 of the 52 students of the Real Analysis class actually chose learning models using YouTube, with the video uploaded is the original videos made by lecturers, and uploaded before the schedule of lecturers then on the schedule the lecturers filled with discussion that discussed about the video that has been uploaded.

In both classes the Mathematical Statistics and Real Analysis classes, this learning model received the most votes followed by zoom's media as the second most media afterwards. But the difference in the sound is quite significant. More in depth interviews were conducted by researchers to explore why these results were less in line with the researchers's assumptions. Based on the results of interview obtained several reasons as follows:

1. Although the unlimited internet quota has been given, but some students admitted to the place of residence, the signal is bad. So if it is done learning to use the video conference is the explanation is given discontinuous so that the student increasingly do not understand about what is conveyed by the lecturer. Not only bad signal, also makes the application automatically closed so that many explanations are left behind.
2. Using the zoom and video conference applications requires adequate gadgets. While the students admitted that their phone does not have enough space to install the application.
3. Some students mentioned that the zoom application often has errors and is considered complicated and troublesome when entering ID.
4. Some students claimed to be afraid that the application of zoom disseminates the user's personal information.
5. Some students also argued that using video conference applications made them less able to concentrate because because it is interrupted by the expressions of their colleagues in the gadget's screen.

This is in line with the research conducted by Leontyeva[6] and Sadeghi[3] which mentions many problems in the implementation of online learning, and most are constrained in technological issues such as the ownership of qualified gadget facilities.

4.5. Students selected learning models with current real conditions.

Subsequently given a similar question but this time adjusted to the real conditions of students. The logical explanation is that when students are given unlimited internet access, but most of them do not choose the learning model to use the video conference applications for reasons as previously

discussed. So it is not surprising if on this question model selector learning to use the video conference is decreasing.

The biggest data in both classes is still on the learning model that uses YouTube with videos created by the lecturers and then followed by a discussion using WhatsApp. On the other hand, although not significant in learning of Mathematical Statistics and Real Analysis using the WhatsApp discussion learning models also increased in two classes. This happens because nowadays they have to adjust to their economic conditions (internet quota).

The outline of this research is a learning model that combines YouTube and WhatsApp with a guided by lecturer in the discussion on the research as a result of learning models that is considered to be the most effective, efficient and not burdensome for students. Students based on the interview mentioned the reasons for this learning model chosen as follows:

1. Because the video is made directly by the lecturer and made by observing the skills of their students, so it is not very direct to the main points but give the first advance, so that the students increasingly understand the concept.
2. Videos on YouTube and the results of the discussion on WhatsApp can be learned again at any time. So that when the students forget it can still be opened and understood again.
3. The required quota is far less than video conference. This is in accordance with the explanation by Sadeghi[3] that economic constraints have also been a limitation on the implementation of ideal online learning.
4. The signal problems are quite resolved because at the time the signals supports being able to download the video, so understanding the video is not intermittent. Also the poor signal can still be used to monitor the course of discussion.
5. WhatsApp is a common media and is owned by all students.
6. WhatsApp media is the best complement when there are questions or difficulties when understanding the videos, so it can be discussed immediately.
7. Because it can determine the learning styles of students who learn by looking, reading and by listening.
8. The gadget used does not need to have high specifications.
9. No need to download certain applications.
10. The discussion is better guided by the lecturer, so the questions that arise can be answered directly without doubt that it is true or false. Because if guided by students who serves as presentators, sometimes the video is difficult to understand and when discussion of the answer is still not acceptable.

Based on the reasons of the interview excerpt, what is the answer and why the collaboration learning model between YouTube and WhatsApp that is guided by the lecturer is an effective, efficient, and not burdensome learning model for students.

5. Conclusion

Starting from the findings of the research and discussion, can be taken several conclusions among others, after the need pandemic students will increase Internet quota 4 to 5 times more than before the pandemic. The positive impact is the intensity of student learning is increasing, because the absence of face-to-face process, so those students are required to understand independently more than usual (before there is a pandemic). This can improve the student's ability to construct mathematics materials. Also with the introduction of an online learning system, the learning model that felt most effective, efficient and not burdensome based on student's perspective in both the classes of Mathematical Statistics and Real analysis are learning model that combines YouTube with WhatsApp. The learning first starts from the lecturers who made an explanation video about certain materials and then uploaded on YouTube and students are given an address/link to access and learn it, then during the learning schedule, conducted discussions led by the lecturer in question through WhatsApp about the videos that has been learned before.

6. Suggestion

Based on these conclusions, the advice presented by the researchers for educators are expected to be open (want to listen the suggestions from students) in determining the online learning model used, also it must consider the characteristics of the subjects to be taught first for the exact courses. From the results of this research, the researchers also suggested to use learning model that combines YouTube and Whatsapp as an effective, efficient and not burdensome model for students.

2 Acknowledgment

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References

- [1] King F, Young M, Richmond K D and Schrader P 2014 Defining Distance Learning and Distance Education *Educ. Technol. Rev*
- [2] Buselic M 2012 Distance Learning—concepts and contributions *Oeconomica Jadertina*. **1** 23–34
- [3] Sadeghi M 2019 A Shift from Classroom to Distance Learning: Advantages and Limitations *Sade. Int. J. Res. English Educ.* **4** 80–88
- [4] Kiryakova G 2015 Review of distance education *Trakia J. Sci.* **7** 29–34
- [5] Traxler J 2018 Distance Learning—Predictions and Possibilities *MDPI J. Educ. Sci.* **8** 1–13
- [6] Leontyeva I A 2018 Modern Distance Learning Technologies in Higher Education: Introduction Problems *EURASIA J. Math. Sci. Technol. Educ.* **14** 1–8
- [7] Annizar A M, Masrurotullaily, Jakaria M H, Mukhlis M and Apriyono F 2020 Problem solving analysis of rational inequality based on IDEAL model *J. Phys. Conf. Ser.* **1465** 1–14
- [8] Aini A N, Mukhlis M, Annizar A M, Jakaria M H and Septiadi D D 2020 Creative thinking level of visual-spatial students on geometry HOTS problems Creative thinking level of visual-spatial students on geometry HOTS problems *J. Phys. Conf. Ser.* **1465** 1–7
- [9] Creswell J W 2012 *Educational Research: Planning, Conducting and Evaluating, Quantitative and Qualitative Research* fourth edition (Boston: Pearson)
- [10] Annizar A M, Sisworo and Sudirman 2018 Pemecahan Masalah menggunakan Model IDEAL pada Siswa Kelas X Berkategori Fast-Accurate *J. Pendidik. Teor. Penelitian, dan Pengemb.* **3** 634–640
- [11] Annizar A M, Maulyda M A, Khairunnisa G F and Hijriani L 2020 Kemampuan Pemecahan Masalah Matematis Siswa dalam Menyelesaikan Soal PISA pada Topik Geometri *J. Elemen.* **6** 39–55
- [12] Maulyda M A, Annizar A M, Hidayati V R and Mukhlis M 2020 Analysis of students' verbal and written mathematical communication error in solving word problem *J. Phys. Conf. Ser.* **1538** 1–11
- [13] Khoo E and Cowie B 2010 A Framework for Developing and Implementing an Online Learning Community *J. Open, Flex. Distance Learn.* **15** 47–59
- [14] Yates A, Richards W B and Thistoll T 2014 Student Engagement in Distance-based Vocational Education *J. Open, Flex. Distance Learn.* **18** 29–44
- [15] Pratt K 2015 Supporting Distance Learners: Making Practice More Effective *J. Open, Flex. Distance Learn.* **19** 12–26
- [16] Bozkurt A 2015 Trends in Distance Education Research : A Content Analysis of Journals 2009-2013 *Int. Rev. Res. Open Distrib. Learn.* **16** 330–363
- [17] Tull S, Dabner N and Arthur K A 2010 Social Media and E-learning in Response to Seismic Events : Resilient Practices *J. Open, Flex. Distance Learn.* **21** 63–76
- [18] Margarella E and Blankenship M U 2015 Student Engagement, E-connectivity, and Creating Relationships In the Online Classroom: Emerging Themes *Int. J. Instr. Technol. Distance*

Learn **12** 65–72

- [19] Fields A and Hartnett M 2020 Online Teaching and Learning: COVID-19 Special Issue *J. Open, Flex. Distance Learn* **24** 1–2