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Students' understanding in the subject of statistical method at moodle through scientific approach

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Abstract: This study aims to investigate the understanding of mathematics department students in the subject of statistical method at moodle through scientific approach. The research design is qualitative research. The research subjects are fourth semester students of mathematics department at IKIP PGRI Bojonegoro who are chosen using purposive sampling. The data is analysed using data triangulation. The results of study reveal that from all five subjects; in the online learning using moodle; get so easy in understanding the learning materials. The learning becomes flexible; it can be carried out anywhere and anytime. Students are able to study by looking for learning references from other sources. Hovewer, there are several problems in the online learning such as lecturer's explanation is not as clear as when learning in class, there are more assignments given, and several materials have not been mastered by students. In the online learning, students have to be more focus when it is directed from YouTube. When the students have not understood the learning material in online learning, they can ask it to the lecturer or their classmates. Therefore, five subjects can anwer the questions about homogeneity and balance tests. Their completion steps are precise and perfect.
Keywords: Understanding, Scientific Approach, LMS Moodle

Pemahaman mahasiswa pada mata pelajaran metode statistik moodle melalui pendekatan ilmiah

Abstrak: Tujuan dari penelitian ini adalah mengetahui pemahaman mahasiswa pendidikan matematika melalui pendekatan saintifik pada mata kuliah metode statsitik dalam LMS Moodle. Jenis penelitian menggunakan penelitian kualitatif. Subjek dalam penelitian ini adalah mahasiswa pendidikan matematika semester IV IKIP PGRI Bojonegoro. Sedangkan cara pengambilan subjek penelitian ini dengan cara *purposive sampling*. Teknik analisis data yang digunakan adalah triangulasi data. Hasil penelitian dari kelima subjek tentang pembalajaran online dengan lms moodle, mereka mendapatkan kemudahan dalam memahami materi yang sudah disampaikan. Belajar menjadi fleksibel, kapanpun dan dimanapun, mereka bisa belajar dengan mencari beberapa referensi materi di sumber lain. Meskipun dimudahkan dengan pembelajaran online, namun ada juga masalah dalam pembelajaran online diantaranya penjelasannya tidak sejelas saat pembelajaran di kelas, tugas yang diberikan lebih banyak, dan materinya yang belum ia kuasai. Dalam pelaksanaan pembelajaran online menurutnya ia harus lebih fokus, terlebih jika pembelajaran onlinenya diarahkan dari YouTube. Saat tidak memahami materi yang disampaikan melalui pembalajaran online, diatasi dengan bertanya pada dosen atau teman sekelas. Oleh karena itu subjek 5 mampu menyelesaikan soal mengenai uji homogenitas dan uji keseimbangan dengan benar serta langkah penyelesaian tepat dan sempurna.
Kata Kunci: Pemahaman, Pendekatan saintifik, LMS Moodle

INTRODUCTION

The covid-19 pandemic has spreaded in several countries in the world at the end of 2019 and the beginning of 2020. The Indonesian people are shocked by covid that enters Indonesian territory. It does not take long time to spread in all over the world. This non-

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natural disaster is not the first time to be faced by several countries. The history records that there have been several viruses that are life threatening if it is not treated immediately, such as, Ebola virus, SARS, H5N1 or bird flue, HIV, MERS, etc (Palimbong, 2020). This pandemic starts to change human's social life in economics, social culture, and even the educational fields. It also influences Indonesian people. The covid-19 pandemic influences on all life aspects, and it becomes more expanding. The Covid-19 pandemic that started at the end of December 2019 has brought tremendous impacts on education in Indonesia and worldwide. Responding to this situation, the ministry of education appeals (Rahmani, 2021).

During the COVID-19 pandemic, educational institutions are urged to implement online learningbased on their capability. A very long period of the pandemic has created a massive change in the learning process (Arwidiyarti & Hikmi, 2020). Various efforts are taken by Indonesian government to break the spread of covid-19 virus. One of the Indonesian government policies to overcome it is physical distancing. It influences every field, especially the educational field. In early 2020 the school levels start from kindergarten to university have suddenly stopped the face-to-face learning in an emergency situation (Damayanthi, 2020).

The distance learning process in all schools has been carried out. It is in line with the Minister of Education and Culture Decree No.4 in 2020 about the implementation of education policy in emergency of Covid-19 pandemic. Distance learning emphasizes more on the student learning process. Meanwhile, distance education is a combination of the terms distance teaching and distance learning and is more appropriate to use. Various initiatives have been carried out to ensure that the learning activities are still going on when there is no face-to-face learning. Technology such as internet, smartphones, and laptop is utilized to support distance learning (Basar, 2021).

The distance learning starts to be common things for students. It has been carried out to do the learning process. One of learning management system which is utilized to carry out the distance learning is Moodle. Educators and students can to access it anytime and anywhere and through any device such as PC, tablet or smartphone in LMS Moodle. LMS Moodle has features that must be fulfilled to facilitate the online learning process, this is because basic features that an LMS must have are: an attractive interface; customization to adjust the system according to the user's wishes and virtual class. It provides open source facility, so it is used in this study. Moodle is a program which supports the classroom learning in form of web. It facilitates students to obtain various learning sources in the class. By utilizing Moodle, teacher is able to deliver information, provide assignment, assess it, deliver electronic journals and other learning sources (Raharja et al., 2011).

MOODLE (Modular Object-Oriented Dynamic Learning Environment) is a cloud-based media can be accessed via a computer or smartphone must be connected with the internet. This media can also minimize abuse smartphone by students while the ongoing learning process in the classroom, as well as familiarize students to learn ICT-based to meet the digital era where the current national examination has been implemented online (Sari & Setiawan, 2018). Moodle has been developed by many schools and universities to support distance learning. As stated by (Jati, 2013), the rapid development of e-learning and the use of LMS (moodle) have triggered some universities and schools in Indonesia to develop e-learning. According to (Fitriani, 2020), using Learning Management System, the learning system and communication can be carried out very well by utilizing the facilitates of the application; it also becomes an alternative learning media in the era of covid-19. The use of LMS allows students to independently gain access to notes and academic sources, discover

further information on their own and therefore experience a personalized education (Of, 2021).

In IKIP PGRI Bojonegoro, the online learning is carried out using Moodle based e learning. One of courses which utilizes Moodle as the learning media is statistical method. In this course, the learning materials are data presentation, the measure of central tendency, the measure of location, the measure of dispersion, and hypothesis testing. To drive students in understanding the learning materials and experiencing the meaningful learning, the course of statistical method presents various learning sources, such as learning videos, power point presentation using google meet or zoom apps, additional materials in form of pdf files, archived and evaluated assignments. All of them can be accessed by students using Moodle.

The distance learning using Moodle can be joined by students anytime and anywhere, so the learning process is not limited by space and time. It is in line with (Mayssara A. Abo Hassanin Supervised, 2014) who states that moodle strongly supports electronic learning that can be used in various formats of learning materials, such as, in the form of text, portfolio, animation, audio and video, etc. By using this format, lecturer and teacher are able to deliver learning materials through e-learning and can build systems with the concept of e-learning as distance learning. This learning concept puts a teaching and learning system which is not limited by space and time. A lecturer can provide learning materials from anywhere. Likewise, students can access it anywhere and anytime so they can repeat it many times.

In the subject of statistical method, there are many discussions related to data / facts and scientific steps in completing hypothesis testing. In creating meaningful distance learning with Moodle, this study implements a scientific approach. So that distance learning with Moodle LMS remains meaningful, in this study the author will implement a scientific approach in it. As stated by Ine (2015) that the scientific approach is an approach in the learning process which integrates science skills i.e. finding out the facts and knowledge associated with learning materials. Scientific learning is a type of learning which implements scientific steps in building knowledge through the scientific method. The learning model needed has to allow the cultivation of scientific thinking skills, develop students' sense of inquiry and creative thinking abilities. According to Junaidi (2017), the scientific approach is also able to create a rational national character based on science.

Scientific approach emphasizes more on students as learning subjects who have to be actively involved. Moreover, in scientific approach, students are required to carry out various activities to collect information, compare, categorize, analyse, integrate, reorganize materials and make conclusions. The scientific approach also includes five learning experiences, namely observing, questioning, gathering information (experimenting), reasoning (associating), and communicating. It is in line with the learning material on statistical method.

The scientific approach has been applied to general courses at the University of PGRI Madiun. A study conducted by Winarsih and Sulistyowati (2016), reveals that the scientific

approach can increase students' productivity in producing written works. It is also used by Jamaluddin (2018), to develop learning tools which refer to the process standard in national higher education standard. Furthermore, the scientific approach has also been applied in the online learning or e-learning. The results of study conducted by Wiyanto (2017), revealthat scientific approach can be implemented in e-learning system which starts with instructional designs made by lecturer for students and the learning activities which implement the stages of scientific approach. Therefore, it is expected to be used as an alternative, especially to encourage students to be active in the learning process. The urgency of this study is the existence of covid-19 pandemic that requires students to carry out distance learning activities. The success of distance learning cannot be separated from the satisfaction, comfort, and understanding of students about the lesson, so that students can easily digest what the teacher means in distance learning and teacher is a component that greatly determines the success of the learning process, the teacher should always present learning activities that make students interested in following it (Arif et al., 2021). Therefore it is necessary to combine certain approaches in distance learning, and one of approach is scientific approach.

The scientific approach is added in distance learning process, so it remains meaningful learning even though it is distance learning. This approach trains students to learn with the scientific method through the process of observing, asking questions, gathering information, experimenting, associating and communicating the material they are learning. This method suitable with material in statistic method subject. Some of the advantages of the scientific approach using online learning are the dependence of students on educators is slightly reduced because learning is carried out more at home through the network (online); the flexibility of time and place to take the steps of the scientific approach to be a separate experience for students, and train students to use learning technology from an early age. Based on the explanation, the author interested to integrating scientific approach with distance learning to find out students understanding.

METHOD

Type Of research

This study is qualitative research. It is a research method which is based on philosophy of positivism. It is used to examine the condition of natural object.

Time and Place of Research

This research was conducted in the even semester of the 2021/2022 academic year in IKIP PGRI Bojonegoro.

Subjects of Research

The research subjects are fifth semester students of mathematics education department in IKIP PGRI Bojonegoro, there are 36 of them. In taking samples, purposive sampling technique is chosen based on the goal to be achieved, namely knowing students' understanding about the subject of statistical method through a scientific approach in online learning in the new normal era.

Research Procedure

The data collection techniques are tests, interviews, and documentation. In this study, test is used to determine students' understanding in the subject of statistical method. Interview is used to collect data related to the implementation of online learning for mathematics education students using Moodle. The documentation is used to obtain data on the number of mathematics education students at IKIP PGRI Bojonegoro.

Data Analysis Instrument and Techniques

To obtain the accuracy of study, the researchers use triangulation technique. For instance, the data obtained from interviews are checked using observation or documentation. This technique is carried out to obtain the correct data. Time triangulation tests the credibility by using observation, interview, and survey. When the test results produce different data, it has to be carried out repeatedly to find the certain data. The data analysis technique is used to search and compile data obtained from interviews, field notes, and documentation. Researchers summarize the data to select, focus on the important parts, and provide a clear description of long-distance relationships which utilize video call as a media in communication. Data presentation can be done in form of brief essays, diagrams, media relations, flowcharts, etc. The most frequently used to present data in qualitative research is narrative text. Drawing conclusion is the last step of a study to answer the problem statements. In this step, the researchers conclude the data obtained from interviews and observations, so it answers the problem statements.

RESULTS AND FINDINGS

In this study, the researchers implement the scientific approach which consists of 5 stages namely observing, questioning, experimenting, associating, and communicating.

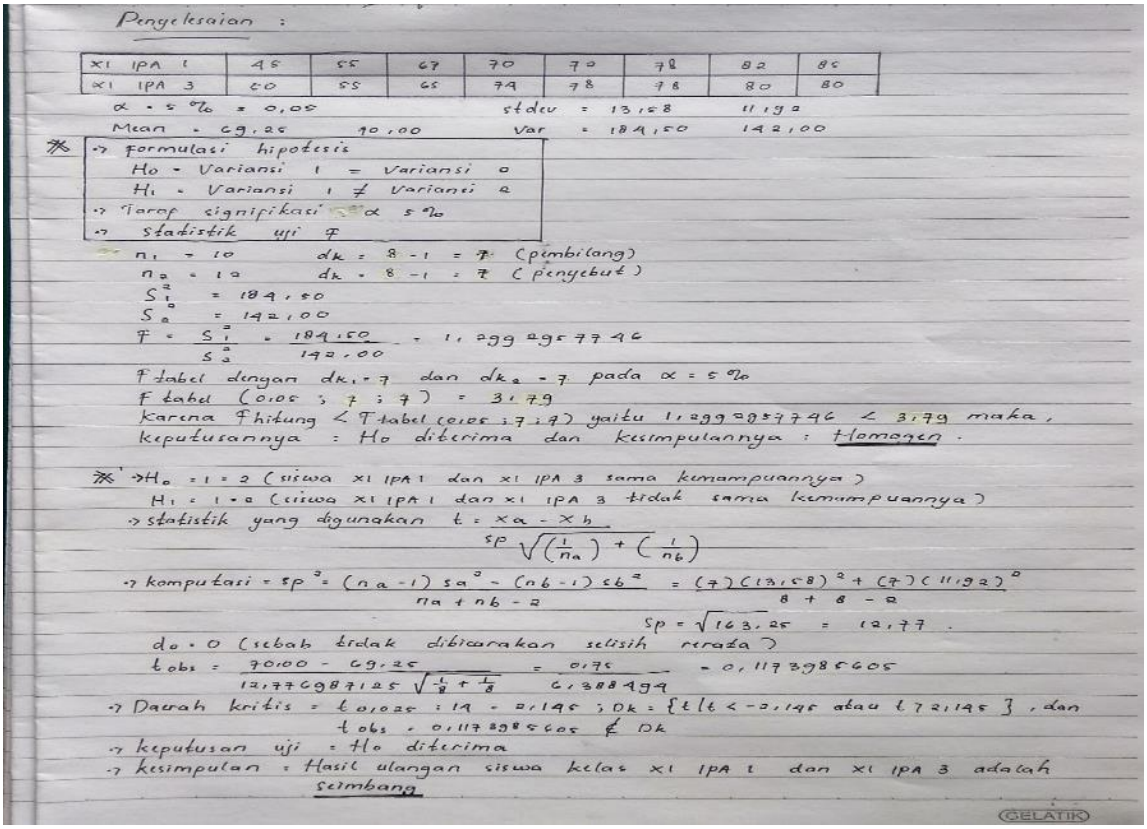
Observing is a method which uses meaningful learning. Learning activities carried out in observing are reading, listening, and seeing (without or with tools). Competence developed is to train students' seriousness, thoroughness, and skill in looking for information. At this stage, they read the material provided through the Moodle in pdf form, listen, and see explanations through learning videos that made by the lecturers themselves which are also available on Moodle. This process will train their sincerity and thoroughness independently.

Questioning is a learning activity which is carried out by asking questions about information that is not understood from what is observed. It can also be questions to obtain additional information about what is observed (starting from factual questions to hypothetical questions). The competencies developed are to support students' creativity, curiosity, and ability to formulate questions to develop critical thoughts which are necessary for intelligent living and lifelong learning. At this stage, students are able to ask material that is not understood directly through google meet or chat during online learning. This process develops their critical thinking skills.

Experimenting is a learning activity in form of doing experiments, reading another learning source, observe the object/activity, and interviewing the source persons. The developed competencies are careful, honest, polite, respect others' opinions, communication skill, ability to collect information from various sources, learning habit, and lifelong learning. In this stage, the students collect information related to the problems given. For example, the students are given the problems of homogeneity test and balance test. In the questions, the data from observations are presented to test whether it is homogenous and balance.

Associating is a learning activity in processing the information collected from the results of experimenting activities, observing activities, and collecting informations. The developed competencies are honest, careful, disciplined attitude, obeying rules, hard works, the ability to apply procedures, the ability to think inductively and deductively in making conclusion. From the results of experimenting activity, the answers from five students are obtained. Moreover, the answers from each subject (student) are presented as follows:

Answer Analysis of Subject 1.



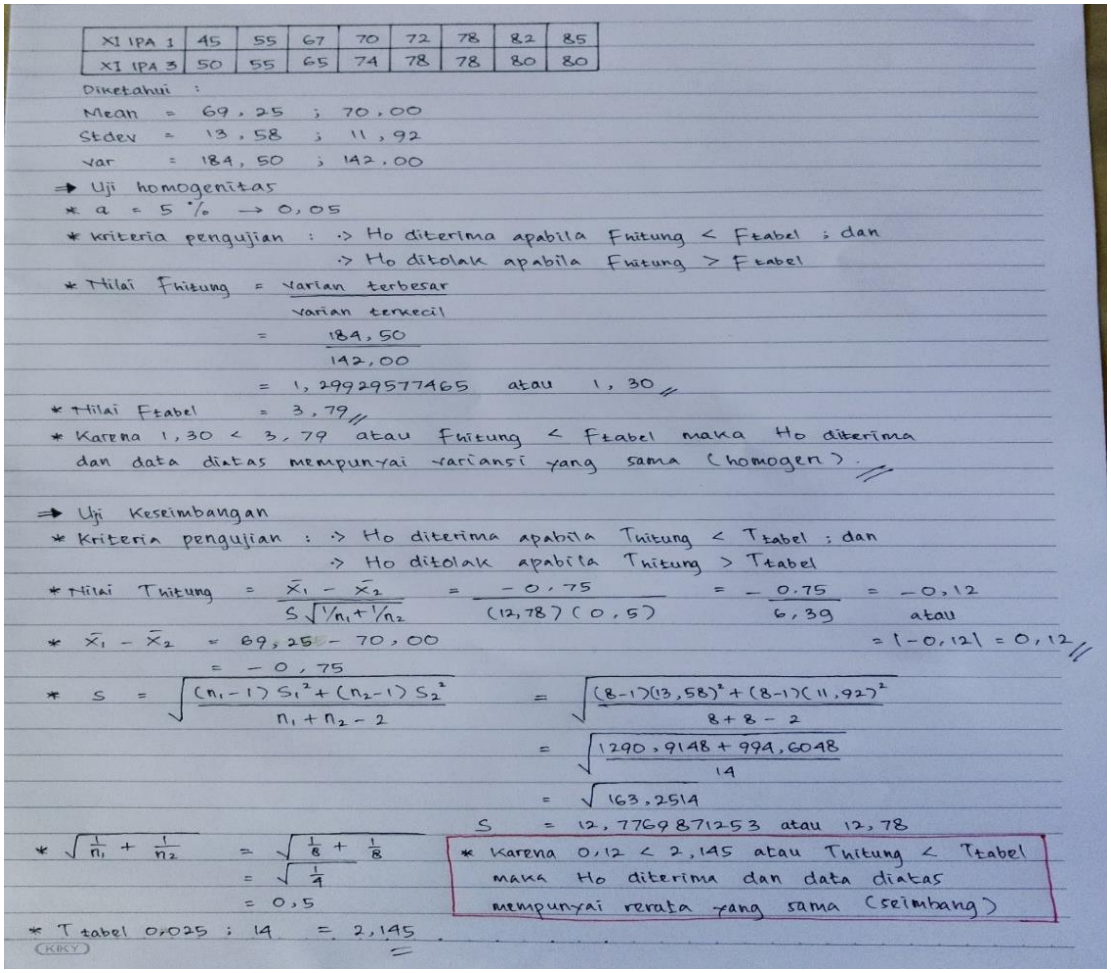
Picture 1. The answer of subject 1

Question: Completion of Homogeneity Test and Balance Test

From the answer of subject 1, it can be viewed that she is able to complete the homogeneity test and balance test. However, her completion steps are not written completely in both tests. Based on picture 1, it can be concluded that subject 1 is able to complete the homogeneity test and balance test correctly, even though her completion steps are

incomplete. In balance test, she does not write down the significance level and in the homogeneity test, she does not write down the critical area.

Answer Analysis of Subject 2.



XI IPA 1	45	55	67	70	72	78	82	85
XI IPA 3	50	55	65	74	78	78	80	80

Diketahui :
Mean = 69,25 ; 70,00
Stdev = 13,58 ; 11,92
Var = 184,50 ; 142,00

⇒ Uji homogenitas
* α = 5 % → 0,05
* kriteria pengujian : ∴ Ho diterima apabila Fhitung < Ftabel ; dan
∴ Ho ditolak apabila Fhitung > Ftabel
* Nilai Fhitung = varian terbesar / varian terkecil
= 184,50 / 142,00
= 1,29929577465 atau 1,30
* Nilai Ftabel = 3,79
* Karena 1,30 < 3,79 atau Fhitung < Ftabel maka Ho diterima dan data diatas mempunyai variansi yang sama (homogen).

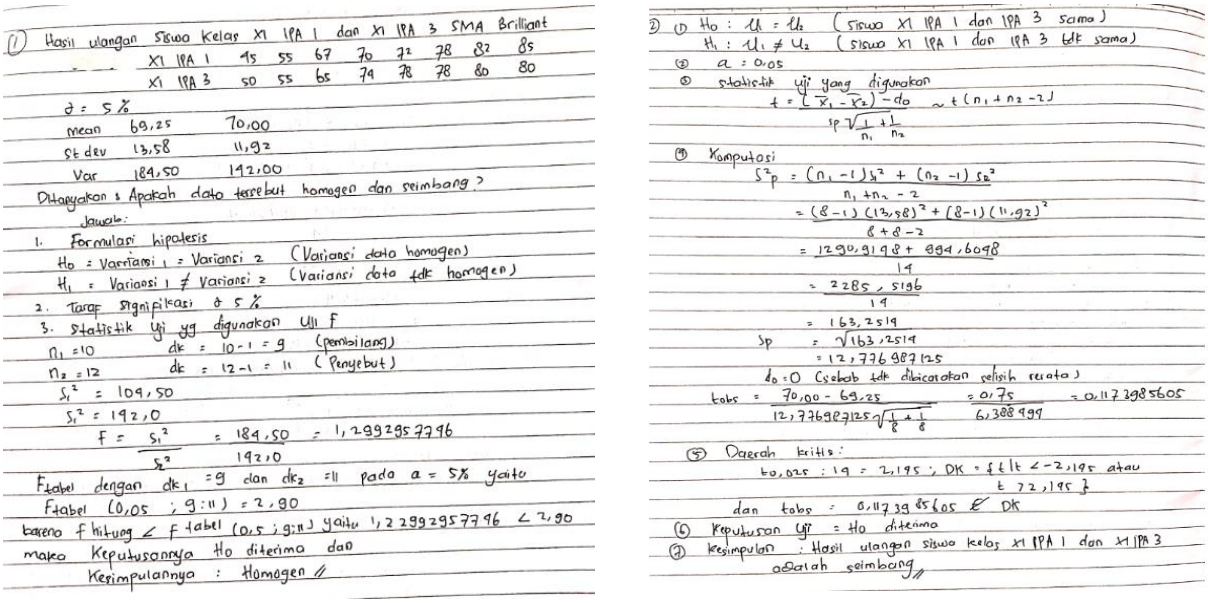
⇒ Uji Keseimbangan
* Kriteria pengujian : ∴ Ho diterima apabila Thitung < Ttabel ; dan
∴ Ho ditolak apabila Thitung > Ttabel
* Nilai Thitung = $\frac{\bar{x}_1 - \bar{x}_2}{S\sqrt{1/n_1 + 1/n_2}}$ = $\frac{-0,75}{(12,78)(0,5)}$ = $\frac{-0.75}{6,39}$ = −0,12 atau |−0,12| = 0,12
* $\bar{x}_1 - \bar{x}_2$ = 69,25 − 70,00 = −0,75
* $S = \sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}} = \sqrt{\frac{(8-1)(13,58)^2 + (8-1)(11,92)^2}{8+8-2}}$
$= \sqrt{\frac{1290,9148 + 994,6048}{14}}$
$= \sqrt{163,2514}$
S = 12,77698871253 atau 12,78
* $\sqrt{\frac{1}{n_1} + \frac{1}{n_2}} = \sqrt{\frac{1}{8} + \frac{1}{8}} = \sqrt{\frac{1}{4}} = 0,5$
* Karena 0,12 < 2,145 atau Thitung < Ttabel maka Ho diterima dan data diatas mempunyai rerata yang sama (seimbang)
* T tabel 0,025 ; 14 = 2,145

Picture 2. The answer of subject 2

Question: Completion of Homogeneity Test and Balance Test

From the answer of subject 2, it can be viewed that she is able to complete the homogeneity test and balance test. However, her completion steps are not written completely in both tests. Based on picture 2, it can be concluded that subject 2 is able to complete the homogeneity test and balance test correctly, even though her completion steps are incomplete. In balance test, she does not write down the significance level and the critical area.In the homogeneity test, she does not write down the critical area.

Answer Analysis of Subject 3.

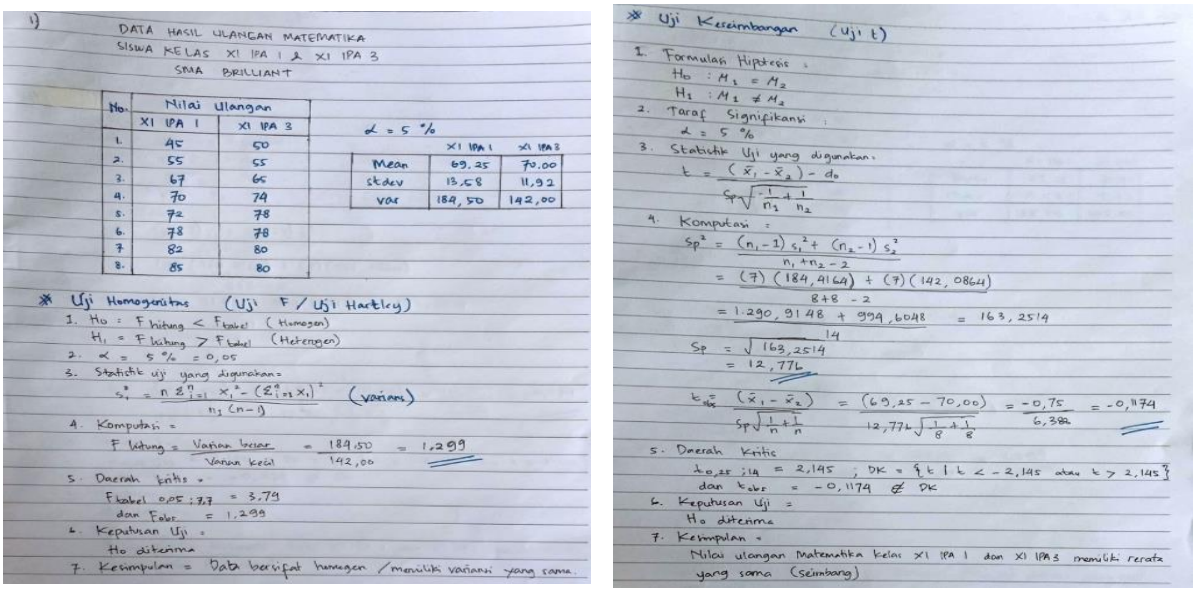


Picture 3. The answer of subject 3

Question: Completion of Homogeneity Test and Balance Test.

From the answer of subject 3, it can be viewed that he is able to complete the homogeneity test and balance test. However, his completion steps are not written completely in balance test. In the homogeneity test, his completion steps are less systematic. Based on picture 3, it can be concluded that subject 3 is able to complete the homogeneity test and balance test correctly. His completion steps are correct. However, in homogeneity test, his completion steps are less systematic. In the balance test, his completion steps are correct and complete.

Answer Analysis of Subject 4.

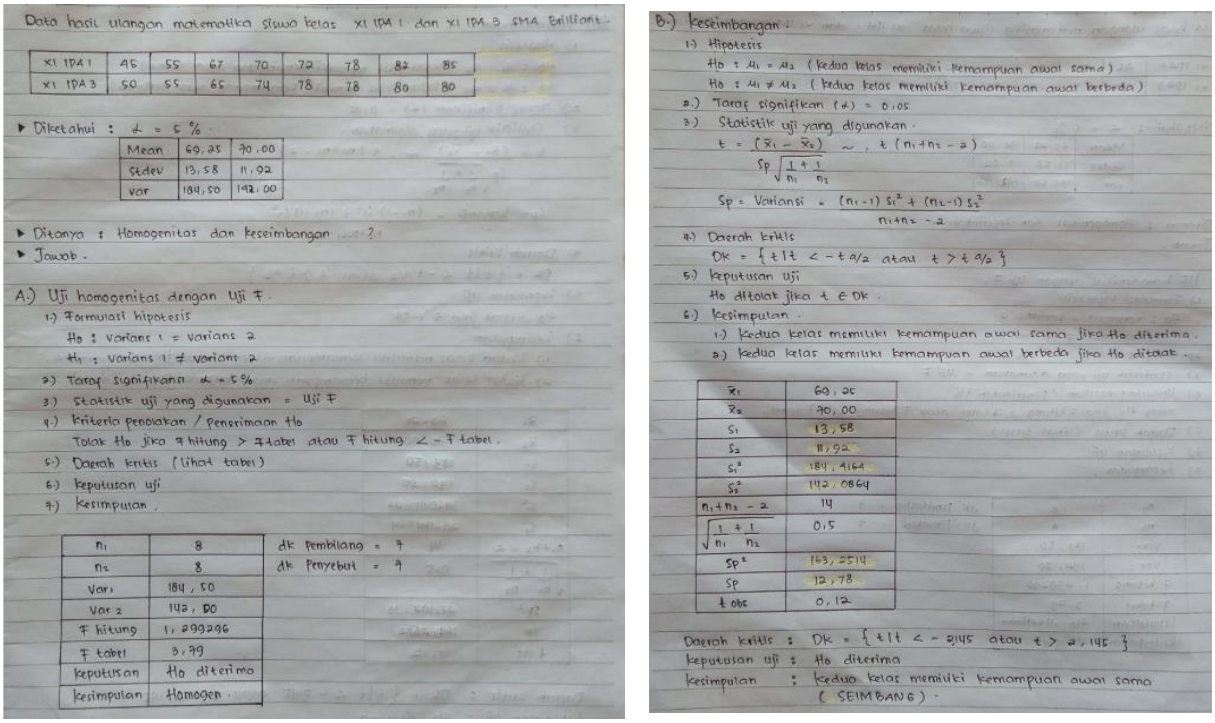


Picture 4. The answer of subject 4

Question: Completion of Homogeneity Test and Balance Test.

From the answer of subject 4, it can be viewed that she is able to complete the homogeneity test and balance test correctly. Her completion steps are complete and perfectly correct. Based on picture 4, it can be concluded that subject 4 is able to complete the homogeneity test and balance test correctly with correct and perfect completion steps.

Answer Analysis of Subject 5.



Picture 5. The answer of subject 5

Question: Completion of Homogeneity Test and Balance Test.

From the answer of subject 5, it can be viewed that she is able to complete the homogeneity test and balance test correctly. Her completion steps are complete and perfectly correct. Based on picture 5, it can be concluded that subject 5 is able to complete the homogeneity test and balance test correctly with correct and perfect completion steps.

From the analysis results of five subjects, it can be viewed that all of them are able to complete the homogeneity test and balance test correctly. However, there are some subjects who do not write down the completion steps completely, such as subject 1 and subject 2. Subject 3 has written the completion steps correctly but it is less systematic. Subject 4 and subject 5 are able to complete both tests with the correct and perfect completion steps.

Communicating is a learning activity in delivering the results of observations and conclusion based on the analysis results orally, written, or using another media. The developed competencies in this stage are to be honest, careful, tolerant, systematic thinking ability, the ability to share opinion briefly and clear, and communication skills. In this stage, the researchers interview the five subjects through video calls in order to investigate their concept's understanding on online learning using Moodle in which they have participated during the covid-19 pandemic.

a. Based on the interview result with subject 1, she explains that online learning drives her to have less understanding about the materials given. However, she thinks that online learning has some advantages in its process, such as being able to find another example related to the questions given. She also experiences several problems including the internet network which is less good. Moreover, her concentration in participating online learning is not as good as in face-to-face learning. She is lack of enthusiasm, so it makes her difficult to understand the materials. From several problems in online learning, she looks for ways to overcome it by finding other learning sources. In this way, subject 1 is able to answer the questions about homogeneity and balance tests correctly even though her completion steps are incomplete.
b. Based on the interview result with subject 2, she says that online learning does not provide convenience and easiness in understanding the materials. She finds it very difficult to learn, especially in the exact subject. She also experiences problems in online learning, such as she is not patient to see the YouTube videos, and the network is bad. To overcome it, she asks the lecturer and her classmates for the materials given. In this way, subject 2 is able to understand the materials and able to complete the assignments. So, she can answer the questions about homogeneity and balance tests correctly even though her completion steps are less complete.
c. Based on the interview result with subject 3, he argues that online learning provides less convenience. It is different with face-to-face learning in the classroom in which the materials can be easier to be understood. He thinks that when the materials are more numerous and he cannot remember it, he is able to open the archive repeatedly on Moodle. Furthermore, he finds some problems in online learning, such as the network signal is not good. It makes him difficult to understand the materials. According to him, online learning is very influenced by signals. When the connection is bad, it is very unpleasant especially during the google meet activities. To overcome it, subject 3 re-opened the materials on Moodle and he asks his classmates. In online learning, he less understands the materials presented. In his opinion, when he does not practice it, he will forget it and has to learn it again. However, subject 3 is able to answer questions about homogeneity and balance tests correctly with correct completion steps.
d. Based on the interview result with subject 4, she explains that online learning makes her difficult to understand the materials. She has to open and study it several times. In her opinion, it is less effective. To overcome her problems, she asks the lecturer or her classmates when she does not understand the materials. She is able to understand 80% of materials even though she opens the materials on Moodle repeatedly. Therefore, subject 4 is able to answers the questions about homogeneity and balance tests correctly with perfect and precise completion steps.
e. Based on the interview result with subject 5, she says that in online learning, she finds it easy to understand the materials. According to her, she can study flexibly whenever and wherever she wants. She is able to look for other learning sources. However, she also encounters problems in online learning, such as lecturer's explanation is not as clear as in

face-to-face learning in the classroom, in face to face learning student's can give question to lecturer directly and lecturer will be give answered directly too. In online learning, more assignments are given, and there are many materials that she has not mastered In online learning, she has to be more patient especially when it is directed from YouTube and there is an incoming message from WhatsApp. She fails to focus and immediately read the incoming message. When she does not understand the materials, she asks her lecturer and classmates. Therefore, subject 5 is able to answer the questions about homogeneity and balance tests correctly with perfect and precise completion steps.

Sometime online learning make many students do not understand the materials presented. It is in line with a research conducted by (Argaheni, 2020) which reveals that online learning is still considered confusing for students and the accumulation of materials and concepts is deemed less useful for students. However, online learning also has advantages that can be felt by students, such as learning is more practical and accessible anywhere and anytime. A study conducted by (Adi et al., 2021), shows that distance learning or online learning is more practical and relaxed, the delivery of materials and information becomes faster and can be accessed by many students. Moreover, (Sadikin, 2020) explains that online learning has flexibility in its implementation and fosters students' motivation and learning independence.

CONCLUSION

Based on the data obtained, it can be concluded many students do not understand the materials presented in online learning. During the learning process, the main obstacle is low internet connection in students' area. It also has a big influence on students' understanding on materials given. The unstable network causes some students are less able to focus the process of understanding the materials. Moreover, several other problems are also experienced by students including their lack of enthusiasm and patience when they have to watch YouTube videos, lecturer's explanations are not as clear as in face-to-face learning in classroom, students obtain more assignments, and they are less serious in online learning.

To overcome students' problems in understanding the materials in online learning, they have several ways, such as looking for other learning sources and references, asking the lecturer and classmates. The online learning in the subject of statistical method makes many students do not understand the materials presented. However, some of them can understand it. There are some students who say that lecturer's explanation in online learning is not as clear as in face-to-face learning. They also argue that online learning makes them difficult to remember the materials given. Moreover, when they do not retrain the materials, they will be easier to forget it and have to study it again.

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