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Students' Ability in Solving Statistical Problem Using the Context of the COVID-19 Pandemic

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Abstract

This study aims to determine mathematical abilities of the students in grade 8 in solving statistical problem using RME and LSLC in online learning during the COVID-19 pandemic. Learning began with the provision of were given interactive videos as an asynchronous pre-learning stage. Furthermore, at the synchronous stage, students were given sharing tasks and jumping tasks then synchronous activities were closed by giving independent assignments. In asynchronous pre-learning, students sent independent assignments via Google Classroom at a predetermined time. Subjects in this study were 31 eight graders junior high school students. This research used a descriptive method, where the data were obtained by using observation, test, and interview. The data were analyzed qualitatively descriptively.The result of this study is students' abilities in a good category with an average 68,5. Therefore, it is concluded that RME and LSLC are suitable for use during a pandemic as teaching methods for statistics.

Keywords: COVID-19, LSLC, RME, Problem Solving, Statistical Problem

Abstrak

Penelitian ini bertujuan untuk mengetahui kemampuan pemecahan masalah matematika siswa kelas 8 materi statistika dengan menggunakan RME dan LSLC di masa COVID-19 dalam pembelajaran daring. Pembelajaran diawali dengan tahap asinkronus pra belajar yaitu pemberian video interaktif. Selanjutnya, pada tahap sinkronus siswa diberikan sharing task dan jumping task lalu kegiatan sinkronus ditutup dengan pemberian tugas mandiri. Pada asinkronus pra belajar, siswa mengirimkan tugas mandiri di google classroom pada waktu yang telah ditentukan. Subjek pada penelitian ini adalah 31 siswa kelas 8 SMP. Penelitian ini menggunakan metode deskriptif, dimana data diperoleh menggunakan observasi, tes dan wawancara. Data di analisis secara deskriptif kualitatif. Hasil penelitian ini berupa kemampuan pemecahan masalah matematika siswa terkategori baik dengan rata-rata 68,5. Dengan demikian, disimpulkan bahwa RME dan LSLC cocok digunakan pada masa pandemi dengan materi statistika.

Kata kunci: COVID-19, LSLC, RME, Pemecahan Masalah, Permasalahan Statistika

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INTRODUCTION

Statistics is one of the materials taught to eight graders students according to the 2013 Curriculum Learning (MoEC, 2017). The Minister of Education and Culture Nadiem Makarim, said, "*statistics is a language to understand and use data critically*" (Rahman, 2019). At this time, people must be able to read and analyze data so that they will not fall behind and be fooled by data. However, currently, there are still students who experienced difficulties in learning statistics. Surya, Zulkardi, & Somakim (2017) in his research stated that students can not solve problems with indicators that apply the concept of median and mean to solve problems.

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Through the design of Curriculum 2013, students are expected to have abilities and skills that are following the core competencies in learning mathematics cited in Permendikbud No. 21/2016. One of the 21st century skills in these competencies is a problem-solving ability (Rahmawati, 2016). This is in line with Zulkardi (2015) which states that one of the foundations for learning in the 2013 curriculum is to provide questions that require problem-solving abilities. Problem solving is a student's process of solving problems by relying on the abilities they have (Budiarti, 2016).

However, the ability of students in Indonesia to solve math problems is still not good. It can be seen clearly in the PISA score in Indonesia in 2018 where only 1% of Indonesian students scored at level 5 in mathematics (OECD, 2019). According to Son, Darhim, & Fatimah (2020), students still experienced difficulties in solving the given math problems. This is evidenced by more than 50% of students experiencing errors in solving problems and many students making mistakes in all indicators of their mathematical problem-solving abilities.

The cause of low PISA achievement of Indonesian students related to problem-solving indicators is that Indonesian students are not accustomed to solving non-routine problems and are weak in interpreting real situations into mathematical problems, and interpreting mathematical solutions into real situations (Wafiqoh, Darmawijoyo, & Hartono, 2016). The same result were discovered by Yusuf (2017) that the learning carried out by teachers now is directly explaining what the meaning of the material is and students are not allowed to first construct that knowledge. Meanwhile, students' lack of understanding of the material is due to the difficulty of students applying the material in their daily life (Juliana & Zanthy, 2020).

Furthermore, to improve mathematics learning and meet the demands of the 2013 curriculum and 21st-century skills, learning approach and learning methods that can emphasize student activity and facilitate student problem-solving abilities are needed. One of the efforts to reform mathematics education in Indonesia is the development and implementation of Realistic Mathematics Education (RME) (Sembiring, 2010; Meitrilova & Putri, 2020). Putri & Zulkardi (2018) said that RME must relate to everyday life and therefore, it requires a contextual problem that is close to students.

As a coaching effort to improve the learning process, teachers together continuously plan, implement, observe and report learning outcomes using the lesson study system (Sato, 2014). According to Situmorang, Putri, & Lelyana (2020), lesson study is a learning process through exchanging information with the following stages: choosing learning, making learning implementation, and realizing this in teaching and learning activities.

Based on government policies regarding efforts to prevent the COVID-19 virus in the field of education, a distance learning process (*pembelajaran jarak jauh or* PJJ) is carried out (Sari, Rifki, & Kamila, 2020). Distance learning is a learning process that is carried out face-to-face between teachers and students in different places (Ahmad, 2020). The blended learning strategy is used so that online learning can be applied creatively and innovatively (Wardani, Toelioe, & Wedi, 2018).

Research on mathematical problem-solving abilities has been carried out by many other researchers, for example, focused on the ability to solve mathematical problems in solving PISA problems (Mita, Linda, & Nur, 2019), students' problem-solving abilities in PISA questions on geometry topics (Annizar, Maulyda, & Khairunnisa, 2020), and reasoning and problem-solving skills through a collaborative model (Fauzi, 2019). Based on the problems that have been previously mentioned, it necessary to research students' mathematical Problem-Solving ability in statistical material using RME and LSLC (lesson study for learning community) during the COVID-19 pandemic. Therefore, this study aims to determine mathematical abilities of the students in grade 8 in solving statistical problem using RME and LSLC in online learning during the COVID-19 pandemic.

METHODS

This type of research used in this research is descriptive research. Where this research will determine how students' mathematical problem-solving abilities during the COVID-19 period using RME and LSLC. The subjects of this study were 8th grade students in a junior high school located in Palembang. The research process was carried out using the LSLC system, which consists of four stages, namely planning, doing, seeing, and redesigning.

The data collection technique used was written test, interviews and observation. The written tests were carried out online after synchronous learning, consisting of two questions in the description to see students problem solving abilities. The Interviews were conducted through a Zoom meeting to obtain information on how students could solve the evaluation questions that had been given. Then, the observations were made to see the continuity of learning and focus on student activities during learning.

The data analysis method used was qualitative descriptive method. Furthermore, the data from the written test result were analyzed by determining the students' test scores. The maximum score on each indicator is 4 and the minimum score on each indicator is 0. If students get score of 4 on each indicator of the questions, it can be said that students can come up with mathematical problem-solving ability correctly. However if students get score lower than 4, it can be said that the students has raised an indicator of mathematical problem-solving ability but not the maximum. However, if the students get a score of 0 it can be said the student does not come up with mathematical problem-solving ability. Thus the researcher determined that with a score 4,3,2,1 on each indicator, students' mathematical problem-solving abilities appeared. Even though the scores of 3,2,1 are not maximum scores, scores indicate that the students have come up with mathematical problem-solving abilities are not maximized and the researcher appreciate the students' answer. Observations and interviews were analyzed with descriptive qualitative.

RESULT AND DISCUSSION

This study used four stages of the LSLC according to Sato (2014), namely planning, doing, seeing, and redesigning which will be described as follows.

Planning

In the planning stage, the teacher and the researcher prepared a set of teaching materials so that the learning process can be carried out effectively during the COVID-19 pandemic.

Figure 1. Planning stage about sharing and jumping task

Figure 1 shows the process in the planning stage. This stage was carried out twice meetings involved two mathematics teachers and three researchers. The first meeting was to discuss the material, with the aim that in learning, students can solve problems related to the mean and median to make decisions and draw conclusions correctly, and to discuss indicators of competency achievement and indicators of student abilities. The next meeting was to arrange learning tools such as lesson plans, sharing tasks, jumping tasks, test questions, and learning videos, determine research subjects, determine the schedule of learning activities, and choose one of the teachers to be the model teacher.

Doing

The do stage was the implementation of the planning stage in advance, where the model teacher will carried out the learning process and the others acted as observers. The learning process during the COVID-19 period used blended learning consisting of asynchronous pre-learning, synchronous, and asynchronous post-learning (Wahyuni, 2018). In asynchronous pre-learning, the teacher sent interactive learning videos via google classroom (GCR) and asked students to watch it and note important things.

The synchronous activity was conducted via Zoom meeting, where there were 20 students out of 31 students who attended like in the Figure 2. The core activity in the learning process with the LSLC system is the provision of sharing tasks and jumping tasks that students will do individually and collaboratively with their group friends (Octriana & Putri, 2018), followed by the presentation of the results of completion by student and giving tests.

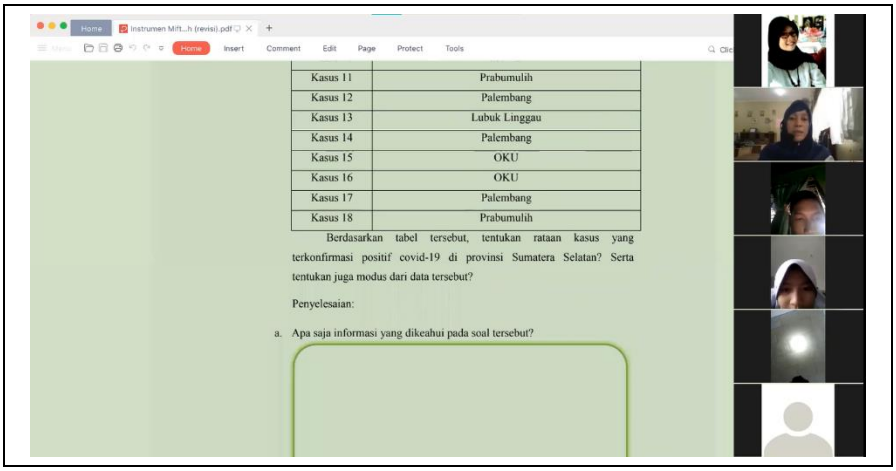


Figure 2. Synchronous activities about learning mean

Figure 2 shows the synchronous learning with statistical problem, where synchronous learning were closed by conveying conclusions from the learning activities that have been taking place. In the asynchronous post-learning test that has been given, students collected task in GCR based on a predetermined time, which was then assessed by the teacher based on indicators of problem-solving abilities.

After learning process occurred twices meetings, students were given a test to see students problem solving abilities.

1. Additional number of COVID-19 patients under monitoring since Monday in the city Palembang: 10, 4, p, 6, 11, and 3.
   a. If mean and median is the same, define the value of P!
   b. If the next day it is expected that mean addition number of COVID-19 patients under monitoring will decrease to 6, estimate of the number of additional cases that day?

Figure 3. Problem solving test about mean and median

Students were given questions about the addition of COVID-19 cases in Palembang (as shown in Figure 3). Next, the students were asked to determine the mean and median values. After carrying out the test of students' mathematical problem-solving abilities, the following results were obtained in Table 1.

Table 1. Students mathematical problem-solving ability

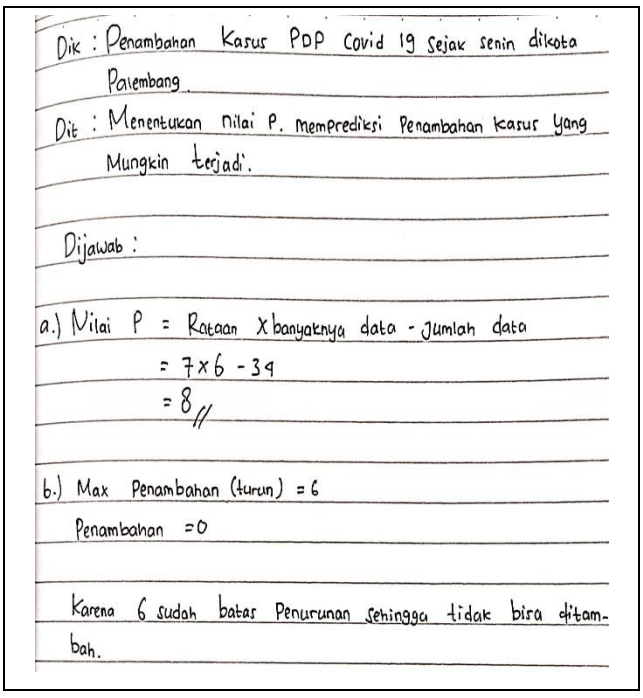
Score	f_{tot}	X_i	f_{tot} . X_i	Average
81 - 100	12	90.5	1086	68.5
61 - 80	17	70.5	1198.5	
41 - 60	7	50.5	353.5	
21 - 40	3	30.5	91.5	
0 - 20	1	10	10	
Total	40		2739.5	

Description:

f_{tot} : The number of students completing the questions

From Table 1, it is known that the number of students who completed and got score of 80 - 100 and got a very good category were 12 students (30%), 17 students (42,5%) got a score of 61 - 80 with a good category, 7 students (17,5%) got a score of 41 - 60 with a sufficient category, 3 students (7,5%) got a score of 21 - 40 with a less category, and 1 students (2,5%) got a score of 0-20 with a very less category. So, the average students' problem solving abilities is 68.5 with a good predicate.

The results of students' answers on problem solving test will be described as below.



Translated into English:

Let: Additional number of COVID-19 patients under monitoring since Monday in the city Palembang

Find: the value of P and estiamation of the number of additional cases.

Answer:

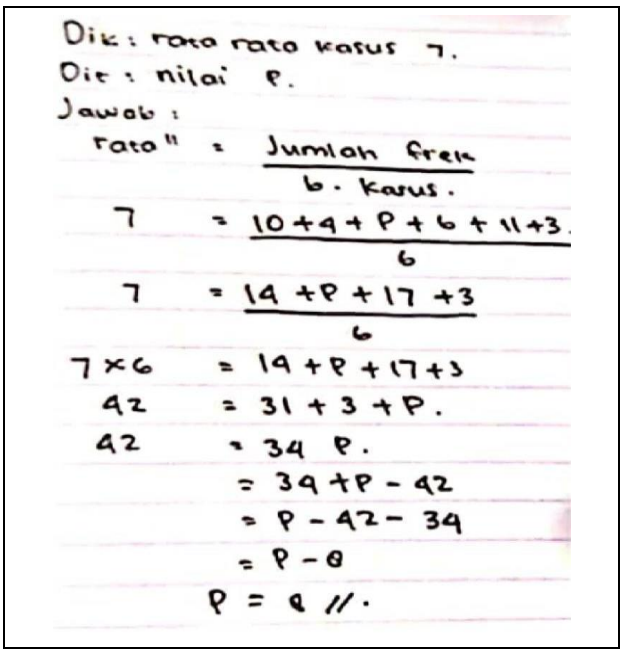
a. P = Mean x mode – amount of data
   p = 7 x 6 -34
   p = 8
b. Maximum addition = 6
   Addition = 0

Because 6 is already the limit of reduction so it can't be added

Figure 4. S1's Answer to question number 1a and 1b about mean

Figure 4 illustrates that S1 demonstrated indicators of planning completion. When s(he) was asked "*why they wrote such a strategy"*, s(he) simply replied "*I looked it up in the internet*". The indicator of completing the plan that they demonstrated was good enough. However, S1 did not demonstrate well the re-checking indicator. In the interview, S1 firmly answered that they were sure of the answer they

had proposed. Next, S1 did not understand the problem presented in question number 1b. S(he) only expressed his/her opinion about the problem solving. This happened becase s(he) did not understand the problem well. As a result, s(he) could not plan and solve the problem well even though their final answer to question 1b was correct.



Translated into English:

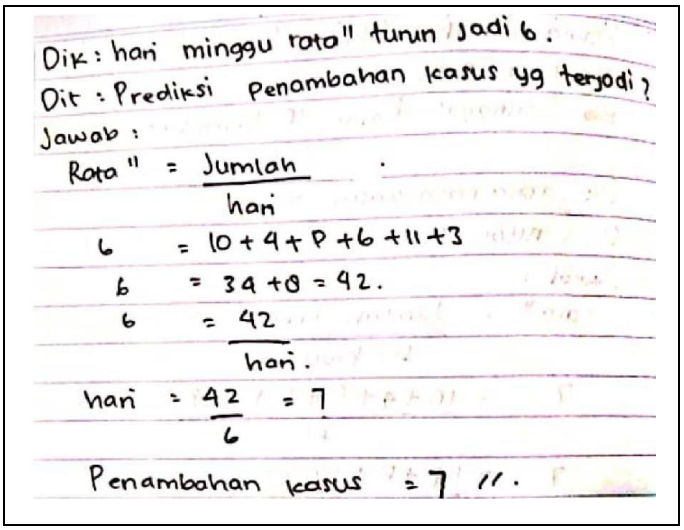
Let: Mean = 7

Find: The value of P

Answer:
Mean = The sum of all frequencies/many cases
7 = (10+4+p+6+11+3) / 6
7 = (14+p+17+3) / 6
7 x 6 = 14+p+17+3
42 = 31+3+p
42 = 34 p
= 34 + p – 42
= p – 42 – 32
= p – 8
p = 8

Figure 5. S2's Answer to question number 1a about mean

S2 was able to understand the problem quite well, as shown in Figure 5. S(he) was able to write "let" and "find" statements, but not answer it perfectly. However, when s(he) was interviewed, they were able to mention both statements very well. In addition, the indicator of planning completion also well demonstrated. In terms of problem solving indicator, S2 wrote things that were not quite right, for example, when s(he) was working on problem number 1a, s(he) forgot to write the symbol of "+" and only wrote "*42 = 34p*", which should have been written "*42 = 34 + p*".



Translated into English:

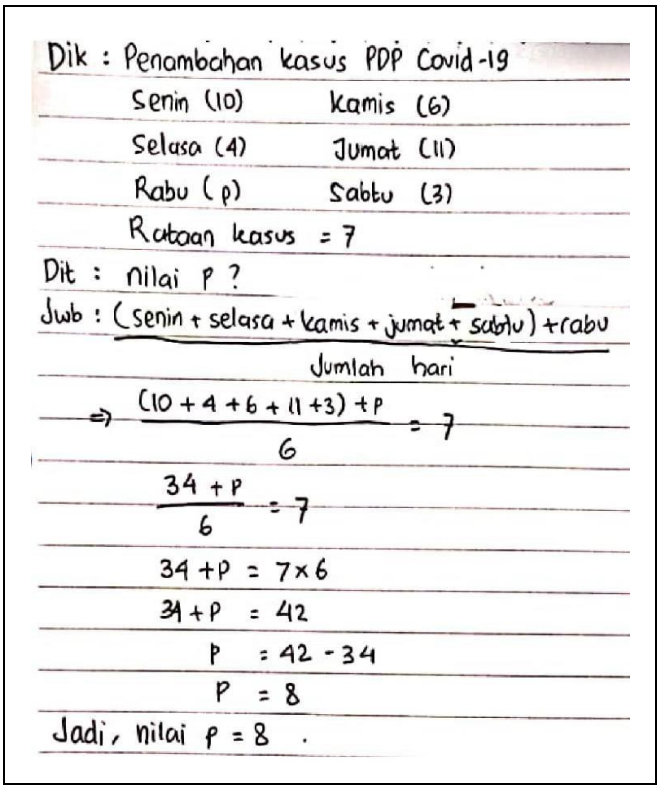
Let: On Sunday, the mean dropped to 6

Find: The estimated number of additional cases that may occured

Answer:
Mean = the sum of all cases / number of day
6 = 10+ 4+ p + 6 + 11+ 3
6 = 34 + 8 = 42
Number of day = 42 / 6 = 7
Additional cases = 7

Figure 6. S2's Answer to question number 1b about mean

The last indicator is the indicator of rechecking. S2 has not been able to demonstrate well the ability to re-check the answers that s(he) has been proposed as shown Figure 6.



Translated into English:

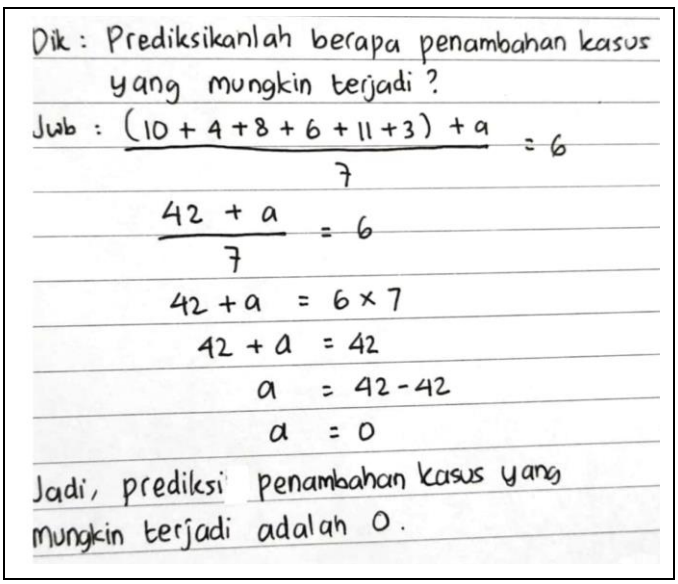
Let: Additional number of COVID-19 patients under monitoring (PDP) on Monday (10), Tuesday (4), Wednesday (p), Thursday (6), Friday (11), Saturday (3), mean = 7

Find: The value of p?

Answer:
Mean = (Mon+Tues+Thurs+Friday+Sat)+ Wed / the number of days
((10+4+6+11+3)+p) / 6 = 7
(34 + p) / 6 = 7
34 + p = 7 x 6
34 + p = 42
p = 42 – 34
p = 8
So, the value of p = 8.

Figure 7. S3's answer to the question number 1a about mean

S3 was able to understand the problem well, plan solutions, and solve the problem with the right strategy, and was able to do it carefully. Furthermore, S3 was able to demonstrate the indicator of rechecking well. It can be seen from the conclusions that s(he) has wrote as shown Figure 7.



Translated into English:

Find: The prediction of the number of addictional cases that may occur

Answer:
6 = ((10+ 4+ 8 + 6 + 11+ 3) +a) / 7
(42+a) / 7 = 6
42 + a = 6 x 7
42 + a = 42
a = 42 - 42
a = 0

So, the prediction of possible additional case is 0.

Figure 8. S3's Answer to the question number 1b about mean

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Based on the explanation from Figure 8, S3 was able to demonstrate all indicators in 1a and 1b and perform the four problem solving steps based on Polya. Therefore, when s(he) was required to address a problem, s(he) could solve the problem correctly.

Seeing

The seeing stage aimed to see the advantages or disadvantages of the learning process that has been implemented. The model teacher began this activity by conveying impressions, constraints, and experiences regarding the learning process that has been carried out. Furthermore, the observers conveyed student activities in the learning process and provided suggestions if any. Suggestions from observers can be used to design further learning to make it even better.

Based on the result of this stage, it is known that the learning designed at the plan stage wasrunning properly. Students in their groups actively engaged in disscussion and each students in their group showed the role that teacher and researchers should expect. When there were students who did not understand, the student asked their friend by saying "please teach me" and their friend who understands helped their friend who did not understand.

Re-Designing

At this stage, improvements were made to the design of the learning process if it needs to be improved based on suggestions from the previous stage that have been agreed upon by the teacher involved. The learning process with LSLC at the doing stage and the learning process that occurs must be in accordance with the principals and the characteristics of RME. Following are the characteristics of RME in completing sharing tasks. In the Sharing task, there was one activity that will be done by students. This activity will guide students to understand measurement of central tendency.

Generally, the used of the COVID-19 context is very helpful for student in solving the problems given, in line with Permatasari, Putri dan Zulkardi (2018), the used of context in statistical learning is very important because it can present a mathematical problem into everyday problems or realistic problems. It can be seen in Figure 3, to see students mathematical problem solving abilities were given COVID-19 data and asked students to calculate the mean of the data.

At the time of synchronous learning using lesson study, students work in their groups, where when there are students who have not been able to solve the problem, the students must ask their friend for help by saying "please teach me" so that when completing the math problem solving abilities test, students get on average with a good predicate as shown in Table 1. Situmorang et al., (2020) discover the same result where lesson study is learning process through the exchange of information to realize goals in learning activities.

CONCLUSION

It can be conclude that the average ability of students based on test results was 68.5, which, based on data on the category of student abilities, is categorized as good. Where there are 30% of students is very good category, 42.5% is good category, 17.5% is a sufficient category, 7.5% is the less category, and 2.5% in the very less category. Therefore, it is concluded that RME and LSLC are suitable for use during a pandemic as teaching methods for statistics.

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