

An analysis of Elementary School Students' Errors in Solving Statistics Problems in Online Learning during a Pandemic Period

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ABSTRACT

This study aims to describe the errors made by students and their causal factors in solving statistical problems. This study used descriptive qualitative method. Participants in this study were taken by purposive sampling and obtained 4 selected students. Collecting data in this study using tests and interviews. Based on the results of the research that has been done, it can be concluded that some students make mistakes due to poor understanding of the material, errors in writing flow or systematic answers, error processing skills, basic multiplication skills that are still low, and errors in reading graphs. Factors causing student errors are lack of interest in learning due to online learning that is currently being applied only to providing material and assignments from the teacher and the absence of an explanation of material from the teacher even though online, students' inaccuracy, lack of mastery of multiplication which should have been mastered by multiplication basis 4th grade level, do not understand the concept of material, do not understand in operating calculations, and students' unfamiliarity in writing conclusions.

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INTRODUCTION

One of the impacts of the outbreak of the corona virus is that the learning process is not held face-to-face in schools. On March 24, 2020, the government through the Minister of Education and Culture of the Republic of Indonesia issued Circular Letter Number 4 of 2020 concerning the Implementation of Educational Policies in the Emergency Period for the Spread of COVID. The contents of the circular explain that the learning process is carried out at home through online or distance learning with the aim of providing a meaningful learning experience for students. Mathematics is no exception, because mathematics is one of the subjects that must be studied by every student from elementary school to high school (Sulistiyarini, 2017), learning is also carried out online.

Wiryanto (2020) in the results of his research describes the negative impacts of online learning, including that teachers and students cannot provide feedback quickly, students' understanding of the material is not deep, besides that the assessment is only done through results assessments, the emergence of boredom. on students who feel that they are only focused on assignments, and the teacher's explanation is not clear when learning through

face-to-face applications when the signal is bad so that the material presented is unclear. From the results of this study, it can be assumed that students' mastery of the material cannot be optimally ascertained, and it is suspected that there are many mistakes made by students in working on the questions given. This is in line with research conducted by Sandra (2019) which explains that many students encounter problems by making mistakes in solving mathematical problems such as errors at the reading stage, process transformation, and inference stage. As stated by Nakayama, et. Al (2007) that from all the literature on e-learning indicates that not all students will be successful in online learning, due to learning environment factors and student characteristics.

Ulifa (2014) states that a mathematical error is a form of deviation from the right thing, a predetermined procedure, or a deviation from what is expected. Mathematical errors are part of deviations in terms of errors in understanding questions, errors in making completion steps, and errors in calculating, writing or stating the final answer (Wijaya, et. al, 2014). This statement is reinforced by the results of research conducted by Indra (2017) which explains that students who make mistakes at the stage of writing the final answer are because they do not understand what the questions or problems are like. The results of this study are also supported by the results of research conducted by Misdfelt (2016) which illustrates that errors made in understanding the problem and writing the wrong answer have a fairly high relationship, namely as much as 68%. The number of students who are less able to master the problems in the questions, is the cause of most of the respondents who experience errors in the process skills stage which is the result of research from Jackson (2018). In addition, Winarsih, et al (2015) in their research results emphasize that elementary school students' errors in solving statistical problems are in the form of errors in writing incorrect data, incorrect procedures, missing data, missing conclusions, indirect manipulation and hierarchical problems skills.

Based on the results of online observations conducted on elementary school teachers in Karawang Regency, the researchers got some information. From the information given by the teacher, for mathematics subject matter conducted online, students are instructed to watch the discussion of material from YouTube where the link is given by the teacher. At the end of the video, there are questions that students have to do about the material. Assignments that have been completed, are photographed, and sent via WhatsApp to the teacher. In addition, there are also teachers who give assignments through LKS every day, and the results of the work are collected collectively on weekends. From the explanations of the teachers, they emphasized that because online learning and assessment were only carried out through results assessments, the teachers could not be sure whether the students had mastered the material well, or whether the assignment was really done by the students or by someone else. However, according to the teachers, there are still many students who complain in working on the questions given because they do not understand the questions well so they often make mistakes in solving them. And the mistakes made by these students vary according to the abilities and characteristics of each student.

From the results of previous research conducted by Seto (2012) and Bunga and Daniel (2012) regarding the number of students who made mistakes in solving statistical problems and the results of initial observations made by researchers where there were errors in solving mathematical problems by students needed attention. . There is no exception for basic statistical material where if the initial statistical concepts studied often have errors in their completion, the application of the next concept will also encounter errors. This is because the basic knowledge of statistics possessed by students will be useful in understanding and mastering statistical concepts at the next level of education. It is important for teachers to know how the pattern of errors that are often made by students and what factors cause

students to make mistakes in solving math problems. In this way, it is hoped that the teacher can help students in correcting the mistakes made. Therefore, researchers are interested in analyzing the mistakes of elementary school students in solving statistics problems in online learning during the pandemic. The purpose of this study was to describe the errors made by students and the factors causing them in solving statistical problems.

METHOD

This study is a qualitative descriptive study that focuses on analyzing the errors of sixth grade public elementary school students in statistical material. Research subjects were taken by purposive sampling which were selected based on considerations including that students who were selected as subjects had received statistical material, research subjects were easy to interview, research subjects were able to communicate well making it easier for researchers to obtain in-depth information in interviews, research subjects get permission and recommendation from the class teacher. There were 4 students as research subjects who were included in several ability categories, 2 students in the high ability category, 1 student in the medium ability category, and 1 student in the low ability category. The steps taken in this research are compiling research instruments, carrying out description tests for statistical material, analyzing errors made by students, conducting interviews with research subjects, processing, describing, and analyzing errors made by students from the results of the tests given with reinforced interviews and conclusions. The validation test of the analysis results was carried out by triangulation. In this study, researchers used triangulation techniques, namely by examining data from the same source with different techniques and then reviewing and analyzing research data and each data collection technique for further study and comparison. Researchers tested the validity of the data using tests, interviews and documentation to obtain data on student errors in solving statistical problems.

RESULTS AND DISCUSSION

Based on the results of students' work in working on the given statistical problems, several errors were found by students. Student test results are as follows.

1. Low Ability Students (KRN)

Based on the analysis of KRN's test result answer sheet, it appears that KRN was only able to fill in 1 question, and even then, not all of them were completely answered. Of the 11 questions given, KRN was only able to answer 1 correct question, namely question number 1b which asked about the modus. The rest, KRN only writes down the numbers listed in the question without taking steps to fill in the answer and also doesn't write down any answers in the question.

2. Medium Ability Students (RST)

Of the 11 questions given, RST was able to solve 6 questions correctly, namely questions number 1a, 1b, 2a, 2b, 2d and 5. 1 other question was not done at all, 3 questions were done but the result was wrong, and 1 more question was done with the answer leads to the correct answer, but has not been completed.

3. High Ability Students (KYL and SR)

There are 2 students who fall into the category of high ability who were selected in this study. Of the 11 questions given, SR was able to solve 10 questions well and 1 question was answered but incorrectly. Meanwhile, KYL, from 11 questions given, was able to answer 7 questions correctly, 1 question was answered leading to the correct answer, only an incomplete solution, 1 question was not answered at all, and 2 questions were answered but the result was wrong.

Analysis of test results

a. Analysis of Test Results Question Number 1a

Based on the results of the test number 1a, all participants were able to correctly answer this question except students with low abilities. The question in question number 1a is a question about average. Based on the results of interviews that have been carried out, students with modusrate and high abilities claimed to understand what was asked about the question then they answered the question and when checked the answer was correct. While students with low abilities when asked why the answer was empty or the question was not done, the student smiled and claimed to understand the meaning of the question but he forgot how to find the average.

b. Analysis of Test Results Question Number 1b

In test number 1b, the question asked is about the modus. All students are able to answer properly and correctly what is asked in the question. Low-ability students (KRN) in their answers write down the numbers that are known in the problem, then sort them from the lowest data to the highest and then the student writes the sentence "the modus is 64 salak". Meanwhile, students with modusrate ability (RST) wrote down all the names of fruits and their number, when the last time they wrote the sentence "Modus = Salak". For high ability students (SR) in the answer column write "modus is the value that appears frequently. Modus = 64 pieces of salak". Meanwhile, other high-ability students (KYL) answered by sorting from the lowest datum to the highest datum then given a "=" sign and ending with the number 64 (the answers were written: 29, 32, 40, 45, 60, 64 = 64).

Based on the results of interviews conducted with the four students, all four said they understood what the question meant and knew what the definition of the modus was. If it is analyzed what was asked with what the research subjects answered and the results of the interviews, only modusrately capable subjects (RST) correctly answered the question in question number 1b. In question 1b, what is being asked is the modus of fruit, meaning that the desired answer is in the form of modus in the form of the type of fruit and the only answer according to the question is RST. However, in the conclusion for question number 1b, all subjects understood the meaning of the question, but were not careful in reading the questions properly.

c. Analysis of Test Results Question Number 1c

The question in question number 1c is still related to the answer to question no. 1a. If question number 1a is asked what the average value is, then question number 1c is asking which types of fruit are below the average value. Because it is related, if students are able to answer question number 1a, question number 1c should also be answered. The two high-ability students were able to answer the question well, while the modus rate and low-ability students did not answer the question by leaving the answer sheet blank. when the interview was conducted, students who were able to say that the question escaped their view. That is, this student skipped the question not because he couldn't do it, but because of his carelessness because he was in a hurry to move on to the next question.

d. Analysis of Test Results Question Number 2a

In question number 2, the command is to create a frequency distribution table. Students with high abilities (SR and KYL) and students with modusrate abilities (RST) were able to answer questions properly and correctly. When interviewed, the three research subjects claimed to understand what was instructed in the question, understand what a frequency distribution table is and understand the steps in making the table. while the low-ability students (KRN) vacated their answers and when interviewed admitted they could not answer them.

e. Analysis of Test Results Question Number 2b

The question that arises in question number 2b is about the modus. All participants were able to correctly answer the question. There is a slight difference in the method used by the research subjects in answering question number 2b. Low-ability students write down all the datums, but they are not sorted and even a frequency distribution table is not made. Then in the row of datums KRN circled the same numbers that appear most often. Meanwhile, the two highly capable students (SR and KYL) immediately wrote an answer without writing down the steps for doing it. And the correct answer is the result. When interviewed separately, both of them answered that they understood the meaning of modus very well, so they immediately looked for the values that often appeared without writing down the numbers first. This is assumed to be related to their cognitive abilities which are classified as high so that they are able to answer questions quickly and precisely. It is different with low ability students (RST). The subject in the answer step in the beginning sorts the values from the smallest to the largest first. Then in the next line the subject writes down each value with how many frequencies. Finally, RST concludes by writing "modus = 8".

f. Analysis of Test Results Question Number 2c

The question asked in question number 2c is about the average. Only 1 student who did not answer the question, namely KRN. Students with modusrate ability (RST) answered the question but the answer given was wrong. RST wrote down the numbers that were not in the question and then divided them by 5. When interviewed about the answer, RST admitted that he had written because he was in a hurry after seeing the test time running out. RST wrote the answer with the reason "that it is important to fill in" only. It's different with 2 high-ability students. SR clearly and systematically answered questions well and the answers given were correct. Meanwhile, KYL wrote a good answer but didn't finish what the final result was. Based on the results of interviews conducted with KYL students, it was obtained information that KYL had difficulty in the final settlement process because KYL had difficulty doing division problems.

g. Analysis of Test Results Question Number 2d

Questions in question number 2d about the median. All students answered the question. Students who are highly capable both perform the same steps, namely sorting the datum from the lowest to the highest. Then round the 2 numbers in the middle of the sequence. Then finally write down the answer "median = 8". KYL and also SR when interviewed about the reason why they rounded 2 numbers in the middle, explained that they sorted the datum and then they counted the data from the far left and the far right. Then move forward one by one. When in the middle of the data sequence, both hands point to a number that is in a different position but is in the middle. From the two numbers in the middle, they add up the numbers and divide by 2. Especially for low-ability students, they answer by writing down all the known datums but not in order. After that, it gave a circle to one of the numbers and got the result 9. When an interview was conducted why rounded the number, KRN replied that according to him the median was the middle value. KRN writes down all the datums that are not sorted first and then calculates which datum is in the middle position. In the end KRN found the most middle position and rounded the number indicating that it was the requested median value.

h. Analysis of Test Results Question Number 3

In question number 3, a bar chart is presented of 27 students' science test scores. In this matter, the question asked is the average value of the IPA test results. All students answered the question but only 1 student was able to complete it well and gave the correct answer. KRN writes the answer by adding up some numbers and then dividing by 6. And doesn't solve the final result. When interviewed for the reason for the answer, KRN said that he could not read bar charts. As for the values that are added up, according to him, the values

are presented on the left-hand line (the line that is in the direction of the y-axis, and represents the frequency). The vertical line is written with the numbers 0, 2, 4, 6, 8, and 10. Then KRN adds up the numbers and divides by the number 6. According to him, the number 6 is obtained from the number of numbers earlier. And the end result is not resolved. It is different with RST which is classified as a medium-ability student, in which the answers are written all the datums are sorted from the lowest to the highest, but there is no follow-up answer. KYL, who is a student with high ability, answers the questions by adding up each value multiplied by the frequency and then dividing by the number of frequencies. However, the error made by KYL was not being thorough because it missed 1 value in the calculation so that the results obtained were not in accordance with the correct answer. For SR who are other high-ability students, write down answers that are in accordance with the steps they should take and do the division well so that they get the final results as expected.

i. Analysis of Test Results Question Number 4

In question number 4, a story question is presented that contains sales data from Monday to Sunday and the question in this question is about the average sales from Monday to Sunday. Of the four students, only 1 student was able to correctly answer the question. KRN did not answer the question on the grounds that it could not. RST and also KYL answered by adding up the datum and dividing by 7. When interviewed why divide by 7, from the interview both answered because from Monday to Sunday there are 7 days. However, the two of them did not finish the answer to completion. When interviewed, RST answered because the answer to the question required 7 divisions, while he still didn't memorize all the multiplications, so in the end the question was not solved. It's different with KYL, when interviewed why the question was not solved, KYL replied that he didn't have time to calculate the division because the test time was tight while there were 2 more questions he had to do.

j. Analysis of Test Results Question Number 5

A line chart is presented in question number 5 which contains the amount of salary and the number of employees who get the salary. In this question, the question asked is about the modus on the line chart on the question at what salary. The four participants when asked about the line chart, all answered they understood and could read what was presented in the line chart. And this is proven by the answers to these questions by the four research subjects.

k. Analysis of Test Results Question Number 6

In question number 6 a bar chart is presented. All students cannot solve this problem. In fact, the questions presented are not much different from the previous questions which display bar charts. Low-ability students did not fill out the question, while the other three students all made mistakes in the frequency divisor. When interviewed one by one, the three students lead to the same answer, namely their mistake in thinking that the divisor is all days from Monday to Sunday. Even though what is shown in the picture is only the 1st day to the fourth day. So that everyone divides it by division

The results of the analysis of the results of the statistical tests given, can be shown that the errors made by students in answering statistical test questions consist of several kinds of errors. The first error is due to poor understanding of the material. Based on the results of interviews conducted with low-ability students (KRN), information was obtained that KRN actually likes mathematics. However, because of the online learning system that is currently being implemented, KRN feels that the material about statistics which is only explained by the teacher not via youtube makes him not understand the material well. In the end, as a result of the poor understanding of the material, KRN easily forgot about the material presented. The next error is an error in writing the flow or systematic answer. From the results of the data analysis that has been done, it can be shown that basically the research

subjects understand what the questions in the questions are. However, due to the lack of accuracy, the questions in the questions are not well understood. In addition, the systematics or the flow of answers from the participants are sometimes not ordered correctly and systematically. KYL, who is a high-ability student, seems to often make many mistakes by going through several lines of answers that should be done so that in the end because of his carelessness, KYL often gives inaccurate answers. Like for example in question number 1b, only RST answered exactly what was asked in the question. When interviewed, participants other than RST admitted that they read the questions unsteadily or in a hurry. The three of them read the questions at a glance, which was basically just so that the core questions or the intent of the questions were not caught. So in the end write the wrong answer. In addition, sometimes the participants work on the answers quickly but not carefully. So that in the end, lack of accuracy in answering questions resulted in inaccurate final results. The next error is about the mistakes made as a result of not mastering multiplication. After further investigation through interviews, KRN admitted that he had not memorized multiplication. Meanwhile, KYL, who is one of the students in the high ability category, admits that he often forgets or confuses multiplication of 7, 8, and 9. So in question number 2 which requires calculation through division, KYL is unable to complete the answer properly. The next error is regarding errors in operating calculations. Many of the participants made this type of error, but the students who made the most mistakes in their calculation operations were students who were in the low category. Students with low abilities admitted that they did not know how to calculate the concept, how to operate it. And of the four participants in this study, they were not used to drawing conclusions at the end of an answer, so that all of the participants did not conclude answers to the questions asked.

CONCLUSION

Based on the results of the research that has been done, it can be concluded that some students make mistakes due to poor understanding of the material, errors in writing flow or systematic answers, errors in process skills, basic multiplication abilities that are still low, the fourth error reading graphs Factors causing student errors are lack of interest in learning due to online learning that is currently being applied only to providing material and assignments from the teacher and the absence of an explanation of the material from the teacher even though online, students' inaccuracy, lack of mastery of multiplication which should have been mastered from the basics of multiplication. 4th grade level, do not understand the concept of the material, do not understand in operating calculations, and students' unfamiliarity in writing conclusions

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Analisis Kesalahan Siswa Sekolah Dasar dalam Menyelesaikan Soal Statistika dalam Pembelajaran Daring di Masa Pandemi

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Abstrak

Penelitian ini bertujuan untuk mendeskripsikan kesalahan yang dilakukan siswa dan faktor penyebabnya dalam menyelesaikan soal-soal statistika. Penelitian ini menggunakan metode deskriptif kualitatif. Partisipan dalam penelitian ini diambil dengan *purposive sampling* dan didapatkan 4 orang siswa terpilih. Pengumpulan data pada penelitian ini menggunakan tes dan wawancara. Berdasarkan hasil penelitian yang telah dilakukan dapat disimpulkan bahwa beberapa siswa melakukan kesalahan dikarenakan pemahaman materi yang tidak baik, kesalahan menulis alur atau sistematika jawaban, kesalahan keterampilan proses, kemampuan dasar perkalian yang masih rendah, dan kesalahan dalam membaca grafik. Faktor penyebab kesalahan siswa yaitu minat belajar yang kurang dikarenakan pembelajaran daring yang saat ini diterapkan hanya sekedar pemberian materi dan tugas dari guru saja serta tidak adanya pembedaan penjelasan materi dari guru meskipun secara daring, ketidaktelitian siswa, kurangnya penguasaan perkalian yang seharusnya dasar perkalian sudah dikuasai dari tingkat kelas 4, tidak pahamnya konsep materi, tidak paham dalam mengoperasikan perhitungan, dan ketidakbiasaan siswa dalam menuliskan kesimpulan.

Keywords: Kesalahan matematis, pembelajaran matematika, statistika

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