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Exploring Students' Interpretation Skills on Data of Covid-19 Infographic Relating to Statistic

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ABSTRACT

This study aimed to determine the ability to interpret the Covid-19 infographic data relating to statistics. This research was a descriptive study with a qualitative approach and using online system. The data collection techniques are carried out through test of the ability of interpreting the Covid-19 infographic data and interview. The subjects of this study were students of grade VII, Junior High School 1 Palembang which consisted of 4 students with various ability. The most common indicators are reading simple graph, reading a trend in graph and extracting qualitative information from quantitative information. The least likely indicator is reading key features from graphs and comparing information from two graphs.

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A. INTRODUCTION

NCTM (2000) includes the content of "Data Analysis and Probability" in one of the content standards namely Number and Number Operation, Algebra, Geometry, Data, and Probability. In line with that, the importance of statistical content is also evaluated internationally in PISA related to uncertainty and data in the last two decades (OECD, 2012, 2015, 2019a) . Statistics have broad uses in the right decision making in daily life, making statistics important (Rohana & Ningsih, 2019). This is because statistics can be seen as a tool that can solve problems that occur in everyday life, in the workplace, and in science (Yusuf, 2017). In the 2013 curriculum, one of the learning topics that students must master is statistics in this case students are asked to interpret a variety of data in the form of graphs.

Interpretation (Amin et al., 2020) is a way to convert information to other forms such as graphic or image forms, sentences to numbers, sentences to sentences, and more. Graph interpretation ability is one of the important competencies mastered by students.

(Boote & Boote, 2017; Susac et al., 2018) stated that reading and interpreting information from graphs is an important skill in science and mathematics, literacy and social scientific literacy. Not only that, but this interpreting ability is used also in everyday life related to various

information in the charts that can be accessed on newspapers, TV, and the internet (ÇİL & Kar, 2015).

Student have difficulty understanding statistics (Chan & Ismail, 2012; Rohana & Ningsih, 2019). In line with this, the most difficulty faced by students was interpreting data in statistics (Whitaker, Foti & Jacobbe, 2015). Based on (Rosidah, 2016), students have not been able to interpret statistical values in a good context, resulting in the low international ability of students at the world level. Pisa results in 2018 (OECD, 2019b) Indonesia is ranked 74th out of 79 participating countries which means the ability of Indonesian students aged 15 years in mathematics is still weak with a score of 379 still below the OECD average score of 489.

Referring to the low PISA results that were restored at the end of December 2019, the Minister of Education and Culture of December issued a new breakthrough known as the free learning program. One of the breakthroughs is to abolish the annual National Examination replaced it with MCA (Minimum Competency Assessment) (MENDIKBUD, 2019). AKM refers to the PISA framework with a focus on literacy, numeration, and character survey (MOEC 2020a, 2020b). According to (Maulidina, 2019) numeration is the ability to understand and use mathematics in various contexts to solve problems in everyday life. (Nasrullah et al., 2017)one indicator of numeration capability is the ability to interpret data.

Infographic is a combination of information and graphic (Tsai et al., 2020) . (Arigia et al., 2016; Elena Gallagher et al., 2017) mention infographics are a new way of presenting this modern, fairly effective information. In line with (Naparin & Binti Saad, 2017; Apriyanti et al., 2020) infographic is data visualizations that present information quickly and clearly which includeds signs, photos, graphics, maps and charts. Further infographics change text data to be easy to understand through various interesting data visualization techniques. (Siricharoen, 2013) mentioned that one of the categories of usability-based infographics is statistically based. In line with that, various infographic data related to the development of Covid-19 cases continue to be displayed by the Covid-19 Task Force Acceleration Team related to confirmed cases of positive, death, and recovery every day. The data can be used as an example of an interesting context as a starting point for students in the school (Nusantara et al., 2020a, 2020b).

Given the importance of interpreting data and low student achievement in PISA, it is necessary to conduct in-depth research on the ability to interpret student data with statistical topics using the context of Covid-19. Based on the above, this study aims to explore students' interpretation skills of Covid-19 infographic data relating to statistic.

B. METHODS

This research was a descriptive study with a qualitative approach to describe students' interpretation data skills. The subjects of this study were 4 students of Junior High School 1 Palembang grade 7. Data collection techniques consisted of tests and interviews. The test was conducted to determine the students' interpretation ability. During collecting data was supported by using online systems such as zoom meeting, google classroom and whatsapp. Following (Aoyama & Stephens, 2003) identify indicators of data interpretation from Kimura (1999):

Table 1. Indicator of Interpreting Skills

No	Indicator
1	Basic reading of tables and graphs.
2	Reading key features from graphs and comparing information from two graphs.
3	Reading a trend in graphs.
4	Extracting qualitative information from quantitative information.

The interview used is a semi-structured interview that aims to determine students' understanding of interpretation skills. Data analysis techniques according to Sugiyono (2017) consist of data reduction, display data, and data verification. This study uses Covid-19 infographic during lessons and tests. The following is a Covid-19 infographic in South Sumatra used in this study.

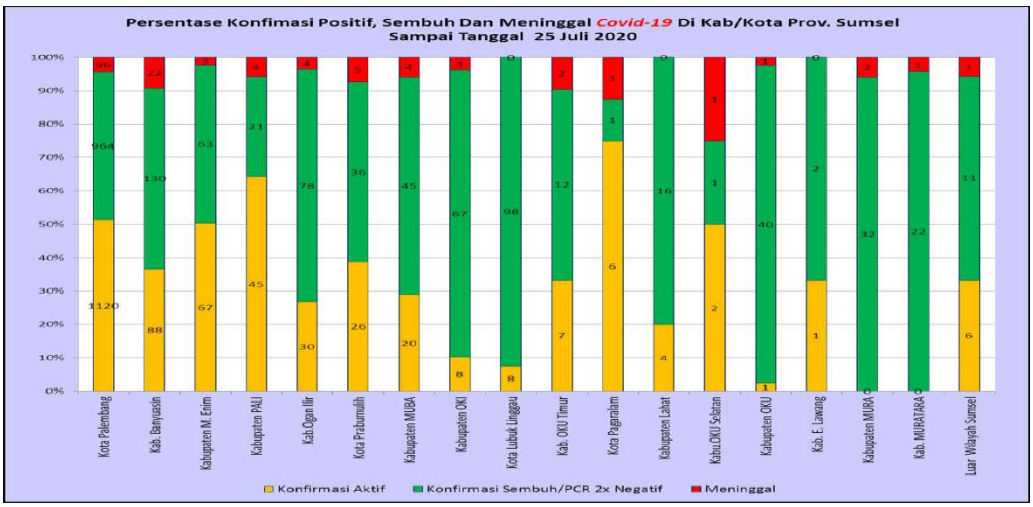


Figure 1. Infographic of Covid-19 in South Sumatera

C. RESULT AND DISCUSSION

There are 4 questions with 4 indicators of data interpretation ability. This infographic presents information about the Covid-19 case in South Sumatra province. RF is high ability student, MF is middle ability student and FK is low ability student.

In question number 1 with the indicator reading a simple graph, RF chose the right option C. 50 percent.

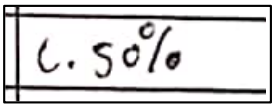


Figure 2. Answer of Indicator 1

RF : Judging from the numbers the same color miss and then divide it
R : which number?
RF : The numbers in South OKU miss, the numbers in the diagram is two miss

Based on the interview transcript above, something is interesting about how RF found information on the infographic, RF did not see information on the y-axis, namely information on the percentage of cases but RF made calculations. The explanation of calculation RF is below:

R : *This 1? hmm or see this one? Which one?*
Indicates the (percentage) y-axis.
RF : *Oh no, I don't see the percent, just look at the number and then divided, 2 plus 1 plus 2 divided by 2. Ok. Just found out that this (percent)*
R: *2 divided by 4?*
RF: *4 divided by 2*

RF counts all cases in South Oku bar chart and then divided by 2. Seeing from the explanation RF shows that RF can read a simple graph.

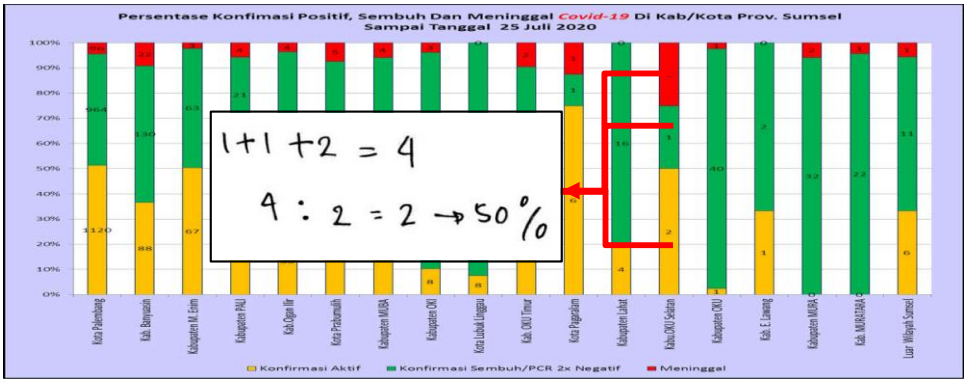


Figure 3. The Explanation of RF' Answer

FK also answers this question correctly. The transcript of the interview between the researcher and FK is below:

R : Your *answer is C*
RF : *fifty percent miss see from this whose percent line is the same as the diagram.*

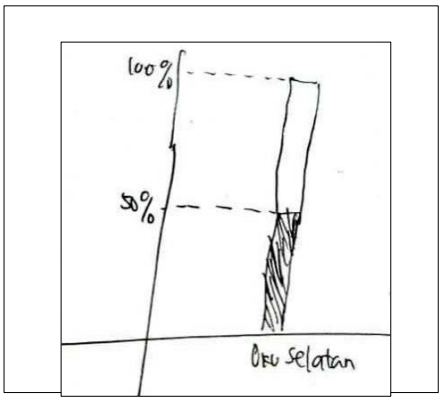
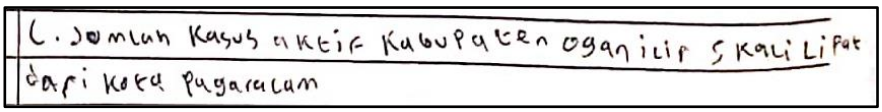


Figure 4. FK' Answer

In the interview transcript above, it can be seen that FK read the information on the bar chart of the South OKU according to what was asked for further questions FK read the diagram and found the percentage on the y-axis.

In question number 2 with the second indicator, reading key features from graphs and comparing information from two graphs. The following is the RF answer to this question.



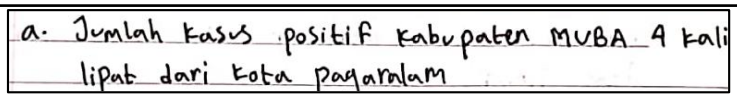
Translation:
The number of active cases in the district of Ogan Ilir is 5 times than Pagaralam city.

Figure 5. RF' Answer

The transcripts of interviews between researchers and RF is below:

R : *How did you answer C ?*
RF: *From thirty divided by six is five times.*

In the interview transcript above, it can be seen that RF can compare two of the information from two different bar charts. In solving this problem RF compared the number of active cases in Ogan Ilir and the city of Pagaralam. In others hand, there is the MF's answer. The answer is incorrect.



Translation:
The number of active cases in the district of MUBA is 4 times than Pagaralam city.

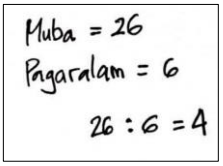
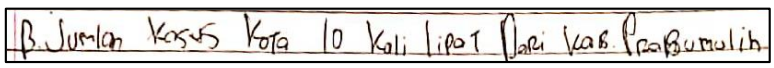


Figure 6. MF' Answer

Below is a transcript of the conversation between the researcher and MF:

MF: *the yellow one is miss, if I am compared to miss,*
R : *twenty-six divided by six get four, is it true?*
MF: *Yes miss*
R : *twenty-six divided by six get four, is it true?*
MF: *No miss*

From the above conversation, it was seen at the end of the interview that MF realized that the comparison was not quite right. This is due to incorrect calculations. It can be concluded that MF has not met the second indicator. FK also chose wrong option. The FK's answer is below:



The number of deaths cases in Palembang City is 10 times than Prabumulih City.

Figure 7. FK' Answer

The conversation between researchers and FK below:

R : How did you answer B?
FK : Seeing that Prabumulih's recovery cases were more than ten times, if the city of Palembang his recovery was nine six hundred and sixty-four if Prabumulih thirty-six.

Based on the transcript above, FK can compare information from two different bar charts but does not use calculations. FK makes exactly one comparison between two data charts by finding 2 key information from the data graph, but the results are also inaccurate, let alone not using calculations so that FK does not meet the second indicator.

In question number 3 with the third indicator, reading a trend on the graph .The MF' answer graph is correct.

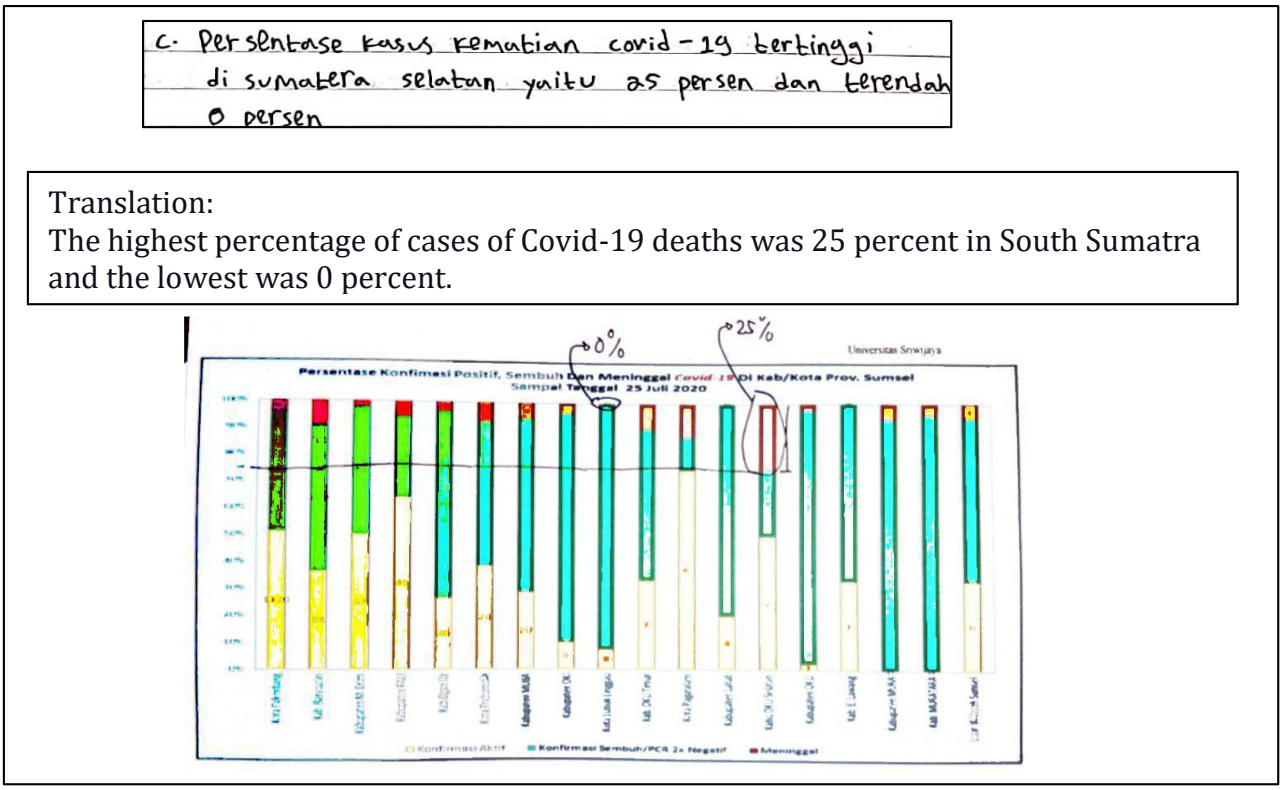
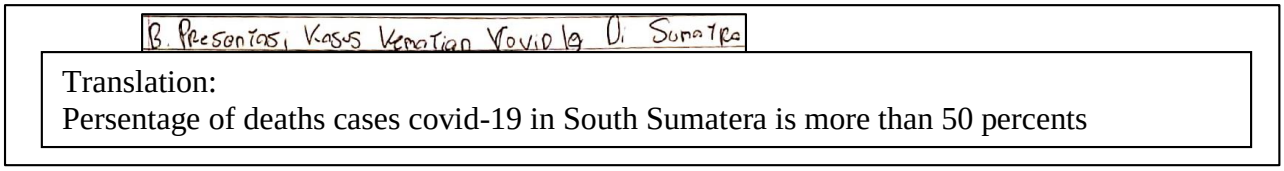


Figure 8. MF's Answer

Below is a transcript of the interview between the researcher and MF:

MF : *The highest percentage of Covid-19 deaths in South Sumatra is twenty-five percent miss, for example, Oku Selatan district is approximately twenty-five percent miss but if the lowest is zero percent as in Lubuklinggau district.*

FK's answer is incorrect, FK chose option C. Further explanation regarding S4's answer is described through the interview stage.



Below is a snippet of interviews between researchers and FK :

FK : because the percentage is the same, the diagram is more than the yellow one, which is fifty percent above fifty percent.
R : Which diagram is fifty percent ?
FK : Not above fifty percent, the yellow bar chart

Figure 9. FK's Answer

In the interview transcript above, FK's answer has not explained the reason for the percentage of the graph as 50%, but after digging deeper through interviews it turns out that S4 misread the meaning of the diagram.

In question number 4 with the fourth indicator, which is extracting qualitative information from quantitative information. RF describes the answer but it is incomplete, but through the interview stage, RF can explain the answer completely

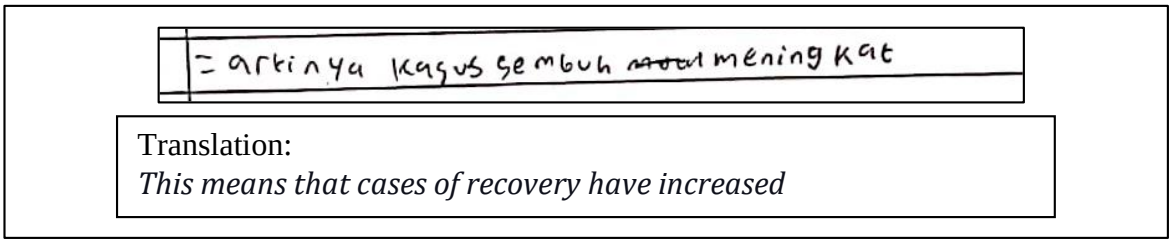


Figure 10. RF's Answer

The transcripts of the interviews for researchers and RF are as follows:

RF : *If the green bar chart are increasing, it means that the stems will enlarge, repeat if the green stems rise, the green stems mean that confirmation of recovery / PCR is negative 2 times, it means that it is up and if the opposite means that the case is confirmation Healed decreased or decreased slightly and PCR was 2 times less.*

In the transcript of the interview above, RF explains in full the answer to this question. RF can conclude from the information represented on the green bar chart. This shows that RF founds the indicators of extracting qualitative information from quantitative information.
The transcript of the interview between the researcher and MF as follows:

MF : if the green bar chart means that miss confirmation is cured, if it rises, it means that the area with the green zone has experienced an increase in Covid- 19 cases who recovered
R : otherwise?
MF : if the opposite means that areas with a green zone have experienced a decrease in recovered Covid-19 cases.

The transkript of the interview above, it shows that MF can extract qualitative information from quantitative information on the green bar chart which represents cases of recovery in the South Sumatra area, meaning MF fulfills this indicator where MF can conclude from the data on the green data graph.

FK's answer is correct, but something is interesting from FK's answer where FK concludes that cases recovered increased by more than 80%,

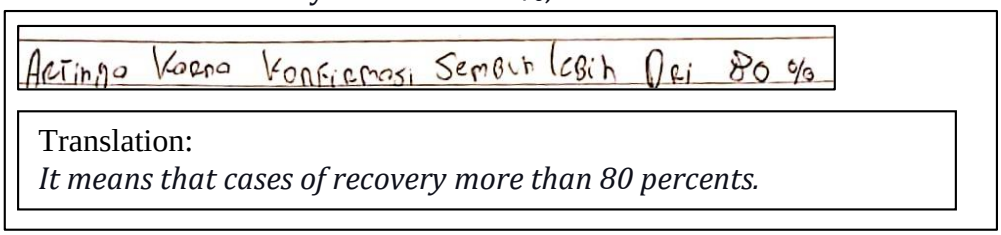


Figure 11. FK's Answer

The interview excerpts between researchers and S4 are as follows:

R : why is it more than 80 percent?

FK : because of this, there is Palembang 80 percent with Banyuasin also more than 80 percent then Muara Enim district is also the same as Palu, Ogan Ilir and Muba Oki districts, Lubuklinggau, East Oku, Pagaralam City, Lahat Oku Selatan Regency, and Oku Regency what is that district Lawang continues, Mura district, Muratara regency, and outside the South Sumatra region

Based on the interview above S4 in answering this question, S4 considers that the percentage of cured cases is calculated from the end line of the green bar chart but on the infographic, the information at the starting point is active cases of Covid-19 percent so that the percentage of cases cured starts at 0%.

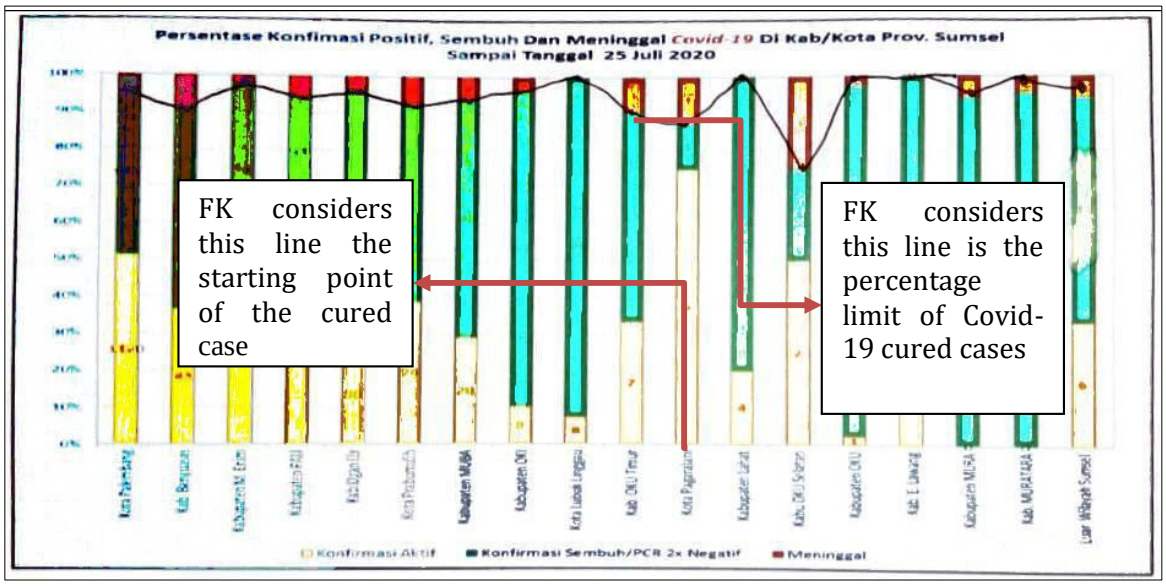


Figure 12. The Explanation of FK' Answer

So that FK has not met the threading indicator *trend* on the chart where FK has not been able to see changes in the data on the chart properly.

Indicator 1 is categorized as an easy indicator or question. This is in line with (Aoyama & Stephens, 2003) who stated that this indicator cannot be expected to be high because since elementary school this material has been taught. Researchers also found students' interesting ways of finding information on infographics where the student used calculations so that he did not immediately see the information contained on the vertical axis contained in the diagram.

This shows that students involve communication skills in solving problems (Yansen et al., 2019). However, on this indicator there are still students who are not precise in answering the questions, this is because the questions are less clear when viewed from the phone considering the learning that is carried out online.

The second indicator is reading key information from the graph and comparing information from the two graphs where students with dominant high abilities answer correctly. Curcio (1987) states that students have entered the indicator reading between the data. Students can see the relationship between different data in the graph. At the time of the interview, it turned out that the students were inaccurate when comparing the data so that the comparison was wrong. In contrast to low category students who did not make a comparison of the two data but immediately concluded without calculating.

In the third indicator, which is reading the *trend* on the chart, it can be seen that most students only compare one diagram and the basic error is the simple reading of the chart where students misread the labels or information contained in the diagram. In line with (Friel et al., 2001) in (Aoyama & Stephens, 2003) students do not understand the initial material where the initial material is reading simple graphics, namely reading the information contained on the x-axis and y-axis in the diagram.

In the fourth indicator, it extracts qualitative information from quantitative information. This indicator appears in all categories of students. The results found that students also use their argument skills when working on problems with these indicators. Besides, students think that the context of Covid-19 helps them better understand the material in statistical learning.

The majority of 7th grade students mentioned that this was the first time to know what an infographic was. This is line with the use of infographics is a new tool in the learning process, especially in the cognitive sphere (Damyanov & Tsankov, 2018) .This is in line with (Hartini et al., 2015) the use of context in mathematics learning is seen as a daily activity can solve life problems experienced by students. This research is also relevant with (Zulkardi et al., 2020) which used Covid-19 as context.

D. CONCLUSION AND SUGGESTIONS

Based on the results of the above research, indicators of student data interpretation ability by using covid-19 infographics as context, especially on reading a simple graph, reading a trend in the graph, and extracting qualitative information from quantitative information are good categorize and reading key features from graphs and comparing information from two graphs indicator is not good categorize yet. Infographic of Covid-19 as the context can be used as an example of an interesting context as a starting point for students in the school.

The suggest proposed by researchers is to familiarize students with contextual questions that require data interpretation skills and can conduct broader research on indicators of data interpretation ability and questions made by the material and indicators of data interpretation ability.

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