ANALYSIS OF STUDENT ERRORS IN COMBINATION AND PERMUTATION MATERIALS WITH THE LEARNING SYSTEM IN PANDEMIC

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ABSTRACT

Online learning is considered to make it difficult for students to understand certain subjects, especially mathematics which is considered quite difficult by most students. Therefore, due to the many problems and concerns over learning outcomes during this pandemic period. We are interested in examining the mistakes of student learning outcomes, especially the material that has been taught during the pandemic. The errors that have been analyzed can be used as material for evaluating learning, especially during this pandemic. The methodology used is descriptive qualitative research with the aim of describing the errors in the answers of class XII students in the village of Simbang. The test instrument used consisted of ten questions. The data collection technique begins with distributing questions using an online system. Then the answers are also collected by means of an online system. Then the answers are grouped to determine which students will be interviewed. Then from the results of the interview, the answer errors were classified by type and the reporting was presented using the description method. Of the 11 students from Simbang village who had worked on the combination permutation questions, 23.6% of the total questions presented were wrong. These errors include 46.15% concept errors, 30.77% procedural errors, and 23.08% technical errors.

Keywords: Errors, Pandemics, Permutations and Combinations

INTRODUCTION

2020 is not an easy year for all of us (Amelia et all, 2020: 29) until now Indonesia is still hit by the Covid-19 pandemic. Covid-19 is an infectious disease caused by the acute respiratory syndrome coronavirus 2 (serever acute recipiratory syndrome coronavirus 2 or SARSCoV -2). Covid-19 is an infectious disease that attacks the respiratory system such as the nose, throat and lungs with common symptoms of fever, cough, flu, and shortness of breath (Dewi, 2020: 56). To fight Covid-19, the government prohibits people from crowding around, applies social distancing and maintains physical distance (physical distancing), wears a mask when leaving the house and always wash their hands (Sadikin & Hamidah, 2020: 215).

The spread of Covid-19 in Indonesia has had a major impact in various fields, especially in the education sector resulting in learning that was originally face-to-face being transferred to online learning. Online learning is learning that is able to bring teachers and students together to carry out virtual learning interactions with the help of the internet (Sadikin & Hamidah, 2020: 216). Online learning gives students the flexibility to study time, can study anytime and anywhere. The media used are WhatsApp Group, Google Classroom, Zoom, YouTube and E-Learning. The material is given in the form of powerpoints, concept maps or mind maps, short videos, and reading materials (Mustakim, 2020: 3). This is in accordance with Circular Number 4 of 2020 issued by the Minister of

Education and Culture of the Republic of Indonesia on March 24, 2020 concerning Implementation of Education Policies in an Emergency for the Spread of Coronavirus Disease (Covid-19) as an effort to save students and break the chain of Covid spread. -19 (Argaheni, 2020: 100).

Apart from this, many students complain about the online learning system, the main problem lies in the change in the learning environment from offline to online so that things are needed that attract students' online learning interest through creating a positive learning environment, building learning communities, providing feedback consistent, and using the right technology to deliver the right content (Aji, 2020: 5). Online learning is considered to make it difficult for students to understand certain subjects, especially mathematics which is considered quite difficult by most students because it is seen as a subject that has a high level of difficulty and is quite boring. This can affect and cause students to experience difficulties in understanding mathematical concepts and theorems (Kolins et al, 2020: 86).

Not only students who find it difficult, teachers also complain that the learning system during the Covid pandemic is very chaotic, bad and confusing. Online learning is not yet suitable to be applied, especially in low-class classes. This is because the teacher is not free to monitor the overall development of the child. Controlling children from a distance is quite difficult to do, especially for elementary school children. Coupled with the existence of children who are rarely guided by their parents and also a lack of understanding by parents about children's development, the learning process is mostly not carried out optimally (Anggianita, 2020: 180). Not much different, the homeroom teacher admitted that online learning was not good and was detrimental. The examples of losses here are, for example, material losses such as buying more quotas than usual. The quota must always be filled if the quota is empty then it will have an impact on learning, for example behind materials, assignments and so on. whereas currently the economy is very difficult. Not all economic parents of students who are in the middle and upper class are even more from the middle to lower class (Anggianita, 2020: 181).

Therefore, due to the many problems and concerns over learning outcomes during this pandemic period. We are interested in examining the mistakes of student learning outcomes, especially the material that has been taught during the pandemic. The selected material is permutation and combination. The errors that have been analyzed can be used as material for evaluating learning, especially during this pandemic.

RESEARCH METHOD

The methodology used is descriptive qualitative research with the aim of describing the errors in the answers of class XII students in Simbang village, Buaran district, Pekalongan district. There were 11 students who participated in this research activity. Untung (2019: 278-279) states that descriptive research is research to describe the facts accurately and systematically. Then the research results that are examined are an objective picture of the object under study. The test instrument used consisted of ten questions with permutation and combination material that students had learned during the online learning process during the pandemic. The data collection technique begins with distributing questions using an online system. Then the answers are also collected by means of an online system. Then the answers are grouped to determine which students will be interviewed. Then from the results of the interview, the answer errors were classified by type and the reporting was presented using the description method.

FINDINGS AND DISCUSSION

Permutation is a different arrangement or sequence formed by part or all of the objects or elements taken from a group of objects or elements that are available (Tia Purniati, 2009: 12). The number of permutations of k elements taken from the n available elements is equal to n factorial divided by n minus k then factorialized.

$$ {}_nP_k = \frac{n!}{(n-k)!} $$

The permutation arrangement takes into account the order, meaning that AB and BA are calculated differently. Permutations There are 3 types of cyclic permutations first defined "the number of permutations of n objects arranged in a circle is (n - 1)! ". Second, permutation with some of the same elements nPn$_1$, n$_2$, n$_3$ = $\frac{n!}{n1!n2!n3!}$, n$_1$ + n$_2$ + n$_3$ + … < n. The third is cyclic permutation (circles) $_nP_{siklis}$ = (n - 1)! ". Both permutations with some of the same elements nPn1, n2, n3 =, n1 + n2 + n3 +… <n. The three cyclic permutations (circles) nPcyclic = (n - 1)!$\frac{n!}{n1!n2!n3!}$

A combination can be called a grouping of a number of elements, is the arrangement of a group of objects regardless of their arrangement or order. The number of combinations of r objects taken from n available objects is denoted by nCr or C (n, r) or Cn, r

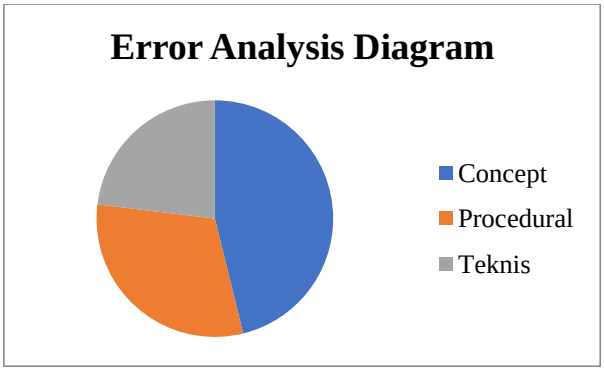
or

$$ C_r^n = \frac{n!}{(n-r)!r!} $$

The material achievement uses permutation rules and combinations in problem solving.

Errors that are usually made by students in working on math problems can be classified into three types, namely concept errors, principle errors and mistakes due to carelessness (Nurianti, 2015: 2).According to Nurjatin et al in Kolins et al (2020: 88) that errors in solving students 'math problems include concept errors in the form of students' mistakes in determining theorems and formulas, procedural errors in the form of irregularities and errors in manipulating formulas, and technical errors in the form of incorrect calculations. So, the error analysis that will be used in the classification of student errors is concept errors, procedural errors and technical errors.

Of the 11 students from Simbang village who had worked on the combination permutation questions, 23.6% of the total questions presented were wrong. These errors include 46.15% concept errors, 30.77% procedural errors, and 23.08% technical errors.



The following is a summary of the errors from the students' answers.

Error	Student Initials
Concept	IZ, BU, ND, MU, NL, AN, QO
Procedure	IN, BU, IY, AN, SI, QO
Technical	IN, BU, AN

1. Concept Error

From question no. 8 which reads "In a room there are 10 people shaking each other, many possible shakes are ..". One of the students with the initials MU answered as shown below:

n = 10 Orang
Csiklis = (n - 1)!
= (10 – 1)!
= 9!
= 9 x 40.320
= 362.880

The students' answers is a misconception because the question should not be included in the cyclical context but is an ordinary combination. Then the researcher conducted an interview with the student with the initials MU.

Researcher : "Why is the way of answering the problem like this?"

YOUR : "I think shaking each other is circular so it uses a cyclic. "

It can be concluded that the students answered incorrectly because they misunderstood the concept of the problem. Apart from this, the other students made mistakes in their answers because they were wrong in dealing with the differences between permutation and combination story questions.

2. Procedural Error

Nurjatin et al in Kolins et al (2020: 88) state that algorithmic errors or procedural errors are errors in formula sequencing or in manipulatively changing algebra. From question no. 5 which reads "In a room consists of 4 chairs. If there are 6 people who will sit on that chair, then there are many ways to occupy that seat are… ". One of the students with the initials BU answered as below,

n = 6

s = 4

$6P4 = \frac{6!}{4!(6-4)!}$

$= \frac{6x5x4x3x2x1}{4x3x2x1\,.\,2x1} = \frac{30}{2}$

= 15 cara

The students' answer included a procedural error due to incorrect manipulation of the permutation properties and formulas. Then the researcher conducted an interview with the student with the initials BU.

Researcher: "Can you understand the meaning of the problem?"

BU : "I did. Using permutations. But I was hesitant about the permutation formula itself so got it got wrong be combination formula. Even though I know it should be a permutation. "

It can be concluded that the students answered incorrectly because they were wrong in manipulating the formula. Apart from this, other students made mistakes in their answers because they ignored the nature of factorials so that they were wrong in manipulating algebra.

3. Technical Problem

From question no. 9 which reads "Out of 3 students (ABC) 2 students will be selected to represent the campus in the robot competition. How many ways can be done to select these students? ". One of the students with the initials AN answered as in the picture below,

$$C\ (3.2)! = \frac{3!}{(3-2)!3!} = \frac{3!}{3} = 0$$

The students' answer is a technical error because the student made the wrong calculation. Then the researcher conducted interviews with the student with the initials AN.

Researcher: "Why can the answer be zero?"

AN : "Because three factorials are divided by three factorials. "

Researcher: "Where did the three factorial divides come from?"

AN: "I wrote it wrong. It should have been two factorials and as a result I also miscalculated. "

It can be concluded that the students answered incorrectly due to incorrect calculations and inaccuracy.

HEADINGS AND SUB HEADINGS FOR CONCEPTUALLY-BASED PAPER

The number of wrong answers in the permutation and combination questions is not a quarter of the total questions given. So that if it can provide an overview of the results of student learning during the

pandemic, especially in combination permutation material.

CONCLUSION

From a total of 11 students of class XII Madrasah Aliyah who came from Simbang Village, Buaran District, Pekalongan District, after being analyzed the most errors were misconceptions. Either it is in the form of not being able to understand the meaning of the problem and or differentiating between permutation and combination story questions. Then sometimes in writing formulas and manipulating factorials there are still mistakes so that procedural errors are found, although not as many as types of conceptual errors. Technical error is the least error among other types of errors. However, it is still necessary to be accurate and double-check the results so that there are no more mistakes in answering the questions.

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