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Students' Thinking Interference of Real Global Type in Solving Permutation and Combination Problems

Sukoriyanto[1], Toto Nusantara[1] , Subanji[1], Tjang Daniel Candra[1]
[1]*Department of Mathematics, FMIPA, State University of Malang (Universitas Negeri Malang), Indonesia*

Abstract: *This research aimed to reveal the interference shape experienced by the students in solving permutation and combination problems. This research was conducted at Department of Mathematics, State University of Malang on semester 3students who took Discrete Mathematics lecture. It consisted of 20 students with details of 12 female students and eight male students. The result showed that 50% of students experienced global interference when they solved permutation problems. The form of thinking interference experienced by students in solving permutation problems was real global .*

Keywords: *Thinking Interference, real global type, permutation and combination.*

I. Introduction

Thinking Interference in solving the problem according to Subanji (2015) occurs when the student has a construction of two or more different concepts in which the two or more concepts are interrelated. According to Stemberg and Sternberg (2012) interference theory refers to view that the error occurs because the number of responses are jumbled, so that one response interferes the other responses. Meanwhile, according to Slavin (2006) interference occurs when two or more information was mixed or information is obstructed by the other information. Therefore, thinking interference is an error that occurs because of the conception that interferes each other, so one concept disturbs or interferes another concept.

According to Polya (1973) problem solving is interpreted as an attempt to find a way out from a difficulty in order to achieve a goal that is not immediately achievable. Meanwhile, according to Saiful, et al.(2011) there are three conditions of a matter considered as a problem: first, if the matter is not yet known how the procedure finishes it (non-routine), second, if the matter is in accordance with the thinking level and prerequisite knowledge of the student, third, when the student has an intention to solve the matter. According to Polya (1973) mathematics problem is a matter that has a challenge in mathematics field that needs a solution for those who face it.

In the scientific field of mathematics, the problems stemming from two or more materials that the presentation in learning are adjacent can be classified into two namely mutually prerequisite mathematical problems and mathematical problems which are not mutually prerequisite. Two problems in mathematics are said mutually prerequisite when in solving the second problem, the understanding of the first problem is needed, or vice versa. While two problems in mathematics are not mutually prerequisite if learning presentation of the two materials is adjacent, but in understanding the first material, the second prerequisite material is not required, and vice versa.

The examples of problem that have mutual prerequisite in mathematics are; the problems in addition and multiplication operations and problems in limit function and derivative function. The material about addition operation is a prerequisite to understand the material of multiplication operation (Musser, et. al., 2011: 87). It is because to understand multiplication, understanding the addition operation first is necessary. Material about the limit function is a prerequisite to understand the material on the derivative function (Purcell & Verberg, 2014, Thomas & Finney, 1998). It is because to be able to understand the derivative function, understanding the limit function is necessary.

The examples of mathematical problems that do not have mutually prerequisites include; turned value comparison and worth comparison, least common denominator and greatest common divisor, corresponding angle and opposite angle, permutation and combination. This research only took the mathematics problems that are not mutually prerequisite associated with permutation and combination.

The material presentation of permutation and combination is not required of each sequence. To understand the permutation material, someone does not need to understand the combination material first, and to understand the combination material, someone is not required to understand the permutation material first (Susanna. 2011).

Global Interference is the exchange of knowledge related to permutation and combination, that is the students look at the permutation matter as the combination problem or combination problem is seen as a permutation problem. The real global interference is global interference if it continued with reflection, the answer is still wrong.

The students of the Department of Mathematics State University of Malang still find difficulties in solving problems related to permutation and combination (Sukoriyanto, et. al, 2016). When the students are given problems related to the combination, there are some of them completed by using the permutation concept (Sukoriyanto, et. al. 2016). According to Slavin (2006) those students experience an interference that is the students solve combination problems using the concept of permutation. Therefore, this research will reveal the interference forms experienced by students when solving permutation and combination problems

II. Research Method

This research was conducted at the Department of Mathematics, State University of Malang on semester 3 students who took Discrete Mathematics. The subjects were 20 students consisting of 12 female students and eight male students. All students volunteered to be the subject of research. Furthermore, the subjects were asked to work on the problems associated with permutation. The students' works were checked and if the permutation problem given was done by using a combination, then those students were chosen as the subject of research. If the students' works were right or the students did not use combination to solve the problem, the students were not chosen as the subject of research. Next, one student was chosen from the group of students who solved permutation problems by using combination to reveal the interference form that he or she experienced.

The permutation problem given to the students is as follows: "In a studying room there are 4 different titles of books namely book A, B, C and D. There are four books for each title. "In how many different ways these books can be arranged in rows on the shelves? "

III. Findings And Discussion

The data obtained based on the students' works in solving problem permutation is shown as in table 1 below.

Table1. Distribution of students' works in solving permutation problem

No.	The kind of students' answers	number of students	Percentage (%)
1	Permutation problem is solved by the student using combination	10	50
2	Permutation problem is solved using permutation, but the student's answer is wrong	4	20
3	Permutation problem is solved using permutation and the student's answer is correct	4	20
4	Student's answer is incorrect and it is not solved by using permutation or combination	2	10

Based on the distribution of students in solving permutation problem, it was gained that only 20% of students were able to solve the problem correctly. 80% of students were incorrect in solving permutation problems. From the 80% of the students who were wrong in solving the permutation problem, there were 50% of students who experienced global interference that was a permutation problem was solved by using a combination. It showed that most students in Department of Mathematics, State University of Malang (Universitas Negeri Malang) still experienced interference when they were given a problem associated with permutation and combination. Next, a student was chosen from the group of students who solved permutation problems by using combination. The selected student was a student with initial S. The result of students' work with the initials S experiencing global interference is shown in figure 1 below;

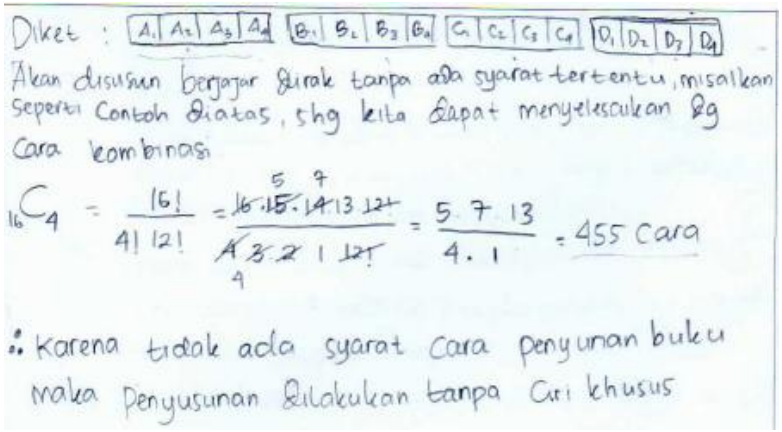

Figure 1. The students' work with the initial S experiencing global interference

Translate to English
Let: A1A2A3A4 B1B2B3B4 C1C2C3C4 D1D2D3D4
Will be arranged in rows on the shelf without any specific requirements, as the example above, so that we can solve it using combination.

$$C_4^{16} = \frac{16!}{4!\,12!} = \frac{16.15.14.13.12!}{4.3.2.1} = \frac{5.7.13}{4.1} = 455$$ ways

Thus, because there is no requirement for books arrangement, the arrangement is done without special characteristic.

Based on the result of the work, the student decided to look at the problem as the problem associated with combination. Here is the result of the interview with the subject.

P*: In your opinion, what is the thing related to the problem which you face?*
S: In my opinion, because the question is "how many ways to arrange the books on the bookshelf, "I think it uses combination.
P*: What is the reason for you to complete the problems using combination?*
S: Since we are looking for the way to arrange books on the bookshelf from 16 different books and to group into four.
P: OK, if you look at the problem as combination problem, why did you use 16 C4 formula when you solved the problem?
S: Yes, as far as I remember it is because there were 16 books, and they were arranged four by four, then I used 16C4.
P*: By using 16C4, which one do you think the thing associated with?*
S: Hem, I'm confused too, Sir. I am confused of the arrangement between being grouped into four, or sixteen books are arranged simultaneously. I therefore decided to use the combination of 16C4 formula.
P*: From what point of view then you think that the problem you did was combination problem?*
S: (the student thinks a little longer) based on my experience, Sir, that is when arranging books on the bookshelf, it is seen as problem combination.
P*: Are you sure with the result of your work?*
S: Actually, I am less sure, Sir.
P*: Do you have any other alternative to solve the problem?*
S: Yes, I do, Sir, may I try again?
P: Yes, please. Do it again.
Description: P is researcher, S is student with the initial S

The result of student's work with initial S after reflection is as in figure 2 below;

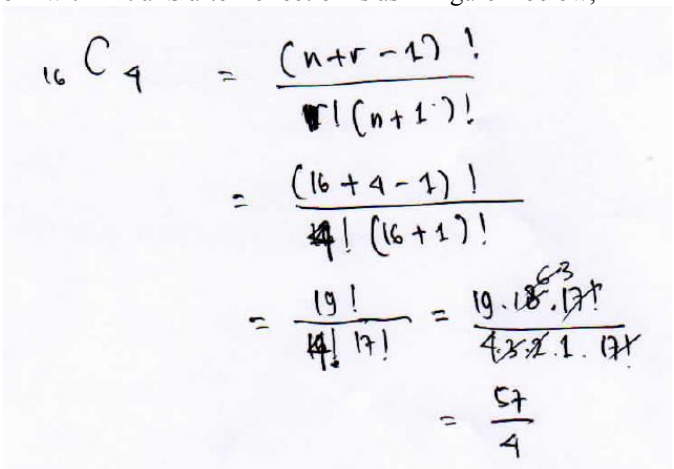

Figure 2 The result of student's work with initial S after reflection

The result of student's work after reflection was that he still looked at the problem as problem combination. It indicated that the student experienced global interference that was permutation problem was solved by using combination. When he was asked to reflect, actually the student still believed that the problem was combination problem. It showed that the interference experienced by students was real global interference.

The form of interference experienced by the student with initial S can be described like Figure 3 below

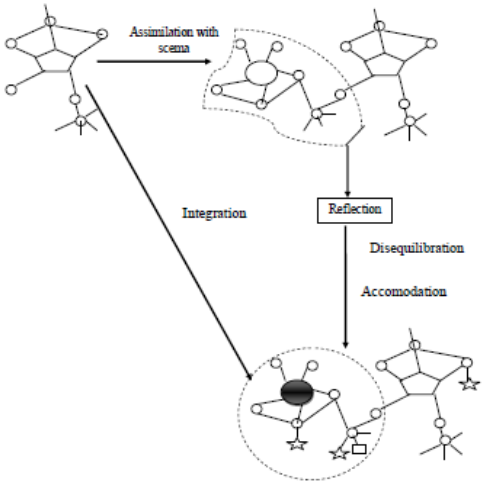

Figure 3. The shape of real global interference that is experienced by the student with initial S

Information

 : Problem related to permutation

 : The student's work by using combination

In real global interference associated with global interference, the student with initial S had already had a scheme related to two problems, namely permutation and combination. However, the scheme used to interpret permutation problem was precisely the scheme for combination problem. After doing reflection, the student had awareness to improve it, but he could not change into the correct answer (based on the structure of the problem).

IV. Conclusion

Student's thinking interference in completing the permutation problem occurs because of the conceptions that interfere each other, namely permutation concept and combination concept, so combination concept interferes permutation concept. A student experiences global interference when he or she solves permutation problem there is an exchange of an understanding related to permutation and combination, namely the student looks at the permutation matter as the combination matter. The Student experiences real global interference when he or she solves permutation problems: if the student experiences global interference, and doing reflection, he or she still obtains an incorrect answer.

References

[1]. Musser, G. L., Burger, W. F. & Peterson, B. E. 2011. Mathematics for Elementary Teacher. A Contemporary Approach. Ninth Edition. USA : John Wiley & Sons, Inc.
[2]. Polya, G. (1973). How To Solve It. New Jersey: Princeton University Press.
[3]. Purcell E. & Verberg, Dale. 2004. Kalkulus dan Geometri Analitik Jilid 2. (Edisi delapan terjemahan). Jakarta: Erlangga.
[4]. Slavin, R. E. 2006. Educational Psychology Theory and Practice. Eighth Edition. USA : Pearson
[5]. Stemberg, R. J & Stemberg, K. 2012. Cognitive Psychology, Sixth Edition. USA : Wadsworth, Cengage Learning
[6]. Subanji. 2015. Teori Kesalahan Konstruksi Konsep dan Pemecahan Masalah Matematika. Malang : Penerbit Universitas Negeri Malang (UM Press)
[7]. Sukoriyanto, Nusantara, T, Subanji & Candra, T.D. 2016. Students' Errors in Solving the Permutation and Combination Problems Based on Problem Solving Steps of Polya. International Education Studies; Vol. 9, No. 2; Pp. 11 – 16
[8]. Sukoriyanto, Nusantara, T, Subanji & Candra, T.D. 2016. Students' thinking process in solving combination problems considered from assimilation and accommodation framework. Educational Research and Reviews; Vol. 11, No. 16; Pp. 1494 – 1499. DOI: 10.5897/ERR2016.2811
[9]. Susanna, S. E.. 2011. Discrete Mathematics With Applications Four Edition. Boston : Brooks/Cole Cengage Learnin
[10]. Syaiful, Kusumah, Y. S, Sabandar, Y & Darhim. 2011. Peningkatan Kemampuan Pemecahan Masalah Matematis Melalui Pendekatan Matematika Realistik. Prosiding Seminar Nasional Penelitian Pendidikan dan Penerapan MIPA. Fakultas MIPA Universitas Negeri Yogyakarta 14 Mei 2011 : 215 – 223
[11]. Thomas, G.B. JR. & Finney. R. L. 1998. Calculus and Analytic Geometry. New York: Addison Wesley Publishing Company