CAN WE JUST ADD LIKE THAT?

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The poster is a presentation of a qualitative study, where the focus is to analyse the mathematical reasoning of a group of teacher education students, and ask if it can be categorised as creative mathematical reasoning. After an introduction the research question is formulated and the methodology indicated. Finally an excerpt from the transcripts of the study is given with a discussion.

Keywords: The Four-C Model · Imitative reasoning · Creative mathematically founded reasoning.

INTRODUCTION

In Sriraman (2009) the problem of defining creativity is discussed, and the conclusion is that creativity can be defined as the ability to produce novel or original work. In Beghetto and Kaufman (2009) the Four-C Model of Creativity is proposed. This model has four categories of creativity. The highest level of creativity is called eminent or Big-C creativity. The creative work done by professionals in some field of study, though not eminent is called Pro-c creativity. The discoveries created by students when learning something have personal novelty. This kind of creativity is called mini-c creativity by Beghetto and Kaufman (2009), and will be applicable for the study. The ordinary creativity of everyday life is called little-c creativity in the Four-C Model of Creativity. Lithner (2008) uses the terms imitative reasoning (IM) and creative mathematically founded reasoning (CMR). The basic idea here is that rote learning reasoning is imitative (IR), while the opposite type of reasoning (CMR) is creative and mathematically founded, meaning that the reasoning has novelty and is plausible and anchored in the mathematics of the given problem.

Research question:

Can teacher education students' mathematical reasoning be creative reasoning, in the sense of creative mathematically founded reasoning (CMR)?

METHODOLOGY

A group of teacher education students were given the following sequence:

0, 4, 10, 18, 28, 40…

They were asked to find an explicit expression for the n'th term a_n of the sequence. I recorded the group working on this problem on video and prepared transcripts based on the recording. The transcripts will be analysed using the theoretical framework of Lithner (2008)

THE STUDY

If we write down the differences between each term and the previous term of the sequence, we get a set of equations which can be added. The result will be the equation: $a_n - a_1 = 2(2 + 3 + 4 + \ldots + n)$. This is what the students did. Here of course the first term a_1 is zero which means that we have an expression for the n'th term a_n in the form of a sum. What remains to find is the sum: $2 + 3 + \ldots + n$. The students were familiar with the triangular numbers, but something is missing. Let us look at the transcripts to see how the students dealt with this problem.

1 Student 3: We are missing 1,

2 Student 2: we are missing 1, yes if we add,

3 Student 1: add 1 to each side,

4 Student 2: we have to add 2 … 2 … 2 times 1 … to both sides, because we have the number two …. Yes, if we try that, add 2 times 1, then you get an plus 2 times 1 equals 2, and then we get 1 plus 2 plus 3 plus 4 plus … plus n.

5 Student 1: yes don't we?

6 Student 2: yes,

7 Student 3: can we just add like that?

The students add 2×1 to both sides of the equation $a_n = 2(2 + 3 + \ldots + n)$ which gives the equation $a_n + 2\times1 = 2(1 + 2 + 3 + \ldots + n)$. Since they are familiar with the triangular numbers, the problem is solved. Student 1 suggests in line 3 that they should add 1 to each side of the equation. In line 4, student 2 suggests that they should try to add 2×1 to both sides of the equation. This means that they make their own choices, which indicates that their reasoning is not imitative. Student 3 in line 7 asks if one can just add like that. One way to interpret such a question might be that student 3 does not understand equations and that one can add the same number to both sides of an equation, but for student 3 the problem is rather that 1 is missing as indicated in line 1. Another way to interpret the question is that the idea used by the students to solve the problem has personal novelty to student 3.

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