A new digital environment for formative assessment in primary mathematics education: Some first experiences

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Introduction

Formative assessment is found to be relevant for raising students' achievement [1, 2, 3]. Therefore, the enhancement of teachers' formative assessment practice is considered an important area of research. In this study, which is part of the EU funded FaSMEd project, a digital assessment environment (DAE), meant to support teachers in assessing their students, was developed and tried out.

Research questions

a) What can the DAE reveal about the students' mathematics achievement in the domain of percentage?
b) What new knowledge did the teachers discover about their students' mathematics achievement in this domain?
c) How did the teachers plan to use this knowledge?

Method

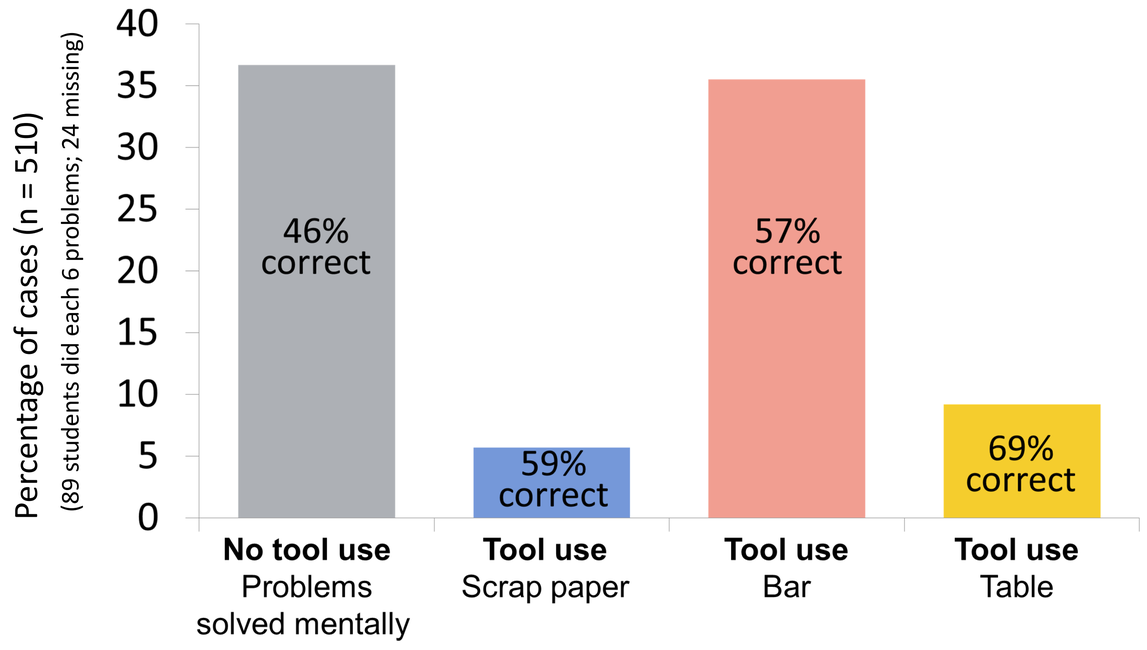
- Grade 5 (n = 49) and 6 (n = 40) students
- Six key problems in the domain of percentage
- Optional auxiliary tools: scrap paper, bar, table
- Collected data
  - Students' work (correctness of answers and tool use)
  - Teachers' responses to students' work (interviews)

Problems presented tot the students in the DAE.

1. When a battery is full, it works for 120 hours. Now it is charged for 40%. How many hours can you still work with this battery?
2. A cell phone costs 70 euros. You get a 20% discount. How much will you have to pay?
3. A bar weighs 70 grams. You get 50% extra. How much does the bar weigh now?
4. Karin plays a computer game. She scores 24 out of 80 points. How many percent is her score?
5. In 24 minutes, a battery is charged 75%. What will be the total charging time?
6. A school has 200 students this year. This is 25% more than last year. How many students were there last year?

Results

a - What can the DAE reveal about the students' achievement?



- On average, in one third of the problems students did not use a tool and solved the problems mentally.
- The bar was the most popular tool.
- Scrap paper and table were less chosen, but students were most successful with the table.

b - What new knowledge did the teachers discover ?

Teachers were primarily interested in the tool use by students. Teacher grade 5: "With this you can see which mistakes are made, and by which children. And if they used a certain tool, does it work for them?"
However, teachers did expect a different distribution of tool choice. Teacher grade 6: "I'm surprised the table is not used as often. We use it a lot in class."

c - How did the teachers plan to use this knowledge?

Teachers reported that they were most motivated to apply their new knowledge to helping students with difficulties in mathematics. Teacher grade 5: "I think I would direct my attention to the lower performers, and see what is the best way to teach them this. [...] Some children just need to see a bar for this."

Discussion

This pilot study revealed that the fifth-graders and sixth-graders involved in this study were not very proficient in solving percentage problems. Despite of this, one third of the students did not make use of the opportunity to use an auxiliary tool when solving a problem. On the occasions when students did use a tool, they were more successful in solving a problem correctly than when they did not. Teachers recognized that the information about the students' tool use, especially of the low performers, is important to take adequate didactical decisions for further teaching. Solving the problems with a tool shows the zone of proximal development of a student. Additional research is needed to investigate whether this better knowledge in the students' understanding of percentage may lead to an enhanced teaching practice and learning outcomes.

References
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