Communication Proposal for the MACAS 2025 Symposium

University of Moncton, Moncton Campus, Canada

Title: A critical analysis of calculator integration in school mathematics teaching: Between dependence and necessity

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Abstract:

The goal of my presentation is to encourage the audience to think deeply about the use of calculators in mathematics education, in line with the MACAS theme Critical Issues in STEM and STEAM education. In particular, I will focus on calculators used for performing calculations, whether on an iPad or a laptop.

In summary, I provide several examples based on my experiences. As a math professor, I work with students who are accustomed to using calculators in their high school math courses but coming to the university, see the calculators removed (institutionally forbidden) from their desks. As the person in charge of the New Brunswick provincial math competition for grades 7, 8, and 9 on our campus, I have noticed that students are dependent on calculators. As a mother, I notice my seventh-grade son instantly using a calculator for simple calculations when he knows he can do them mentally.

For instance, entering university mathematics courses, such as differential calculus, integral calculus and even linear algebra, the students have to do all calculations without calculator which causes them enormous stress.

In my paper, I will present concrete examples of situations in which the prohibition of calculator use makes students uncomfortable or even vulnerable when performing relatively simple operations, such as multiplying or dividing natural numbers.

On the other hand, I am the person in charge of the New Brunswick provincial math competition for grades 7, 8, and 9 on our campus. It has been observed that students experience significant stress when informed of the ban on calculator use during the competition. These are our highest-performing students in mathematics. In post-competition feedback, many participants expressed surprise at the need to solve mathematical problems without a calculator.

I particular, based on literature, I will highlight how a possible dependence on calculators prevents students from advancing in their problem-solving processes. Conversely, I will present quotes from research demonstrating the calculator's benefits in different situations (Rufer, C. (2010); Ulrich, Monika; Goupil, J. F. (2012); Hivon, L., Pean, M., & Trouche, L. (2008); Assude, T., & Eysseric, P. (2009); Tricot, A. (2017)).

Overall, despite a great number of studies about how to use calculator in mathematics lessons (and beyond), the best way to integrate calculators in schools is not known.

Although using a calculator is part of students' interaction with technological tools, it must be planned well so as not to reduce its pedagogical value. Below are some disadvantages of using calculators in a school setting (Benrherbal, A., 2013):

- Students don't bother to check the accuracy of their results. Instead, they rely on the results given by the calculator.

- Excessive use of the calculator, even for simple questions that don't require it. In some cases, using this tool becomes a bad habit because students rely on the calculator for even the simplest calculations. This dependency on the calculator can extend to basic calculations that don't require it.

- Regular use of calculators can undermine understanding.

In particular, it is important to determine which tasks require the use of a calculator and which do not.

- The use of a calculator is authorized.

- When learning mathematics, it is essential to identify the types of operations for which students have access to a calculator.

- To select the most suitable calculator model for each grade level, teachers should consider a set of relevant criteria based on their classroom experience.

- About preparing students for university-level mathematics courses, it is essential to assess the relevance of gradually limiting its use in secondary school's final mathematics courses.

In conclusion, using calculators in school mathematics instruction is probably necessary in some cases. However, they should be used reasonably. In my presentation, I will offer recommendations for standardizing their use in schools.

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