

Invitation to submit abstracts for a DEME special issue entitled: “On the intertwined contributions of physical and digital tools for the teaching and learning of mathematics”

DEME special issue “On the intertwined contributions of physical and digital tools for the teaching and learning of mathematics”

Invited Editors

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Dear Colleague:

You are invited to submit an abstract for a paper you propose to write for this DEME special issue. This letter includes a description of the thematic scope of the special issue and a timeline for the processing of paper submissions. Please, let us know whether you wish to participate in this project and feel free to ask us any additional questions. The deadline for submission of abstracts is February 28, 2019. They should be submitted by email to the invited editors

Cordially

Ricardo and Sophie

Thematic Scope of the Special Issue

There is a long tradition in mathematics education regarding the use of manipulatives or physical objects. Some of these became well known in many parts of the world, such as Cuisenaire rods, Montessori color beads, abacuses, Dienes blocks, GEO boards, and snap cubes. Geometric solids, such as cones, tori, and other shapes used to be standard resources for geometry classes at all levels. A century ago many university mathematics departments kept collections of geometric objects for class demonstrations — in some cases they have been reassigned as museum exhibits. 3D printing is a technology that may herald a renaissance of these kind of geometric productions.

As computers started to be used in mathematics education, digital applications began to proliferate allowing for the implementation of radically new learning environments and the questioning of long-held assumptions about the nature of mathematics and mathematics learning. Traditional manipulatives have been digitized and adopted, in

part because they can be easier than physical objects to access and use in the classroom. Hybrids digital/physical have also been developed, such as the Logo turtle as a robot (Turkle & Papert, 1992), mouse-dragging in dynamic geometry (Arzarello, Olivero, Paola, & Robutti, 2002; Leung, 2008), motion detectors (Nemirovsky, Tierney, & Wright, 1998), and the tagging of objects to be digitally recognized with radio-frequency identification (RFID) (Manches, O'Malley, & Benford, 2010)

We can distinguish between digital tools that are centered on the screen, and tangible tools that are designed for touching, grabbing, and manual transport. In both cases: 1) the visual sense is or can be a central component of the learning experience and, 2) there is high potential for bodily engagement. The second point has been widely documented by mathematics education literature informed by embodied cognition and gesture analysis (Edwards, Radford, & Arzarello, 2009; Nemirovsky & Borba, 2004). Furthermore, the notion of body syntonicity, proposed by Papert (1993), is equally applicable to digital and tangible tools.

These commonalities raise some of the questions that will be the focus of this special issue: How do the learning affordances of digital and tangible tools *differ* from each other? In what cases they are or aren't mutually substitutable? Are there optimal combinations of digital and tangible tools? How do tangible and digital tools entangle differently with the aesthetics and affective dimensions of mathematics learning? Are there sequences for their alternate use that appear to enhance learning experiences? What theoretical frameworks can help us understand their differences and complementarities? While some of these issues have been explored in the literature, (Kalenine, Pinet, & Gentaz, 2011; Lei, Chan, & Leung, 2018; Manches et al., 2010; Sarama & Clements, 2016; Voltolini, 2018), these questions have not so far been a major focus of research in mathematics education. The goal of this special issue is the creation of a reference volume to foreground these research questions in the field.

Timeline

	Deadline
Submission of Abstracts	February 28, 2019
Communication of Abstract Acceptance	March 29 2019
Submission of papers	July 22 2019
First round of reviews	October 22 2019
Second round of reviews	January 15 2020
Re-revised articles	March 15 2020
Copy-editing/proofing and publication	June 15 2020

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