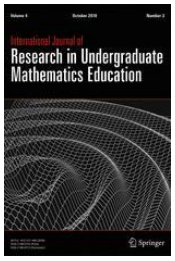

IJRUME Special Issue

Calculus at the intersection of institutions, disciplines and communities

Call for Extended Abstracts

Description

In studies discussed at the *Calculus in Upper Secondary and Beginning University Mathematics Conference* (Kristiansand, August 6-9, 2019) as well as in other fora, such as *CERME*, *INDRUM, Delta,* and *RUME conferences,* calculus courses are often viewed as crossroads where institutions, disciplines and communities intersect. Very often, in an intended way or not, calculus is at the center of various controversial issues that in recent years are undergoing extensive scrutiny. These may include: the secondary-tertiary transition; failure and dropout rates in STEM education; achievement gaps for different demographic groups; and, the academic preparation of future professionals, including engineers, scientists, and teachers. In our view, to explore and address these issues, research on calculus education needs to acknowledge the diverse cultural and institutional contexts of the teaching and learning of calculus, and avoid treating students and teachers of calculus as uniform cohorts. Motivated by the aforementioned discussions, we are delighted to announce this *Call for Extended Abstracts* for an *International Journal for Research in Undergraduate Mathematics Education* (*IJRUME*) *Special Issue,* guest edited by Irene Biza, Alejandro S. González-Martín, and Alon Pinto. This *Special Issue* will bring together research that explores the following question from an intra-mathematical and interdisciplinary perspective: *How can calculus education address the varied, sometimes conflicting, goals, values, and needs of different institutions, disciplines, and communities?*

We invite *Extended Abstracts* of up to 1,000 words (excluding references) to the three guest editors by email by August 31, 2020. Authors of selected abstracts will be invited to submit a full paper in English of up to 8,000 words (excluding references) by February 1, 2021. Papers will be reviewed by three reviewers: at least one reviewer will be from the IJRUME editorial board (or list of reviewers) and at least one will be an author of a submitted paper for the *Special Issue*. Publication of the *Special Issue* is planned for April to July, 2022.

Rationale and focus

Calculus courses are widely viewed as beneficial for students with varied academic and professional aspirations and a critical milestone in various transition processes, such as the transition from school to university mathematics and / or to its applications in professional practice. Calculus courses also often function as a gateway, or a gate keeper, in various academic and professional paths. Considering the different goals and roles of calculus in different contexts, it may seem odd that calculus is taught de-facto as if it is one and uniform discipline, with similar curricula across programs, institutions, or even countries. A growing body of evidence indicates that students around the world struggle in their calculus courses in which the rates of failure are particularly high. While there is an extensive body of research on the teaching and learning of various topics in calculus at various levels, including the tertiary level, studies in this area tend to treat students and teachers of calculus as uniform cohorts, with shared cultural and institutional characteristics. As Hitt & González-Martín (2016) stress, there is a "need to investigate the relationships between calculus and client disciplines in terms of practices, what should be taught, and what students are learning" (p. 29). In this vein, and going further, Rasmussen, Marrongelle, & Borba (2014) state that "research [of calculus education] that takes up the institutional and cultural context and how these aspects constrain and enable sustained uptake of advances in calculus learning and teaching is sorely needed […] this represents a new research theme, one yet to be realized to any large extent" (p. 513). Motivated by these observations, this *Special Issue* aims to contribute to the long-term holistic exploration of calculus education at the intersection of different institutions, disciplines and communities, an exploration that will provide insight into the boundaries, tensions, and connections that underlie the teaching and learning of calculus at the post-secondary level. To

this end, we invite abstracts that report on studies which provide novel insight into at least one of the following interrelated themes:

A. *Intra-mathematical:* Calculus at the intersection of mathematical domains (e.g., geometry, algebra, analysis, probability) and mathematical practices (e.g., reasoning and proof).
   - A.1. What is calculus for mathematics teachers and students at different educational levels?
   - A.2. How do mathematical meanings and practices in calculus interrelate with meanings and practices in other mathematical domains?
   - A.3. How does the learning of calculus influence, or is influenced by, the learning of other mathematical domains?

B. *Interdisciplinary:* Calculus at the intersection of STEM or STEM-related disciplines (e.g., economics, biology, engineering, teacher education, etc.) and professional communities (e.g., mathematicians, empirical scientists, engineers, economists, mathematics school teachers).
   - B.1. What is calculus for different professional and academic communities?
   - B.2. What are the mathematical practices related to calculus in different disciplines?
   - B.3. What are the potential synergies and tensions in calculus across disciplines and communities?
   - B.4. How could synergies be promoted, and tensions be reduced?

Selection criteria

We look for *Extended Abstracts* that will produce papers meeting IJRUME's criteria, as at https://www.springer.com/journal/40753 , and make a solid contribution to the discussion around at least one of the above themes.

We very much look forward to your Extended Abstracts!

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Guest Editors

Irene Biza, Alejandro S. González-Martín and Alon Pinto

Timeline

Extended abstract submissions: August 31, 2020
Invitations for full papers: October 15, 2020
Full paper submissions: February 1, 2021
Publication: April to July, 2022

Length and Language

Extended Abstract length: 1,000 words (excluding references)
Full paper length: up to 8,000 words (excluding references)
Language: English

How to submit your Extended Abstract

By email to the Guest Editors (Irene, Alejandro, and Alon)
Include the title, and the names and affiliations of the authors

References

Hitt, F., & González-Martín, A. S. (2016). Generalization, covariation, functions, and Calculus. In A. Gutiérrez, G. L. Leder & P. Boero (Eds.), *Second Handbook of Research on the Psychology of Mathematics Education. The Journey Continues* (pp. 3-38). Rotterdam: Sense Publishers.

Rasmussen, C., Marrongelle, K., & Borba, M.C. (2014) Research on calculus: what do we know and where do we need to go? *ZDM Mathematics Education*, *46*, 507–515.