

Guest lecture

Monday November, 10th 2025, 15:15 – 16:45

**Using simulations to teach
about problem-based instruction
in mathematics:**

*Design considerations and
research opportunities*

Patricio Herbst, University of Michigan

**Abstract**

In this talk I'll describe the use of Design Based Research in an ongoing project to develop and improve a set of digital simulations that seek to develop mathematics teachers' capacities to teach geometry through problems and classroom discussions. The intervention is inscribed in the approach known as practice-based teacher education and the simulations are conceived as approximations of practice—where the teacher-learner practices key tasks of teaching. The first simulation acquaints teachers with the problem space: using a problem about constructing a circle tangent to two lines to teach the tangent segments theorem where they act as observers of an avatar teacher. Teachers then simulate teaching the whole lesson to a class of student avatars for the first time, having the opportunity to select and sequence students' work for classroom discussion and eliciting and responding comments from students. The following two simulations give them opportunity to notice students' work and to respond to students' contribution respectively. Finally, they have another opportunity at teaching the whole lesson. I'll share considerations for the design of these 4 simulations and how they developed as a result of waves of data collection and analysis. Initial observation of the performance differences when simulating the teaching of the whole lesson (before and after the two learning simulations) suggest these are associated with performance gains. I'll share how we are using participants' responses during the learning activities to reveal learning traces that might help explain those gains.

In-presence

Room B348/349, Theresienstraße 39, 3rd floor, 80333 München

Online

<https://lmu-munich.zoom-x.de/j/581970248?pwd=SkdUZS8yWE53Ri9MVnBBMzMrb3RrQT09>

Biographical sketch

Patricio Guillermo (Pat) Herbst is a professor of education and mathematics at the University of Michigan in the United States, where he has worked since 1999. His scholarship is focused on understanding the professional work of mathematics teachers and university instructors, with particular interest in teacher knowledge, thinking, and decision-making and on the design of online learning environments for mathematics teachers. He also does research on the teaching and learning of geometry in secondary schools and college classes, with particular interest in the teaching and learning of mathematical proof. As a byproduct of his research activities, Herbst designs and maintains technologies for learning from video (Anotemos) and storyboarding (LessonDepict). From 2021 to 2025, Herbst has been the Editor in Chief of the Journal for Research in Mathematics Education.