

In this workshop, participants will explore a selection of the reSolve teaching tasks designed for elementary classes and examine how the resources promote a spirit of inquiry in school mathematics and exemplify the three Protocol elements. The workshop will also address the work of the Champions. It will specifically unpack the role of building teacher capacity through the development of communities of inquiry within individual schools.

## References

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## BUILDING LEARNING OPPORTUNITIES IN CLASSROOMS OF DISADVANTAGE: RETHINKING THE LEARNING TRAJECTORIES

Jana Višňovská , José Luis Cortina  and Pamela Vale 

### Abstract

Researching learning trajectories in classrooms of disadvantage introduces specific challenges as well as opportunities. Situating our work within design research, we illustrate the power of theoretical approaches in which close attention is paid to both learners' conceptual developments and the means capable of supporting such developments for all learners. We illustrate how considerations of teachers' learning can and should inform the formulation of (students') learning trajectories, if these are to become viable outside of research studies.

**Keywords:** design research, learning trajectories, means of support, supporting teachers' work, mathematics education and equity


### Background

Scaling up the use of instructional innovations, especially the complex products of classroom design research, is an important research problem (Cobb, Jackson and Dunlap, 2016). It could be argued that doing so in well-resourced first-world classrooms is already difficult, and teachers in less-well-resourced settings will be even less ready to use the complex resources well. Our experiences from working in under-resourced schools and classrooms begin to sketch a different,

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 University of Queensland, Australia; e-mail: [j.visnovska@uq.edu.au](mailto:j.visnovska@uq.edu.au)

 Universidad Pedagógica Nacional, Mexico; e-mail: [jose.luis.cortina@mac.com](mailto:jose.luis.cortina@mac.com)

 Rhodes University, South Africa; e-mail: [pamela.vale@ru.ac.za](mailto:pamela.vale@ru.ac.za)

much more positive perspective. Teachers, who were in many ways typical of the settings of their work, accomplished unparalleled learning for their students. We argue that two elements were important: (a) the resources designed with the teacher's learning and use at the fore of design considerations (cf. Cobb, Zhao and Višňovská, 2008), and (b) the professional development support the teachers experienced. We suggest that we need to treat the conditions of teacher support, which make use of the products of design research locally viable, and the ways in which such conditions could become accessible, as research questions. While learning trajectories and progressions have the capacity to inform top-down systemic interventions, we discuss how such uses alone have been problematic, especially in classrooms of disadvantage.

**Session 1:** *On classrooms of disadvantage and what is possible.* In this session, participants will engage in reviews and analyses of materials that will illustrate (a) typical starting points for student and teacher learning in classrooms of disadvantage (specifically, in Mexican and/or South African elementary contexts); and (b) documented outcomes of the teacher's and all students' learning that was facilitated in these settings by the designed means. These experiences will serve as a backdrop for review and analysis of features of a *Fractions as Measures* instructional sequence, implicated in the findings.

**Session 2:** *On equity-driven design commitments, heuristics, and products.* Working in classrooms of disadvantage necessitated specific commitments in theoretical positioning on the part of the research team, and resulted in the formulation of learning trajectories that differ from those established in more advantaged settings. The participants' engagement with the instructional sequence on *Fractions as Measures* (Cortina, Višňovská and Zúñiga, 2014) will be guided towards the identification of designers' theoretical assumptions, commitments, and specific decisions. Designed means of supporting *teacher learning* will be highlighted, and discussed in relation to an overarching instructional heuristic of making learning experiences *coherent from students' point of view*. We may explore how and why instructional sequence addresses some of the following themes, and how these themes aid in supporting students' as well as teachers' learning: (a) developing a classroom culture (as part of a *mathematical* learning trajectory); (b) developing students' need for each mathematical innovation; (c) using story as a means of providing coherence and purpose to individual learning activities; (d) providing multiple and different opportunities to develop and demonstrate the emerging mathematical *reasoning* with the innovation; and (e) adopting a need-based perspective on symbolizing and language.

**Session 3:** *On learning trajectories and the teacher.* Many classrooms of disadvantage are faced with "one size fits all" governmental interventions, where unwavering high expectations for student learning are among the central means of improvement. Such interventions often "fail to accommodate the extreme

backlogs in learner knowledge” (Graven, 2016, p. 8) that are typical in most classrooms in these settings. However, adjusting the content to learners’ needs is positioned as ‘lowering the bar’, and thus unacceptable. What are the teachers expected to do in classrooms where systemic support resources might be of good quality, but are unsuitable for students who are yet to reach the assumed learning levels? What resources do these teachers need, and how can we support them to transition from using resources as a means for covering and assessing prescribed content to using them as a guide for supporting their students’ mathematical reasoning, while reducing the backlog? We will explore some of these issues.

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