

## ENHANCING LANGUAGE AS A CATALYST FOR DEVELOPING ROBUST UNDERSTANDING – A TOPIC-SPECIFIC RESEARCH APPROACH

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Robust understanding of mathematical concepts is an important consensual goal of mathematics education in most countries (Hiebert & Carpenter, 1992). However, many studies show that the goal is only partially achieved for many students, in particular for students with limited access to academic language experiences (e.g., OECD 2016). Our research can show that much more students can acquire robust understanding for secondary mathematics concepts (such as fractions, percentages or the derivative) with a language-responsive instructional approach that enhances exactly the language needed for developing robust understanding (Prediger & Wessel, 2013; Prediger & Neugebauer, 2021).

In the invited lecture, I will present the topic-specific design research approach by which we specified those language demands which are most crucial on students' pathways toward robust understanding and designed the content- and language-integrated learning opportunities. The focus is on discourse practices of explaining meanings and describing mathematical structures, because being able to participate in these discourse practices is a key for exploiting conceptual learning opportunities (Moschkovich, 2015). Design experiments were conducted to identify the meaning-related language means that students need for realizing the discourse practices, each for different mathematical topics (Prediger & Zindel, 2017). The language-responsive instructional approach engages students in rich discourse practices and provides learning opportunities for the relevant meaning-related language which can serve as a catalyst for the conceptual learning. For the developed instructional approaches with the specified topic-specific language to be learnt, two large intervention studies proved the effectiveness in quasi-experimental controlled trials (Prediger & Wessel, 2013; Prediger & Neugebauer, 2021).

Looking back to twelve intense years of research, one major goal of the invited lecture is to explicate the successively generated local theory underlying the topic-specific realizations of the instructional approaches. The theory explains *why* enhancing language can be a catalyst for developing robust understanding, *what* language demands to focus and guides the process *how* to design of substantial mathematical learning opportunities.

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