



Teacher Professional Competence: Theoretical, Methodological and Instructional Challenges in the Domain of Preschool Mathematics

E-CER founding date: 1st of January 2024

E-CER Scope:

Preschoolers' early mathematical competencies are foundational for later academic performance and civic success. Although the provision of high-quality early childhood mathematics education is viewed as a critical vehicle to help children to realize their potential, we lack a thorough understanding of the key components of high-quality instruction in the domain of early mathematics at the preschool age and the teacher competencies that are associated with it. This E-CER aims to address current theoretical, methodological and instructional challenges related to this timely topic by engaging in scientific reflections and discussions, joint research projects and cross-cultural comparison studies with the partners of the E-CER.

Our first goal is to work towards theoretical synergy. Current scientific understanding of high-quality early mathematics instruction and the teacher competencies that are associated with it is constrained by the variety in theoretical concepts, definitions and frameworks used. Similar concepts refer to different characteristics and competencies, and different concepts are used for similar characteristics and competencies. By critically reflecting upon actual theoretical frameworks on high-quality instruction, teacher professional competence and learning-supportive interaction and by conducting cross-cultural comparison studies in the different partner countries (i.e., Belgium [Flanders], Denmark, Germany and Sweden), we aim to develop a common theoretical framework that integrates the key components for describing, understanding and optimizing early mathematics instruction quality and the teacher competencies that are associated with it, offering a shared language to further discuss and investigate these topics within the international scientific community.

Our second goal relates to the methodological challenges. Empirical studies on instructional quality and teacher professional competence rely on a rich diversity of methods, instruments and analysis techniques. There is no one-to-one relation between the theoretical concepts addressed and the methodologies used in the current research literature. Considering the range of available and frequently used methods, instruments and analysis techniques, we aim to bring methodological clarity and synergy, and, as such, research findings that can be integrated to further current understanding of the topic.



Our third goal is to provide building blocks to optimize current early mathematics instruction quality and teacher training and professional competence in the domain. Our cross-cultural studies will help to point to key characteristics of learning-supportive instructional activities with preschoolers and powerful teacher training and professional development courses. Moreover, the theoretical and methodological synergy we aim to realize will be foundational for future international studies on the topic, further adding to deepened and refined insights that can help to optimize educational practices worldwide.

E-CER Members:

1. Joke Torbeyns

Joke Torbeyns is associate professor at KU Leuven, Centre for Instructional Psychology and Technology (Belgium). Her research focuses on the characteristics and design of (technology-enhanced) learning environments for young children and the teacher competencies that are associated with it. Her research mainly addresses the domain of mathematics, instruction at the preschool age level, and preschool teacher professional competencies. Children's (mathematical) development and picture books are also included in her research projects.

2. Camilla Björklund

Camilla Björklund is professor of Education at the University of Gothenburg (Sweden). She is also scientific leader for education in the city of Gothenburg. Her research is focused on early mathematics learning and teaching in educational practices that include 1-year-olds up to 7-year-olds. In particular, the child's perspective and meaning making of mathematical objects and concepts as well as how the learning of mathematics can be facilitated by professionals in early childhood education are key components of her research projects.

3. Pernille Bødtker Sunde

Pernille Bødtker Sunde is assistant professor at VIA University College, Centre for Pedagogy and Bildung (Denmark). Her research focuses on the learning and teaching of mathematics in the early years, with special emphasis on number and arithmetic, as well as the development and measurement of teacher professional knowledge and competencies.

4. Simone Dunekacke

Simone Dunekacke is assistant professor for Research of Early Childhood Education at the Freie Universität Berlin (Germany). Her research is focused on learning in the domain of mathematics and in other domains at the preschool and the primary school level. In particular, her research focusses on teacher competences and the measurement of these competences.

5. **Nore Wijns**

Nore Wijns is post-doctoral researcher at KU Leuven, Centre for Instructional Psychology and Technology (Belgium). Her research focuses on the development and stimulation of early mathematical competencies, more specifically early numerical and patterning competencies.