

Perspektiven der Mathematikdidaktik

Gabriele Kaiser *Hrsg.*

RESEARCH

Xiaoli Lu

# Novice Mathematics Teachers' Professional Learning

A Multi-Case Study in Shanghai

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**Reihe herausgegeben von**

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Xiaoli Lu

# Novice Mathematics Teachers' Professional Learning

A Multi-Case Study in Shanghai

 Springer Spektrum

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## Foreword

Teacher quality is the most important element in children's education, and effective teacher professional development (TPD) has been recognised as essential for promoting teacher quality and thus improving students' academic performance. While the literature on mathematics teacher professional development is extensive, focusing on mathematics teacher beliefs, teacher knowledge, teaching practice and environmental influences on TPD, most of this body of literature focussed on only a few components of TPD and the influencing factors, and failed to address the complex and dynamic characteristics of TPD embedded in the mathematics teachers' professional lives and working conditions and the explanatory causality and reciprocal influences of various TPD components.

The present book by Xiaoli Lu, based on her PhD research, aims to fill this research gap. It presents a multiple-case study of novice teachers with the aim of providing key information and insights for TPD. The book's target readership includes future and practicing teachers at all levels as well as researchers, teacher educators and policy-makers. The book presents in detail the professional learning processes of three novice mathematics teachers during the initial two years of their teaching careers in Shanghai. It documents the novice teachers' professional learning outcomes in terms of teacher beliefs, knowledge and teaching practice as well as the opportunities and challenges in their learning of teaching during the TPD process. The findings illustrate the interactions among teacher beliefs, knowledge and teaching practice as well as the influences of environmental factors on the ways in which teachers achieved professional learning. In particular, the three teacher cases provide important implications for teacher educators and policy-makers by promoting early career teachers' professional learning of student-centred pedagogies in contexts dominated by traditional teaching practice.

The multiple-case study followed a rigorous research methodology and design and was based on a comprehensive survey of literature on TPD theories, teacher expertise and mathematics teachers' teaching in the context of China. The book presents in detail the professional learning processes of three novice mathematics teachers who had different learning experiences and taught in different schools. The findings from the three cases were synthesised to examine the opportunities and constraints that various mentorships present in terms of teachers' professional learning. The study's findings reveal how teachers' experiences, beliefs, knowledge and practices interact to produce various learning outcomes and the important role that the environment plays in novice mathematics teachers' implementation of student- or teacher-centred teaching within the context in which they are situated.

Two journal articles have been published based on the study presented in this book. That by Lu, Kaiser and Leung (2020) focuses on a model that examines various approaches to mentoring, while that by Lu, Leung and Li (2021) investigates novice mathematics teachers' agency with respect to integrating history into mathematics teaching in a performance-driven context.

This book and the two above-mentioned articles address a research gap in the field of TPD. Taking the specific subject and context into consideration, this study reveals the complexity, dynamics and openness of TPD in present-day mathematics education. We hope that this book will contribute to enriching theoretical knowledge regarding TPD and to enhancing mathematics teaching in China and beyond.

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February 9, 2022

Xiaoli Lu  
鲁小莉

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## Abstract

This study's central aim is to explore how three novice upper secondary school mathematics teachers in Shanghai experienced the professional learning process in the early stage of their careers in situated contexts. Teacher professional learning is considered a complex and dynamic system that connects both cognitive and situated perspectives on learning theory.

The study adopted a longitudinal case study approach in which teachers' beliefs, knowledge and teaching practices were analysed over the two academic years from 2013 to 2015. The data consisted primarily of classroom observation and interviews and were collected in four rounds. In each round, three or four consecutive lessons for each teacher were observed, and semi-structured interviews were conducted that focused on the teachers' background information, beliefs, knowledge and teaching practice, as well as their own reflections on the learning process and their mentors' perceptions of their interactions with their mentees. A qualitative data analysis approach was adopted to generate a holistic description of the teachers' teaching and their pedagogical learning.

Doris, who underwent teaching-related training in her bachelor's and master's programmes and during a one-year voluntary teaching practice, focused on learning to teach school mathematics in a teacher-centred way that was consistent with the collective ideas of other teachers in the same environment while integrating the history and culture of mathematics into her teaching in a bid to promote students' interest and mathematical thinking. Jerry, who learned to teach mathematics during his bachelor's programme and obtained a master's degree in mathematics, in particular delivered performance-oriented learning, as required by the school environment. Tommy, who had not received any teaching-related training, focused particularly on learning how to teach mathematics in a school context and adjusted his original pedagogical beliefs accordingly.

Combining the three cases revealed that the three teachers brought different beliefs and knowledge to their teaching practices owing to their different individual experiences. However, they consistently implemented teacher-centred, content-focused and performance-oriented teaching practice over the two years in the school context and learned related knowledge during the professional learning process. At the end of the two years, interviews with the three teachers revealed contradictions between their stated beliefs and their actual teaching. While in principle they tended to support student-centred teaching, in practice, their teaching focused on the contents and students' performances, as demanded by the environment. Moreover, the novice teachers experienced seven one-to-one mentorships during the two-year teaching practice period, four of which were found to be unnecessary, one demonstrative, one mainly demonstrative and sometimes collaborative, and one mainly supportive and sometimes collaborative. The opportunities and challenges associated with the various mentorships in terms of the novice teachers' professional development are discussed. The study finally summarises the three teachers' learning outcomes during the two-year professional learning period as well as the influences on their professional learning.

The results indicate that the novice mathematics teachers' professional learning processes differed owing to their different previous experiences in learning and teaching mathematics and the environmental influences and that the novice teachers could promote student-centred pedagogies (e.g., integrating history into teaching); however, novice teachers' professional learning is heavily influenced by the environmental norms, which reveals a dominant performance-driven context. The study's findings contribute to verifying and enriching the theory of teacher professional learning, a comprehensive understanding of novice teachers' professional learning process in a particular subject—here, mathematics—and within the specific context of China as well as insights into pre-service and in-service teacher education. Further research is needed to widen the scope of the investigation with the aim of better understanding and promoting novice mathematics teachers' professional learning in different environmental contexts.

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