

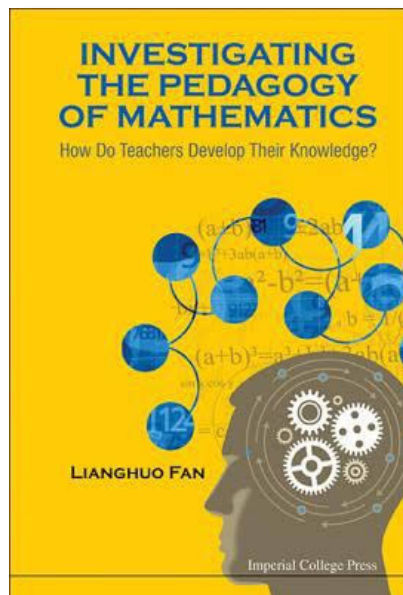
## Приказ

**INVESTIGATING THE PEDAGOGY OF MATHEMATICS,  
HOW DO TEACHERS DEVELOP THEIR KNOWLEDGE?***Lianghuo Fan (2014), Imperial College Press.*

This is a book that looks specifically, as its title suggests, at the development of the knowledge of teachers of mathematics. During the last half-century, the teaching of mathematics globally, and its results, have been studied, compared, lists and rankings have been created. These have then been used by the governments to reform mathematics education: and the book in question specifically looks at what has happened in the US in relation to mathematics education reforms, in the period 1980-2000, and compares these developments with how teachers develop in Singapore. Singapore has, for the past half-century gained a reputation of being an exemplary (in terms of its successes) system of mathematics education. Considering the reforms that were imposed on the US mathematics education system with a very little knowledge and account about how the actual teacher knowledge develops, the author argues a crucial piece of information has been left out as the reforms went on – and this book seeks to address this particular issue.

Unfortunately, we can not study something that has happened in the past unless through a historical analysis, and so the book is dedicated to two

empirical contemporary case studies: that of how mathematics teachers learn in the US (Chicago) and in Singapore. The two cases are compared and analytic statements are made at the end of the volume, with some very interesting logistic regression analysis for the US Chicago study. The latter



appears in the appendices at the end of the book, along with some other details: the profiles of teacher participants, the lesson observation and feedback questions, and the questionnaires used in the studies.

There are many reasons why one should look at, and indeed have this volume in one's collection, especially if you are either a teacher educator, or a policy maker (or a mathematics teacher for that matter). Let me look at these reasons.

Firstly, the book introduces a background to the phenomena so blatantly disregarded in the reform movements on mathematics education: the consideration of what *is* knowledge. Fan gives interesting overview of the historical account of this question; a discerning teacher or teacher educator could do worse than look at this in great detail and follow some of the works in this area mentioned in this chapter. Whilst one can see (from my personal, and general UK experience) that the reformers pay attention to the type of knowledge teachers should have or develop, the basic question about what is knowledge in not usually considered. Here I mean in particular the difference between knowledge as 'justified true belief' which becomes 'objectively reasonable belief' on one hand, and 'evidentially supported belief', on the other (Fao, 2014, 11). I don't argue that this is necessarily applied to mathematics per se (although that may be

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argued in certain cases), but to mathematics education instead. The belief that something works or doesn't in mathematics pedagogy is based on various methods, and the conclusions that are made give way to different interpretations in what should be done to improve (a) situation(s). But ultimately, the original question is – what do we actually know? And what is the knowledge based on, in the pedagogy of mathematics?

This topic, fascinating in itself, is followed by the main question of the book: if teachers' knowledge is, as some studies Fao mentions suggest, insufficient in quantity and unsatisfactory in quality in a range of points, what can be done? Well not much if we don't know how teachers go on to develop their knowledge during their careers. Fao gives a survey of such studies, and builds on them, giving a conceptual framework that places the interaction between the subject (teacher) and the object (knowledge needed) at the center. This then sets the scene for the rest of book: the interaction teacher makes with the knowledge is not only important, it is crucial.

The most important headings are therefore examined, that show how teachers decide what to learn: from the important questions about what to use in their teaching, what are the ways of presenting mathematical concepts and procedures, what are the instructional strategies and classroom organization, as well as the knowl-

edge of the ways to foster the spirit of learning, to the knowledge of how and what to assess in the learning of mathematics. Of course Fao is not only aware, but analyses also the various definitions of pedagogical types of knowledge, and more importantly, looks at the ways of sourcing the learning for teachers and their different phases: the pre, and post-service experience for example. I find this particular chapter (3) a very important contribution, and one which should be recommended to all teacher educators.

The research design and procedures are, or course sound, and give many interesting results. The samples of both US and Singapore groups I found on the smaller end of the spectrum, and would have wished to probably see either a longitudinal study or larger case studies which could establish further patterns for teacher educators, policy makers, and teachers in equal measure. But equally I am happy with the philosophical and intellectual study that Fao presented so masterfully in this volume.

I will not spoil the fun of reading this fascinating study, so will not give you all the conclusions. One that I did find I could not keep for myself is this: the importance teachers place on their interaction with their colleagues in gaining the pedagogical knowledge on the one hand, and how, in contrast, they find their pre-service training not so important. I consider that this however, does not

do the teacher education a disservice, but just the opposite: it shows the importance of access to such networks of communication that are not possible to gain through a school training only. In the era of increasing regulation and control in mathematics education, the teacher development that is based on the education entirely in a context of a school (or a few schools jointly in one area) would not give an overview of either the networks available to mathematics teachers, nor the role of mathematics teacher identity development and roles available to mathematics teachers in the landscape of the field of learning, teaching, and even producing new mathematics. Access to such networks, and learning from colleagues, is in a school-only environment reduced to the very local, and limited by the boundaries of a mathematics department to which one belongs.

Finally, I can say that I thoroughly enjoyed this work. It comes highly recommended for all the reasons stated above: and the many more that readers would find in learning about particular cases and incidences recorded. A great contribution to the mathematics teacher education scholarship.

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