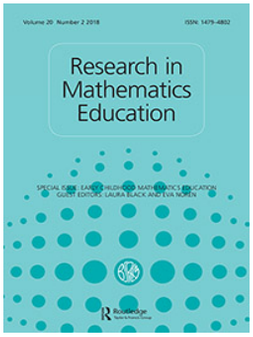

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Research in Mathematics Education

ISSN: 1479-4802 (Print) 1754-0178 (Online) Journal homepage: http://www.tandfonline.com/loi/rrme20

The effectiveness of mathematics teaching in primary schools

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To cite this article: Michiel Veldhuis & Xiaoyan Zhao (2018) The effectiveness of mathematics teaching in primary schools, Research in Mathematics Education, 20:2, 200-204, DOI: 10.1080/14794802.2018.1477059

To link to this article: https://doi.org/10.1080/14794802.2018.1477059

RESEARCH IN MATHEMATICS EDUCATION
2018, VOL. 20, NO. 2, 200–204

Routledge
Taylor & Francis Group

BOOK REVIEW

The effectiveness of mathematics teaching in primary schools, by Zhenzhen Miao and David Reynolds, London, Routledge, 2017, 179 pp., £105 (hardback), ISBN-13: 978-1-138-68032-6

Introduction

How a teacher teaches mathematics is one of the biggest influences on students' mathematics learning. This is a statement with which most mathematics educators and mathematics education researchers will probably agree. This is one of the main reasons why most of the mathematics education literature focuses on understanding and evaluating teaching approaches for particular content domains, or on developing tasks teachers can provide students with and on how students react to such an approaches or tasks. There is a complex amalgam of factors that can mediate a teacher's influence on students' mathematics learning. Such factors include the specific mathematical content, the teacher and his or her background and content knowledge, the teaching approach of the teacher, the tasks the teacher provides, the students and many others. Owing to this complexity, it is almost impossible to produce general statements about teacher effectiveness without explicitly limiting the applicability of such statements to the specific context in which the particular findings have emerged. In the general education research literature, especially in the teacher effectiveness literature, these factors are much less in the foreground. The main focus is more generally on the assumption that if better learning outcomes are produced, then the teaching is more effective. Against this background, at less than 180 pages in length, the title of the book "The Effectiveness of Mathematics Teaching in Primary Schools: Lessons from England and China" is very promising from a mathematics education perspective. The study described in this book appears, however, to be more situated within the research paradigm of teacher (or teaching, the authors use these terms interchangeably) effectiveness research. We, the reviewers of this book, are not from that particular domain of study or research, but from research in mathematics education, so our review mainly focuses on the mathematics education content of the book. We will try in our review to answer the question: Were the authors able to derive general findings that do justice to the complexity of their study subject? Before going into more detail on this issue, let us first provide a general description of the book and an overall summary of its content.

Background and theme

The book is based on the first author's (Zhenzhen Miao) doctoral study, and it is written with her supervisor, David Reynolds. The authors examined the aspects of mathematics teaching that influence students' mathematics performance in two groups of primary school teachers: one group from three schools in Southampton (England) and the other from four schools in Nanjing (China). Zhenzhen Miao was a mathematics and English teacher before pursuing her PhD and now works as a lecturer at Jiangxi Normal University, whereas David Reynolds is professor of Education at Swansea University. In this book, they sketch a broad, and at the same time detailed, picture of what mathematics teaching looks like in the two countries (as evidenced by the teaching in the seven schools in these two cities), leading to a description of the differences between the English and Chinese lessons. This international comparison can be very informative for the readers who are interested in the practice of mathematics teaching in these two nations.

Summary and description

The book appears in a sleek blue, white and black hard cover format and comprises nine chapters, describing step by step the parts of the first author's doctoral study. The background of the study is sketched in the first chapters to be the evident differences between students' mathematics learning outcomes across nations as found by international assessments like TIMSS and PISA, in which students from East Asian countries generally outperform their counterparts from Western countries. Students' mathematics achievement has often been found to be correlated to teachers' teaching, so the authors set out to identify the effective teaching factors that can lead to better student learning outcomes. Guiding this endeavour, they formulated three main research questions about mathematics teaching in England and China: (1) How are various teaching approaches and students' mathematics achievement across the two countries related? (2) How is the effectiveness of mathematics teaching in the two countries perceived? (3) How are the answers to the abovementioned questions related? (e.g. p. 136).

In Chapter 2, an overview of some pedagogical theories and practices in mathematics teaching related to the typical educational contexts in England and China is provided. For example, the authors describe how progressive and differentiated teaching is promoted in the West, including England, whereas teaching with coherence and variation receives specific attention in East Asian countries such as China. The authors state that very few large-scale international comparison studies have been performed with teachers from mainland China, and, of those, only a couple attempted to measure and relate learning outcomes to teaching practice. Chapter 3 starts with a reflection on the history of educational effectiveness research and then focuses on its subfield of teaching-effectiveness research. Taking a process-product point of view, a number of effective general teaching behaviours are described that have been identified through quantitative research methods. By showing how teaching effectiveness research rarely crosses borders, this chapter points out how teaching effectiveness research across nations is needed. Also, as the authors describe, more qualitative evidence, which can be used to explain the reasons behind various quantitative correlations, is badly needed. Both these research gaps led to the study described in this book, as can be read in the remainder of the chapters.

In the following chapters, the comparability on a number of background characteristics of the two cities is illustrated first, and then the design of the study is described to be, in the authors' terms, an integrated approach or, in more generally accepted terms, a mixed methods study. Among the qualitative methods used, there are unstructured lesson observations and individual, and group, video stimulated teacher interviews. For the quantitative part, the authors employed structured lesson observations with two instruments to investigate the "quantity of teaching" by investigating teacher provided opportunity-to-learn and the "quality of teaching" by investigating the types of teaching behaviours the teachers showed (ISTOF), teacher and student questionnaires, and mathematics performance on items from TIMSS 2003. The authors emphasised the connections between these multiple types of data and the findings to answer the third question of linking the "hard measurement and soft voices" (p. 152) about teaching effectiveness. This chapter provides the reader with a clear image of the set-up of the study. In particular, the framework (p. 53) is helpful to understand how the multiple research methods are connected to answering the research questions.

Chapters 5–8 report the findings of the study. Chapter 5 focuses on the results from the questionnaire survey, including, among others, information about students' demographic background, teachers' professional background and general teaching-related beliefs. Regarding the socio-economic status of the students, it seemed the Chinese students came from a slightly more advantaged background than their peers in England. Compared with their English

colleagues, Chinese teachers involved in this study had, in general, more teaching experience, reported to attend more professional development activities, and reported to have a stronger wish to develop in both the subject matter and pedagogical content. Another interesting finding is that Chinese teachers seem to be more pro-constructivist, and English teachers tend to hold more direct transmission beliefs about teaching and learning, whereas the literature review of Chapter 2 suggested the opposite. In Chapter 6, the detailed results about the evaluation of mathematics teaching, the measurement of students' mathematics achievement and the correlation between particular teaching behaviours and student achievement are presented. There were large differences between the mathematics teaching practices of the two groups of teachers, and Chinese students generally outperformed their English counterparts. By examining the relationship between various teaching behaviours and student achievement, a list of effective and ineffective teaching factors was identified. The effective factors mostly coincided with what is already known from literature, such as whole-class interaction, time on task, assessment and evaluation or clarity of instruction. The ineffective factors were whole-class lecture, individual/group work, and classroom management.

Chapter 7 presents the multiple views of teaching from people with different roles in and beyond the classroom. From the authors' perspective, lesson flow and teaching characteristics in each country are summarised. This chapter provides the reader with vivid images of how mathematics teaching takes place in these two contexts. Individual teachers reported on their perception of effective mathematics lessons, their self-evaluation of teaching, their awareness of teaching in the other country and their attitudes about changing their teaching practice. In focus groups, the teachers also gave their opinion about an English mathematics lesson and a Chinese one. Since a large number of examples of teaching activities in the classroom are provided in this chapter, it really sheds light on how the teachers perceive an effective mathematics lesson to be organised. The teachers' opinions, as they are described, provide a very interesting insight into their ideas about mathematics teaching in their own country and that of teachers from abroad. This chapter is very well organised and focuses on individual teachers and on groups of teachers. The section on "Seeing maths teaching through individual teachers' eyes" (p. 108 and further) is a pleasure to read. Chapter 8 summarises the findings regarding the correlations between teaching and students' mathematics achievement, and the ideas about the effectiveness of teaching from the different actors' viewpoints. Moreover, the chapter discusses how these findings echo, support and explain each other. The authors show that the distinction of teaching styles is related to, and influenced by, teachers' opinions about what effective teaching is and how to organise it. Finally, Chapter 9 presents the conclusions, limitations, and implications of the book, and suggests some directions for future research. The authors interpret their findings in the light of what they can add to existing research and sketch some limitations such as the statistical methods not including more control variables such as degree of parental involvement, and the content of the different mathematics lessons. In the paragraph on "Improve maths teaching cross-nationally, now!" the authors mention many actionable suggestions for improvement for English teachers related to the established effective factors from Chapter 6, such as "avoid the utilisation of whole-class lectures", which was an ineffective factor, and pursue the effective factors such as "increase the proportion of lesson time on whole-class interactions" (p. 94). Remarkably, no suggestions for improvement are provided for China, in which the teaching apparently is flawless – or, in the authors' own words, "The problem in China does not lie in classroom teaching and learning. It lies in the political, social and cultural domains of the country" (p. 160). Whether this statement is true or false, we cannot evaluate, certainly not on the basis of the results of the study in this book, and in any case, it feels out of place as a final message.

Comments

Let us use this peculiar final statement as a stepping stone towards a short discussion of several other rather unsubstantiated statements the authors make in this book. The authors appear in several instances in the chapters to offer a rather negative view of mathematics teachers and teaching in England, and the opposite, hence positive, view of mathematics teachers and teaching in China. Although, on the basis of results of international assessments, there might be something to say for this view as students from particular regions in China generally outperform their English peers in mathematics, this apparent bias sometimes seems to cloud the authors' supposed objectiveness when describing teachers' mathematics practice. For example, in Chapter 7, the authors rather negatively sketch the teaching practice they observed in the English classrooms. For example, they state "[a]cross classrooms, English pupils show certain knowledge gaps such as times tables, place value, subtraction […] [p]robably because of heavy reliance on the calculator from a very young age, English children show considerably weak calculation skills and number sense across classrooms" (p. 99–100). There is no evidence presented about these observations or about calculator use in this book that would support these claims. Remarkably, the title of a heading in this section about English teachers is "Lack of accuracy in teaching"! The description of the Chinese lesson is much more positively framed. Although we can imagine that the observed lessons, and especially the videotaped lesson in Southampton, might have been less well organised or even weaker, if judged from a particular perspective, to those observed in Nanjing, it makes us, as researchers working with students and teachers, very uncomfortable to read about teachers in such subjective, value-loaded, negative terms. Furthermore, the video of an English teacher used in the stimulated recall interview focus group was, as the authors acknowledge, a rather ineffective lesson, which could have negatively influenced the reactions of the Chinese and English teachers and thus bias the conclusions of the authors in this respect. Another difference between the mathematics teaching practice of Chinese and English teachers was almost completely ignored by the authors. English teachers appeared to make more use of formative assessment to inform their instruction, which has repeatedly been described as one of the most effective aspects of teaching on student learning (e.g. Black & Wiliam, 1998). It is striking that the authors almost do not comment on this finding at all in their discussions of the results, and particularly when comparing the English teachers to the Chinese teachers, who appear to use assessment less formatively.

In their conclusions, the authors seemed to over emphasise some of the results. For example, in the "Connecting the dots"-chapter, the authors draw strong conclusions in general about Chinese and English teachers without any attention to the rather specific and small samples of three schools in Southampton and four schools in Nanjing they took, which are evidently not representative of the complexity of the entire countries of England and China. Another example is how they state that their study is the "first teacher effectiveness research study attempting the value-added approach across nations" and "first teacher effectiveness research study seeking to form an international dialogue on effective mathematics teaching" (p. 155). The claim "first" in both cases is inaccurate. There are many other studies, including a relatively recently published edited book with a very similar focus, to which the authors surprisingly do not refer at all (cf. Cai, Kaiser, Perry, & Wong, 2009).

Concluding comments

If the reader is looking for thought-provoking statements about mathematics teaching in England and China, then they should read (at least parts of) the book by Zhenzhen Miao

and David Reynolds. If they want to read very good descriptions and interpretations of teachers' perceptions of other teachers' lessons, then we can recommend Chapter 7 of this book. However, if the reader is looking for a thorough and balanced discussion about prevalent ideas on teaching from the mathematics education literature and a review of the evidence about the effectiveness of particular teaching practices in either England or China resulting in a carefully designed experimental study, then one might do better to look for another book, or browse through several issues of quality mathematics education journals. Referring back to our own question at the start of this review, i.e. whether the authors of this book would manage to derive general conclusions that do justice to the complexity of their study object, we regrettably think the answer is: no. Although the authors do derive general conclusions, they rather easily step over the complexity of their study subject, mathematics teaching by mathematics teachers, and the limitations of their study design to make general, and thus in our view empty, conclusions about educational effectiveness.

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https://doi.org/10.1080/14794802.2018.1477059