

BOOK REVIEW

Transforming Mathematics Instruction: Multiple Approaches and Practices, edited by Yeping Li, Edward Silver, Shiqi Li, Heidelberg, Germany, Springer, 2014, 586pp., £117.00 (hardback), £93.50 (e-book) ISBN: 978-3-319-04992-2

This weighty volume is part of the monograph series: "Advances in Mathematics Education" (series editors: Gabriele Kaiser and Bharath Sriraman), which brings together key previously published research within particular themes, continuing the tradition of the international journal "ZDM - The International Journal on Mathematics Education". These syntheses of research are debated in light of the future of, and new approaches towards, mathematics education.

"Transforming Mathematics Instruction" synthesises both recent developments in mathematics education research and critical debates focussed on innovative approaches to changing mathematics classroom culture with the aim of overviewing different approaches for transforming mathematics education. Of course, many other texts aim to do something very similar and there is a wealth of volumes exploring 'recent developments', 'innovative approaches' and the transformation of the mathematics classroom and mathematics education. "Transforming Mathematics Instruction" claims to bring new insight through its cultural focus. Asserting that many similar meta-analyses focus solely on Western Education, the bulk of contributions to this book, alongside some Western chapters, come from research and an exploration of approaches underpinning mathematics instruction in East Asian countries. I was left unclear as to the claimed 'weakness' of Western focused meta-analysis or of how a focus on East Asian countries may address this. In spite of this, this volume offers a strong and far-ranging discussion applicable to those interested in mathematics education in any culture. There is a need however to be wary of cultural variations in the language used, not least in the title word 'instruction'. While this may bring to mind a very traditional didactic approach when considered within approaches typical in England, its meaning is far broader in this volume, more akin to our use of the terms pedagogy or pedagogic approaches.

The East Asian focus certainly does not limit the scope of this volume. Divided into five parts each with a distinct focus, the volume encompasses 29 chapters (including four chapter prefaces) contributed – with many multiple authored chapters – by 56 writers representing ten different education systems. This broad perspective gives insight into how the 'instruction' of mathematics is approached in different education systems and details many current explorations into innovative approaches. With all the caveats surrounding the extraction of any approach from one culture to another, this wide view provides a rich and deep source of discussion and debate for anyone interested in current trends in mathematics education at all levels of schooling, with contributions considering every stage from elementary / primary education to Higher Education.

It is possible that the focus on East Asian contributions – and a view of this as somehow addressing weaknesses of other similar volumes – many detract from the actual, and achieved, purpose of this volume which is to highlight new research and insights, to debate the implications for the future of

mathematics education teaching and learning and to promote new channels and methods within mathematics education in an international community of scholars.

The volume is compiled in four distinct parts; unifying these are four themes which run through and across all chapters. These broader themes allow the reader to gain a deeper insight into current issues, understanding what is valued and how learning is considered within different approaches.

The editors identify these themes as:

- Identifying what is important in mathematics for teaching and learning emphasised in different approaches;
- Exploring how students' learning is considered and facilitated through different approaches and practices;
- Understanding the nature of various approaches that are valued in different systems and cultural contexts;
- Probing culturally valued approaches in identifying and evaluating effective instructional practices.

These themes highlight the wide-ranging and expansive definition of 'instruction' used throughout this volume. As highlighted previously, instruction – in this volume – means far more than a one-way teacher-centred view, understanding teaching and learning in the mathematics classroom both in terms of the multiple interactions taking place and in terms of the multiple influences (e.g. curriculum, professional development, teacher education) impacting on practice. It is very clear throughout this volume that instruction carries this deep meaning and does not limit the depth or range of debate in this book. Any reader approaching from an English context will need to get past this title and it may be worth the editors considering how they may have foregrounded the far-reaching nature of the definition of instruction used in the volume. The volume's aim – which I suggest is achieved – is clearly set out within the commentary concluding the volume. It seems a shame that the reader needs to get to almost the end of the book to find this:

“a collection of projects and studies aimed at transforming mathematics instruction, using curriculum and teacher professional development to leverage change. With an eye on improved student learning of mathematics, the chapters' authors navigate the complex environments of teaching and learning. Doing this requires influencing the primary interactions that shape students' learning opportunities – namely, the interactions among teachers and students around content in classrooms. The relationship between levers for change – such as curriculum materials and professional development – and instructional interactions is complex. In order for such efforts to succeed, understanding these dynamics is vital.”

(Ball and Hoover, 2014, pp.549-550)

The bulk of this book, the first 400 pages or so, addresses the first part of this aim, outlining different projects and studies intended to take mathematics education forward. The three parts making this up are: innovative approaches that bring direct changes in classroom instructional practices (Part 1), curriculum reforms that introduce changes in content and requirements in classroom instruction (Part 2), and approaches in mathematics teacher education that aim to improve teachers' expertise and practices (Part 3).

The chapters comprising each part examine a wealth of approaches. Part one, exploring direct changes to instructional practices (in the broadest sense) looks at issues as diverse as the teaching of modelling and problem-solving and the use of random group assignment in the mathematics classroom. Given my research focus on ability grouping in the primary mathematics classroom I was particularly interested in this chapter by Liljedahl (2014), who, writing from a Canadian perspective, looked at the impact of leaving group placement to chance – and making this randomness clear to students – on student collaboration and co-constructed responses, enthusiasm, engagement, and the changing role of the teacher. Liljedahl illustrates how such randomness can allow for changes both to teachers and students as well as to what is considered possible. This is important as it demonstrates how this approach and others considered in this volume can be used to take thinking forward, with a debate around key issues. Whilst there are many small-scale case study approaches discussed in this volume, collectively they offer ways forward, essential in the rapidly changing world of education.

The second part of this volume will be of particular interest to a wide audience engaged with current trends and concerns in mathematics education. This part examines the impact of curriculum reform (both content and instructional method) examining issues such as the use of textbooks, teacher guides and teacher enactment of textbooks (considered by Gravemeijer (2014) through the case of Realistic Mathematics Education (RME) in the Netherlands and Watanabe (2014) looking at textbook transformation in Japan) and the development of the ‘exemplary lesson’ in China. Given that teachers in England are currently grappling with a new National Curriculum, stated by the Government to be a Mastery Curriculum and with various groups attempting to define and support the assessment of mastery (see for example the recent materials produced by the NCETM and the MathsHubs, Askew et al., 2015) and that we are seeing an intense Government and media interest in the approaches of high-performing Pacific Rim countries which includes the use of textbooks (see for example Nick Gibb’s (2015) fervent position on this) the debate in the chapters of this part of the volume is particularly timely.

An important issue Gravemeijer raises is the role of teachers in how any curriculum intervention – such as the use of textbooks – is actually played out in the classroom. Unlike the rather unproblematic stance espoused by Gibb in his textbook ‘solution’ to mathematics teaching in England, Gravemeijer’s more critical stance recognises that teachers play a major role consciously or unconsciously translating a curriculum change into instructional practices. As such, the debates of Part Two lead effectively into Part Three focussing on teacher education and professional development. Here, predominantly through case studies, approaches to (such as video clubs), theorisations of (such as the problem-solving cycle) and challenges inherent in professional development are discussed across seven chapters.

While parts one to three outline a range of approaches to the transformation of mathematics instruction, part four has a different feel. Potentially able to stand as a book within its own right, this part details some specific advances in theoretical and methodological approaches to the study of mathematics instruction, while noting that the field of research in mathematics education is still relatively young. Theoretically heavier than parts one to three, the six chapters of part four, to various extents, examine either (or both) theoretical and methodological issues inherent in the assessment of, or study of, classroom instruction. As Ball and Hoover (2014) note in their commentary, this volume takes up the major challenge of developing research on teaching in

mathematics education, working towards an articulation of theory building from approach development. One chapter I was particularly struck by, and which led to me re-reading some preceding chapters from parts one to three with a more critical eye, was that by Even (2014) who, through an innovative multiple case study approach, exposes the complex web of factors which impact on students' opportunities to learn in the mathematics classroom. Even notes that, rather than standing alone, class, teacher and topic characteristics are interwoven in complex ways meaning that even under the same teacher and with the same instructional material, two classes may look very different. This is an important message when looking at theorising and implementing new instructional practices and would certainly be one worth bearing in mind when considering the adoption of any 'quick-fix' standardising approach to mathematics education in England. Across part four there is a call for a disciplined study of instruction with carefully constructed, fit for purpose 'tools' with which to study instructional practice addressing one of the major challenges, noted by Ball and Hoover, facing the mathematics education field.

The length and title of this volume are perhaps not the most enticing. This is a shame, for while I would not see or recommend that this is a book to be read from cover to cover it is one with wide appeal covering a range of educational stages and instructional approaches. It very valiantly attempts to address, to quite a degree of success, some of the major challenges facing mathematics education particularly within the theorisation of instructional practice and provides debate and possibilities to take the field forward. The editors suggest that they address the Western dominance and limitation of previous meta-analyses through their focus on East Asian studies alongside Western studies. I find this unconvincing, but this focus does open up the possibility of exposing approaches perhaps less familiar in the Western system (and vice versa). At the same time I also found much of the debate from both Western and East Asian contributors surprisingly familiar. Perhaps one job a volume such as this does is to encourage much needed critical debate and engagement rather than the constant search for any jurisdiction doing it 'best'.

Covering such a range of instructional practices, curriculum reforms and teacher education approaches in parts one to three this is unlikely all to be of interest to one reader but there is likely to be something of interest to many. Unless purchased as individual chapters (an option available via the Springer website) this is perhaps a book for institutional libraries rather than individual bookshelves. However, I am pleased to have had the opportunity to engage with this volume and the important debates covered in moving mathematics education forward. To quote Ball and Hoover:

"We thank all of the scholars contributing to this volume for the opportunity to reflect on the many important programs of work being conducted in the field today and on the progress being made and needing to be made to reach the shared goal of transforming mathematics instruction into the dynamic and effective professional practice that we know it can be."

(Ball and Hoover, 2014, p.557)

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