

Book Review for RME:

Diversity in mathematics education: towards inclusive practices, by Alan Bishop, Hazel Tan and Tasos N. Barkatsas (Editors), Cham, Switzerland, Springer, 2015, 262pp., £90.00 (hardback), ISBN: 9783319059778

This book provides valuable insight for those carrying out research into developing inclusive practices in mathematics classrooms. It focuses on diversity, both in terms of students' differing backgrounds, and in considering multiple approaches to teaching and learning mathematics. It explores issues of equity within mathematics education, highlighted by differences in achievement and engagement with mathematics between individuals and various groups of learners. It contributes to a rich tradition of research literature addressing issues of equity, social justice and empowerment in mathematics education (Burton, 2003; Sriraman, 2008; Coles, et al., 2013).

The book comprises a series of fifteen chapters with contributions from academics either working at, or associated with, Monash University. It builds a vivid picture for the reader of issues around diversity and inclusion in Australia and serves as a valuable starting point for those carrying out research into equity in mathematics education in that country. Many of the issues are not unique to Australia, for example Sullivan (Chapter 1) describes mathematics teaching which is "*generally repetitious, lacking complexity, and rarely involved reasoning*" (6), characteristics which would be familiar to educators around the world. The book therefore provides additional insight for researchers interested in diversity and inclusivity in mathematics education working in other contexts.

Sullivan makes the point that there is plenty of existing research offering advice to practitioners on how to teach inclusively, such as making learning intentions clearer, drawing on students' cultural experiences, and developing classroom communities. However he argues that offering advice is not enough as it fails to take account of constraints teachers may face in implementing such advice. Researchers need to articulate the implications for practice if they are to have an impact in raising the attainment of all or narrowing differences in attainment between students. The main contention of the book is that efforts over recent years to address diversity by differentiating the curriculum to meet the diverse needs of individual learners have failed, with differences in attainment still very much evident. In order to develop a curriculum that is genuinely inclusive, the focus instead should shift towards the learning environment and classroom cultures created by the structuring of the curriculum and the pedagogies adopted.

The book is divided into three sections with a helpful commentary at the end of each section which draws together themes from different chapters. With hindsight I would recommend reading the commentary for each section before the individual chapters, since the themes which link the different contributions together are not always immediately apparent.

The first section 'Surveying the territory' comprises seven chapters which report on various studies focusing on differences in students' achievement in mathematics. Sullivan outlines the challenges for reporting research aiming to bring about more inclusive practices, emphasising the responsibility of researchers to make the applicability of findings to classroom practice more explicit. Leder and Lubienski (Chapter 2) and Panizzon (Chapter 3) explore barriers to learning that result in differences in achievement between boys and girls, as well as those between students from different socio-

economic backgrounds. These mirror those in many other countries. However, there are ways in which the situation in Australia is unique, for example the indigenous population and students in more remote areas achieve at significantly lower levels than the rest of the population.

Forgasz and Leder (Chapter 6) highlight how gender stereotypes still persist amongst the general public. Whilst a majority of respondents in their survey suggested that neither boys or girls were better suited to mathematics or more scientific work, those who did suggest a difference exhibited very stereotyped views. The reasons given tended to reflect personal experiences, i.e. assuming girls are less suited to mathematics and scientific work because they are less visible in those fields, suggesting that stereotypes still play a role in reproducing post-compulsory gender differences in enrolment in mathematics and science.

Quantitative analysis features strongly across the studies in Section 1 and the authors attempt to make the methodologies followed as clear as possible. At times, however, I found myself having to rely on the author's own interpretations of the data based on statistical processes that I am not completely familiar with, for example with Panizzon's contention that the socio-economic status of the school is much more significant than that of an individual student in predicting achievement. What is clear from the studies is that the picture of diversity in Australia is highly complex with a wide range of factors, including geographical location, socio-economic status and indigeneity, having an effect. The authors attempt to draw out implications from their findings for developing classroom practice, for example Panizzon argues that, given the distances between schools and communities in rural areas, professional development needs to be more collegial with technology enabling relationships to be built over longer distances. However, these implications tend to be speculative in nature, perhaps reflecting the strength of quantitative research in describing the situation as it exists, whilst not necessarily fully understanding its underlying causes.

There are several interesting comparisons made between the situation in Australia and that in East Asian countries often held up as examples of high-performing jurisdictions to be emulated. Barkatsas and Seah (Chapter 4) found that students in Australia tend to prefer working on more open-ended tasks than those in China. In contrast to Australia, and many other parts of the world including England, boys in Singapore out-perform girls in Grade 11 mathematics examinations and Tan (Chapter 5) explores these differences in relation to students' confidence in using graphical calculators and technology.

A theme that recurs throughout the book is that higher levels of mathematical achievement amongst students in East Asia depend far more on positive values exhibited towards achieving in mathematics than the adoption of specific teaching approaches. Askew (Chapter 8) argues that the Pacific Rim countries do well in international comparisons due to cultural norms which include pressure from peers to keep up with learning and the family honour associated with attaining success in mathematics. This explains why parents are willing to spend so much money, and students spend so much time, attending extra cramming lessons after school. Assuming that similar pressures on students to do well will work in different cultures is doomed to fail: *"Simply exhorting students outside that cultural milieu to try harder is not only unlikely to raise standards but also to reinforce individuals' views of themselves as failing."* (p.133) This calls into question the value of increasingly popular 'exchange visits' in which colleagues are invited to observe teachers from Singapore teaching mathematics lessons in schools in England as part of their professional

development. Seah and Andersson (Chapter 10) highlight the extent to which students in East Asia value achievement in mathematics, despite exhibiting generally low enjoyment of, and interest in, the subject.

The second section 'Interrogating the Boundaries' provides a number of theoretical perspectives considered relevant to developing inclusive practices. I found Askew's ideas particularly compelling and, for those who don't read the whole book, I would strongly recommend reading at least this chapter. He challenges the notion that differences in attainment should be attributed to natural variation which implies that individual students have deficits that need to be addressed in order to conform to the 'norm'. This leads to labelling of learners as 'disengaged' or 'low achievers', which in turn leads to unequal assigning of value, and ultimately the provision of distinct curricula for different types of learners. He outlines the dangers of recent moves within the Australian curriculum towards viewing the *"intended and attained curriculum as coterminous"* (p.135). This is mirrored by developments in the National Curriculum in England, in which the initial separation of the 'intended curriculum', i.e. the 'programmes of study', from the 'attained curriculum', i.e. 'levels of attainment', has disappeared from the new curriculum which refers only to what students will be taught to do. Within such a framework, the 'implemented curriculum', i.e. pedagogy, is reduced to *"... fostering a technical-rationalist approach to teaching and learning: select a predetermined, atomised, learning outcome, teach to that outcome and test for 'mastery'"* (p.134). With such an approach, grouping by attainment is seen as a logical way of attending to the needs of individual students as it allows different learning outcomes to be set for different groups, inevitably resulting in increasing gaps in attainment over time.

Askew argues instead that differences in attainment should be recognised as social creations and that the mathematics curriculum should be reviewed from the perspective of collective construction of knowledge. He maintains that current thinking is based on the notion of 'curriculum as fact', in which the teacher is regarded as the expert and students as passive learners. An improvement on this is the constructivist notion of 'curriculum as activity', in which the teacher acts as facilitator and students as 'sense-makers', although the emphasis here is still on the individual. However, in order to promote inclusive mathematics education, he argues for a move towards a notion of 'curriculum as inquiry', in which knowledge is viewed as *"co-constructed and emerging through interaction with others"* (p.135). He advocates building the conditions necessary for the emergence of 'learning communities' characterised by genuine dialogue between teachers and students. This involves a shift from viewing the classroom as a collection of learners, where some do better than others, towards developing a sense of what the community as a whole does well.

Several authors point out that the new Australian curriculum refers explicitly to addressing issues of equity and incorporating 'ethical understanding' across all subject areas. Forgasz, Bleazby and Sawatzki (Chapter 9) explore the ethical, moral and social justice dimensions of learning mathematics and how focusing on these requires inquiry-based pedagogies. They challenge the myth that moral development is of no concern to mathematics teachers, based on the false assumption that the subject is neutral, which results in the 'ethical filtration' of real life problems. They argue instead that the role of the mathematics teacher should be to intervene, ask questions and make suggestions which highlight how mathematical reasoning can be used to make ethical decisions. They outline teaching approaches and existing resources that might facilitate this,

however, the link between developing ethical understanding and inclusive teaching is not made clear.

Seah and Andersson (Chapter 10) offer an alternative view of diversity as potentially enriching students' learning rather than something to be viewed as problematic. They advocate the valuing of diversity of students' ideas and reasoning, experiences and cultures in order to optimise mathematics learning. Importance is attached to listening, openness, enjoyment, communication and discussion in order to make mathematics less threatening, less impersonal, more rewarding and open to all. How teachers respond to incidents where students offer alternative methods is seen as an important factor in developing their views of learners of mathematics. They argue that engaging with and explaining alternative methods, developing metacognitive awareness and valuing achievement contribute towards greater inclusivity. However, the authors' assertion that teachers' and students' values need to be aligned in order to optimise learning appears to conflict with arguments made elsewhere in the book that pre-conceived notions of mathematics and mathematics learning need to be challenged.

The third section 'Towards Inclusive Practices' offers further suggestions for teaching approaches that have potential for achieving greater inclusivity. However, contrary to what the title might suggest, it stops short of exploring classroom situations where such theories are put into practice. I was disappointed with the lack of evidence from classroom studies which might have been used to back up claims made by the authors about the benefits of the alternative teaching approaches advocated.

In this section, Bishop and Kalogeropoulos (Chapter 12) highlight how values and valuing are an essential component of re-engagement of students with mathematics. Teachers need to help students to value the importance of mathematics in the world by making it more meaningful, value the idea that mathematics is interesting by making it more enjoyable, and value certain ways of doing maths. The authors argue for a shift in focus from disengaged individuals to classroom conditions for learning and teaching that promote engagement. They advocate inquiry-based approaches, group work, a focus on higher-level thinking, encouraging students to take responsibility for learning and promoting 'mathematical wellbeing'.

The rationale for including Hopkins and de Villiers' study (Chapter 13) of misconceptions in early learning of addition is unclear. Their recommendation for adopting interventions targeted at meeting the needs of individual students appears to be at odds with the consensus amongst other authors that greater attention should be paid to social factors behind differences in achievement rather than individuals' deficits. Sullivan (Chapter 14), for example, focuses on structural factors inhibiting the learning of some students. He questions how schools might be organised to support the fundamental aim of the Australian mathematics curriculum to "...educate students to be active, thinking citizens" (p.240). He highlights how lower-attaining groups contain disproportionately large numbers of students from lower socio-economic groups, indigenous and rural backgrounds. He summarises the arguments for and against heterogeneous and homogeneous grouping, concluding that the way in which lower-attaining groups are taught differently is the biggest factor explaining the under-achievement of students in these groups. He describes a self-fulfilling prophecy in which teachers believe some students are less likely to learn, thus providing them with less opportunities to do so, accompanied by labelling and stereotyping. He argues for an alternative teaching model

based on building a communal classroom experience, greater use of open-ended tasks, using enabling prompts for students experiencing difficulties, extending thinking beyond the initial task and making hidden pedagogies explicit.

The detailed focus on different aspects of diversity and inclusion tackled in this book highlights the contribution made by researchers associated with Monash University towards debates in the field. Contributors include well-known names, such as Bishop and Askew, whose previous work in this field I have found interesting, useful and inspiring, as well as early career researchers and doctoral students. The book therefore provides something of a showcase for the institution. However, I can't help thinking that this is at the expense of further insight that might have been gained by drawing on a wider range of authors and perspectives. Whilst some of the authors have a range of international research experience, the book focuses primarily on the situation in Australia. This situation is shown to be in many ways unique, although many of the issues raised have relevance to other situations including that in England with which I am familiar. I would suggest the book is a valuable resource for educators and researchers worldwide. I am confident that, through developing an in-depth understanding of one particular case (Australia), the reader will gain significant insight into the general field of diversity and inclusivity in mathematics education. However, contrary to the claims of the book, because of the focus on describing the situation as it exists, rather than generating evidence on the effectiveness of alternative approaches, I am not convinced that teachers would benefit in the same way.

References:

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