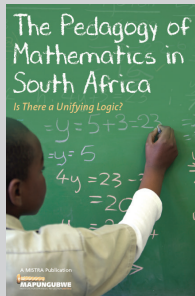


Pedagogical narratives in mathematics education in South Africa

**Book title:**

The Pedagogy of Mathematics in South Africa: Is There a Unifying Logic?

Book cover:**Author:**

István Lénárt; Patrick Barmby; Karin Brodie; Mellony Graven; Fritz Hahne; Stephen Lerman; Mogege Mosimege; Werner Olivier; Nicky Roberts; Anna Rybak Paul Webb and Nicky Roberts (Eds).

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Pedagogical narratives in mathematics education in South Africa

Reviewer:

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Introduction

The Pedagogy of Mathematics in South Africa: Is There a Unifying Logic? is an important book for anyone interested in how to accelerate the slow improvements in mathematics from Grade R to Grade 12 that are underway in South Africa. After reading the book I was reminded of this quote by Bélanger (1997) which, and I paraphrase, reminds us that:

[S]ocial development is synonymous with the capability of communities to take responsibility for their own development. In this regard, education is an indispensable tool for any country and its people to achieve social development in that it mediates young people to scientific concepts needed for social development. (p. 83)

This captures the message the editors intended with this book. The purpose of the book is elucidated as:

There is a well-worn tale of 'the crisis in mathematics education' in South Africa. While recognizing the crisis, this book attempts to articulate less commonly known narratives as to how our situation is in fact improving. Its specific focus is on mathematics pedagogy, which is interpreted in the broad sense of interaction between society and its values. Within that broad interpretation, the various chapters seek elements that may point to the way to develop a unified South African mathematics pedagogy, rather than a systematic review of current ideas and knowledge pertaining to the issue. (p. 20)

The central message of the book

To fully appreciate this book, it is important to first understand its background and genesis. During the Science Forum South Africa, which took place on 06–08 December 2017 at the Council for Scientific and Industrial Research (CSIR) Convention Centre in Pretoria, Mapungubwe Institute for Strategic Reflection (MISTRA) launched its research report on *The Pedagogy of Mathematics in South Africa: Is There a Unifying Logic?* as one of the forum's side events (University of Johannesburg, 2018). This book investigated the best pedagogical methods for nurturing of mathematical talent among young people. It studied how the pedagogy of mathematics has evolved in South Africa over time and assessed current approaches against best practice in successful domestic schools and in selected international case studies. It also commented on the impact of historical socio-economic and political relations on mathematics proficiency in our country.

Against this backdrop, this book presents an overview of the historical as well as the current position of teaching and learning of mathematics in South Africa. It poses the question whether there is (or should be) a unifying logic informing the way mathematics is taught and learnt. Chapters written by a number of eminent local and international mathematics teachers and researchers contribute ideas towards creating deeper understandings of mathematics, developing learners with productive mathematical identities, and ways of nurturing abstract reasoning. The sections focus the reader to understand the logic of the book:

- The introduction and overview are presented in Chapter 1.
- Chapter 2 is titled: Setting the scene.
- This is followed by section 3: International frameworks as levers for change (Chapters 3–5).
- Section 4 is titled: What South Africans are saying (Chapters 6–14).
- The book concludes by discussing cross-cutting issues and lessons learnt.

The different authors and their contributions will be elucidated in the course of this review.

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Key issues that emerged were the importance of teaching mathematics in a way that links to learners' concrete social environment, and the necessity for joint efforts on the part of government, unions and private partners. Chapter 1 and Chapter 2 provide the rationale, and this is elaborated in the other chapters. In addition, the book argues for the importance of teachers developing a deeper understanding of mathematics and of creating learners with productive mathematical identities, capable of making sense of mathematics in South Africa's diverse languages.

In the South African context social pedagogy takes a critical stance on the historical, structural and systemic issues that beset the education of the marginalised South African population. Thus, social pedagogy concerns itself with education, well-being and growth. This comes across in the opening chapters, which are written by the editors. In Chapter 1 they note that:

South Africa emerged from years of colonial domination with its first democratic elections in 1994. The immediate task was to unite the country around the programme of eliminating the vestiges of colonialism and creating an equitable society. A critical element of that ongoing effort is extending access to education and ensuring quality educational services. (p. 20)

In all, there are 15 chapters in the book which the reader may read sequentially or as self-contained papers, depending on the need for specific insights. The editors claim that the book is targeted at policy actors, policy implementers and other stakeholders in the education field. This suggests that education administrators, researchers as well as teachers are the intended audience. Teachers may wish to read Chapter 1, in order to get an overview of the central problem that is at the core of this book and interventions by various role players in the search for workable solutions. They may then selectively read other chapters in which they may have an interest. There is no need to read the chapters sequentially, besides taking cognisance of the division into sections in which chapters may address a given thread. More of this later in the review.

Critique of the title

The title may be somewhat misleading for the lay person in that it may suggest to teachers that it is narrowly about teaching and learning in the mathematics classroom.

The question 'is there a unifying logic?' is a quest by the editors to add to the debate surrounding the crisis that faces mathematics education in South Africa. Thus, by inviting a number of accomplished academics and researchers in the field of mathematics education to contribute chapters in the book, they seek to find 'resonances', in other words a common thread in the South African discourse aimed at solution-seeking interventions to improve the teaching and learning of school mathematics. In this regard they also pursue international perspectives as potential levers of change (Chapter 3 by Stephen Lerman, Chapter 4 by Fritz Hahne and Chapter 5 by István Lénárt and Anna Rybak).

However, given the suggested target audience, namely policymakers and policy implementers, the gap in the discourse is the voice of teachers. The editors missed the opportunity to highlight the challenges faced by teachers in terms of a very dense or overfull curriculum and its support mechanism in terms of a very prescriptive 'pace setter' or 'annual teaching plans'. This flawed mechanism, although well intended, has the unintended consequence of reducing curriculum delivery to curriculum coverage (see a related comment by Venkat on page 155: 'the pace of teaching may well outstrip the pace of learning'). Furthermore, the book is silent about the intended, delivered and assessed curricula in the South African context.

Despite this absence of the voice of the teachers the book is a compelling read for the serious student of mathematics education, be they an academic, administrator or classroom practitioner.

The section called 'International perspectives as potential levers for change' is included to provide lessons from international research that may assist South Africans in their quest for transformation and improvement. This section draws on international perspectives on mathematics education and is followed by a section called 'What South Africans are saying', which is authored by Patrick Barmby. This author worked both in an international as well as the South African context and has an in-depth understanding of issues at both levels. He especially focuses on the preservice and in-service training needs of teachers.

The section that follows presents the voices of South African academics in the field of mathematics education and is complemented by a chapter on ethno-mathematics by Mogege Mosimege. He surveys this genre as it applies to the teaching and learning of mathematics in South Africa. Mosimege is arguing for acknowledging indigenous knowledge systems as well as cultural artifacts that may serve as starting points to introduce mathematical concepts. He provides a number of examples of how this could be done.

There is a chapter on visualisation in the mathematics classroom by Marc Schäfer, a chapter by Werner Olivier on a techno-blended approach and two chapters on language issues – a chapter by Paul Webb and a chapter by Lindiwe Tshuma. Mellony Graven, in Chapter 8, foregrounds homework as a practice that can support student learning.

An important observation made is that visualisation processes are critically important in both teaching and learning of mathematics in actual classrooms. The issue of e-learning gained traction in both national and provincial education departments and the technology blended model (Olivier, p. 205). The technology blended model described in this book offers many pointers to possible ways to make resources available offline. This is an important consideration

given the challenge of internet access, especially in the deep rural areas of the country.

Karin Brodie (Chapter 9) speaks to the impact that teachers' actions have on learning by the students. She also highlights other important areas of mathematics teaching such as:

selecting rich mathematical tasks that support learners to develop key mathematical concepts, problem solving strategies and productive dispositions ... and being sensitive to learners' mathematical errors in ways that are generative for developing disciplinary knowledge. (p. 238)

The chapters on language issues in the mathematics classroom make for interesting reading. The authors lean heavily on the works of researchers in this field especially the South African academics such as Adler and Phakeng (Phakeng, 2016; Phakeng & Essien, 2016). In this regard Tshuma, in Chapter 14, takes the perspective that language is a resource and takes lessons from her doctoral research to highlight linguistic features that influence mathematics teaching and learning in the middle grades. The authors then suggest pedagogical strategies for improving the mathematics register, that is, the evolving vocabulary that teachers and learners use in the classroom, and to minimise lexical ambiguity in mathematics classrooms. Related to this is Mosimege's chapter (Chapter 10) making a plea to teachers to:

regard their classrooms activity as part of the efforts of Africans engaged in the formidable task of reclaiming their heritage and restoring African pride in attaining mathematical knowledge. (p. 235)

The concluding chapter by Webb and Roberts considers cross-cutting issues and lessons learnt in order to answer their opening question, taken up in the title of the book: 'is there a unifying logic?' In this chapter they explore resonating themes from the preceding chapters that relate to the affordances and hindrances existing in the mathematics education landscape, as it is relevant to the teaching and learning of school mathematics. They define what they mean by a unifying pedagogy and then proceed to suggest three pillars on which this may be constructed. They encourage teachers to:

work with a curriculum of engagement. A curriculum of engagement is premised on learners and teachers developing positive disciplinary identities and making connections with real life socio-cultural experiences, with one of the key factors being a teacher who believes that their learners can do mathematics. (p. 254)

In the current project I am involved in, namely the local evidence driven improvement of mathematics teaching and learning initiative (LEDIMTALI), we promote a similar notion of 'mathematicalness'. This is an important ongoing task of teachers. They have to create learning environments where learners engage with each other and with mathematics in order to deepen mathematical thinking in relation to the problems they attempt to solve in the classroom. This needs to be ecologically relevant in terms of the sociocultural context of the learners.

My conclusion after reading the book is that there are common threads or resonances that come through in the book. This especially relates to the conclusions that:

- Educational change and improvement are incremental, and demand focused and sustained effort involving all stakeholders.
- Teacher development and support is an essential element in the process.
- Resource development and provisioning support the process.
- Technology integration has the potential to enhance the process.
- Lessons learnt in research need to be embedded in practice.

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