

Editorial

Primary mathematics: Addressing the crisis

Primary mathematics in South Africa continues to be described as being in a state of crisis (Fleisch 2008). Performance on standardised assessments – in the Annual National Assessments (ANA), and other regional or international comparative tests – shows patterns of performance in which the majority of learners find it difficult to achieve even basic levels of competence. In recent years, policy attention has shifted back to the primary years, with the introduction of the Foundations for Learning (FFL) campaign in 2008, with its associated termly ‘milestones’ based curriculum, and the introduction of the ANAs linked to this curriculum specification.

The new Curriculum and Assessment Policy Statements (CAPS) entrench this prescription of coverage with the provision of work schedules detailing content, sequence and pacing on a weekly basis.

A key argument for the need for increased prescription of content is evidence of poor mathematical content knowledge and pedagogic content knowledge among primary teachers (Taylor & Vinjevd, 1999; Adler & Reed, 2002; Carnoy et al., 2011). Evidence continues to point to a lack of articulation between the levels of content advocated in the curriculum and learner performance, and between the images of pedagogy presented in policy and research, and teaching on the ground. Such mismatches lead to the need for methodological and theoretical developments, as well as interventions that are better tailored to contextual conditions.

In this context, a range of policy as well as research and development initiatives with the focus on primary mathematics are underway in South Africa. The Department of Higher Education and Training has instigated a programme of capacity development for Foundation Phase teacher education under the auspices of the Strengthening Foundation Phase Teacher Education Programme, involving projects at twenty South African universities. In addition, there are two Numeracy Chair projects focused on research and development in primary mathematics. Provincial Departments of Education are supporting a range of projects focused on improving primary mathematics performance – the Gauteng Primary Literacy and Numeracy Strategy being one example.

The combined effect of these multiple initiatives is significant research work within the primary mathematics terrain. It needs to be noted that the ‘crisis’ in performance in South Africa is by no means an isolated one, with ‘flat learning profiles’ across Grades noted in other developing countries (Pritchett & Beatty, 2012). In their work, Pritchett and Beatty raise concerns about curriculum formulations in these contexts, arguing that content-laden curricula may push towards a coverage orientation that pays inadequate attention to learning within the pressure for completion.

Articles in this Special Issue on primary mathematics range across a variety of issues flagged in our opening sections, drawing on prior work in the South African and international terrain. Curricular content for well-connected primary mathematics learning is the focus of Mike Askew's article, drawing on literature dealing with the content that links to both 'big' conceptual ideas in mathematics, and the nature of cognition, bringing in considerations related to learning. Commentary on CAPS, in relation to ideas about what might constitute deep and coherent mathematics learning, figures within Askew's chapter. Curriculum analysis focused on shifts in the teacher identities promoted in CAPS Foundation and Intermediate Phase formulations, drawing on Bernsteinian tools and comparisons with prior rounds of reform in South Africa is presented in Peter Pausigere and Mellony Graven's article. Jaamia Galant's paper continues the focus on CAPS and probes whether the shift to a more tightly specified curriculum with greater exemplification and guidelines for teachers has enhanced teachers' ability to select and sequence mathematical tasks for the classroom.

Attention shifts to assessment in the national policy landscape in Maria Weitz and Hamsa Venkat's article. Comparing learner responses on a Grade 1 ANA paper with their responses on an oral-feedback diagnostic early number test, they analyse reasons for discrepancies in performance, providing insights into the national pattern of declining performance across the primary years in mathematics.

Several articles in this issue focus on primary mathematics teaching and learning. Cheryl Bleeker, Gerrit Stols and Sonja van Putten focus on the teaching of geometry in one primary school. They analyse the ways in which snapshots of teaching across Grades provide insights into patterns of learner performance. The reintroduction of geometry into the Further Education and Training Phase within CAPS implementation makes this study timely – as fundamental geometry understandings need to be in place by the end of primary schooling to support the more formal geometric reasoning involving definitions and proofs in high-school geometry. Debbie Stott and Mellony Graven examine the assessment of fluency in early numbers with young learners – and deal not only with the pictures of performance that they are able to track, but also with ways in which their assessments are experienced by young children. A holistic concern with assessment formats that support learning, rather than summatively reporting on performance, lies at the heart of their analyses.

Fluency is also the focus in Sarah Bansilal's article, with multiplication in this instance. In her study, a theory-driven approach is used to understand the ways in which a child's encapsulations, or lack thereof, of prerequisite skills, hinder progress with current learning.

Noor Ally and Iben Christiansen survey Grade 6 mathematics teaching in 30 lessons, examining how teaching supports openings for learning associated with Kilpatrick, Swafford and Findell's (2001) strands of mathematical proficiency. Their findings, linked to broader literature on mathematics teaching in South Africa, point to broad prevalence, but relatively low-level teaching for procedural fluency,

combined with fewer occurrences of teaching that provides opportunities for learning related to the other strands. Nithi Muthukrishna presents evidence of teaching and learning in American Samoa in the context of an intervention that is framed by a highly structured pedagogy. She notes ‘quick successes’ at the level of improving learner performance in a context where significant gaps in content knowledge and pedagogic content knowledge have been identified, and points to the potential of highly prescriptive instructional plans for the South African context.

A final group of articles are concerned with issues relating to primary mathematics teacher knowledge and understandings, and teacher development. Drawing on data from a teacher development project, Elizabeth Henning focused on understanding the underpinning model of cognitive development that underlies an early number diagnostic test. She notes that initial teacher comments about Foundation Phase mathematics teaching are saturated with reference to curriculum rhetoric underpinned by rhetoric associated with constructivist ideas at a general level. She also points to the absence of attention to learner cognition. Using literature to argue the case that ‘content’ in Foundation Phase teacher education ought to centre on teacher knowledge of learner cognition in mathematics, data is presented that indicates fledgling shifts towards these understandings. Her data points to the fact that supporting such shifts is not straightforward.

Sharon McAuliffe and Fred Lubben, and Ulla Runesson both present data with a more central focus on teachers’ ways of handling specific mathematical content in lessons, as part of their participation in mathematics teacher development activity. In the McAuliffe and Lubben article, the empirical focus is on a pre-service BED teacher’s handling of a task focused on early algebra in Grade 3. The paper’s emphasis is theoretical – and points to the ways in which different theories focused on primary mathematics teacher knowledge illuminate different aspects of the pedagogic practice seen in the focal lesson. Runesson shares analysis of teacher learning in the context of a teacher development model that is referred to in the Swedish tradition as ‘Learning Study’. Borrowing the format of Japanese lesson study and adding variation theory as an explicit theoretical underpinning to this work, Runesson describes the shifts in teachers’ identification of critical features of the ‘object of learning’ – related to moving between word problems and algebraic expressions – in this study. The potential of this kind of collaborative model of learning driven by paying close attention to teaching is discussed in her study.

A concern with the importance of teaching for mathematical learning permeates the articles in this Special Issue. Curriculum and assessment, teacher beliefs, teacher education models and the conditions in which teaching occurs all figure within the possibilities for teaching for learning. These articles work across some of this tapestry, and provide a range of interesting insights into a shifting primary mathematics terrain – but one that is shifting now not merely on the basis of curriculum reform, but also on the basis of a broad range of initiatives directed at multiple levels of the education system – learning directly, via the introduction of national workbook

schemes, teaching via a network of interventions focused on curriculum, assessment and supporting pedagogy directly through training and development, and in- and pre-service teacher development programmes.

We have enjoyed reading the submissions for this Special Issue, and interacting with the authors. The articles have provided insights into, and tools for reflecting on our own work in primary mathematics teacher development and research. We have worked hard to make the submission process a supportive and constructive one. Our thanks to all reviewers of articles and to the Editorial team at Perspectives for their support. Above all, we look forward to further engagement in the field with practitioners, policymakers and academics with interests in the field of primary mathematics.

References

- Adler J & Reed Y (eds) 2002. *Challenges of teacher development: An investigation of take-up in South Africa*. Pretoria: Van Schaik.
- Carnoy M, Chisholm L & Chilisa B (eds) 2011. The low achievement trap in middle-income countries: Comparing Botswana and South Africa. Draft report, Stanford School of Education, Human Sciences Research Council and the University of Botswana.
- Fleisch B 2008. *Primary education in crisis - Why South African schoolchildren underachieve in reading and mathematics*. Cape Town: Juta.
- Kilpatrick J, Swafford J & Findell B 2001. *Adding it up: Helping children learn mathematics*. Washington, DC: National Academy Press.
- Pritchett L & Beatty A 2012. *The negative consequences of overambitious curricula in developing countries*. Washington DC: Centre for Global Development.
- Taylor N & Vinjevd P 1999. *Getting learning right. Report of the President's education initiative research project*. Johannesburg: Joint Education Trust.

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Hamsa Venkat & Lynn Bowie
(*guest editors*)