Mathematics education research in South Africa – a review and critical reflection

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Our goal

To build from the 2000 – 2006 survey on mathematics (and science) education research in SA, through

• a survey of research in mathematics education published 2007 – 2015

• to consider and critically reflect on how our field is growing and in what directions.
Overview of presentation

1. What were key questions, foci and findings in the 2000 – 2006 review, and proposed agenda for going forward?

2. What did we do in the 2007-2015 review?

3. What findings, and their relation to the 2006 review and proposed agenda?

4. What else did we see and find important to present and reflect on?
   - “new”, “emerging” journals and marketisation of publishing
1. 2000 – 2006 review

AJRMSTE

Special issue

2009
Key questions

• Concern with state and status of research in mathematics and science education in South Africa
  – What is being done (research priorities), how, by whom, where ...

• In particular research-policy-practice relation
  – Does our research influence policy? How does it speak to practice?
  – Different communities, interests, priorities, discourses
    – What is our role (as researchers and teacher educators) in (re) building mathematics education, particularly in SA but also across our countries?
    – How does our location in universities both facilitate and impede an active and fruitful role?
Journals surveyed for maths review

Local journals
- Pythagoras
- Journal of Education (JoE)
- Perspectives in Education (PiE)
- South African Journal of Education (SA JoE)
- South African Journal of Higher Education (SAJHE)

International journals
- Educational Studies in Mathematics (ESM)
- For the Learning of Mathematics (FLM)
- Journal for Research in Mathematics Education (JRME)
- Journal of Mathematics Teacher Education (JMTE)
- Mathematics Education Research Journal (MERJ)
- Journal of Curriculum Studies
- Journal of Education for Teaching: International Research & Pedagogy

What was not reviewed
- Books and book chapters
- Conference proceedings (refereed too)
- ‘Other’ published research reports e.g. CDE, SA TIMSS
- ‘many other’ journals, some maths ed might be in these, many international (e.g. Curriculum, teacher education, educational research, education development and many others)
Number of papers reviewed 2006
Total=150

125 and so more than 80% of the 150 publications are published in local journals; Half of these in Pythagoras.

Local Maths Education Journals: 88
Local Education Journals: 37
International Math Education Journals: 25

Pythagoras 63
AJRMSTE 25

(Rollnick, Adler & Setati, 2009)
Findings: clusters

• Curriculum reform and implementation
  – IKS, relevance in mathematics
  – Learner centred practices
• Teacher education
• Language - Multilingual learners and learning context

Reminder (and reflection) of context
Findings and research agenda

Connections

– Access and equity the overarching driver
– While qualitative and small scale studies predominate, they do connect (e.g. relevance and language: and both with curriculum reform – and so links with policy and practice)
– and so accumulate
– With international research

Gaps

– Large scale
– Primary, tertiary
Findings and research agenda

Qualitative bias
- strengths (practice)
- weaknesses (policy e.g. language)

Dominance of secondary level, urban studies
- a function of location of researchers – “transformation”
- a problem given “mismatch between learner levels ... and curriculum demands ... in late primary and early secondary”, and in rural settings

Impact
- Points to need for quality (valid) assessment items, processes
Established, thriving, connected, communities with concerns for access and equity and impact on policy and practice that are also fragile
2. 2007-2015 Review

What did we do?
Current context – some comments

- From curriculum reform (policy implementation) and a transformation agenda (access, equity)
- Performance and quality within and equity agenda

Within an increasingly financially constrained and higher education context
Questions guiding the review

• Has the research community continued to grow?
  – In what ways?
  – Is it still ‘fragile’?

• Have the foci and questions changed?
  – In what ways? What is the same? Different?

• What is being done (research priorities), how, by whom, where ...

• Does our research influence policy?
  How does it speak to practice?
  – Different communities, interests, priorities, discourses

• What is our role (as researchers and teacher educators) in (re) building mathematics education, particularly in SA but also across our countries?

• How does our location in universities both facilitate and impede an active and fruitful role?
The scope of the review

Peer reviewed research papers 2007-2015

- International mathematics education research journals
- National/regional (local) – both mathematics education and general education

Again – selection - not full comprehensive review
# Journals – overview 1

<table>
<thead>
<tr>
<th>Publication Title</th>
<th>No. of articles: 2007-2015</th>
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<tbody>
<tr>
<td><strong>International Maths Education</strong></td>
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<td>Educational Studies in Mathematics (ESM)</td>
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<td><strong>National Regional Maths education and General Education</strong></td>
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<td>Pythagoras</td>
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<td>AJRMSTE</td>
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<td>Education as Change</td>
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<td>South African Journal of Education (SAJoE)</td>
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<td>Perspectives in Education</td>
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<td>Journal of Education, Natal</td>
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<td>South African Journal of Higher Education</td>
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<td><strong>Total</strong></td>
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150 over 7 years  
285 over 9 years  

*More and special issues, New journals,*
Journals – overview 2

% of papers to journals

- Pythagoras & AJRMSTE 57%
- Gen Ed National 27%
- International 16%

Similar to 2000-2006 distribution
What was ‘captured’ for analysis

- Author(s) and affiliations (who and where)
- Title and year
- Problems and methods (what and how)
- Participants (Teachers, Learners, other e.g. textbook)
- Focus - level (primary, secondary, tertiary)
  - topic (specific?)
- Results/main argument/findings

Spread?

Policy implementation? Qualitative?

Is gap closing?
3. 2007–2015 review

What did we find?
### Authors 1: Affiliations

<table>
<thead>
<tr>
<th>SA Universities/institutions</th>
<th>1st author</th>
<th>all/total</th>
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<tr>
<td>University of the Witwatersrand</td>
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<tr>
<td>Walter Sisulu University</td>
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Research universities dominant
Universities with large mathematics education departments and undergraduate teacher education programmes – more researchers

Greater spread of institutions and authors – growing community
Authors 2: (Co)Authoring

% of papers to # of authors

- 6 and more authors: 2.8%
- 5 authors: 2.1%
- 4 authors: 3.5%
- 3 authors: 18.9%
- 2 authors: 34.7%
- 1 author: 37.9%

More collaboration
Authors 3. Int’l Collaboration

Looking ‘North’

Numbers of Some of Int’l Universities - Collaboration

- Africa: 5
- Asia: 2
- Australia & New Zealand: 4
- Europe: 21
- North America, Canada & Mexico: 5
- South/Latin America: 1

UK, [VALUE]
Methodology

% of papers and methodologies used:
- Quantitative: 16.8%
- Qualitative: 48.8%
- Mix: 18.9%
- Theoretical: 12.3%
- Advocacy: 2.5%
- Other: 0.7%

Qualitative still dominant; some mixed; advocacy?
Participants

45% of all our research is focused on teachers (or T&L)
Participants - Level

Secondary still dominant, but emergence of primary

% of teachers & learners targeted in papers

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<th>Teachers (T)</th>
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<td>Secondary</td>
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<td>Primary</td>
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<tr>
<td>Secondary</td>
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<tr>
<td>Tertiary</td>
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<td>Total</td>
<td>100</td>
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Maths topics

% of topics in research

Primary

PCK papers largely in here; attitudes;

Calculus: 6.1
Number: 13.9
Algebra: 10.3
Geometry: 9.4
Probability & Statistics: 5.5
Mathematical Literacy: 5.5
NMT (NO Maths Topic): 47.7
Trigonometry: 0.6
undergraduate mathematics: 1.0
Teachers 1. Identity, Knowledge, Teaching

% of papers target Identity, Knowledge, Teaching

- I: 13
- K: 54
- T: 24

Focus on teachers’ knowledge
Teachers 2. PCK/SMK

% of papers target PCK & SMK of teachers

- PCK: 65%
- SMK: 16%
- SMK/PCK: 6%
Teachers 3. P/S

% of papers target Primary / Secondary Teachers

- P: 15
- P/S: 17
- S: 52
Growth? Changes?

• Quantitative growth – community further established and expanded

• Similar patterns – dominance of
  – Local publications
  – Secondary
  – Small scale
  – Research universities ... BUT

• Emergence of primary and some tertiary

• Greater emphasis on teachers’ knowledge, particularly PCK, reduced emphasis on ‘relevance’, ‘learner-centredness’, shift to more emphasis on learner thinking
Tentative explanations

• Shifting context – reform to performance (and focus on teachers’ knowledge)

• New Chairs in Primary Mathematics

• Location of researchers in universities and in teacher education

• Limited (though increasing) reputable international journals, and limitations e.g. time lag
Our challenge

• Has qualitative growth accompanied quantitative growth

• What criteria do we use to answer this? Who decides?

• What is the purpose of our research? Who? What is it for?
4. What else did we “see”

And reflect on?
Our location, pressures to publish

- Other ‘emerging’ international journals
- Awareness through special issues notifications, review processes (promotions, NRF rating, job applications)

A Story

Predator conferences and publishers on the increase
- Some completely bogus
- Some “suspect”
- Market response to our pressures – driven by profit
Our location, pressures to publish

- Other ‘emerging’ international journals
- Awareness through special issues notifications, review processes

2014 & 2015 (2 years)

International journal of educational science (IJES)
35

Journal of Communication (special issue language)
9

Total 44

General educ journal – not only maths - large number of issues per year and apers per issue

Same publisher

Special issues and increasing number of issues per year

Now monthly; with up to 20 papers an issue

Contrast with Pythagoras 98 and AJRMSTE – 65 in 9 years
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Methodology

% of type of methodology in OJ

- Quantitative: 15.9%
- Qualitative: 63.6%
- Theoretical: 4.5%
- Advocacy: 9.1%
Our challenge

• Has qualitative growth accompanied quantitative growth

• What criteria do we use to answer this? Who decides?

• What is the purpose of our research? Who? What is it for?
Questions

• Time lag with review and revision process in many journals including local journals ...

• Gate-keeping and exclusionary
Our purpose is to

- influence policy and practice
- through rigorous, credible research
- influence the international terrain

And so our question then is how do we work to not become victims of predatory practices, but rather agents in improving our field?