Focused initially on sharing FP early number sense/mental maths tasks and ‘structured’ resources. Developed a workshop/demo/observe lesson starters model 3 times/year for discussing and sharing these tasks and resources.

In 2013, post-observation individual and Grade level feedback added.

2011 baseline learner number sense interview assessments conducted in G2. Repeated in 2014 in G2 again.
## LSP: Interim learner test results, G2

<table>
<thead>
<tr>
<th>SEAL Stage</th>
<th>2011 (%)</th>
<th></th>
<th>2014 (%)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=238</td>
<td>N=60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 (Emergent count)</td>
<td>11.8</td>
<td>3.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Perceptual count)</td>
<td>23.5</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>38.7</td>
<td>28.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 (Initial number seq)</td>
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<td>46.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 (Intermed number seq)</td>
<td>5.5</td>
<td>6.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 (Facile number seq)</td>
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## LSP: Interim learner test results, G2

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- Count all or less sophisticated methods: 73.9%
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Count all or less sophisticated methods: 73.9%

Count on or more sophisticated methods: 52.4%
<table>
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<tr>
<th>LFIN Stage</th>
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<tbody>
<tr>
<td>0</td>
<td>Cannot count visible items</td>
</tr>
<tr>
<td>1</td>
<td>Can count items that are seen, heard or felt</td>
</tr>
<tr>
<td>2</td>
<td>Can count items in screened collections by visualising. Counting often involves ‘counting all’</td>
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<tr>
<td>3</td>
<td>Uses ‘count on’ for addition problems &amp; ‘count down from’ but not ‘count down to’ for subtraction problems</td>
</tr>
<tr>
<td>4</td>
<td>Can use ‘count-down-to’ for subtraction sums where appropriate depending on the sum</td>
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<td>Fluencies and strategies</td>
<td></td>
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<td>--------------------------</td>
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<td>Uses 'count on' for addition problems &amp; 'count down from' but not 'count down to' for subtraction problems</td>
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<tr>
<td><strong>4</strong></td>
<td>Can also use 'count-down-to' for subtraction sums where appropriate, e.g. 17 - 14 vs 17 - 5</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>Uses a range of 'non-count-by-ones' strategies, alongside seeing addition &amp; subtraction as inverse operations</td>
</tr>
</tbody>
</table>

---

**Fluencies:**
- Applicable to whole example space

**Strategies:**
- Applicable to sub-spaces
Development task for Stages 4 and 5

Which sums should we switch around?

- 7 + 15
- 13 + 4
- 2 + 7
- 18 + 5
- 3 + 14
- 2 + 14
- 14 + 5
- 6 + 15

What connects all the sums that you have switched around?
20-day ‘primary maths knowledge for teaching’ course

- Numbers attending up year on year (2012 – 33; 2013 – 37; 2014 – 41)
- Median score increase from pre to post-test (focused on content knowledge) without teaching to the test (2012 – 48% to 62%; 2013 - 42% to 58%)
- Possible to improve primary maths content knowledge
Representational shifts

- **Pre test**

1 litre of petrol costs R10.75

Provide a method AND an explanation for working out the costs of:

a) 3 litres of petrol

\[
\begin{align*}
10.75 \\
10.75 \\
10.75 \\
\hline
32.25
\end{align*}
\]

R32.25

17/37 correct answers
Representational shifts

Post test

Provide a method AND an explanation for working out the costs of:

a) 3 litres of petrol

<table>
<thead>
<tr>
<th>1 l</th>
<th>2 l</th>
<th>3 l</th>
</tr>
</thead>
<tbody>
<tr>
<td>R10,75</td>
<td>R21,55</td>
<td>R32,25</td>
</tr>
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Cost: R10,75, R21,55, R32,25

I have shown my answer on a ratio table: 1 l = R10,75
and two l will be R10,75 + R10,75 = R21,55
and 3 l will be R10,75 + R10,75 + R10,75 = R32,25

b) 0,53 litres of petrol

This is a repetition addition.

31/37 correct answers
Flagship projects focused on teaching

**Mathematics teaching**
- Lesson starters project
  - Initial focus on provision of tasks/resources for number sense & mental maths

**Teachers’ mathematical learning**
- 20-day course – MKfT
  - Focus on connecting between representations & explanations (MDI)
Theorizing teacher change, ground up and inclusive of context

<table>
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<tr>
<th>LSP – artefact mediation</th>
<th>20-day course – MDI mediation</th>
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<tr>
<td>□ No structured A presence</td>
<td>□ No MDI/error-laden MDI</td>
</tr>
<tr>
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<td>□ MDI that connects with the concept</td>
</tr>
<tr>
<td>□ Well-structured A presence</td>
<td>□ MDI that connects with the concept &amp; pulls towards generality/ more domain specific cognitive functioning</td>
</tr>
<tr>
<td></td>
<td>□ MDI that connects with concept, pulls towards generality &amp; works in the zpd of class</td>
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Level 1 – Artefact mediation

LSP – artefact mediation

- No structured A presence
- Structured A presence
- Well-structured A presence
  (in example sequence that pulls towards generality/more domain specific cognitive functioning)
- Well-structured A presence
  (in example as above, that works in the zpd of class)
Theorizing teacher change, ground up and inclusive of context

20-day course – MDI mediation

- No MDI/error-laden MDI
- MDI that connects with the concept
- MDI that connects with the concept & pulls towards generality/ more domain specific cognitive functioning
- MDI that connects with concept, pulls towards generality & works in the zpd of class

Half of 26:
Each pair in the class is asked to make 26 balls from clay – which they do. The teacher’s explanation proceeds thus: ‘I want us to count to 13, and move those balls aside. How many balls are on the other side? 13 as well. So 13 is half of 26.'
Theorizing teacher change

MDI take up: 20 day course

Artefact take-up: LSP project

Examining change 2011 to 2014 (G2) teaching of additive relations
Theorizing teacher change, ground up and inclusive of context

LSP – artefact mediation
- No structured A presence
- Structured A presence
- Well-structured A presence (in example sequence that pulls towards generality/ more domain specific cognitive functioning)
- Well-structured A presence (in example as above, that works in the zpd of class)

20-day course – MDI mediation
- No MDI/error-laden MDI
- MDI that connects with the concept
- MDI that connects with the concept & pulls towards generality/ more domain specific cognitive functioning
- MDI that connects with concept, pulls towards generality & works in the zpd of class
Discussing Lessons – Big Books word problems projects

- Two Masters studies: one G4 additive relations; one G6 multiplication, both based on Askew’s ‘Big Books’
- Paired working on carefully structured word problems, teacher-led whole class discussion of structure, models and strategies, individual working on a set of problems, whole class discussion of similarities in structure and effectiveness/efficiency of models/strategies
- Pre- and post-tests; 6 intervention lessons
- Improvements in both; more extensive in G6 multiplication study
Emmanuel Dlamini’s G6 mult study
Leveraging mid-level scale

- Case studies of ‘telling cases’ – based on multiple observations:
  - ‘extreme localization’
  - problems with the ways in which mathematics is held in Foundation Phase (SCK rather than CCK issues)

- Contributing to the national policy and primary maths teacher education landscapes
  - large proportions of Grade 6 teachers with CCK below Grade 6 level & problems with proportional reasoning
Teachers’ affective response shifts

When I went to college, I didn’t take maths for the fear that I can fail in college. Because of the fear of maths which most of us have, I therefore took art at college. In 2011 when I enrolled into ACE program I didn’t take maths, I was still having the fear of maths. But with the course that we did – Wits maths connections course is good, it improve my own knowledge of maths and more tangible ways of teaching maths. If I’m giving an option now, I will definitely take maths because I think I’m more confident in maths especially teaching maths at the level I’m teaching now.

Teacher knowledge change

Teaching practice change

Learner change
Broader research and development activity

Research

- Contributing to debates and development on primary maths in-service teacher development (AMESA Maths Teacher Education panel and SIG)
- Ongoing Teacher articles, I Hate Maths seminars, building platforms and collaborations

Development

- GIZ international study on Numeracy Teaching and Teacher Education (with Mellony Graven)
- ICMI international primary maths study on Whole Number topics, teaching and assessment (Committee member)
Intervention models with promise and follow-up

- LSP > tasks and artefacts
  - Packaging tasks incorporating structured artefacts into user friendly formats
  - Teacher tasks for MDI development for move into strategies
- 20 day course > devising focused and abridged packages for broader trialing with FP and IP phase/subject advisers
- Big Books model > further single case trials incl HL trials in FP, and then move to multi-class/multi-school trials
Scale up requirements

- Looking for insights from Chairs mid-level scale, and linking these to insights from case studies and larger scale interventions
- Multiple single case trials, expanding to multiple case and larger scale trials where possible
- Looking beyond ten schools, and building partnerships for broader trials in the field – with disciplinary expertise from us and larger scale trial expertise and external funding from partners
- Want careful evidence-led policy development through scaled up trial sequences rather than ‘ear of government’ influence
Thanks to a wonderful team!
With lots of graduations!

Thulelah Takane –
M Ed 2012
PhD - 2013
More graduations!

Herman Tshesane
B Sc Hons 2012
MSc 2013
PhD 2014

Marie Weitz
MSc 2012
PhD 2014
And more!

Quinton Nam
B Ed Hons
2012
M Ed 2014

Samantha Morrison
M Ed
2012
PhD 2013
And even more

Michele Alexander & Gift Cheva, graduated M Ed 2013
Great admin support

Nomonde Mda &
Lorraine Thlwaele
And further...