EXPLORING FRAMEWORKS FOR IDENTIFYING LEARNING DISPOSITIONS: THE STORY OF SAKI
Diliza Hewana & Mellony Graven (Rhodes University)

SAARMSTE conference, January 2015, MAPUTO
• A hub of mathematical activity, passion and innovation
• Interconnected communities of practice

- Partnership between in-service teachers, staff in Chair, key partners of the Chair
- Meet regularly & work collaboratively to address objectives from a classroom practice based perspective

- Seminars
- Teacher centre
- ICT support
- Field trips
- Class visits
- Fun math
- Action research
- Exchange
- Leadership

- Seminars & research
  - Colloquia
  - Writing camps
  - Research projects
  - Research outputs

- Family events
- Maths clubs
- Learner events

- Grahamstown Community
- Sustainability

- Based on active engagement of research participants in numeracy research
- Include post graduate students, teacher researchers & lecturers & professors
Development initiatives:

- NICLE (teacher development)
- Maths Clubs
- Sci-Fest
- Family maths
- General buzz & public awareness
**Conceptual Understanding**: Comprehending mathematical concepts, operations, and relations - knowing what mathematical symbols, diagrams, and procedures mean.

**Procedural Fluency**: Carrying out mathematical procedures, such as adding, subtracting, multiplying, and dividing numbers flexibly, accurately, efficiently, and appropriately.

**Strategic Competence**: Being able to formulate problems mathematically and to devise strategies for solving them using concepts and procedures appropriately.

**Adaptive Reasoning**: Using logic to explain and justify a solution to a problem or to extend from something known to something not yet known.

**Productive Disposition**: Seeing mathematics as sensible, useful, and doable - if you work at it - and being willing to do the work.

Enabling the research and development dialectic

Project team space for trialing directly with learners without large class challenges

Interest growing way beyond NICLE

Workshops for schools and development centres

Workshops at conferences (AMESA & SARAECCE)

Continually updated website support
Club Foci

- Strengthening foundations
- Extending and challenging
- Individualised attention
- New dispositions & confidence
- Talk
- Experimentation
- Fun

Learning is fun – join the club
Focus on shifting dispositions

Thomas & Brown (2007, p.8)

“Dispositions involve ‘attitude or comportment’ toward the world, generated through a set of practices which can be seen to be interconnected in a general way…. dispositions are not descriptions of events or practices; they are the mechanisms that engender those events or practices. In short, dispositions capture not only to what one knows but how he or she knows it; and not only the skills one has acquired, but how those skills are leveraged.”

Shifting towards:

- Explorative engagement
- Individual sense making
- Resilience & steady effort
- Willingness to engage with others and the world mathematically
- Mathematical confidence to try and retry - to expose and explore ideas
**Indicators (theory generated) of a productive disposition?**

**Kilpatrick et al.’s (2001) indicators of a productive disposition**

- Tendency to see sense in maths
- Perceive it as both useful and worthwhile
- Believe steady effort pays off
- See oneself as effective and doer of maths (not in C&C)

**Carr & Claxton’s (2002) 3 dimensions of disposition**

- Playfulness - Links to ‘resourcefulness’ - conceptual/explorative understanding
- Resilience - links to steady effort
- Reciprocity - willingness to engage with others (not in K et al.)
A PRODUCTIVE DISPOSITION is:
- See sense in maths
- See it useful & worthwhile
- Believe steady effort pays off
- See oneself as effective learner and doer of maths
What is the nature of student learning dispositions and how do they evolve in after school mathematics?

* Qualitative research
* Empirical field one club with 6 learners - MG as facilitator (ethical permissions)
* Dispositional interviews
* Task based interviews
* Video recordings of club sessions
* Journal
* Teacher comments/ assessment results
Figure 1: An instrument for accessing mathematical learning dispositions (Taken from: Graven, 2012, p.55)
What is the nature of Saki’s mathematical learning disposition?

What adaptations/elaborations of existing dispositional instruments and analytical tools are required to better access and assess learner dispositions such as Saki’s?
10 years old and in Grade 3
English Afrikaans medium ex HOR school - Afrikaans home language
Always early for club and eager
Does the most homework in ‘number sense books’
Shy and soft spoken but attentive and eager to please
If number range is too big – guesses e.g. 2 + 98 = 306 (play school)
Enjoys counting and confident at it
### Summary of Saki’s responses to the learning disposition instrument

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Questionnaire instrument item</th>
<th>May 2012</th>
<th>May 2013</th>
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</thead>
<tbody>
<tr>
<td>Effective learner and doer of mathematics (K)</td>
<td>Scale 1-9 (Q2)</td>
<td>9</td>
<td>9</td>
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<tr>
<td>Seeing mathematics as useful and worthwhile (K)</td>
<td>Maths is: (Q1)</td>
<td>Die beste <em>(the best)</em></td>
<td>goed om te leer <em>(good to learn)</em>, want dit help <em>(because it helps)</em>, it makes you clever</td>
</tr>
<tr>
<td>Sense making (K) resourcefulness (E) (which includes what Carr &amp; Claxton call: playfulness (C&amp;C))</td>
<td>Maths is: (Q1)</td>
<td></td>
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<td></td>
<td>What do you do if you don’t know the answer in maths class? (Q6)</td>
<td>Ek vra die juffrou om te help <em>(I ask the teacher to help)</em></td>
<td>vra die juffrou, <em>(ask the teacher)</em>, tel op my hande <em>(count on my hands)</em>, tel op die tel-kaart <em>(count on the counting card)</em></td>
</tr>
<tr>
<td>Steady effort (K) resilience (C&amp;C)</td>
<td>Describe an effective learner of mathematics (Q4)</td>
<td></td>
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<td>What do you do if you don’t know the answer in maths class? (Q6)</td>
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</tr>
<tr>
<td>Reciprocity (C&amp;C)</td>
<td>No question directly related to reciprocity although some other learners indicated aspects of this when answering what they did when they did not know an answer.</td>
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<tr>
<td>Compliant behavior</td>
<td>Describe an effective learner of mathematics (Q4)</td>
<td></td>
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<td>--------------------</td>
<td>--------------------------------------------------</td>
<td></td>
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<tr>
<td>&quot;What do you do if you don't know the answer in maths class? (Q6)&quot;</td>
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<tr>
<td>Luister na die juvrou (listens to the teacher) hy doen goed want hy wen want hy luister (he does well because he wins because he listens).</td>
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<tr>
<th>Enjoyment /affective relationship (with maths) (E)</th>
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<tbody>
<tr>
<td>&quot;Do you love maths or are you scared of maths? (Q5)&quot;</td>
</tr>
<tr>
<td>Ek hou wiskunde (I like maths)</td>
</tr>
<tr>
<td>Vra die juffrou (ask the teacher) tel op my hande (count on my hands), tel op die telkaart (count on the counting card)</td>
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<th>Language repertoire/able to describe mathematical activities (E)</th>
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<tr>
<td>Maths is: (Q1).</td>
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<tr>
<td>Tel; minus, as gelyke (count, minus and equals)</td>
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### Task 9: Counting with Incrementing Tens

[Use pink strip cards. Show strip (a) then add others for steps b to e. Ask] How many dots are there altogether?

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<tr>
<th></th>
<th>Note Answer &amp; How Answered</th>
<th>Correct?</th>
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<tbody>
<tr>
<td>(a)</td>
<td>The ‘four dot’ strip</td>
<td></td>
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<tr>
<td>(b)</td>
<td>Add a ‘ten dot’ strip to the right</td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>Add another 10 to make 24</td>
<td></td>
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<tr>
<td>(d)</td>
<td>Add another 20 to make 44</td>
<td></td>
</tr>
<tr>
<td>(e)</td>
<td>Add another 30 to make 74</td>
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Absences as important as presences
Saki’s results (ANAs and SANCP) point to very weak foundational skills and predominance of one to one counting for all
Indicators of seeing maths as worthwhile and important and loving it while maybe necessary not sufficient for proficiency in other strands
Additionally Saki worked hard and listened and was eager to please - but not at sense making - tried and tested 1-1 methods persisted
Conclusions

* Instrument is limited - young learners are largely inarticulate
* Emergent categories: love/enjoyment of maths; Compliance - listens and does what is told - delicate balance with agency - but what one loves and how one listens matters?
* Perhaps sense-making and playfulness/resourcefulness (which connects with sense making and creativity/agency/independence) are the critical must haves for proficiency in PF; CU; AR; SC
* Must assist learners to develop sense-making dispositions from early ages to avoid devastating disappointment in later years.
Many thanks - Nkosi

www.ru.ac.za/sanc/