EXPLORING FRAMEWORKS FOR IDENTIFYING LEARNING DISPOSITIONS: THE STORY OF SAKI

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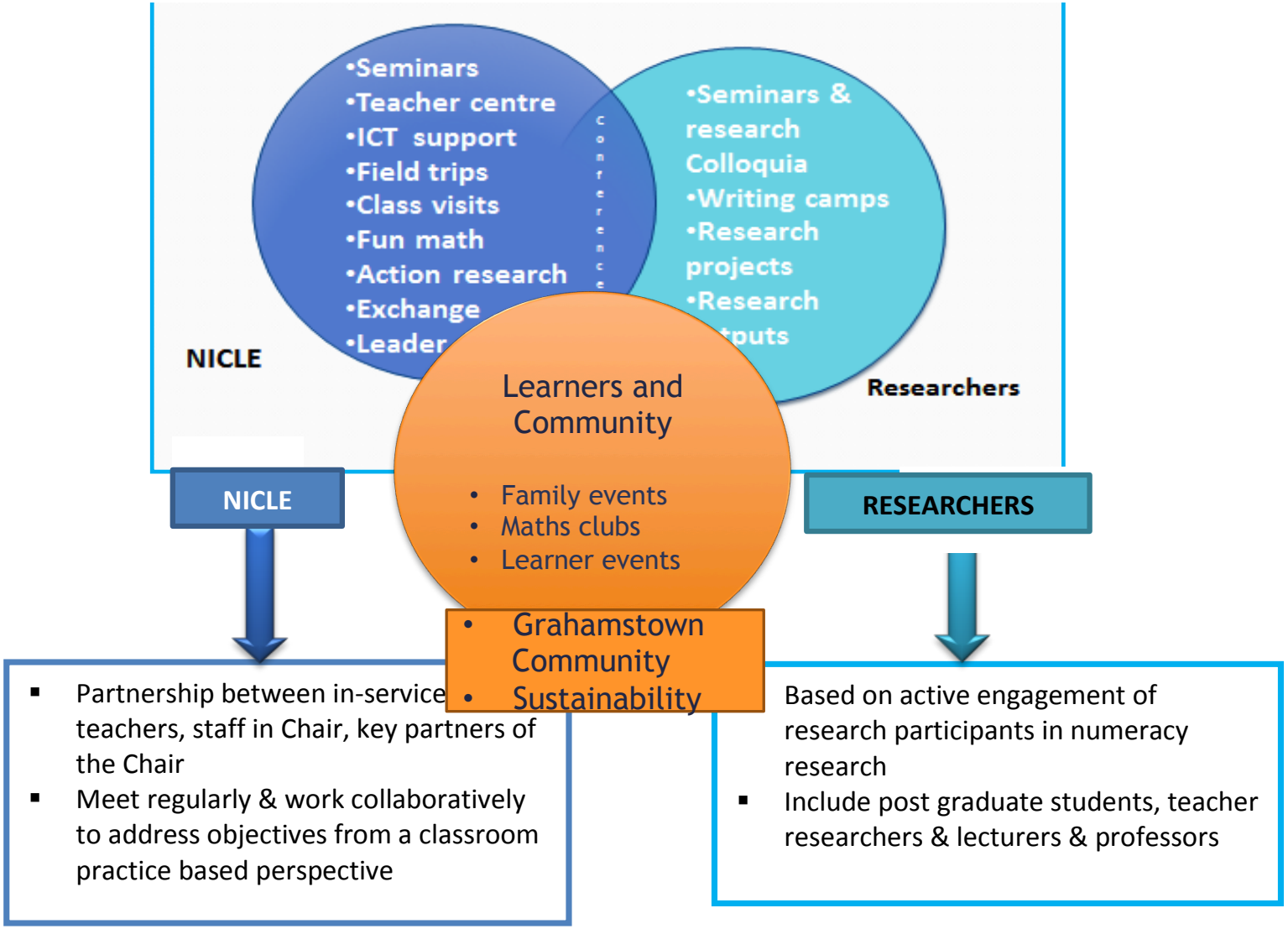
SA NUMERACY CHAIR PROJECT

RHODES UNIVERSITY
Where leaders learn

SAARMSTE conference, January 2015, MAPUTO

- A hub of mathematical activity, passion and innovation
- Interconnected communities of practice



Development initiatives:

* NICLE (teacher development)
* Maths Clubs
* Sci-Fest
* Family maths
* General buzz & public awareness

Framing concept of MP: …

Conceptual Understanding: Comprehending mathematical concepts, operations, and relations - knowing what mathematical symbols, diagrams, & procedures mean

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

Strategic Competence: Being able to formulate problems mathematically & 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, & doable - if you work at it - and being willing to do the work

Kilpatrick, J., Swafford, J., & Findell, B. (2001). *Adding It Up: Helping Children Learn Mathematics*. Washington DC:

After-school maths clubs

Chair run clubs (to date)	Clubs by research students
* 12 clubs (Gr 2-5)	* 15 clubs (Gr 2-7)

* 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 & SARAECE)
* 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

HANCU LOUW

Ten enthusiastic Grade 4 learners from Ntaba Maria Primary School have been members of an after-school maths club for the past two years.

The South African Numeracy Chair (SANC) project was launched in 2011. By February 2012 a maths club was started at Ntaba Maria, running every week after school during term time. According to Debbie Stott, the teacher assigned to the particular club, only one learner has ever been absent.

The children engage confidently with the material, much of which is presented through interactive games, which challenges the learners to react quickly while thinking critically.

"One of the drivers for the clubs is to develop a 'maths is fun' ethos. This is relatively easy to achieve through the use of well-chosen mathematical games," says Stott.

The clubs are limited to less than 15 learners, to ensure individual attention. Children who may benefit from the clubs and are not restricted by transport arrangements are identified and parental consent organised.

The project works with 12 schools in the broader Grahamstown area. Clubs include pupils from six schools in Grahamstown and two schools in Alexandria.

The project also includes a teacher development programme, in which a number of teachers in the wider Grahamstown area are involved. Some of these teachers have started their own clubs at their respective schools.

"The learners have a lot of fun while learning valuable lessons, which they then pass on to their friends in class," says Lulama Gama, a maths teacher at Ntaba Maria who is currently part of the teacher development programme.

According to Gama, the lessons are given in a friendly environment, where children are encouraged to learn through active engagement with material.

"The project has supported me in my teaching by providing not only human resources, but teaching material and resources to use in class," says Gama.

In 2012 an independent maths club programme was started at Samuel Nsiko in response to an article on the South African Numeracy Chair project in *Grocott's Mail*.

For more information on how to get involved or start your own Maths Club please visit: www.ru.ac.za/sanc

TEN OUT OF TEN... Members of the Ntaba Maria Primary School after-school maths club, who come regularly for the fun, hands-on games that help them understand mathematical concepts.
Photo: Hancu Louw

Brought to you by the SA Numeracy Chair Project which is hosted by Rhodes University and is jointly funded by the FirstRand Foundation with the RMB fund, the Anglo American Chairman's Fund and the DST and administered by the NRF.

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

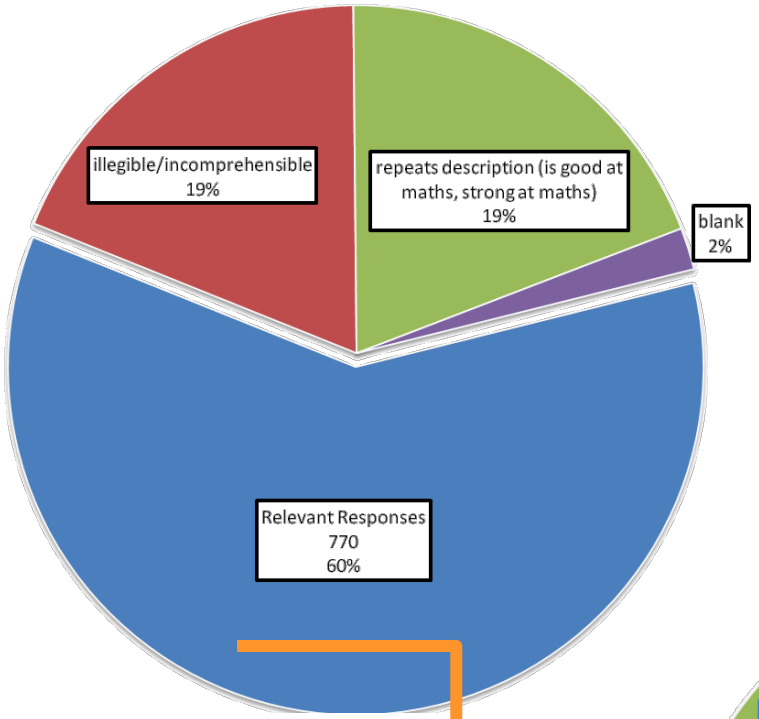
* Playfulness - Links to 'resourcefulness' - conceptual/explorative understanding
* Resilience – links to steady effort
* Reciprocity – willingness to engage with others (not in K et al.)

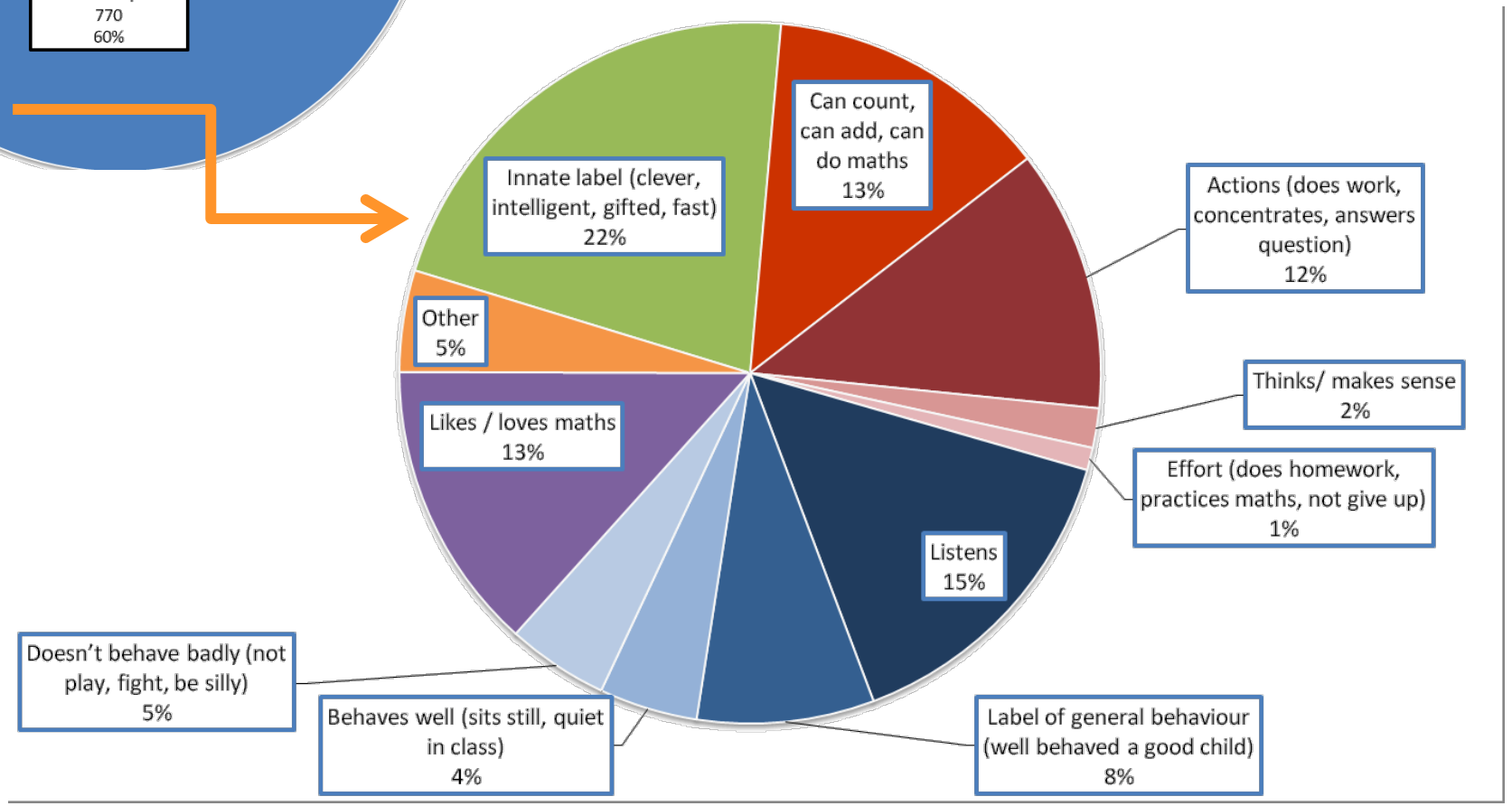
Dispositional Data: Gr3 & 4s 2012

SAM IS …

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 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

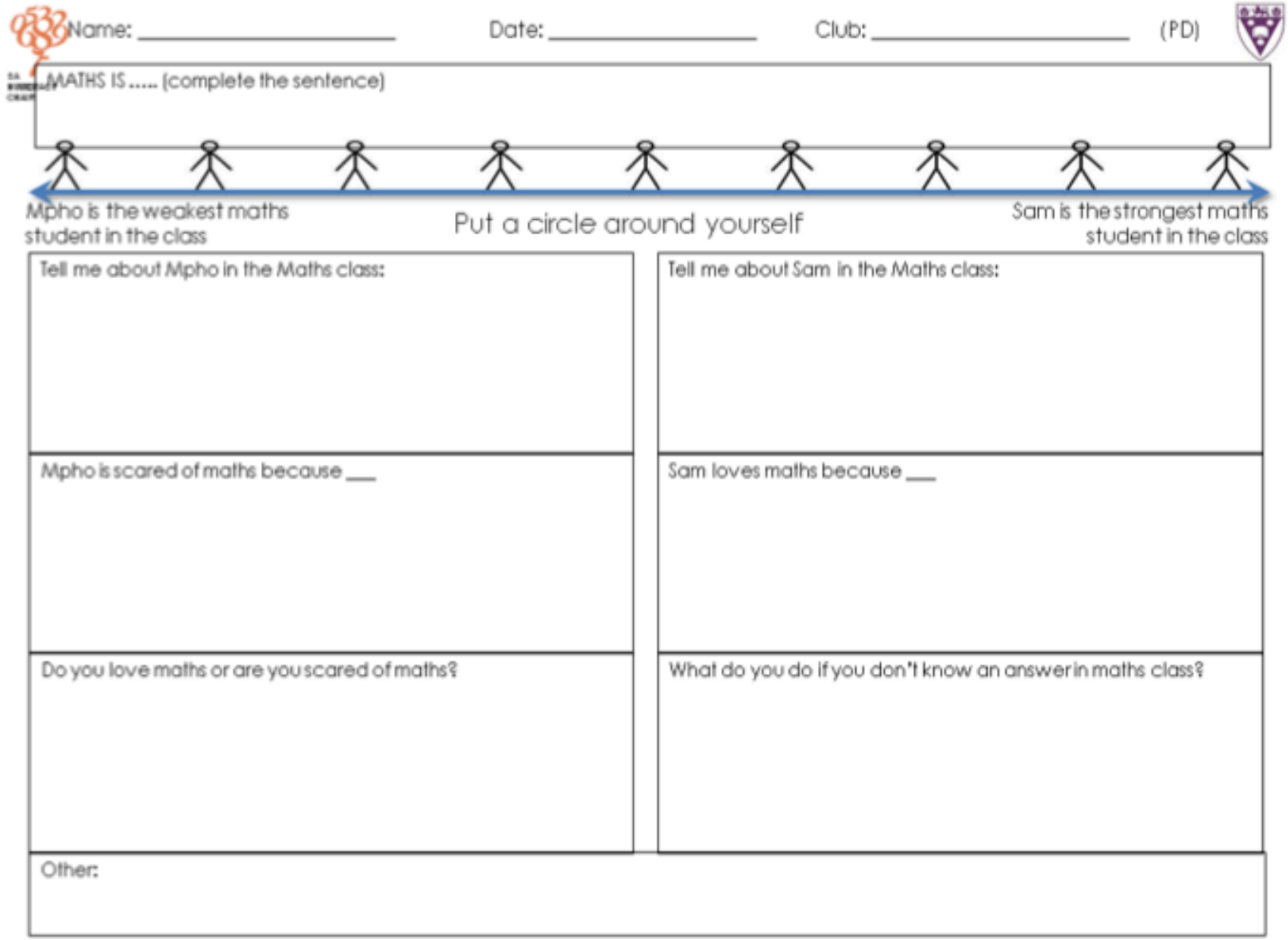


Figure 1: An instrument for accessing mathematical learning dispositions (Taken from: Graven, 2012, p.55)

The Story of one club learner - Saki

- 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?

Background

* 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.

Indicator	*Questionnaire instrument item*	May 2012	May 2013
Effective learner and doer of mathematics (K)	*Scale 1-9 (Q2)*	9	9
Seeing mathematics as useful and worthwhile (K)	*Maths is: (Q1)*	Die beste (*the best*)	goed om te leer (*good to learn*) want dit help (*because it helps it makes you clever)*
Sense making (K) resourcefulness (E) (which includes what Carr & Claxton call playfulness (C&C)	*Maths is: (Q1)*		
	What do you do if you don't know the answer in maths class? (Q6)	Ek vra die juffvrou om te help (*I ask the teacher to help*)	vra die juffrou, (*ask the teacher*) tel op my hande (*count on my hands*) , tel op die tel-kaart (*count on the counting card*)
Steady effort (K) resilience (C&C)	*Describe an effective learner of mathematics (Q4)*		
	What do you do if you don't know the answer in maths class? (Q6)	Ek vra die juffvrou om te help (*I ask the teacher to help*)	tel op my hande (*count on my hands*) , tel op die telkaart (*count on the counting card*)
Reciprocity (C&C)	*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.*		

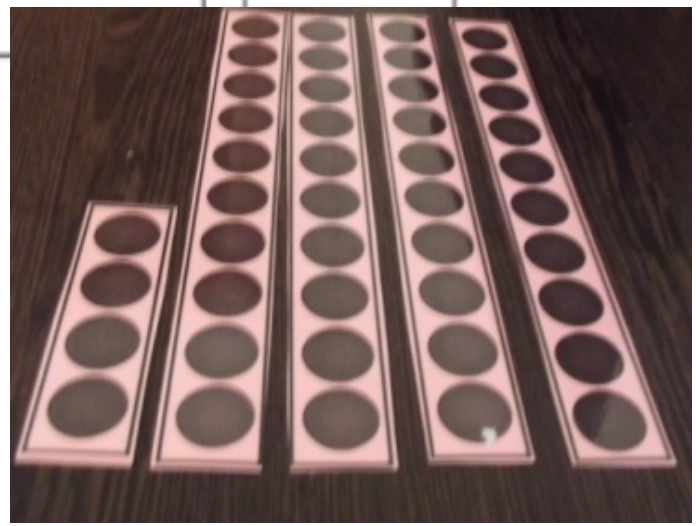
Compliant behavior (E)	*Describe an effective learner of mathematics (Q4)*		luister na die juvrou *(listens to the teacher)* hy doen goed want hy wen want hy luister (*he does well because he wins because he listens*).
	What do you do if you don't know the answer in maths class? (Q6)	Ek vra die juffvrou om te help *(I ask the teacher to help)*	vra die juffrou, (*ask the teacher*) tel op my hande (*count on my hands*) , tel op die telkaart (*count on the counting card*)
Enjoyment /affective relationship (with maths) (E)	*Do you love maths or are you scared of maths? (Q5)*	ek hou wiskunde (*I like maths*)	lief want dis goed en lekker om die tel.it te doen, hou om te tel (*love it because its good and nice to count and do it and I like to count*)
Language repertoire/able to describe mathematical activities (E)	*Maths is: (Q1):*		tel; minus,as gelyke (*count, minus and equals*)

Video recorded task based interviews

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?*

	Note Answer & How Answered	Correct?
(a) The 'four dot' strip		
(b) Add a 'ten dot' strip to the right		
(c) Add another 10 to make 24		
(d) Add another 20 to make 44		
(e) Add another 30 to make 74		



Some analysis

* 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.

Concluding Remark

Many thanks – Nkosi

www.ru.ac.za/sanc/