After school maths clubs ...

... enabling spaces for both recovery and extension of mathematical proficiency in young learners
After school programs are a critical first step in the process of changing not just how we educate our children, but how we come together, in partnership - school and community - to ensure their success (White, 2005, p. 8)

- The **positive** effects of participating in OST programmes as follows:

  - young people benefit when they spend time engaged in structured pursuits that offer opportunities for positive interactions with adults and peers, encourage them to contribute and take initiative, and contain challenging and engaging tasks that help them develop and apply new skills and personal talents (Durlak & Weissberg, 2007 p. 5)
Graven (2011b) gives four reasons:

1. **Remediation work** that consolidates mathematical foundations is an urgent requirement for many learners in South African schools and clubs could provide a place for this type of remediation to take place.

2. Clubs could also create opportunities to **challenge and extend** those learners who are coping at their grade level and perhaps to strengthen their mathematical dispositions and confidence.

3. Clubs could also provide an opportunity to **strengthen groups of learners in class**, who could serve as catalysts for furthering mathematical proficiency of others in their classes.

4. Clubs could provide **extended learning opportunities** for learners to work on mathematics in OST.
Outcomes associated with participation in after school programmes

- **Academic:**
  - better attitudes toward school
  - better performance in school (as measured by achievement test scores and grades)
  - improved homework completion
  - better engagement in learning

- **Social and emotional benefits:**
  - improved self-confidence
  - self-esteem
  - improved social and communication skills and/or relationships with others (peers, parents, teachers)
  - improved feeling and attitude towards self and school
  - development of initiative (Little, Wimer, & Weiss, 2007)
Developing Mathematical Proficiency in our clubs

Productive disposition – connect with identities and ways of being
Maths clubs in our SANC project

- Began with a pilot club in 2011
- Since then our team has run 14 clubs at schools and local development centres
- Support another 7 clubs run by the teachers we work with in our development project
- I run two clubs a year:
  - Two different schools
  - 8 to 10 learners in each
  - Once a week during term time
  - About 1 hour
Contrasting clubs and classrooms

**Formal maths classroom / environment**
- Participation expected (in-school-time)
- Less learner choice over the activities
- Curriculum and assessment standards as a prescriptive framework influencing activities
- Largely acquisition based and often driven by teaching for/to assessments
- Teacher led and much whole class teacher learner interaction
- Assessment tends to be summative and results in ranked performance
- Prescriptive, teacher controlled classroom rules within general school rules

**Informal club / maths environment**
- Voluntary participation (out-of-school time)
- More learner choice over the activities
- Curriculum as contextual guide for activities
- Participation based, where participants are active and engaged
- Many interactions are learner led with few whole class-mentor interactions and many one-to-one interactions between mentors and learners.
- Assessment is formative and integrated and is used to guide individual learning experiences for the participants
- Negotiated sociomathematical norms which may differ from in-school time rules
Developmental foci for learners

- Strengthening foundations
- Extending and challenging
- Focusing on efficiency and progression
- Sense making, connection, conceptual understanding
Clubs as mini explorative spaces (or 'labs')

To try out:

- new activities and games
- assessments before using them in the classroom

Clubs provide a safe space for educators to:

- Build their own confidence
- Try new pedagogical approaches
Clubs essential learning spaces for facilitators and researchers

- trial methods/ ideas/ resources for NICLE
- Aha moments
- Encounter key challenges (linguistic; conceptual, contextual)
- Research spaces and **opportunity to give something back** – ethical commitment with regards to research access
Focus on recovery of foundations is essential!

- Without foundational understanding learners ‘play school’ (no opportunity to learn)
- ANAs & other – show that many of our learners still count all, count on
- 25 + 36; 52 + 369; 236 x 24
  majority of learners can’t participate – there is no OTL without recovery – curriculum is beyond the ZPD for majority
Club research points to strong recovery

- **PhD - 2012 case study clubs (mixed ability)**
  - strong learner progression across Wright et al levels from Feb – Nov 2012
- **Masters research studies –similar shifts**
- **Highlights/ anecdotes 2013 clubs**
  - club learners moving towards ‘top performers’ in class
  - attitude towards doing math hw & working with numbers transformed (Parents)
  - willingness to talk/ share & engagement in class is greater – helpers (Teachers)
Proficiency and participation

Left side:

- A focus on *individual* learner progress and the *acquisition* of mathematical proficiency.

Right side:

- Highlights a focus on evolving forms of *mathematical participation* whereby the learners, myself and other people in the club become participants in the club with increased sense making and communication in mathematics.
OST programmes that focus on using the ‘SAFE’ (sequenced, active, focused, explicit) design features show positive findings.
The Zone of Promoted Action (ZPA):

- describes the activities that were promoted in the club to facilitate development of mathematical proficiency and the efforts of the mentor to promote those skills. It describes the diagnostic activities that allowed me to establish where learners were in their mathematical proficiency trajectories and activities that promoted the development of the five strands of proficiency.
<table>
<thead>
<tr>
<th>LFIN ASPECT</th>
<th>PROMOTED ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A: Structuring numbers 1 to 20</strong></td>
<td>No specific focus</td>
</tr>
<tr>
<td><strong>B: Number words and numerals</strong></td>
<td>No specific focus</td>
</tr>
<tr>
<td><strong>C: Conceptual place value (ability to reason in terms of 10s and 1s)</strong></td>
<td>Mental activities and games designed to develop incrementing and decrementing on and off the decuple and through 100, 200 and 1000.</td>
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<tr>
<td><strong>D: Addition and subtraction to 100</strong></td>
<td>Mental facility and development of strategies for working with numbers to 100 (and over) that did not rely on using the standard vertical algorithms. For example, number talks, SCOOT game etc.</td>
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<tr>
<td><strong>E: Early multiplication and division</strong></td>
<td>Array based activities to develop multiplicative reasoning (2\textsuperscript{nd} half of the year).</td>
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<tr>
<td>Other mathematical skills such as logical thinking, justification</td>
<td>Number talks and general club norms. Logic puzzles and games that promoted logical thinking (2\textsuperscript{nd} half of the year).</td>
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<tr>
<td></td>
<td>No specific focus but promoted mental activities involving skip counting of multiples of 2s, 3s, 5s, 10s and 100s.</td>
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<td>No specific focus except through establishing club norms, one of which is to explain thinking.</td>
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The Zone of Free Movement (ZFM)

- describes the learner-environment relationship and how that environment supports the intended learning, thus playing a supporting role in the emergence of the ZPD.

- Club ethos:
  - “purposeful interpersonal activity based on interactions with others” (p. 35)
  - numeracy teaching is based on “dialogue between teacher and pupils to explore understandings” (Askew et al. 1997 p. 36).
Using the diagnostic assessment activities at the beginning of a club helps to establish what the set of possibilities may be but these possibilities could only be developed in subsequent club sessions.

The ZPD is created (or not) by the social and dialogical interactions of each club session and as such is different for every child, in every session.

Therefore, the notion of the ZPD can only be explored by looking at the actual interactions that took place between the club participants during club sessions.
FLOW

Sometimes learners need:

- consolidation
- opportunities to practice what they know
- to strengthen their fluency
- the opportunity and space to build their confidence in being able to use, apply and communicate what they already know.

I call this space ‘FLOW’

If a ZPD does not emerge, we could talk about ‘FLOW’:

- represents strengthening of foundations: consolidation, sense making, practice and application
Clubs are an enabling space for both recovery and extension of mathematical proficiency in young learners as these spaces are free from some of the contextual restraints we find in classrooms.

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