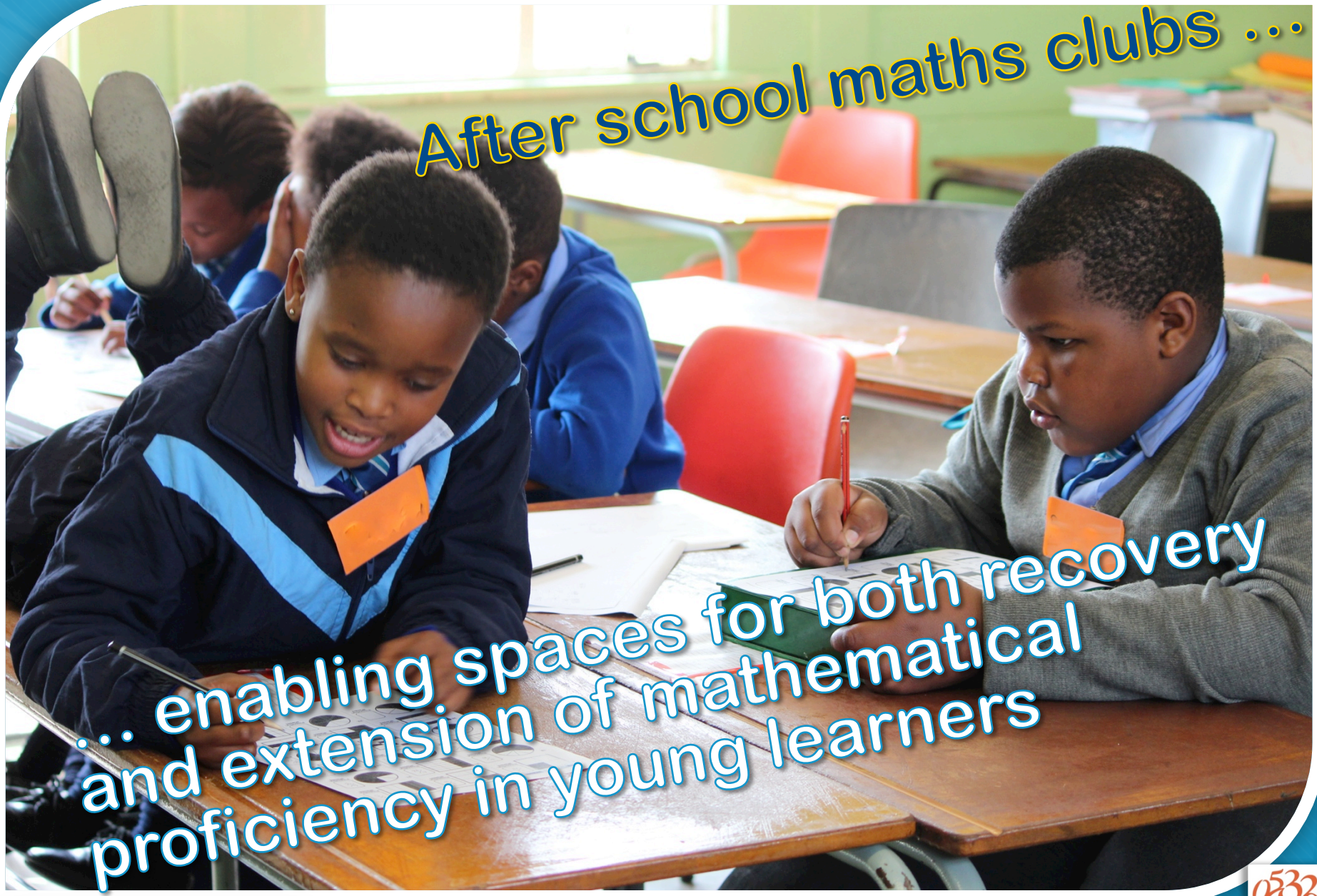
After school maths clubs …



… enabling spaces for both recovery and extension of mathematical proficiency in young learners

RHODES UNIVERSITY
Where leaders learn

PGCE FP/IP Research Conference 28th October 2014

Debbie Stott

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After school maths clubs rationale

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)

why maths clubs could be beneficial

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.

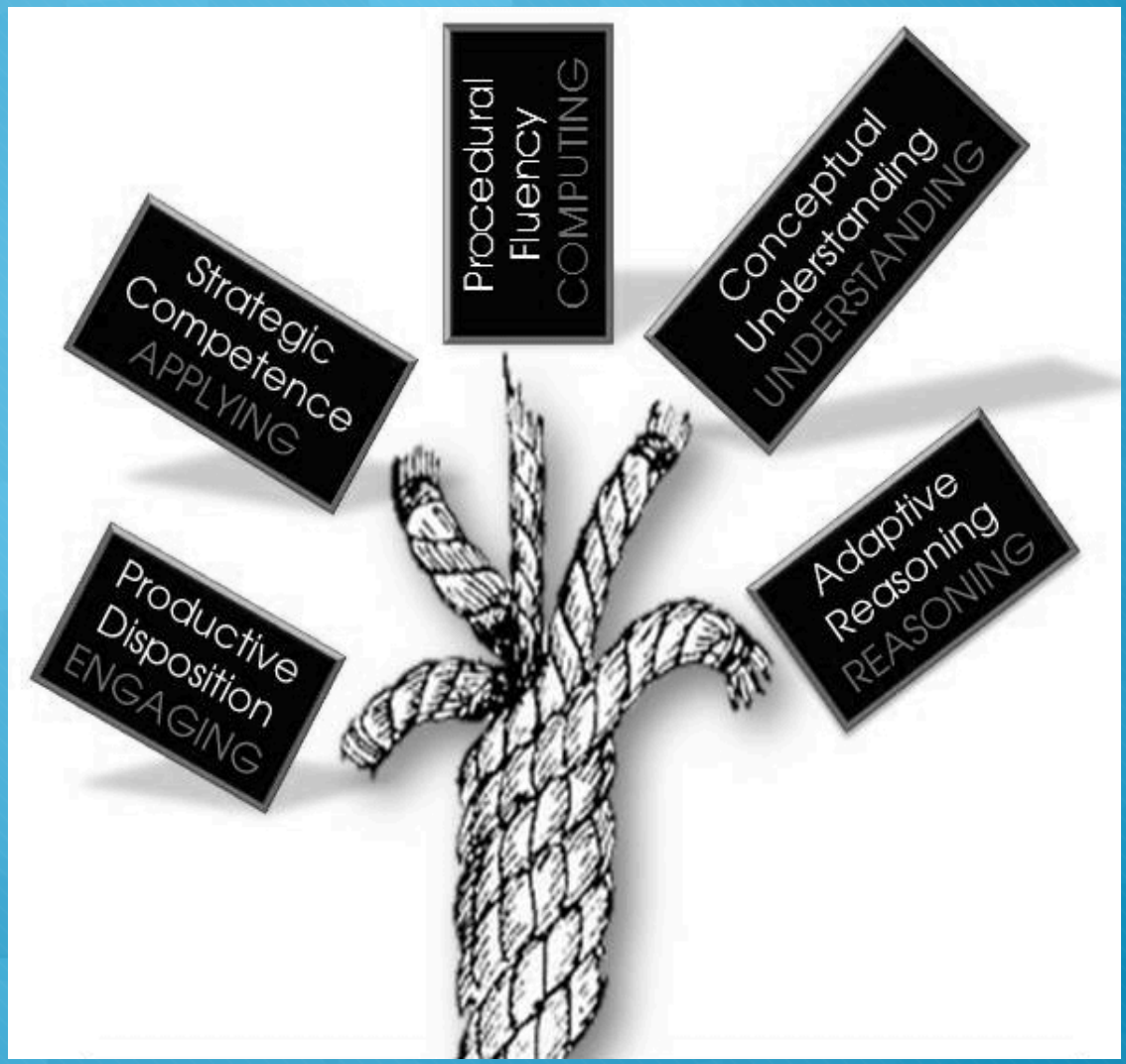
4. Clubs could provide extended learning opportunities for learners to work on mathematics in OST.

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



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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

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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

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Developmental foci for learners

- Strengthening foundations
- Extending and challenging
- Focusing on efficiency and progression
- Sense making, connection, conceptual understanding

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 Ntsiko 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

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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.

Developmental opportunities for teachers too

- 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

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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

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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)

Club Learning Programme Design

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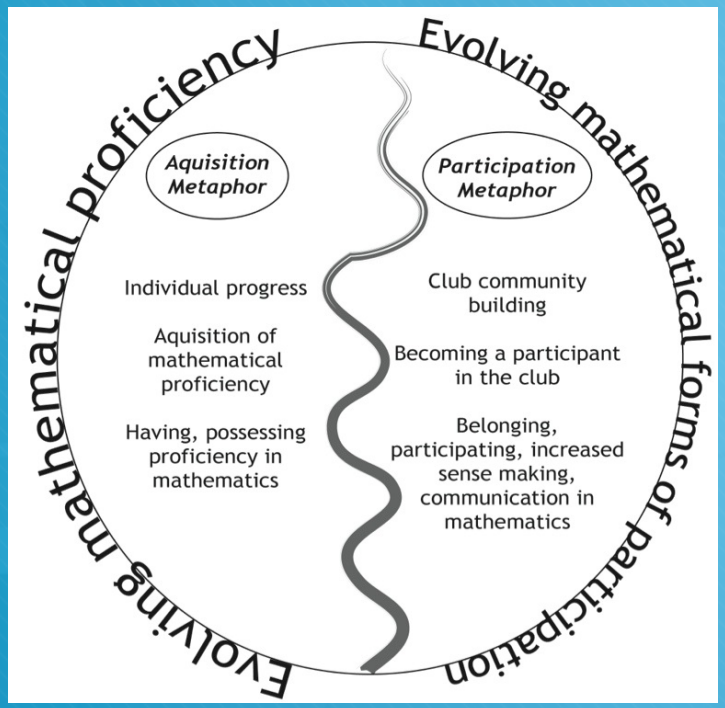
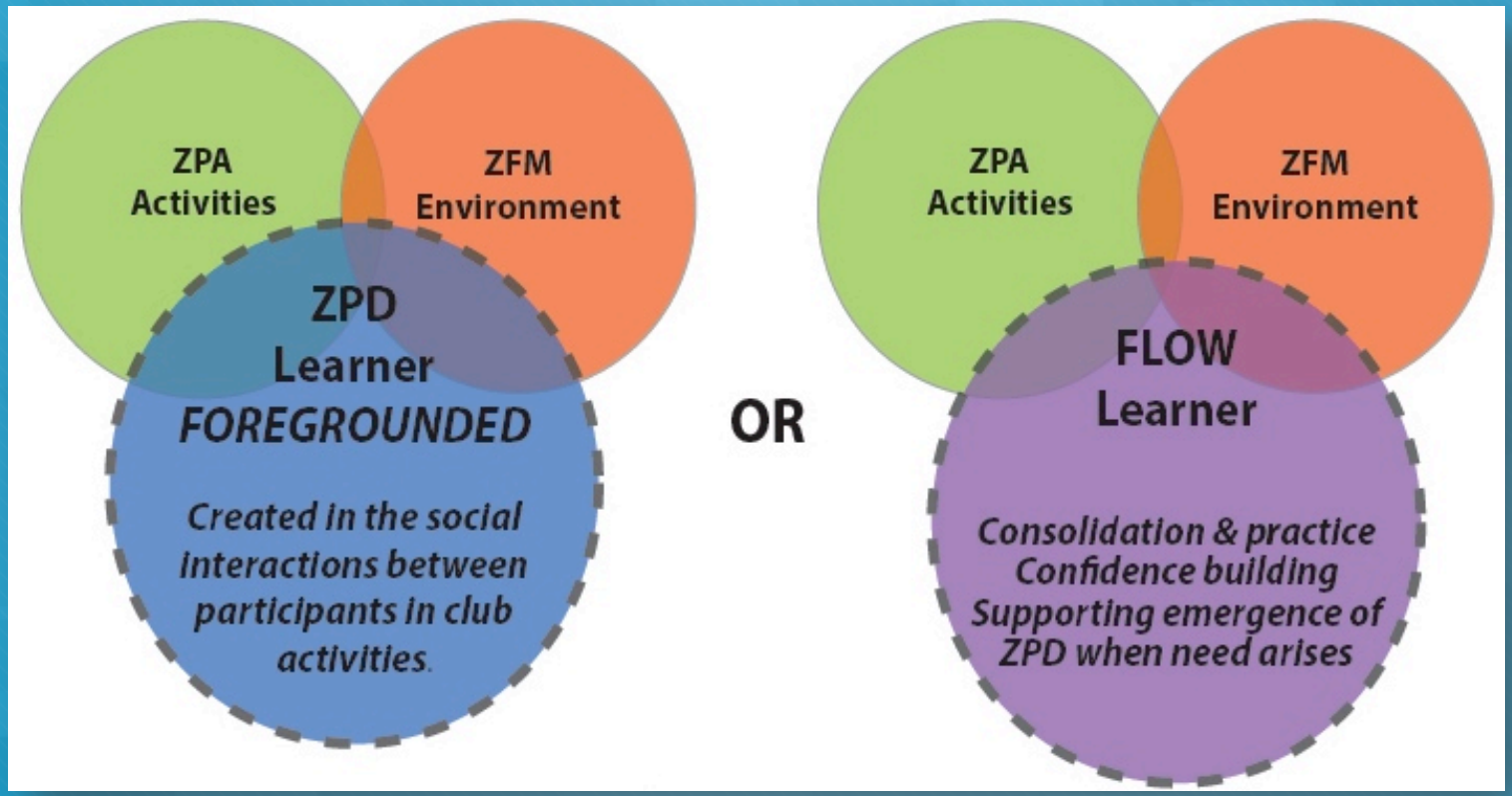
Proficiency and participation



- **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.

Club learning programme design using Zone Theory



allows us to pay attention to:
the types of interventions, activities, socio-mathematical norms and the environment we want to promote in the clubs.

OST programmes that focus on using the '*SAFE*' (sequenced, active, focused, explicit) design features show positive findings.

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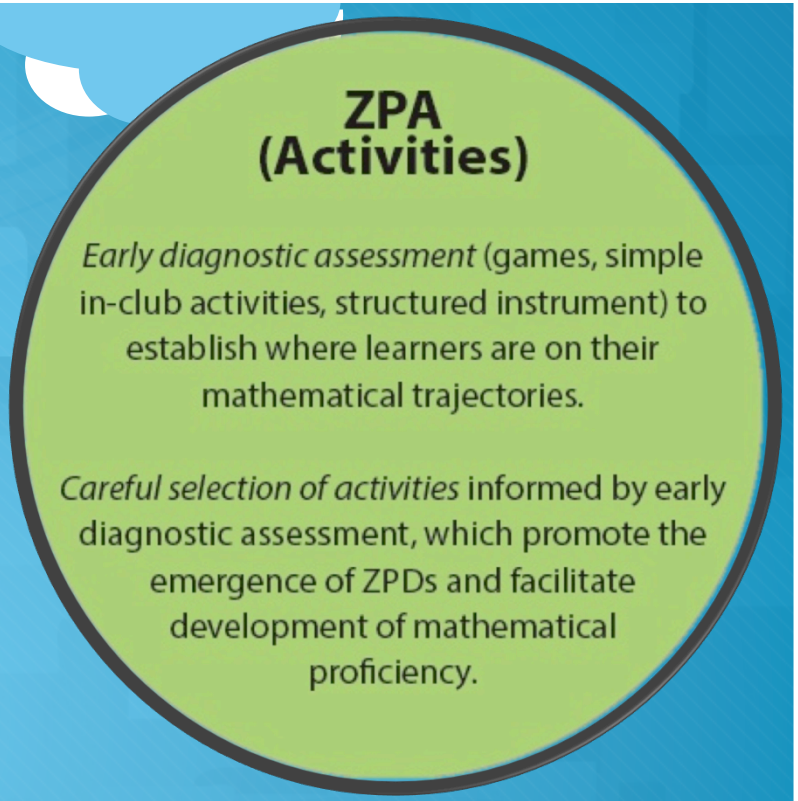
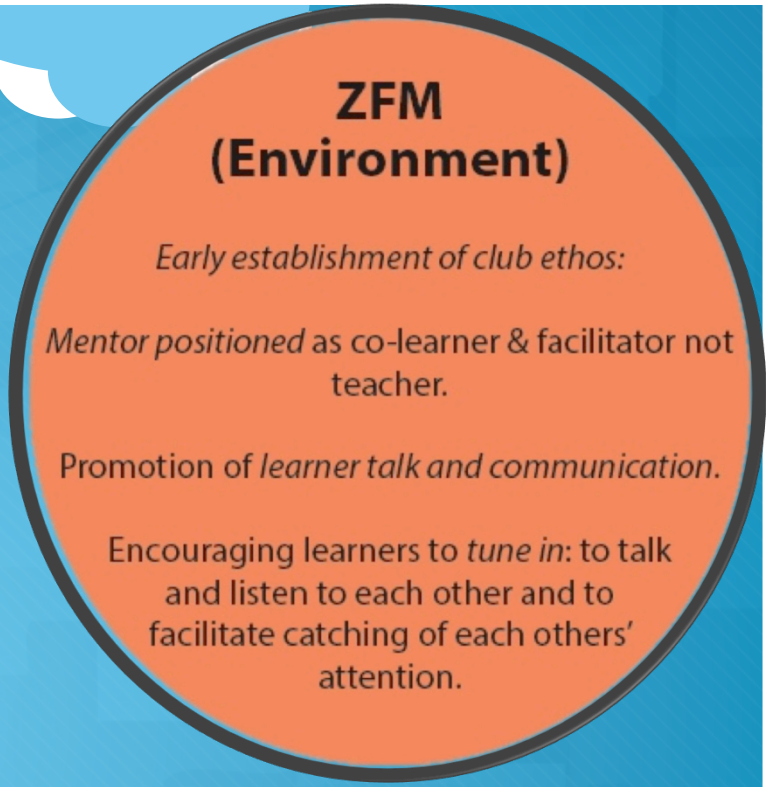


The *Zone of Promoted Action (ZPA)*:

- 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.

PROMOTED ACTIVITIES		
LFIN ASPECT[1]		
A: Structuring numbers 1 to 20	No specific focus	Mental, individual, pair and group activities to strengthen number combinations to 10 and 20.
B: Number words and numerals	No specific focus	Use of Flard Cards (Arrow Cards) to strengthen number recognition of 2, 3 and 4-digit numbers and for building conceptual place value. Mental activities and games designed to develop incrementing and decrementing on and off the decuple and through 100 up to 1000.
C: Conceptual place value (ability to reason in terms of 10s and 1s)	Mental activities and games designed to develop incrementing and decrementing on and off the decuple and through 100, 200 and 1000.	
D: Addition and subtraction to 100	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[2], SCOOT game etc.	Mental facility and development of strategies for working with numbers to 100 that did not rely on using the standard vertical algorithms.
E: Early multiplication and division	Array based activities to develop multiplicative reasoning (2nd half of the year).	No specific focus but promoted mental activities involving skip counting of multiples of 2s, 3s, 5s, 10s and 100s.
Other mathematical skills such as logical thinking, justification	Number talks and general club norms. Logic puzzles and games that promoted logical thinking (2nd half of the year).	No specific focus except through establishing club norms, one of which is to explain thinking.



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.

TUNING IN could be seen as periods of interaction where two (or more) participants continually adjust to each other in order to communicate mathematically.

TUNING OUT could be seen when a participant was not willing and / or simply did not adjust or engage with another.

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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

FLOW (Learner)

When a ZPD does not emerge for learners but instead:

Mediational practices encourage:
clarification and development of learners' own understandings

learner reflection

build confidence

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Concluding Remark

Clubs are an enabling space for both recoevery and extension of mathematical proficiency in young learners as these spaces are free from some of the contectual restraints we find in classrooms.

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