eNICLE Grade 1 and 2
Teacher Development Programme

Session Two
Teacher Handbook

Name

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School

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Summary of the key ideas behind the eNICLE Programme

- The programme is a partnership of teachers, teacher educators, researchers and specialists
- We plan to build an inquiry community that together finds ways to strengthen Grade 1 and 2 numeracy learning
- All eNICLE community members brings expertise which in active discussion will enable strengthening Grade R teaching and learning
- Networking between members is supported through platforms such as Facebook and the SANC project website
- We share the learning of our community with others in various forums
    - emphasises learning the use of language (and mother tongue) as a resource and learners actively construct knowledge through these social activities
    - emphasises use of research informed key representations for learning about number - supported by resources
    - emphasises use of stories (interactive reading and story telling) for strengthening literacy and number sense reading
    - emphasises a growth mindset and development of productive learning dispositions
    - is curriculum aligned
    - focuses on developing number sense
    - strengthens cognitive control with focused research informed activities including physical movement activities as part of the resources provided
- The programme acknowledges that:
    - Development is progressive. We build new knowledge on what learners already know and bring to the classroom. Activities are selected to be at the 'cutting edge' of learners' development.
    - Ongoing / informal assessment of learners is key to understanding, monitoring and supporting progress. Assessment activities and learner progression resources are included in programme

A key on-going focus of this programme is developing increasingly active learner participation, exploratory talk, sense-making and mathematical progression enabled through strategic use of teacher and peer mediation.

eNICLE Programme: key ideas

Broad assumptions

Working with both Vygotskian theory and socio constructivism the programme is based on the following assumptions:

- Language is key to development and learning
- Learners will learn number sense through actively constructing number knowledge through engaging with activities in social settings
- Learning takes place in the Zone of proximal development (ZPD) defined as:

> The distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers. (Vygotsky, 1978, p. 86)

This means that activities should be targeted to an appropriate level of learner development such that activities are neither too difficult nor too easy for the learners and activities should involve active engagement and encourage dialogue with learners. According to Wright, Martland, Stafford and Stanger (2006) activities should be at the 'cutting edge' of learner development. In this way learning stimulates development.

In our work with teachers, we prefer to visualise this idea as three zones:

- Comfort zone: Low challenge, low stress with limited thinking and learning
- Struggle zone: High challenge but low stress which requires thinking for effective learning
- Panic zone: Very high challenge, high stress resulting in cognitive overload and limited learning

For effective learning, the aim is to keep the learners in the struggle zone as much as possible.

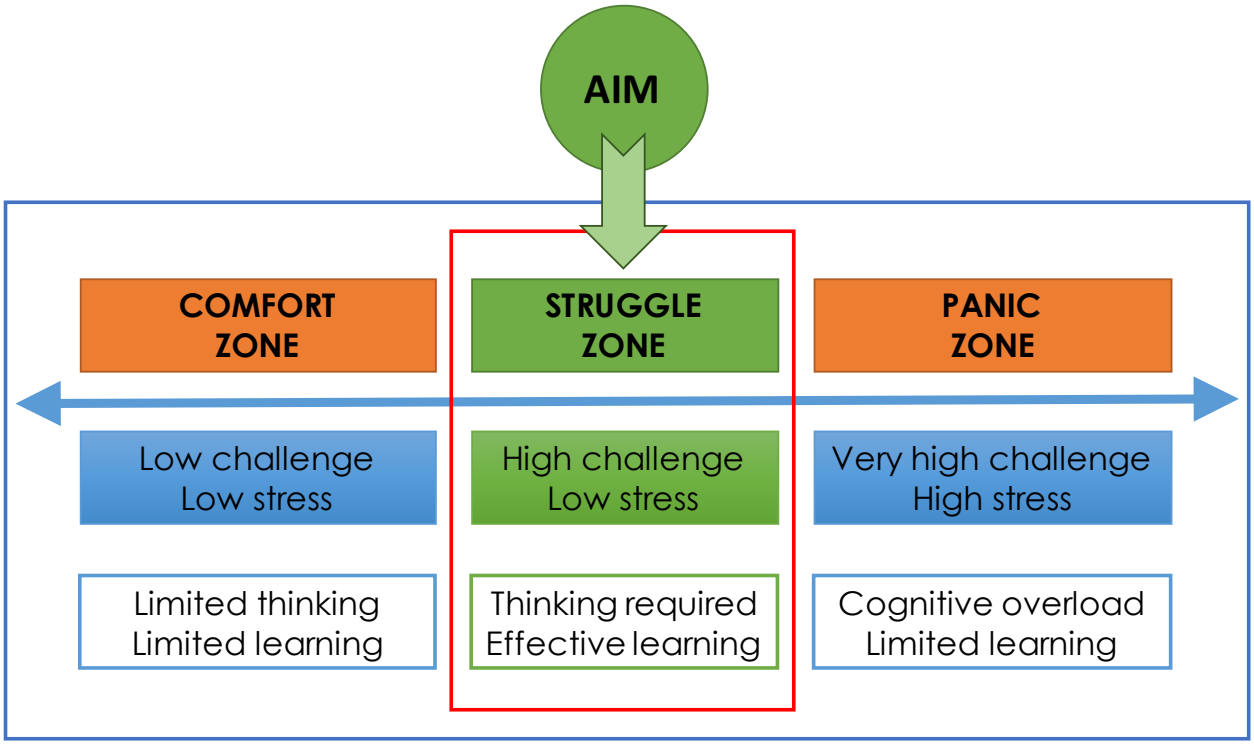

Figure 1: Zones of learning (Source[1])

[1] https://mrocallaghanedu.wordpress.com/2015/07/21/planning-for-learning/

This diagram shows the key focus areas for this programme, which are discussed in detail on the following pages.

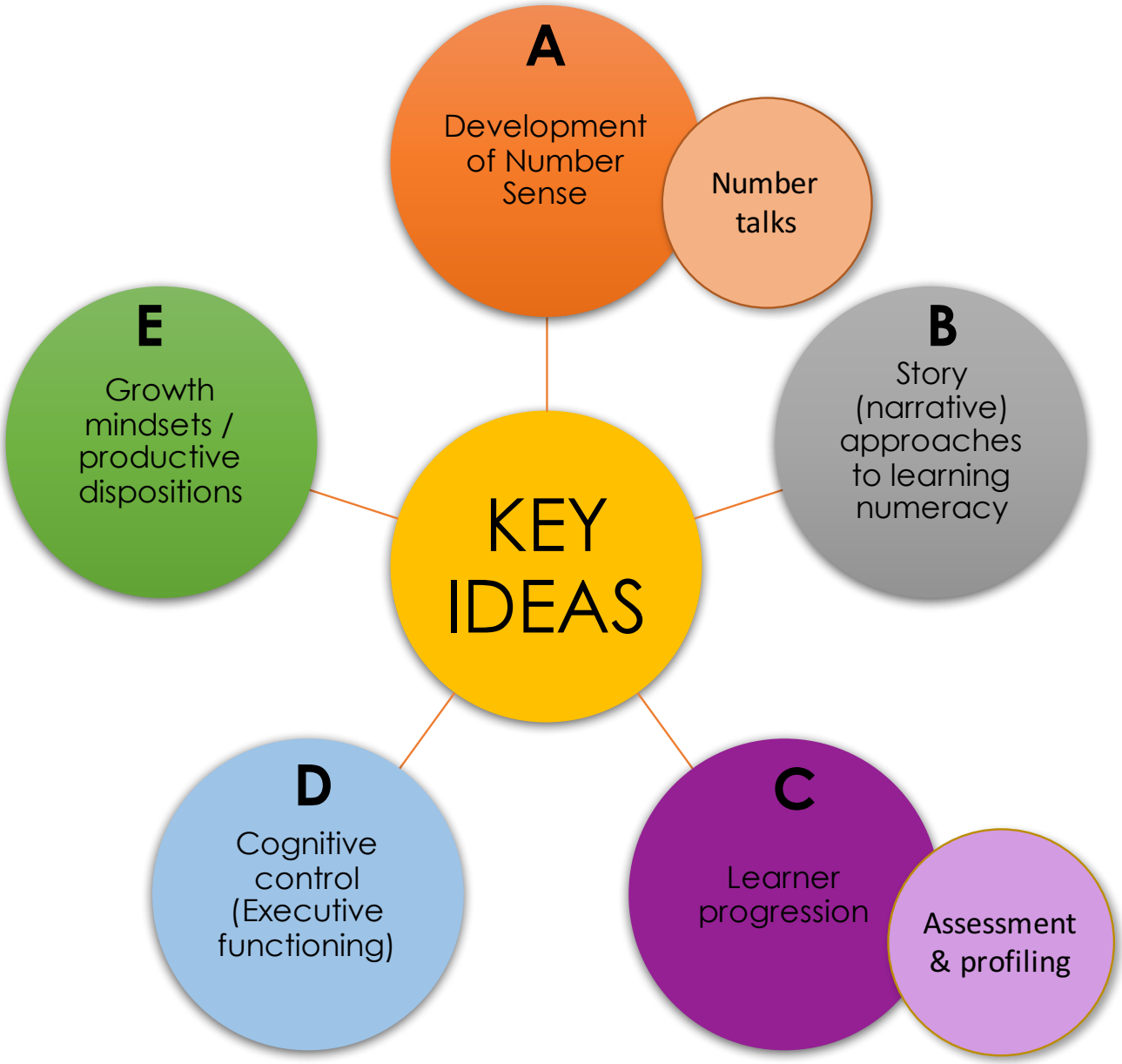

Figure 2: eNICLE programme - key ideas

A - Number sense

Dehaene (1997) defines "number sense" as our ability to quickly understand, approximate, and manipulate numerical quantities. According to Anghilieri (2006) a child with number sense has the ability to work flexibly with numbers, observe patterns and relationships and make connections to what they already know, to make generalisations about patterns and processes. Number sense also includes a positive attitude and confidence (Anghileri, 2006)

The development of number sense in Grades 1 and 2 includes the ability to count both verbal number sequence (forwards and backwards) and recognise numerals up to 200, and developing the capability to operate (adding and taking away) on numbers up to 100 (orally and through showing methods). The diagram below is explained later in this handbook but shows where our focus is on developing number sense.

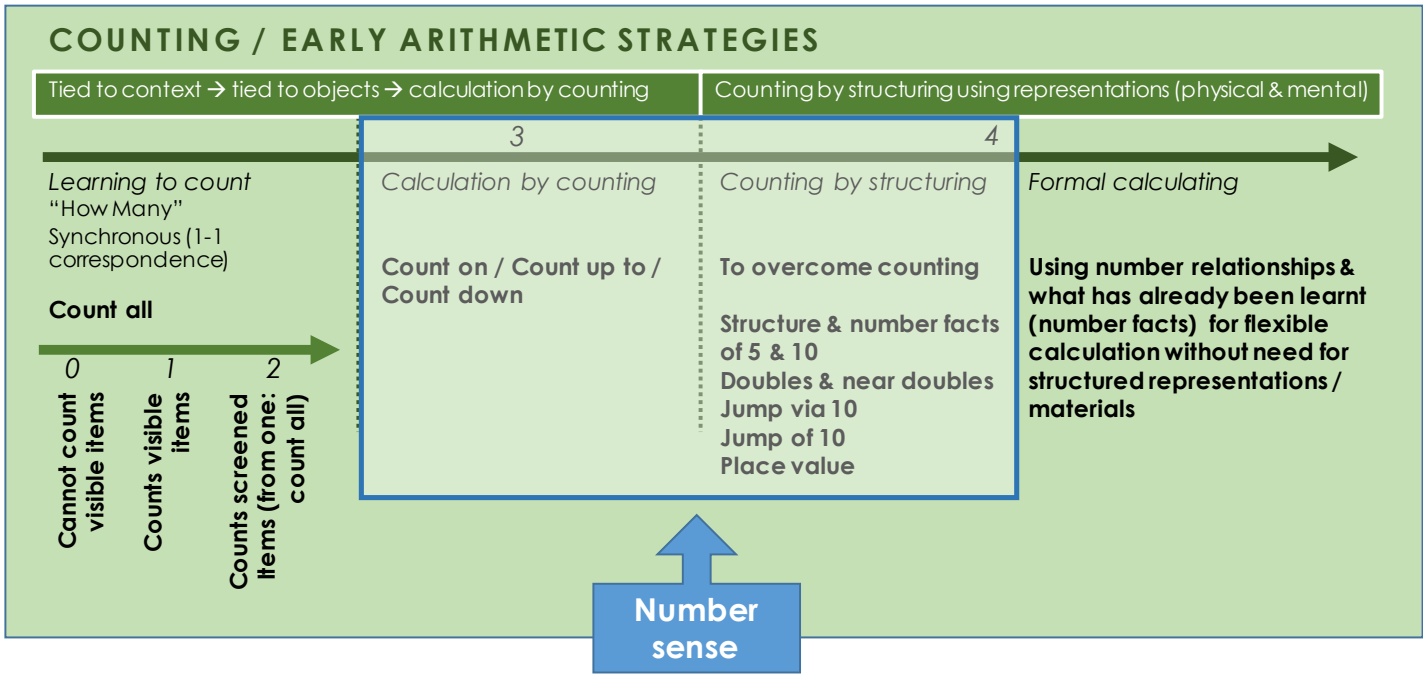

Figure 3: Relationship between counting and number sense

Number talks

> "The heart of number talks is **classroom conversations** focused on making sense of mathematics."

Number talks are short teaching activities that teachers can use as lesson starters. A number talk involves posing a maths problem and asking learners to solve the problem mentally, without pencils and paper and on their own. The teacher then asks the learners to share the different methods used to solve the problem and importantly discusses why they work. By using number talks, teachers can, in a short space of time, change learners' view of mathematics, teach them number sense, help them develop mental maths skills and engage them in creative, open mathematics.

Another advantage of number talks is that they can be used at all levels of difficulty for children and adults of all ages. So for example, '*how many do you see'* type of problems (using dot patterns and 10-frames) can be used for earlier grade learners (grades 1 to 3), whilst addition, subtraction, multiplication and division problems can be posed from grade 3 up to university students and beyond.

During number talks, learners are asked to communicate their thinking when presenting and justifying solutions to problems they solve mentally. These exchanges lead to the development of more accurate, efficient, and flexible strategies. The key aims and objectives of a number talk are to:

- **CLARIFY** thinking
- **INVESTIGATE** and apply mathematical relationships
- Build a **REPERTOIRE** of efficient strategies
- Make decisions about choosing **EFFICIENT** strategies for specific problems
- Consider and **TEST** other strategies to see if they are mathematically logical

We will explore number talks in later sessions.

B Story (narrative) approaches to working with number

Number stories get learners to actively engage with and imagine ways of working flexibly with numbers and are a key part of the resource provided. Using stories is a widely promoted teaching strategy for language and literacy development across contexts. This programme emphasises a narrative (story) approach for developing number sense. Both these forms of reading are shown to improve learner cognitive control discussed below. The resource therefore includes:

- 'Number' stories, which encourage learners to do imitative reading and provide resources for acting out and telling the stories (such as acting out with bundles of sticks).
- Dialogic reading is a method of reading to children, which allows them numerous opportunities to engage in conversation with the reader (Blair & Raver, 2014). Our story books will also allow for opportunities for paired imitative reading (Bodrova & Leong, 2016).

◆ *C - Learner progression*

This programme draws on a wide range of numeracy research particularly the work of both Buys and Treffers (in van den Heuvel-Panhuizen, 2008) and Wright and his colleagues work in Mathematics Recovery on learning-teaching trajectories related to whole number and the elements of number sense.

This programme encompasses progression in the 4 elements listed but with a key focus on progression in counting and early arithmetic strategies:

- Number word sequencing
- Number identification
- **Counting and early arithmetic strategies**
- Conceptual place value

Counting and early arithmetic strategies

There is general agreement from a number of research studies that, for the operation of adding numbers up to 20, children progress through a sequence of: count all, count on from the first number, count on from the larger number, use known facts and derive number facts.

There is also evidence that children can be taught to progress through this sequence.

In the case of lower attaining children there is a worry that over-dependence on counting for calculating may lead to their not committing number facts to memory. However, even children who know many number facts and have developed a range of calculation methods still sometimes combine these facts and methods with counting techniques in order to derive unknown facts.

(Extracted from "How do we teach children to be numerate?" Askew & Brown, 2003 pp. 6 & 8).

There is a well-established sequence of development from counting into mental methods for addition and subtraction up to 20.

The diagram below indicates a ***spectrum*** for progression in counting from Grade R to approximately Grade 4 that draws on a wide range of research[2]. This is just one aspect of numeracy learning.

The spectrum visually represents the typical stages that children learn to count and calculate in numeracy and to show how to transition from counting-based to structured and finally formal calculation for addition and subtraction. The spectrum provides ways to:

- Understand where learners are in their learning in multi-grade classrooms
- Understand where learners need to get to
- Provide ideas for activities that enable the transition or progression from one stage to the next
- Understand where to remediate and extend learners where necessary

Each level of the progression in this spectrum (indicated with the numbers from 0 to 4 in red circles) is explained below.

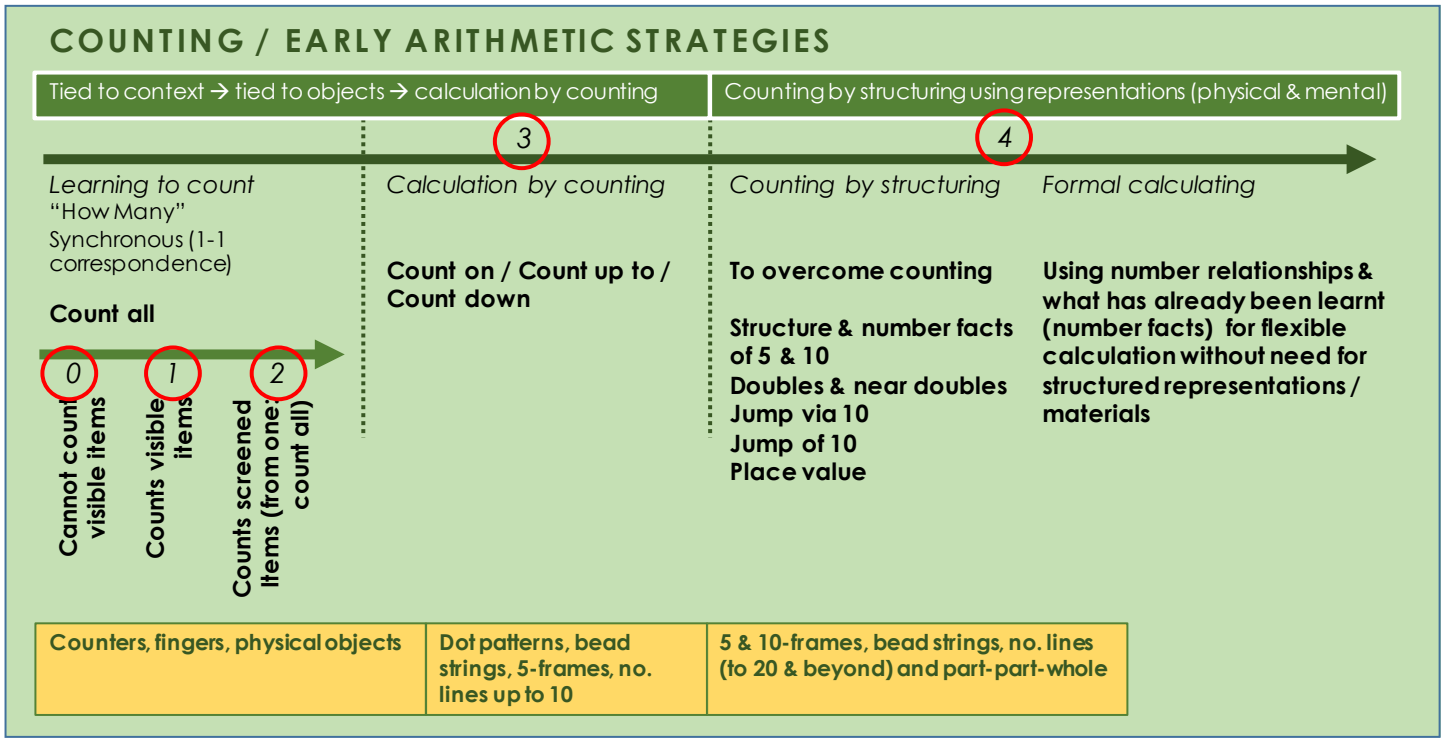

Figure 4: Counting and early arithmetic strategies progression

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[2] Buys and Treffers (in van den Heuvel-Panhuizen, 2008) and Wright and his colleagues work in Mathematics Recovery

1. Learning to count / establishing how many

Often referred to as 'perceptual counting', this involves counting objects that can be seen or touched and often goes together with one-to-one correspondence. This is the first stage in learning to count.

> "The child recreates each number using fingers or other representations. As the numbers get larger and the child can no longer rely on the fingers of their two hands to create the numbers, they will use either objects such as counters or bottle tops or they will reconstruct the number on paper by drawing stripes or circles" (pg. 22).

When presented with an addition problem such as 3 + 5, children at this level count from one – "one, two, three - four, five, six, seven, eight!" This is referred to as **Count All** (equivalent to Level 1 in the Numeracy Handbook for Foundation Phase teachers).

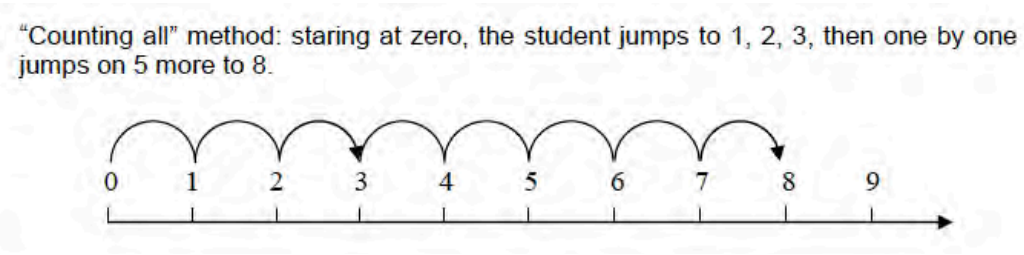

Figure 5: Counting all using a number line for 3 + 5

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2. Counting on and using screened objects

A child who is counting on (for addition) can conceptualise at least one of the numbers without having to see it, and recreates only the other number.

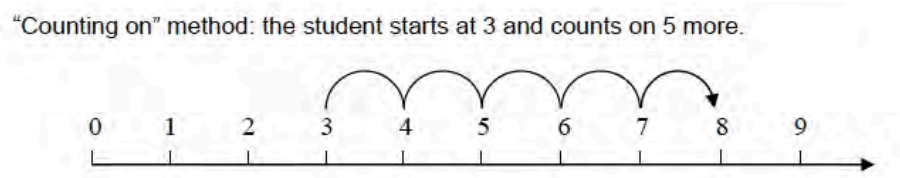
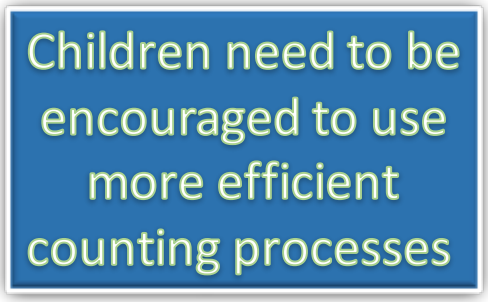


Figure 6: Counting on using a number line for 3 + 5

Pushing to using screened objects



By concealing objects, children must find other ways to count using fingers or other representations. Counting is no longer tied to the object, but to mental representations of the objects. The child can be pushed to work out how many items there are in two collections, where one or both collections are screened from the child's view.

These tasks can be additive (as in how many altogether) or subtractive task (as in how many taken away or how many remaining when the number taken away is given).

Working with these types of tasks allows the child to work towards using the following more **advanced** counting-by-one strategies.

Count-up-from: addition	**Count-up-to**: addition
Example: 6 plus 3 "Six, ... seven, eight, nine, ... nine!" With this scenario, the number to count on is **known** in advance, and the child counts up 3 from 6.	*Example: 6 plus what equals 9* *or* 6 + ☐ = 9 "Six, ... seven, eight, nine, ... three!" The essential feature is that the student counts on from "six". This strategy involves keeping track of counts but the student does not know in advance the number of counts.
Count -down-from: subtraction	**Count-down-to**: subtraction
Example: 9 take away 3 "Nine, ... eight, seven, six, ... six!" This strategy involves keeping track of backward and the student knows in advance the number of counts to count back.	*Example: 9 take away what equals 6* *or* 9 - ☐ = 6 "Nine, ... eight, seven, six, ... three!" This strategy involves keeping track of backward counts. The student knows in advance where he or she is counting to.

Figure 7: Advanced count-by-one strategy examples

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3. Counting by structuring

At this level, the child begins to use strategies that work with the structure of numbers (equivalent to Level 3[3]). In other words, strategies that **break down numbers (decomposing), reorganise them and then build them up again (recomposing)** in some way that are not related to counting up or down. There seem to be two particularly common approaches:

- The first involves **partitioning** or splitting both numbers based on place value.
  For example, 47 + 36 is calculated as 40 + 30 = 70; 7 + 6 = 13; 70 + 13 = 83.

- The second involves a sequencing or **jump** (of 10) method:
  47 + 36 calculated as 47 + 30 = 77; 77 + 6 = 83.

Some studies suggest that children may tend to prefer to use the partitioning method. But they should be encouraged to use the **sequencing** method as it lends itself more readily to subtraction (83 – 47 as 83 – 40 = 43; 43 – 7 = 36).

Other strategies also include:

- Using the structure and number facts of 5 and 10
- Doubles and near doubles
- Making friendly numbers
- Jump via 10
- Jump of 10
- Place value

We will explore some of these below with examples and some simple activities that help to develop the strategy.

Near Doubles

Research shows that children can recall sums for making doubles quite easily, so we can capitalise on this strength as a strategy. It involves seeing that 7 + 8 is the same as 7 + 7 +1 (double 7 plus 1 more).

1st group		**2nd group**	
6 + 6	is 12	15 + 15	is 30
6 + 7	Double 6 is 12, plus 1 more=13	15 + 16	Double 15 is 30, plus 1 more=31
6 + 8	Double 6 is 12, plus 2 more=14	17 + 15	Double 15 is 30, plus 2 more=32
3rd group		**4th group**	
50 + 50	is 100	100 + 100	is 200
49 + 49	Double 50 is 100, less 2=98	99 + 99	Double 100 is 200, less 2=198
49 + 51	**Now try this one**	99 + 98	**Now try this one**

[3] Numeracy Handbook for Foundation Phase teachers (Grades R-3)

Practice the Near Doubles strategy with these activities

If a learner doesn't know their doubling facts, to build their confidence, use a pack of cards. As you flip each card over, the child doubles the number shown. Use J=11, Q=12, K=13. For further practice, add 2 cards together and then double the answer.

DICE GAME TO PRACTICE NEAR DOUBLES

- Play with a friend
- Throw a single dice, then double it and add 1.
- For example: throw a 6. Double 6 is 12 then add 1 = 13.
- The winner is the person with the highest number.

VARIATIONS:
Subtract 1 from the number and then double it e.g. throw a 5.
Subtract 1 is 4, double 4 is 8
Make up your own variations

EXPLORING DOUBLES

- Choose a number and add it to itself. Write the sum.
  For example: choose 5 **5+5=10**
- Now make the 1st number 1 more and the second number 1 less. What number did you get?
  Write the sum. **6+4=10**
- Try this with some other numbers and see what happens.
- What would happen if you made the 1st number 2 more and the 2nd one 2 less?
- *What is the pattern?*
- *Can you explain what is happening?*

NOTES

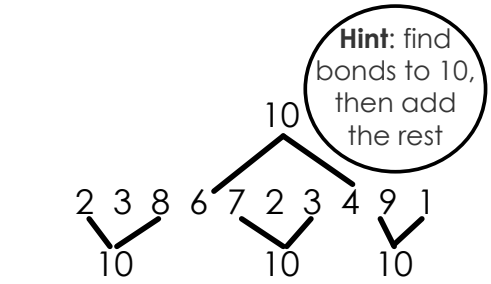
Making friendly numbers

This relies on learners knowing the facts (bonds) to 10. In this strategy, you look for 2 or more numbers that, when added together, make a 10 (or other decuple such as 20, 100 and so on).

1st group 8+2 8 + 2 + 3	Encourage your child to add 8 and 2 first to make a 10, then add the 3.
8 + 3 + 2	Look for a pair that makes 10
28 + 2 + 3	**Now use the same strategy to try and work this one out**
2nd group 6 + 4 6 + 4 + 3	Encourage your child to add 6 and 4 first to make a 10, then add the 3. Look for a pair that makes 10
6 + 7 + 4 16+4	**Now use the same strategy to try and work this one out**
3rd group 4 + 6 + 8 + 2	Encourage your child to look for pairs that make 10 e.g. 4+6=1, 8+2=10
9 + 3 + 1 + 7	Look for pairs that make 10
5 + 6+ 5+ 4	Look for pairs that make 10
5 + 66+ 25+ 4	**Now use the same strategy to try and work this one out**
4th group 3 + 8 + 2 + 7	Encourage your child to look for pairs that make 10 e.g. 3+7=10, 8+2=10
4+4+6+6	Look for pairs that make 10 e.g. 4+6=10, 4+6=10
9+1+1+9	Look for pairs that make 10
9+21+31+9	**Now use the same strategy to try and work this one out**

Practice the Making Tens Strategy with this dice game

Throw 1 dice ten times. Write each number that is thrown. Find ways to add the numbers quickly. Here's an example for the numbers: 2; 3; 8; 6; 7; 2; 3; 4; 9; 1



10 + 10 +10 + 10 + 3 + 2 = 45

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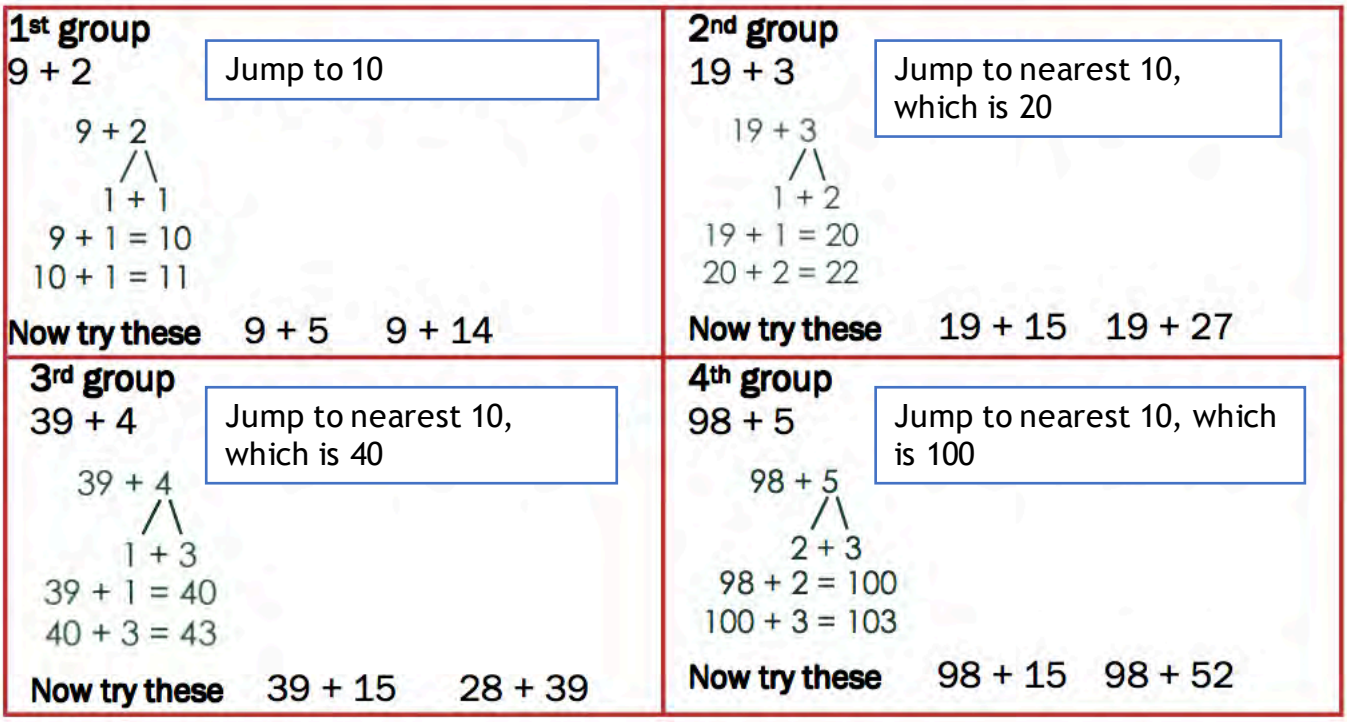
Jump via 10

The jump to 10 strategy is about working with numbers are easy to use in mental calculations such as multiples of 5, 10, 100 and 1000 and then breaking the 2nd number into parts, using basic number facts.



4. Formal calculating

At this stage, the learner begins to work with a variety of different strategies to solve addition and subtraction problems which use number relationships and what has already been learnt (number facts) and understood for flexible calculation without need for structured representations / materials. At this stage, learners will be able to do some calculations mentally, and others noting down intermediate steps where necessary.

NOTES

Other areas of progression

As well as progression in counting and early arithmetic strategies, the following figure shows progression across three other areas of early numeracy:

- **Number word sequencing**: verbal counting both forwards and backwards from 0 to 100
- **Number identification**: Identifying number symbols from 0 to 3-digit numbers
- **Conceptual place value**: progressing to seeing 10 as a unit

Although these are not the key focus area for this programme, some activities will incorporate these, so it is useful to have them here as reference.

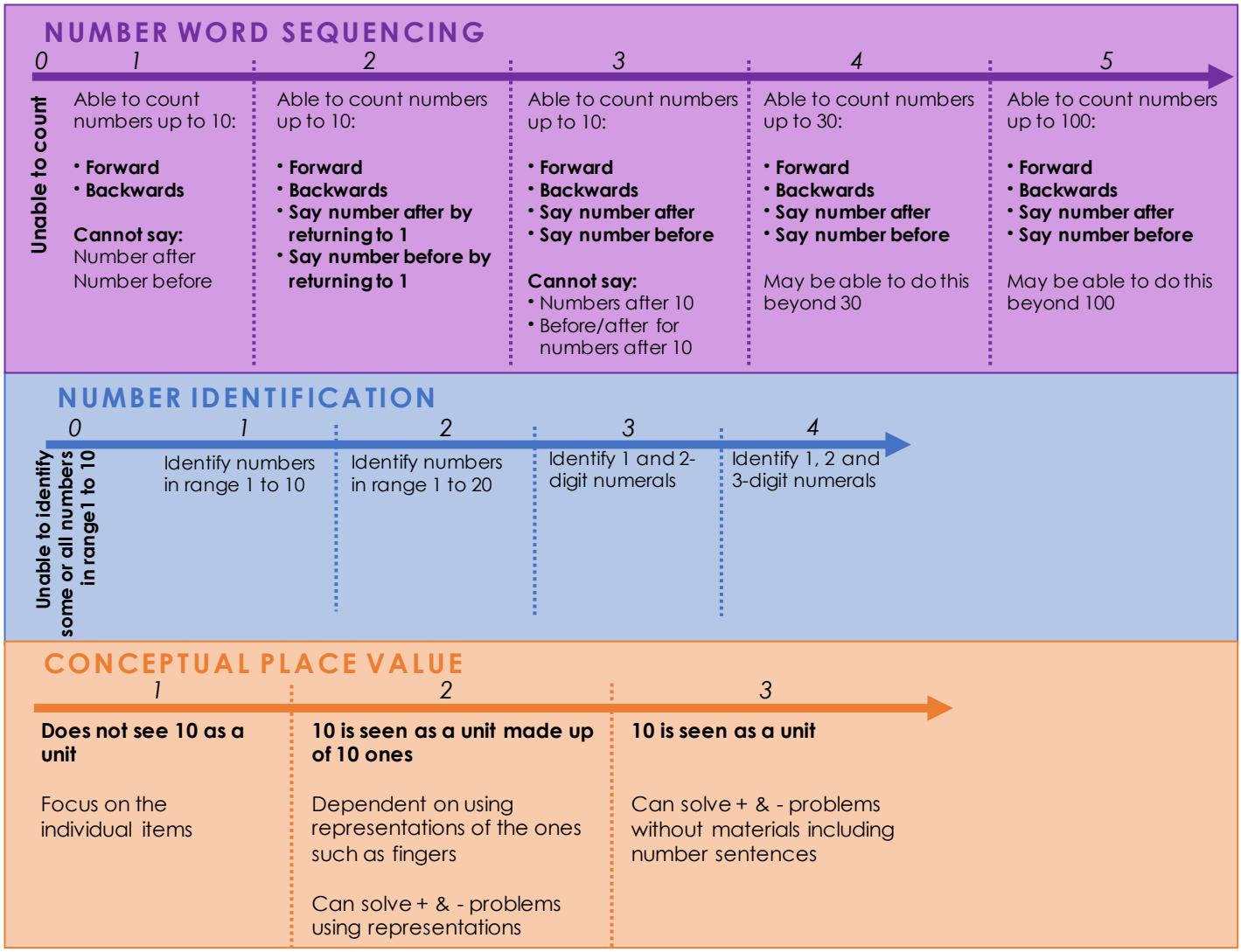


Figure 8: Other areas of numeracy progression

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Assessment tasks and profiling

Many of the assessments our learners write, do not give us any diagnostic information about where our learners are at. The assessments simply tell us that our learners are not at the expected grade level. There is a need for tasks and assessments that allow teachers to understand exactly what level their learners are at, so that they can identify resources and tasks that will help to progress learners to where they should be.

In this programme, as seen in the section above, we provide learner progression spectra that are accessible for teachers as a visual way of understanding how children progress in different areas of numeracy learning.

In a later session, we will share some informal (formative) **assessment tasks** that allow you as teachers to establish where children are along these spectra. The session will also explain **how to profile** a child using these spectra.

D - Learner cognitive control / executive functioning

Neurocognitive research shows that learners' cognitive control (also referred to as executive functioning (EF)) is more strongly associated with school readiness and has greater influence on learners' school performance than their IQ score (e.g. Diamond et. al, 2007), especially in mathematics (Roebers et al. 2012).

Learners in poorer communities need early support to develop such cognitive control because many of these learners have had fewer opportunities for the development of such control. The ages 4 to 6 years have been identified as particularly important for focused support of cognitive control as this is the period when marked improvements tend to occur (Rothlisberger et al., 2011).

Learner executive functioning (or cognitive control) is also used to assess school readiness. This involves 3 main components of:

- **Working memory**: ability to maintain and manipulate information over a brief period of time
- **Inhibition** (interference control): ability to suppress a dominant or automatic response
- **Shifting attention** (flexibility): ability to shift attention from one aspect or mental state to another (so for example from sorting shapes according to colour to sorting according to shape or size – this also involves inhibition as one must suppress earlier mental state to work flexibly with a different state (Garon et al., 2008; Diamond et al., 2007)

In our programme, we will use a series of short sharp focused activities (mainly games) to help learners develop each of these. These have been shown by researchers to support EF and cognitive control if used regularly.

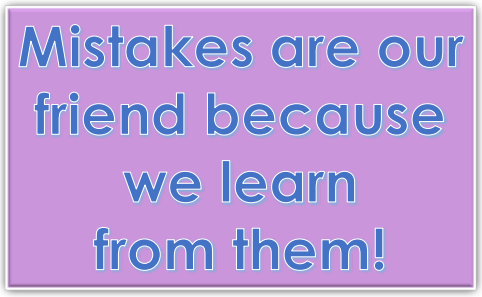
◆ *E - Growth mindsets*

A mindset is a belief about yourself and your most fundamental qualities like ability, faith, personality, political views, talents etc. People with *fixed mindsets* believe that fundamental qualities like intelligence are stable: they don't change much over time. People with *growth mindsets* believe that these qualities are growable: they can change and flourish or wither depending on how one engages with learning opportunities (Hymer & Gershon, 2014).

A fixed mindset makes you concerned with how you'll be judged; the growth mindset makes you concerned with improving (Dweck, 2006 p.13). The diagram on the next page shows some of the differences between the two mindsets.

Kilpatrick et al. (2001) use the term **productive disposition** to describe a particular attitude towards learning mathematics:

> "Productive disposition refers to the tendency to see sense in mathematics, to perceive it as both useful and worthwhile, to believe that steady effort in learning mathematics pays off, and to see oneself as an effective learner and doer of mathematics" (p. 131).



New research shows that when learners make a mistake in maths, and grapple with how to solve it/ fix it, their brain grows, synapses fire, and connections are made; when they do the work correctly, there is brain activity but less growth. This finding suggests that seeing mistakes as useful opportunities for learning is important.

Our focus is on combing these ideas to help us to develop growth mindsets and productive dispositions in our learners by *encouraging effort, perseverance, persistence, sending messages about process and growth* and that making mistakes are opportunities to learn.

The poster in Figure 10 shows some ways that you can encourage a growth mindset in your classroom. You will receive this as a poster in a later session.

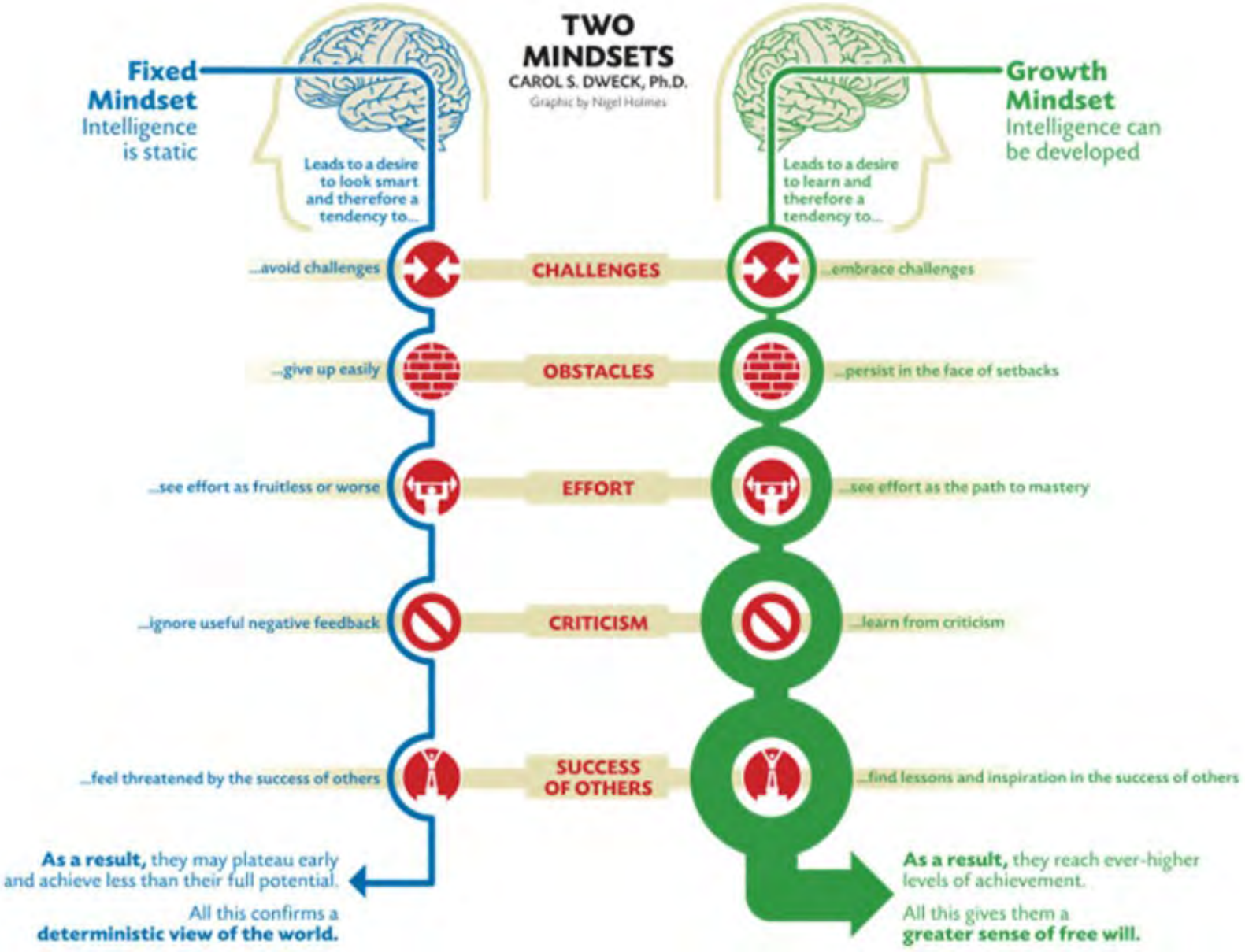
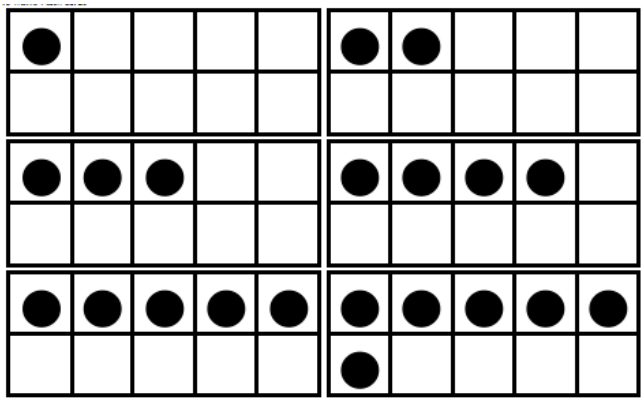
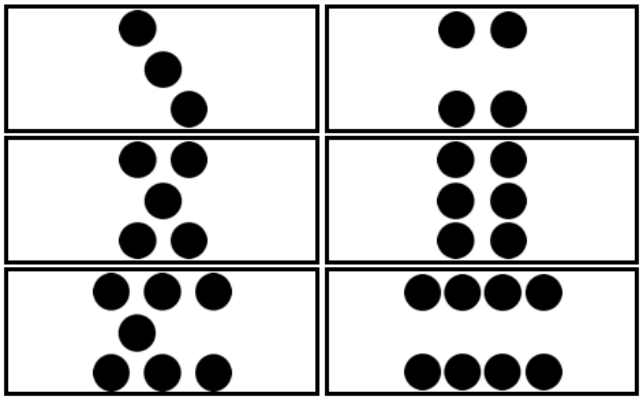
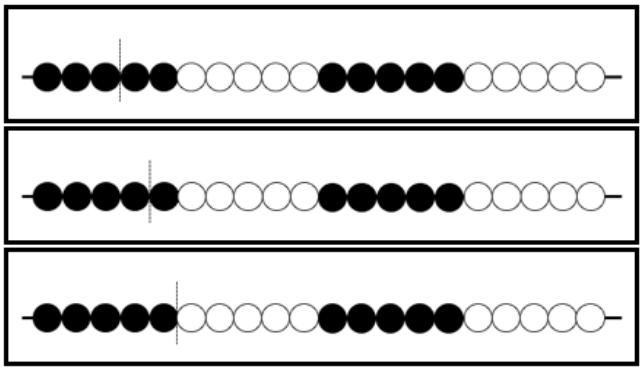
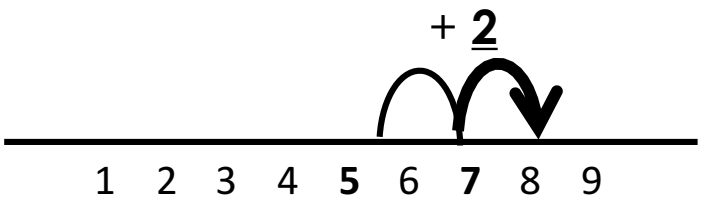


Figure 9: Differences between the two mindsets

Figure 10: Ways to encourage a growth mindset in your classroom (provided in a later session)

Key representations used in the programme

The programme focuses on key representations from the broader research literature (particularly prevalent in the work of Buys and Treffers and in Wright et al.'s work), such as fingers, dot patterns, linear models such as bead strings and number lines, 5 and 10-frames, and concrete items (counters, blocks etc.)

5 and 10-frames	Dot patterns
	
Bead strings	Number lines
	

This section provides details of the activities that are be presented in this workshop.

Every workshop will have a similar section so you know where to look in the handbook.

Resources

Cognitive control
Mathematical Mascot says please… activity

Played in the same way as "Simon says…" but with a mathematical basis. 'Simon says' is a traditional game where you give out statements such as 'sit down'. To do as the statement suggests, Simon must say it. If Simon doesn't say the statement and you move you are out. For example - 'Simon says sit down' – everyone has to sit or they are out. 'Stand up' – Simon didn't say it, so anyone who does stand up is out.

Skills:	***You need***:
• Inhibition and shifting attention	• Class mascot

You can change the way it works for your classroom and the names. If you have a soft toy or a club mascot, give that toy a name (ask the kids for suggestions and vote on a name perhaps). Use that name to play the game. For the instructions below I will replace with a generic 'mascot'.

Once children are familiar with how the game works, you can give them the chance to be the leader. So it will become "Siya says please…"

Rules:

Learner will do what the mascot says if they hear the word "**please**" in the instruction "do this" otherwise they must ignore the instruction and stay still.

Mascot says "please do this" (show action) - learners must do what mascot says

Mascot says "do this" (show action) - learners must not ignore what it says and stay still

This game can be changed to a slightly more difficult version:

Mascot says "do this" (show action) - learners must do what mascot says

Mascot says "do that" (show action)- learners must not ignore what it says and stay still

Example things to do, remembering to change between saying 'please' and not.

Stand on one leg	Show me 3 fingers
Put your right hand behind your back	Touch your toes
Reach for the sky	Touch your nose
Show me two hands	Show me 4 fingers over your head with one hand
Show me one / two hand(s) in a fist	Give yourself a hug
Bend and touch your knees	Use one finger to touch your nose

Cognitive control:
'I spy with my little eye' activities

The aim of these activities is for learners to selectively remember and find a specific object or objects among competing visual stimuli on a page.

Skills:	**You need**:	**Work with**:
to develop executive functions of: • Visual attention, • working memory and • attention shifting • Visual perception: Figure ground • Visual tracking and scanning (needed for reading) • Visual recognition	• Box of "I Spy" resources • teacher's list of questions to ask.	We suggest working in small groups.

Using the activity

- Work with a group of learners.
- Each learner is given a specific object to find.
- They have to remember the item they are looking for and when they find it to record it on scrap paper (Grade R can draw it, Grade 1 and 2 can try and write the object's name)
- This can be done for different objects in succession on the same "I Spy" box
- The objects can be arranged in many different ways
- Other objects from around the classroom can be added: pencils, beans, counters, leaves, sticks, paper clips, anything and everything!

Example Layouts

Start with simple objects with very little visual detail, enough space between objects, and objects grouped together.

List of possible questions (from the pictured arrangement below):

- I spy…the number 5
- I spy…something green
- I spy… 9 of the same thing
- I spy…the number 6
- I spy... something purple. How many did you find?
- etc.

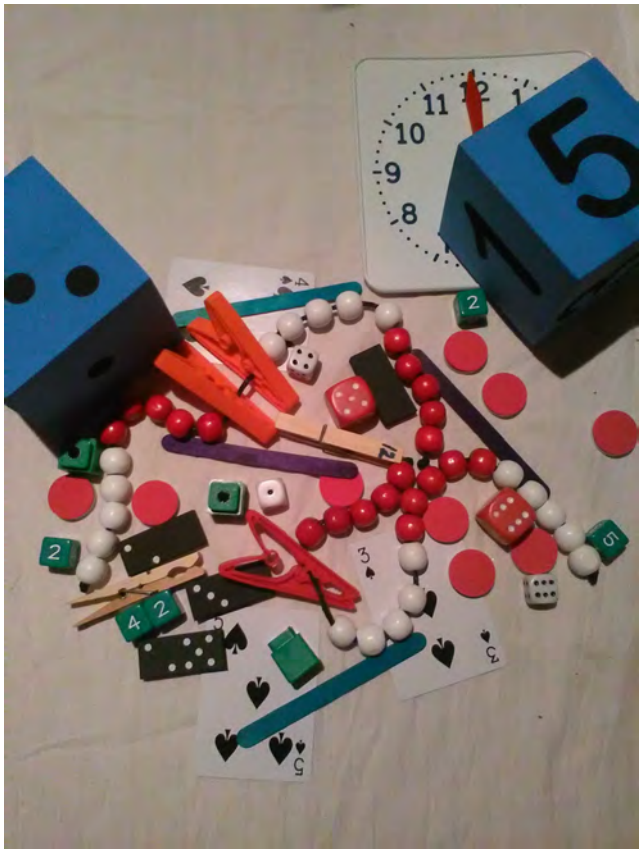
‘I spy with my little eye’ activities continued

More complex layouts (Grade 1 and 2)

These can include more detail and competing objects with less contrast to increase the challenge.

List of possible questions (from the pictured arrangement below):

- I spy…A bead string with two pegs on it
- I spy…a five and a two together
- I spy…something with two 3’s
- I spy…a 12 who is hiding
- I spy…something that when added together makes 6
- I spy…three things that make 12 altogether
- I spy…one less than 4
- I spy…one more than 4
- Etc.



Cognitive control:
'Egg carton counting' activities

The aim of these activities is for learners to visually identify numbers and connect the visual stimuli with a number value.

Skills: to develop executive functions of: • Visual attention, • working memory • problem solving • visual perception: • visual memory • fine motor development: precision grasps	**You need**: • Egg cartons • Small/medium items for counting: • beans, pasta, beads, buttons etc. • Pegs with numbers written on • For the extension: o Pegs with + - and = signs	Work with: We suggest working with smaller groups sitting in a circle on the mat or around a table, each with their own individual work task **Extension**: For grades 1 and 2 these activities can be modified to include basic sums: 1 + 2 = 5 + 3 = 10 – 3 =

Using the basic activity

- Work with a group of learners in a circle or seated at a table.
- Each learner receives an egg carton and enough counting objects (beans/pasta/beads/buttons etc)
- Learners work individually.
- They are expected to look at the visual number presented on the pegs and then place the correct number of items on top

Ask learners to:

- Name the numbers they see in their carton
- Ask properties about them for example:
    - What is one more?
    - What is one less?
    - What is half?
    - What is two more?
    - Etc.

‘Egg carton counting’ activities continued

Other activities

1. Matching objects (beans) to number symbols (up to 6)

In numerical order

2. Matching objects (beans) to number symbols (up to 12)

In numerical order, using tweezers to pick up beans

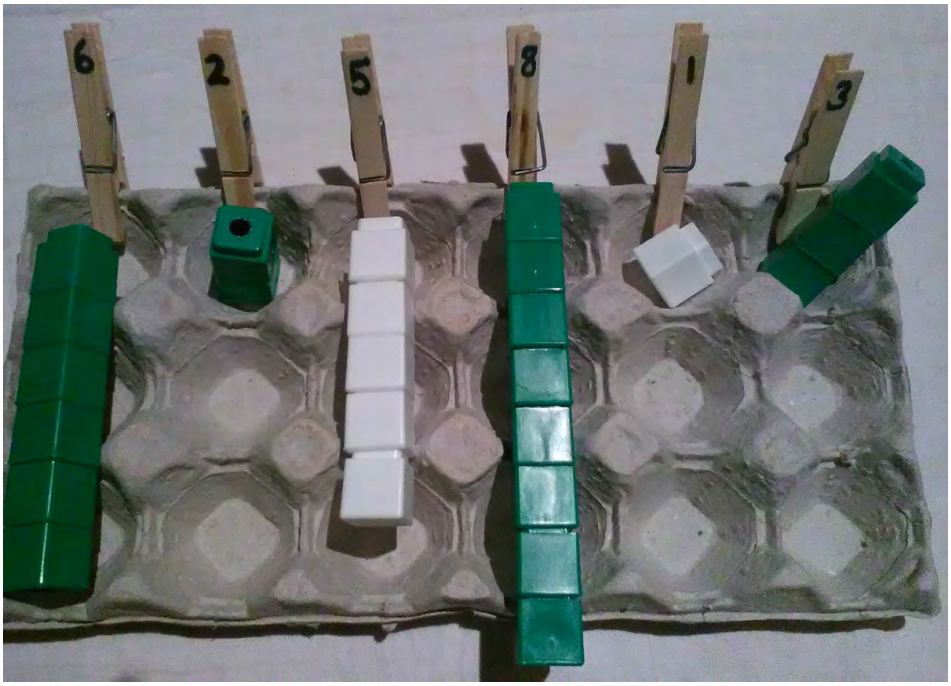
‘Egg carton counting’ activities continued

3. Matching objects (beans) to number symbols

In any order

4. Matching other objects to number symbols

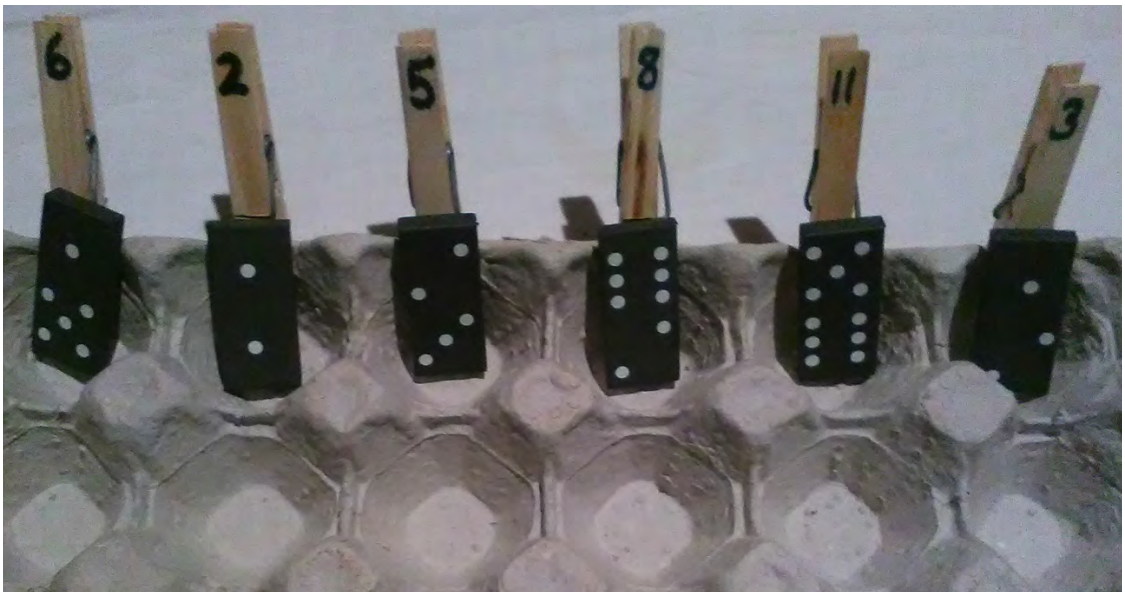
Such as unifix blocks or counters



‘Egg carton counting’ activities continued

5. Matching dot patterns (dominoes) to number symbols

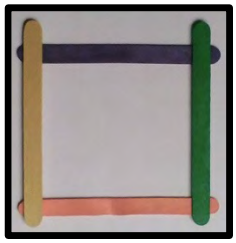
Using dominoes



6. Matching dot patterns AND number symbols to number symbols

Using dot pattern and numeral dice

Cognitive control:
'Copy Cat' activities



The aim of these activities is for learners to look at a picture and copy the picture exactly.

Before starting with this type of activity, encourage the learners to describe what they are seeing: what colours, what shapes, where the shapes are pointing (directionality), what the overall picture represents (a triangle, a cross, a square etc.), and how they plan to copy it, step by step.

Skills:	**You need**:	**Work with**:
to develop executive functions of: • Visual attention • working memory • organisation skills • problem solving • to develop motor ideation, spatial planning and visual motor integration	• Lollipop sticks • Example pictures for copying (see below) • Examples should progress from simple shapes to complex shapes, and should be numbered 1,2,3, etc	We suggest working with smaller groups sitting around a table each copying their own example

Using the activity

- Demonstrate the activity first to the whole group, highlighting a few problem solving tips
- Then, each learner receives an example card to copy.
- Ask them to orientate the card straight in front of them, locating the top and bottom correctly.
- Learners are seated in front of their work and not allowed to change the orientation of the example card (should be placed straight in front of them).
- They are handed an equal amount of lollipop sticks
- Learners select the correct number and colour lollipop sticks needed to copy their shape
- Each card is numbered. Learners work individually on one card at a time.
- When all learners are finished with a card, they pass the card onto the learner on their left.

Ask learners to:

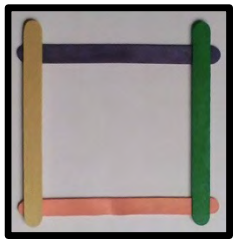
- Look at the example card
- Describe what they see and how they plan to copy the example:
- Is there a clear shape (a cross, a square, a letter, a triangle etc.)?
- How many lollipop sticks do they need?
- Are they all flat or do they overlap?
- How are they planning to copy this shape?

Self-evaluation by learners (with support from the teacher) after completion of the task

Ask learners:

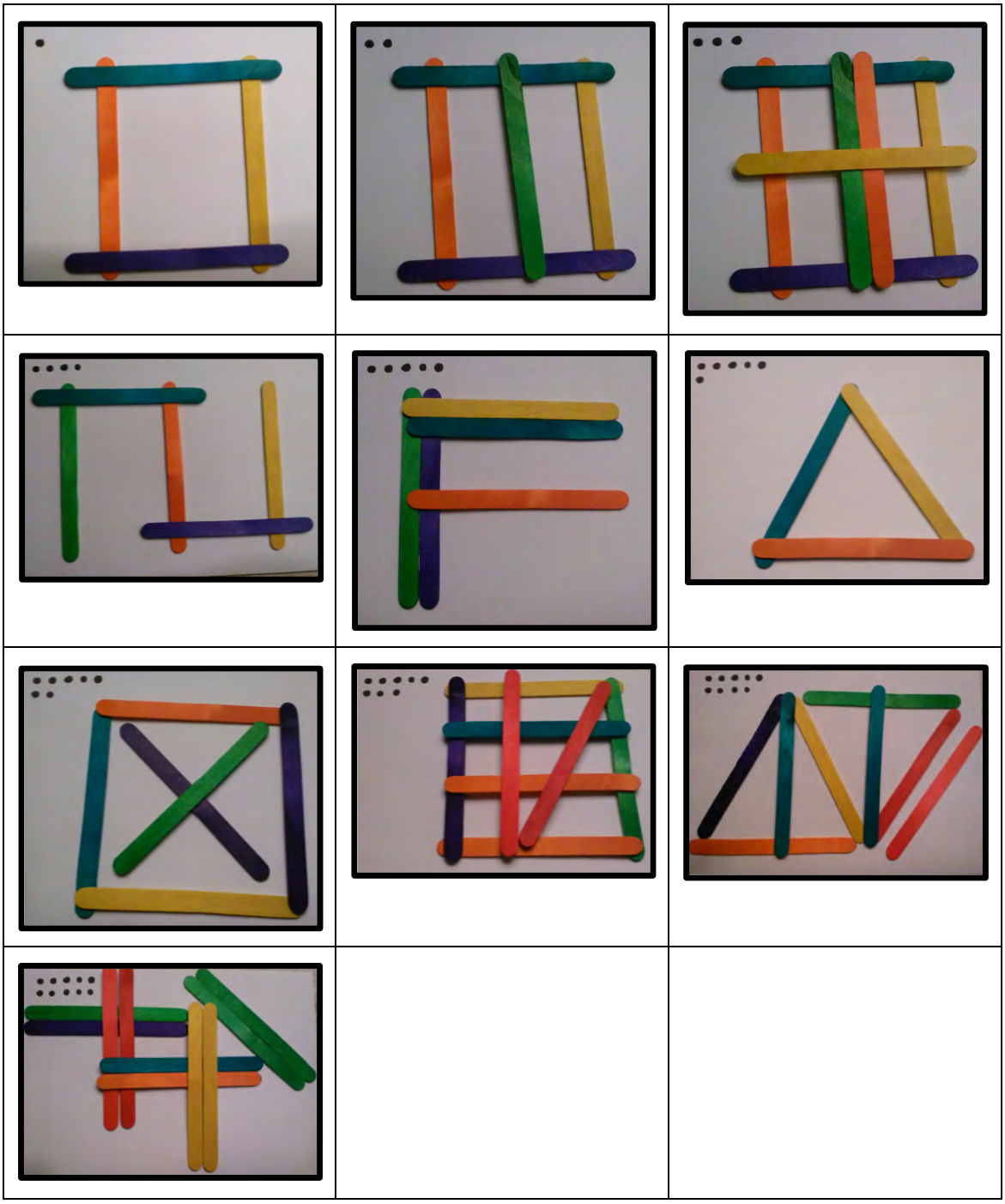
- Is your picture the same as the example?
- If not, what is different?
- "Count the lollipop sticks and show me where each one is in your picture"
- "Show me where is the top and bottom of your picture"
- Is anything missing in your picture?

‘Copy Cat’ activities continued



10 picture examples

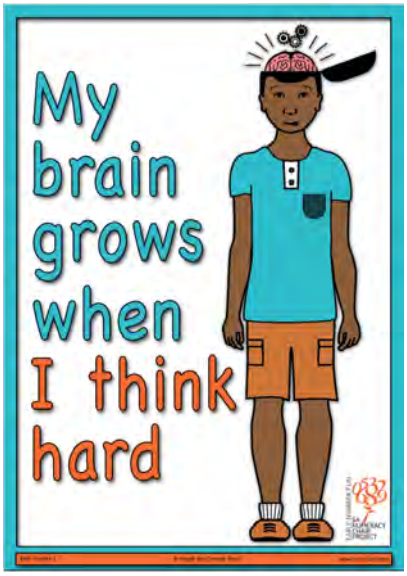
Here are examples of 10 possible picture combination that you can make with coloured lollipop sticks on your black boards, progressing from simple shapes to more complex ones.



Growth mindset activity

My brain grows when I think hard

In this session, you will receive this first growth mindset poster to display in your classroom.



Learner discussion

As you put it up, you could have a discussion with the learners about this.

- It is helpful for learners to revisit a mistake and grapple with it because the brain grows from the **experience of struggle**. When learners struggle with mathematics, their brains grow. Being outside their comfort zone is important and learners must learn to resilience in the face of unfamiliar challenges.
- Mistakes are our friend because we learn from them!
- The harder you work at something, the deeper you think about it the better you will be at it.
- Discussing our thinking strategies with others helps us to reflect on and improve our thinking.

NOTES:

Number sense activity

4

Waku-Waku[5]

Use this activity to encourage learners to think flexibly about numbers in different ways. We suggest that it is not an everyday activity, but rather something you can do regularly so that the children look forward to it, but not grow tired of it.

You need:	***Mathematical object of learning:***	**Duration:**
A hand puppet or fluffy (soft) toy  Give your puppet or toy a name that the learners can relate to.	**Productive Practice** Opportunity to use productive practice in the classroom, where the tasks are more open and allows for differentiation and learners are encouraged to show initiative.	5 to 10 minutes in a session Useful as a mental session starter

Script

Say	"This is Waku-Waku and he can only say 5"
Show	the children a puppet or fluffy toy
Say	"We want to make Waku-Waku think a little about numbers. We have to think of a problem that gives the answer of 5."
Say	"Like this for example: 3 + 2 makes 5, so Waku-Waku can answer"
Ask	A learner to contribute something that gives an answer of 5.
Note	Waku-Waku will only say "5" if the problem gives the answer of 5, otherwise he shakes his head.
Repeat	for about 5 to 10 minutes, gathering different contributions from the learners

Grade 1

Waku-Waku can say a different number on different days. Choose a number that you are working with in class.

Grade 2

Waku-Waku can say a different number on different days. Choose a number that you are working with in class and in time increase the number range beyond 10.

As learners begin to work with subtraction (and explore other operations) encourage them to make up problems for Waku-Waku that make him think a little more.

[4] From: http://www.mathnasium.com/www-mathnasium-com-littleton-news-teaching-number-sense

[5] Taken from: Children learn mathematics: A learning-teaching trajectory with intermediate attainment targets for calculation with whole numbers in primary school. Page 50.

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