# eNICLE Grade 1 and 2
# Teacher Development Programme

## Session Four
## Teacher Handbook

**Name**

_____

**School**


Last updated: 6th October 2017

To access resources for this session, scan this QR code on your phone to go directly to the resources page:

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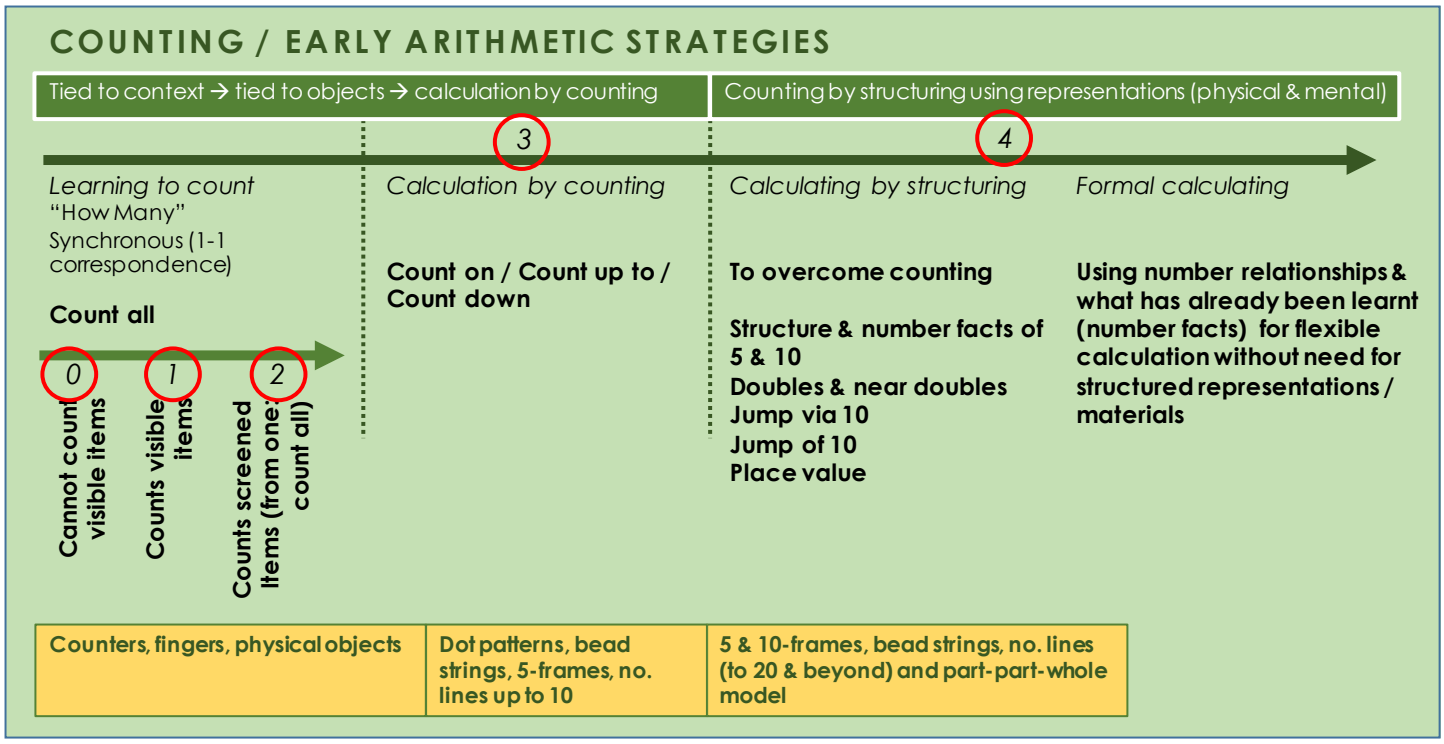
## Table of contents

## *Summary of the key ideas behind the activities in this session*

In the broad introduction in session one we explained the key ideas we focus on across the programme. Here we will summarise the key ideas that are the focus of today's session (Session 4).

*Progression*

In the first session we looked at a progression spectrum for counting / early arithmetic strategies.




The activities that we focus on in this session enable progression:

- Fire and sticks story
  - from context bound calculating to object bound counting and calculating
  - structure and number facts of 10
  - identifying numerals to 10
- Part-part-whole model
  - Calculating by structuring as a way to overcome *calculating by counting*
  - Structure and number facts of 5, 10 and 20
  - Structure of numbers in the range 1 to 20

## *Using story (narrative) approaches for developing number sense*

In this session our focus is on providing a Fire and Sticks story that gives learners contexts for context-bound counting and progressions to object-bound counting. This area of progression is highlighted in the diagram above.

All children love a good story and especially love to interact with stories as they unfold. They show wonderful expressions of a wide range of emotions as stories unfold. Stories and books are also excellent for language and literacy development, developing learner concentration skills. They are also great for developing number sense when numbers are built into stories.

In this session we use provide the first of a series of story-books that have been written to support the transition from context based counting to object bound counting. Using story-books with images, and through encouraging learners to answer questions and represent what is happening in the stories with their fingers and puppets, learners will be supported in developing skills of:

- Context bound counting and calculating (1-10)
- Object bound counting and calculating (1-10)
- numeral recognition (numerals 1-10)
- compare quantities and develop language of more/ less/ many/ none
- develop comparative language for size – big and small; more and less
- recognition of words like 'more' 'less' 'big' 'small'
- develop a patterned / structured sense of bonds to 10 (see part-part-whole model on page 6)
- use written tallies and/or numbers to represent the patterned story of how the 'number of …' changes in each place in each stage of the story (extension for learners ready for this aspect)

The method of working with the stories with learners will encourage learners to:

- Focus on pictures, numerals and words and speak the key words and number names as the story unfolds
- Act out with facial expressions emotions and feelings communicated in the story
- Have a conversation with the reader
- Predict what might happen next
- Tell their own stories using story-boards
- Tell their own stories using their fingers to represent the number of monkeys/frogs/children in different trees/lily pads/places etc.
- Do imitative reading where they 'read' the story to others in the class

## *Why work with the structures of 5 and 10?*

In order to progress learners from calculation by counting to **calculation by structuring** and **formal calculation** (level 4 in the spectrum), learners need a sound base of quickly known or quickly derived number bonds. In the CAPS document these are referred to as items of rapid recall.

> The 'sevenness' of seven becomes visible as a structure by visually seeing five (undivided) finger on one hand and tow on the other. This offers an opportunity to develop a part-whole relationship. Structuring numbers promotes number sense whereas counting single objects could lead to math-difficulties
> (Runesson and Kullberg 2010, p.4).

We can help children to move beyond using their fingers to work out these bonds, to rapid recall of them. Relating numbers to 5 and 10 helps develop knowledge of the number bonds within 20. *For example, with 8 + 7, thinking of 7 as 2 + 5 and adding the 2 to 8 to make 10 and then the 5 to total 15.*

Working with the structures of numbers helps to develop number sense, helps with subsequent understanding of place value and word problems and promotes **relational understanding**.

**Operational understanding**

Procedural. Knowing **how** to do it, work out an answer.

**Relational understanding**

Knowing what to do (**how**) and can explain **why**

Relational understanding is understanding **how** and **why** the rules and procedures work. Learners who understand relationally are more likely to remember the procedures because they have truly understood why they work, they are more likely to retain their understanding longer, more likely to connect new learning with previous learning, and they are less likely to make careless mistakes.

**NOTES:**

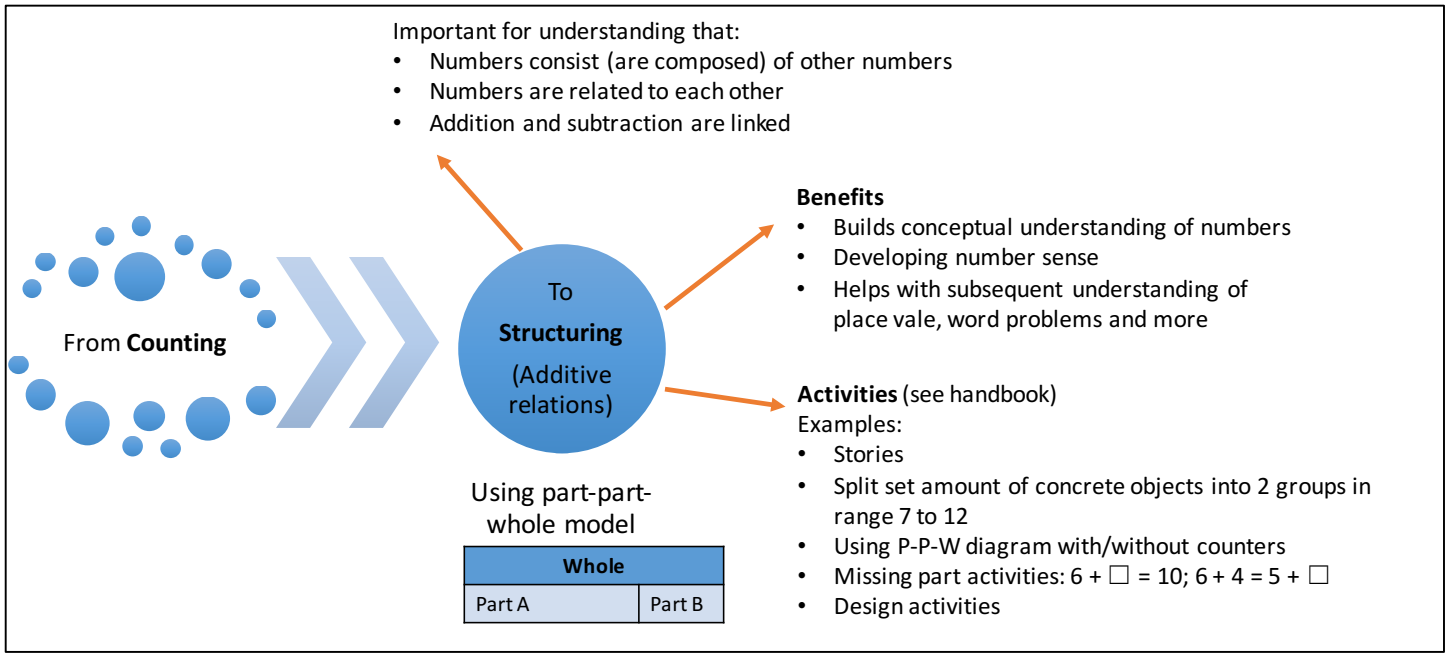
*Part-part-whole model*

Children who can count meaningfully will be able to count out a certain number of objects. However, there is nothing in counting a set of objects will cause a child **to focus** on the fact that it could be **made of two parts**. For example, 8 counters could be separated into two piles such as 2 and 6 or 7 and 1 or 4 and 4 and so on.

Thinking of **part-part-whole** relationships is helpful in thinking about the structure of numbers, the relationships between numbers and in linking addition and subtraction.

> "Probably the major conceptual achievement of the early school years is the interpretation of numbers in terms of part and whole relationships. With the application of a Part-Whole schema to quantity, it becomes possible for children to think about numbers as compositions of other numbers."
> (Lauren Resnick, 1983).

In this session, we provide some introductory activities for working with this model. We will also be referring to this idea in many of the later sessions (5 to 10), as this is a key idea.




*An example:*

*Where the whole is 6, and 4 and 2 are parts.*

*This means that 4 and 2 together form the whole, which is 6.*

*6 subtract 4 leaves the 2 and 6 subtract 2 leaves the 4.*

| *Whole* 6 | |
|---|---|
| *Part A* 4 | *Part B* 2 |

Part A + Part B = Whole (6 + 2 = 6)

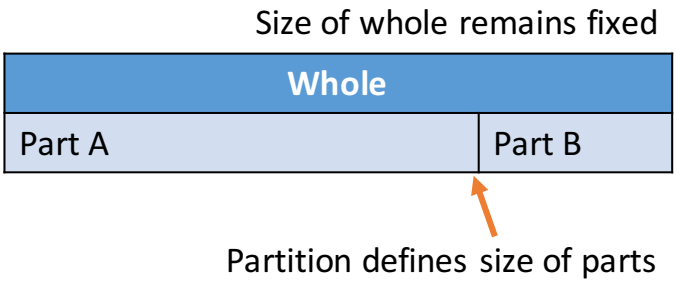
Part B + Part A = Whole (2 + 4 = 6)

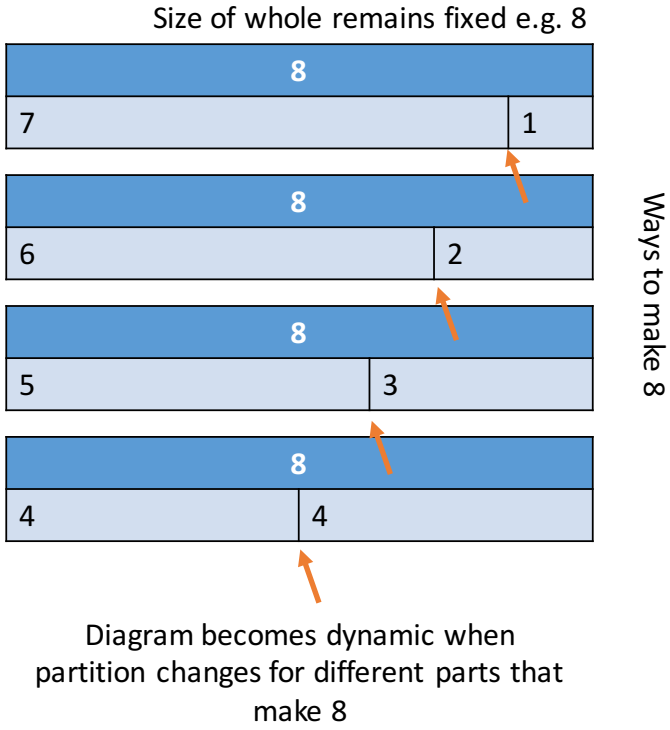
Whole – Part A = Part B (6 – 4 = 2)

Whole – Part B = Part A (6 – 2 = 4)

The part-part-whole model / diagram is a dynamic one:

- The 'whole' remains fixed e.g. as shown in the example below
- The position of the partition defines and represents the size of the part e.g. 7 and 1; 6 and 2; 5 and 3; 4 and 4 etc.



Activities using this model will aim to eventually help learners to write down all the equivalent number sentences for any addition or subtraction fact, starting by using the model and eventually without it. In each of the examples below, the 4 most common number sentences are in the first columns.

To help learners understand that the equals sign is a relational symbol, 4 more number sentences can be written (column 2)


If 6 + 2 = 8 then the following are also true:

| | |
|---|---|
| 6 + 2 = 8 | 8 = 6 + 2 |
| 2 + 6 = 8 | 8 = 2 + 6 |
| 8 – 6 = 2 | 2 = 8 – 6 |
| 8 – 2 = 6 | 6 = 8 - 2 |

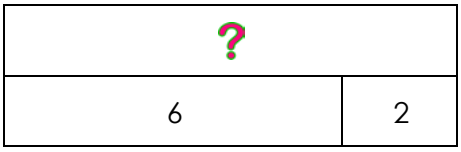
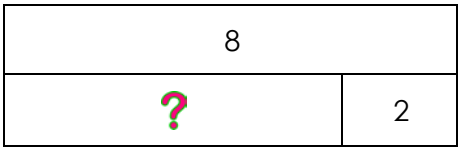

If 80 – 70 = 10 then the following are also true:

| | |
|---|---|
| 70 + 10 = 80 | 80 = 70 + 10 |
| 10 + 70 = 80 | 80 = 10 + 70 |
| 80 - 70 = 10 | 10 = 80 – 70 |
| 80 – 10 = 70 | 70 = 80 – 10 |

There are always **8 ways** to write any addition and subtraction fact. Learners can use this to be flexible about how they calculate. For example, working with 305 – 298 = ☐, may be easier for them than 298 + ☐ = 305.

*Missing parts (shifting the unknown)*

The model can also be used to find missing parts (shifting the unknown). This can lead to introducing the formal notation for a missing addend.

| **Unknown** | **Represented on the model** | **Which can be formally represented as** |
|---|---|---|
| whole |   | 6 + 2 = ☐ |
| part a |   | ☐ + 2 = 8 |
| part b |   | 6 + ☐ = 8 |

*Example Introductory story*

Stories such as the one below can be useful ways of introducing the idea of splitting a single whole number (in this case 7), into two parts in different ways.

*Today I want to tell you about a boy named Siya, who loves to play marbles with his friends at school.*

*Every day, Siya puts his 7 favourite marbles in the front pockets of his school trousers so that he remembers to take them to school.*

*On some days, Siya puts all his marbles in one pocket. And on other days, he puts all his marbles in the other pocket. Most of the time, he uses both pockets and puts some marbles in each one.*

*Work out how many different ways you can tell stories about Siya and his marbles.*

*Using this idea in the classroom.*

See the activities on page 6.

## *Equivalence and the equals sign*

Most learners interpret the equal sign as an operational symbol meaning "find the total" or "put the answer."

However, it should be interpreted as a relational symbol of mathematical equivalence, understanding that it means "equivalent to" and is crucial for later work in algebra.

**The Equal Sign**

Means "equivalent to"

Crucial for later work in algebra

For example

6 + 4 = 10

10 = 6 + 4

5 + 5 = 6 + 4

Empty box problems which involve shifting the position of the unknown item, in conjunction with the part-part-whole model (as shown on page 8 above) can support the development of this key idea. Altering where the equals sign is placed develops fluency and flexibility.

## *Cognitive control activities: finger discrimination*

One of the key focus areas for this programme is developing learner cognitive control. In the first session we discussed 3 key cognitive control functions that need to be developed in young learners. These were i*nhibition, flexibility* and *working memory*.

In this session, we focus on *finger discrimination*. Jo Boaler talks about the benefits of *visual mathematics* as seeing for understanding:

> "*when students learn through visual approaches, mathematics changes for them, and they are given access to deep and new understandings*".

Jo points out that the of our fingers in the early years is one of the key ways that we build visual mathematical understanding as fingers can be regarded as the link between numbers and their symbolic representation.

- Our brain uses representations of fingers, well beyond the time and age that people use their fingers to count. We "see" a representation of fingers in our brains, even when we do not use fingers in a calculation
- Counting numbers on fingers in the early years is important for brain development and future mathematics success.
- It is important that schools help learners **discriminate** between their fingers through the use of finger-based activities.

The *finger discrimination* activities in this session encourage development of:

- **Inhibition**: in terms of learner ability to suppress an automatic response of using a dominant hand or finger
- **Shifting attention**: ability to shift attention flexibly to using different fingers and different paths (among many)
- They can also help to address some issues learners may have with writing **certain number symbols** (such as 5). See page 12 for further information.

## *Number Symbol Reversals*

*Some background*

It is common for pre-schoolers, Grade R and 1 learners to reverse letters and numbers, but by age seven, children should only be making occasional reversals. Making reversal errors hinders learner's progression in reading, numeracy and general academic performance and often show:

- poor visual-motor skills
- a tendency towards poor visual perception

*Which numbers do learners struggle with and why?*

Reversing numbers appear to be linked to the starting position and starting direction of the numbers when written.

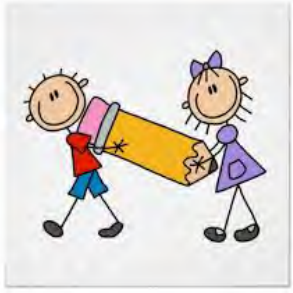
| | |
|---|---|
| 7 / 9 / 3 | • These are the most difficult numbers to **recognise** |
| 2 / 3 / 7 | • Numbers which should start at the **top** and in which the initial direction of movement in writing the number is to the **right** can be most problematic. |
| 5 | • The number 5 depends on the way a child forms the number.<br>• Learners who consistently reverse the number 5 are the ones who start forming it by beginning at the horizontal line at the top, rather than by beginning with the vertical stroke. |
| 6 / 9 | • These tend to be reversed because learners often confuse these numbers with the letters **b / d** and **q / p** which appear to look the same, and thus cause confusion in letter writing as well. |

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

## Reflection Activity



Get into groups of 3-5 teachers who are from a different school to you.

Reflect on your use of the following activities from the last session. Make notes in the space below.

- Assessment activities
- Monkeys in the tree story books and related activities
- Growth mindset posters

Use these questions to guide your reflection and discuss:

1. Have you tried the games/activities in your classroom?
   Explain - discuss
2. How did you organise the children to play the games?
   Explain - discuss
3. Were there any aspects of the activities/games that you adapted that you would like to share with the community?
   Explain - discuss
4. Will you use the activity/game again? Why?
   Explain - discuss

**NOTES**:

# Body position and directionality activities

**BODY AWARENESS AND DIRECTIONALITY**

It is so important to get children familiar with their right and left hand and other body parts to increase their body awareness, sense of directionality and to assist with written reversals of numerals.
For example:

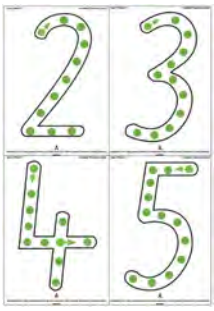
- Show me your right hand/ show me your left hand/right leg/left leg/right ear/left ear etc.
- Also encourage children to identify the parent/teacher's left hand/right hand etc.

*How You Can Help:*

- Use the **Six Bricks Activities** to:
    - Help children get a good sense of direction with **games** that use space, and space words, such as **forwards, backwards, up and down, under and over.**
    - Work on midline crossing with some fun activities that get children reaching over to the opposite side of the body with each hand.
    - **Work on left and right**. This can take some time.
- These Six Bricks activities are particularly useful:
    - Good Morning High Five!
    - Listen & Do
    - Tricky Towers
    - Topsy Towers
    - Refer to the Six Bricks teacher handbook for information on these.
- These activities will also help:
    - The Finger Maze activities on page 17
    - The Number Tracing activities on page 16

- Forwards
- Backwards
- Up
- Down
- Over
- Under
- Left
- Right

## Directionality activities



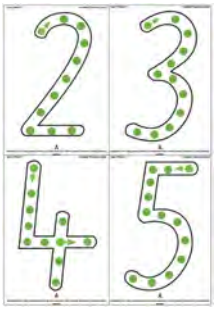
## NUMBER TRACING

These tracing activities will help to address (remediate) common problems children have with writing number symbols i.e. backward 5 and other numbers mentioned on page 12 above.

| ***Mathematical object of learning:*** | ***You need***: | ***Suggested way of working:*** |
|---|---|---|
| • Practice with writing individual numerals. | • One page of number symbols for each learner<br>• Dry wipe markers if you want the learner to trace over the numbers. | • We suggest that you use these activities only with learners who are struggling to write the number symbols. |

There are two types of activity:

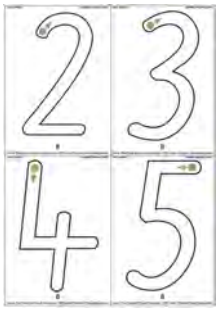
**SET A**



The first set is for tracing number symbols with dots. Use these first if learners are really struggling to write their number symbols.

You will notice special dots for when the direction of writing changes. See the number 8 for example.

**SET B**



The second set is for practicing with less support. You will see that the **starting positions** only are supplied for each number.

*Using the activities:*

- Start with Set A.
- Focus on the numerals that the learner struggles with.
- Allow the learners to either trace the numbers with their fingers or with dry wipe markers.
- Ask them to trace the numbers 5 times.
- Then let the learner practice drawing the numeral on a piece of paper, using the tracing card as a reference.
- Ask them to write the number 5 times.
- Once they have practiced a little with Set A, move onto using Set B.
- Repeat

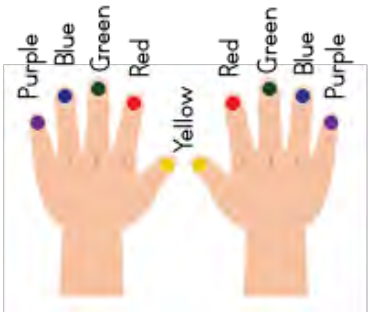
## Finger Maze 1

These finger mazes[1] focus on finger discrimination and encourages finger use for your learners. They can be useful for remediating some of the issues mentioned on page 12.

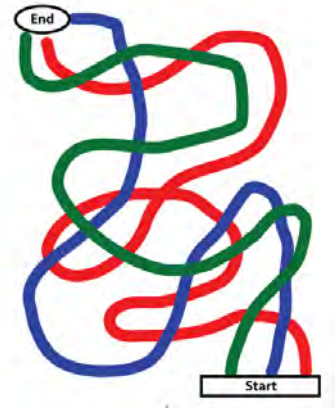
| ***Mathematical object of learning:*** | ***You need***: |
|---|---|
| Build finger differentiation, which is important for developing numerical and visual mathematical understanding<br>***Skills***:<br>• Inhibition and shifting attention<br>• Colour differentiation<br>• Descriptive vocabulary such as *up, down, left, right, curved, straight, around* | • Small coloured stickers for children's fingers in blue, green and red<br>• Finger Maze 1 (laminated)<br>***For extension***<br>• Crayons (red, blue and green)<br>• Scrap paper |

**Directions**:

1. Use the laminated mazes to work in small groups on the mat.
2. Put a coloured dot on each child's fingernail as shown in the diagram.
3. Have the child match their red index finger to the red path in the maze and **slowly** trace the path to the end. Help the child focus on the path and not speed along.
4. Each path should be traced slowly and take several seconds.
5. Next trace the green path with the matching finger.
6. After a child uses their dominant hand to trace all of the paths in the maze ask them to use their other hand.




youcubed Finger Maze 1




Observe if learners struggle with any particular finger or hand. Let them practice more with the fingers and hands they struggle with.

**Extension ideas**:

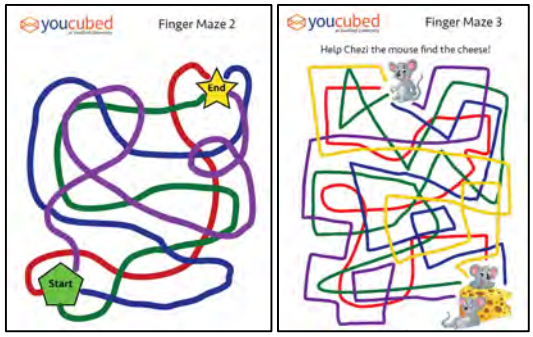
1. After children have used both hands and all fingers, get them to re-trace each coloured path.
   This time encourage them to try and describe <u>how</u> their finger moves along the path using words like *up, down, left, right, curved, straight, around* and so on.
2. Learners can also draw their own paths from a common start and end point in blue, green and red.
   Mark the common start and end points for them on their pieces of scrap paper.
   They can then trace their own paths and swop their paths with other learners.

[1] Youcubed finger mazes adapted from Gracia-Bafalluy, M., & Noël, M. P. (2008). Does finger training increase young children's numerical performance? Cortex, 44(4), 368-375.

## Finger Mazes 2 and 3

Below are two more finger mazes that focus on finger discrimination and encourage finger use and can be useful for remediating some of the issues mentioned on page 12.

| | | |
|---|---|---|
| ***Mathematical object of learning:*** Build finger differentiation, which is important for developing numerical and visual mathematical understanding<br>***Skills***:<br>• Inhibition and shifting attention<br>• Colour differentiation<br>• Descriptive vocabulary such as *up, down, left, right, curved, straight, around* | ***You need***:<br>• Small coloured stickers for children's fingers in red, blue, green, purple, yellow<br>• Finger Mazes 2 & 3 (laminated)<br>***For extension***<br>• Crayons (red, blue, green, purple, yellow)<br>• Scrap paper |  |

**Instructions**:

1. Use the laminated mazes to work in small groups on the mat.
2. Put a coloured dot on each child's fingernail as shown in the diagram.
3. Have the child match their red index finger to the red path in the maze and **slowly** trace the path to the end. Help the child focus on the path and not speed along.
4. Each path should be traced slowly and take several seconds.
5. Next trace the green path with the matching finger.
6. After a child uses their dominant hand to trace all of the paths in the maze ask them to use their other hand.

Observe if learners struggle with any particular finger or hand. Let them practice more with the fingers and hands they struggle with.

**Extension ideas**:

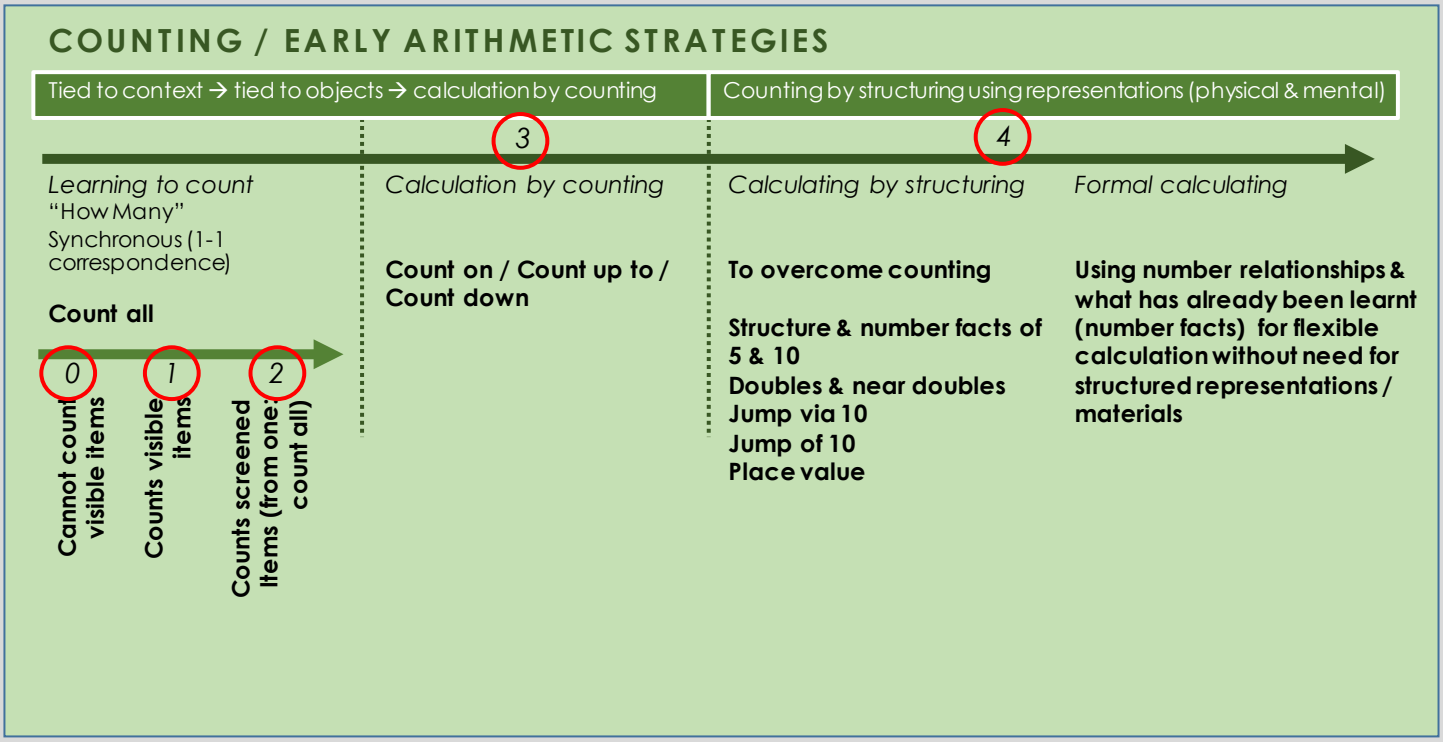
1. After children have used both hands and all fingers, get them to re-trace each coloured path. This time encourage them to try and describe <u>how</u> their finger moves along the path using words like *up, down, left, right, curved, straight, around* and so on.
2. Learners can also draw their own paths from a common start and end point in red, blue, green, purple, yellow.
   Mark the common start and end points for them on their pieces of scrap paper.
   They can then trace their own paths and swop their paths with other learners.

# Part-part whole activities

| Whole | |
|---|---|
| Part A | Part B |

**COUNTING: Progression focus for the following activities**

| Progression level | Progression focus | Number range / other |
|---|---|---|
| 4 | Calculating by structuring | Numbers 1 to 10 / 20 |



## Part-part whole activities continued

| Whole | |
|---|---|
| Part A | Part B |

**STORIES**

| ***Mathematical object of learning:*** | ***You need*:** |
|---|---|
| • Working with structures of number using the part-part-whole model | • Counters of some kind<br>• Paper and pencils |

1. *Siya and the Marbles*

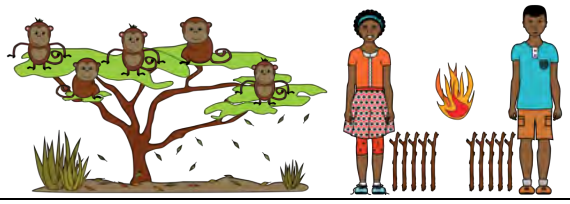
*Today I want to tell you about a boy named Siya, who loves to play marbles with his friends at school.*

*Every day, Siya puts his 7 favourite marbles in the front pockets of his school trousers so that he remembers to take them to school.*

*On some days, Siya puts all his marbles in one pocket. And on other days, he puts all his marbles in the other pocket. Most of the time, he uses both pockets and puts some marbles in each one.*

*Work out how many different ways you can tell stories about Siya and his marbles.*

2. *Use the Monkeys in the Tree and Fire and Sticks stories as the contexts*



There are several ways of developing these stories over a number of days / lessons:

1. Day one:
    a. Learners work alone or in pairs to model this with concrete objects (counters, stones etc.)
    b. Encourage them to draw or represent all the different ways they find.
    c. After some time, ask learners for contributions.
    d. Write these on the board.
    e. Ask if any have been left out.
2. Day two / three:
    a. Use the same story, but use a different number of marbles e.g. 9, 11
    b. Repeat the above process
3. Day four:
    a. Introduce the learners to the part-part-whole model using the first story as an example.
    b. Learners then draw rough models to show how the marbles can be distributed (still using counters if necessary).
    c. At some point, push the learners to try and work without the counters
4. Days five / six / seven and beyond:
    a. continue using the model and the story as context for exploring other numbers in the range 7 to 12, or in Grade 2 in the range 1 to 20.

**Note**: Initially, learners should work with a single total so that they focus on the parts that create the same whole and explore all the possible options. In time, you can encourage them to do so systematically by asking "*how do we know that we have all the different ways?*"

If the totals constantly change within a single lesson, learners often fail to understand how the parts are composed to create the same whole and may develop misconceptions about how many ways they can represent a given value.

## Part-part whole activities continued

| Whole | |
|---|---|
| Part A | Part B |

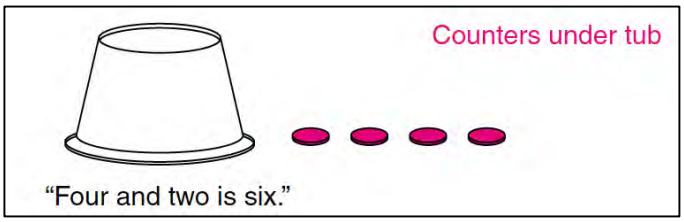
### MISSING PART (SCREENED) ACTIVITIES

In missing-part activities, children know the whole amount and use their already developed knowledge of the parts of that whole to say what the covered or hidden part is. If they do not know or are unsure, they simply uncover the unknown part and say the full combination as they would normally.

Missing-part activities provide reflection on the combinations for a number. They also serve as the forerunner to subtraction concepts. For example: With a whole of 8 but with only 3 showing, the child can later learn to write "8 – 3 = 5."

| ***Mathematical object of learning:*** | ***You need***: | ***Suggested method of working*** |
|---|---|---|
| • Working with structures of number using the part-part-whole model, where some one of the parts is missing or hidden.<br>• Introduction to subtraction concepts. | • Counters for each pair of children<br>• A method of screening counters e.g. plastic container or paper | • Initially, do the activity with groups of children on the mat.<br>• When they are familiar with it, children can work in pairs at their desks |

### COVERED PARTS




- Children work in pairs or with the teacher on the mat.
- Count out a number of counters.
  For example: 6
- Ensure all learners agree with the count
- One child places all the counters under a plastic container or piece of paper
- Some of the counters are then pulled out to be visible.
  For example: 4
- The other child must say how many are hidden to make the target number
  For example: "*Four and two is six*"
- Encourage the children to share their reasoning:
  For example: "*There were six, I can see four, so there must be two hidden*".
- If the child does not know the hidden part, then it can be shown by lifting the screen.

**EXTENSION TO SUBTRACTION**:
Once learners are comfortable with adding the missing part to the visible part, you can reverse the process to introduce subtraction as follows:

| | |
|---|---|
| **NOTES & SUGGESTIONS**: | These missing part (screened) tasks are the same as those included the Assessment Activities. |
| | Only introduce this activity once learners have been working with the part-part-whole model for a few weeks. |
| | When you first introduce these activities, start with a number total in the range 3 to 10. |
| | Over time, work with a bigger number range. |

- Count out a number of counters and ensure all learners agree with the count.
  For example: 6
- Keep all the counters visible.
- Then cover some of the counters, saying "*I am hiding some counters*".
  Hide 2 for example, but don't say how many you are hiding.
- The other child must say how many are hidden from the whole
  For example: "*Six less four is two*".
- Encourage the children to share their reasoning:
  For example: "*There were six, now there are four, so there must be two hidden*".
- If the child does not know the hidden part, then it can be shown by lifting the screen.

## Part-part whole activities continued

| Whole | |
|---|---|
| Part A | Part B |

### GAMES

| ***Mathematical object of learning:*** | ***You need***: |
|---|---|
| • Working **mentally** with structures of number using the part-part-whole model | • Your hands primarily<br>• If you have Unifix blocks, large blue dice or dot pattern cards, you can also use those |

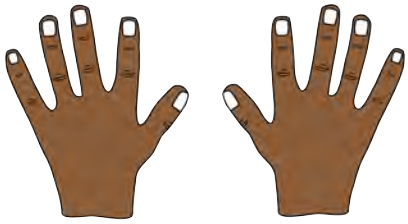
### I WISH I HAD…

Start with "I WISH I HAD 6…"

1. In front of the whole class or a small group, hold up **less** than six fingers (or substitute with your favourite resource, showing a number less than 6) i.e. hold up 4 fingers
2. Say "*I wish I had 6.*"
3. Children think about what part is needed to make 6. i.e. 2 more needed to make six.
4. Encourage them to say: 4 and 2 make 6
5. Staying with the number 6, repeat steps 1 to 4, holding up a different number of fingers each time e.g. 2; 3; 5; 1 and so on.

### Variations

- On another day, choose a different number e.g. 9 and use a resource showing a number less than nine
- On another day, work with the part needed for "how many less".
  Choose a number e.g. 8.
  This time show a resource with a number **greater** than 8, for example 10 fingers.



  Say "*I wish I had 8.*"
  Learners will need to work how many less to get to 8.
  Encourage them to say: 10 less 2 is 8.

### FIZZ POP

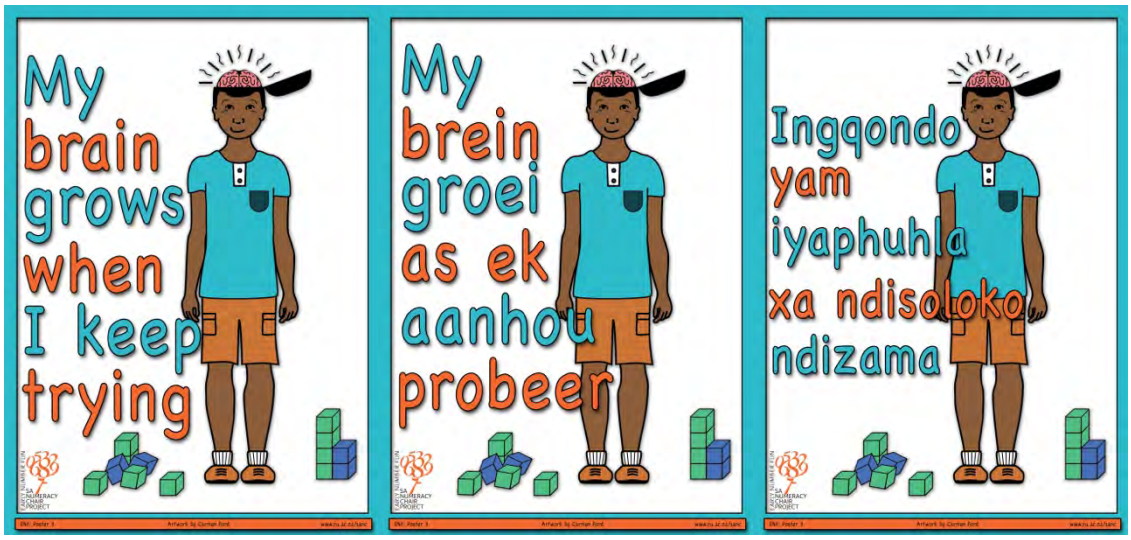
- Practice numbers that add to 10.
- Say "I will say a number and you must say how many more to make 10"
- The game starts with teacher or leader learner saying "FIZZ", class/group responds with "POP"
- Say the number and responds.
- e.g. "5" and learners respond with "5"
- If they struggle, remind them of part-part-whole model or do more work with the model

### VARIATIONS

Change the target number i.e. 5, 8, 10, 20, 30 etc..

*My brain grows when I keep trying*

In this session, you will receive one of these posters to display in your classroom.




*Learner discussion*

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

- Perhaps you and your class could think of a name for this boy such as Thabo
- Refer the learners back to poster one: **My brain grows when I think hard**
- Remind them about revisiting mistakes and grappling 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 develop to resilience in the face of unfamiliar challenges.

The harder you work at something, the more you keep trying, the better you will be at it.

- Ask the learners:
  - How do you get better at sport (running, swimming, or some other sport they are familiar with)?
  - How do you get better at throwing and kicking a ball?
- Point out that the important thing is to 'practice' and keep trying.
- Ask the learners:
  - What do you think Thabo is trying to do in this picture? Gather some ideas
- Talk about Thabo's positive attitude and ask the learners to read along as you point to the words "My brain grows when I keep trying".

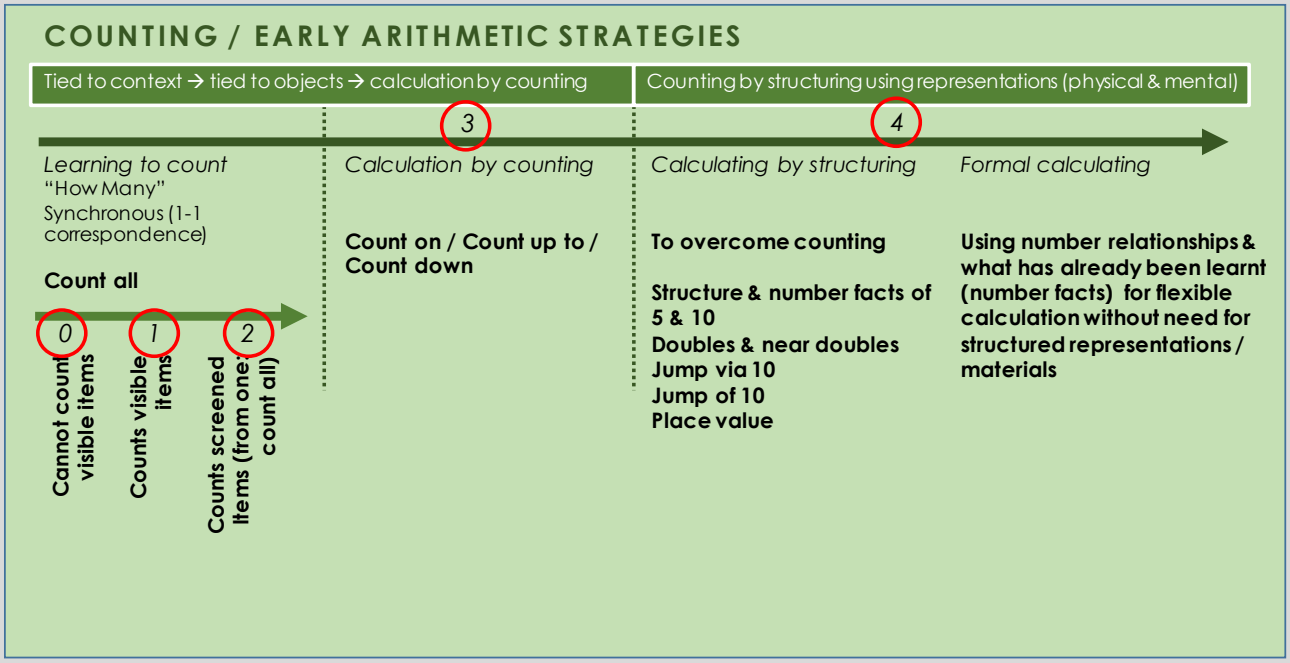
Look up and watch the following **Jo Boaler YouTube clips** on how the brain grows when we make mistakes

- Jo Boaler: The Brain Science On Growth Mindset: https://www.youtube.com/watch?v=s4xqzgBy-IM
- How you can be good at math, and other surprising facts about learning | Jo Boaler | TEDxStanford https://www.youtube.com/watch?v=3icoSeGqQtY

## Story-based activities – Busi, Thabo, the sticks and the fire

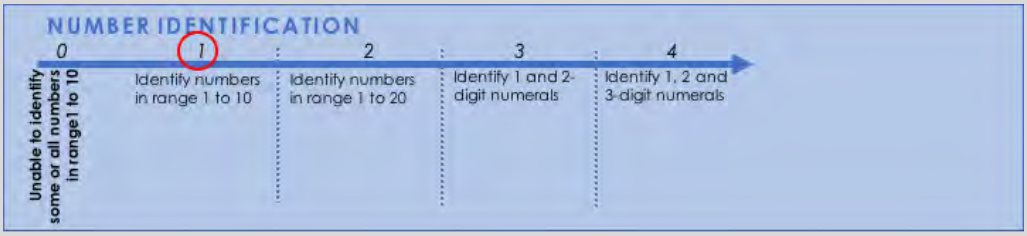
### COUNTING: Progression focus for the following activities

| Progression level | Progression focus | Number range / other |
|---|---|---|
| 1 | Learning to count | Numbers 1 to 10 |
| 4 | Calculating by structuring | Numbers 1 to 10 |




### NUMBER IDENTIFICATION: Progression focus for the following activities

| Progression level | Progression focus | Number range / other |
|---|---|---|
| 1 | Learning to count | Numbers 1 to 10 |



# Busi, Thabo, the sticks and the fire

**Getting started with the story book**

First read the story to your learners. This could be with the whole class on the mat or with smaller groups of learners on the mat while other learners are occupied with other activities.

As you read, pause to ask questions such as:

- "*who has more or less sticks?*"
- "*how many sticks does he/she (Busi/Thabo) have?*"
- "*how many **more** is this than Busi/Thabo?*"

**Use the following prompts for pages 8 to 10**

- Ask: *How does Busi know that she only has three sticks on her head?*
- *Is she right?*
- *How many sticks do Busi & Thabo have altogether?*
- Repeat for page 9 and 10, changing the names as you do so.

**Note about page 11**

- On this page, Thabo's sticks have been coloured green to help the learners think about the problem on page 12 and to use the bundle of five in their thinking

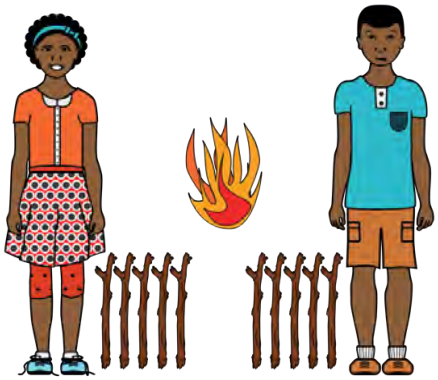

**Discussion for page 12**

- Cover the pictures on the page
- Read the top of the page
- Ask:
  - *How many sticks will Gogo use altogether?*
  - *How many sticks will Thabo have left?*
- Then reveal the pictures and ask the learners which picture shows this.
- Ask learners to tell a number story about the other picture


**What is different from 'Monkeys', 'Umbrellas' and 'Frog' books?**

- Number range 1 to 10
- Working with combinations that make 10
- New vocabulary of "same" and "equal"

## Busi, Thabo, the sticks and the fire continued



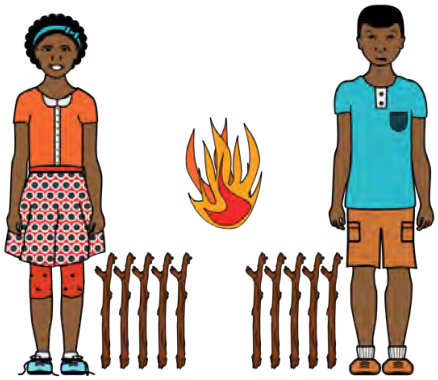
**Re-enact the story**
Now get the learners to re-enact the story with the pages of the story as a guide and using the popsicle sticks.

| | |
|---|---|
| dieselfde | gelyk = |
| fanayo | zenza = |
| same | equal = |

- Lay a pile of popsicle sticks on the floor
- Re-enact the story with 2 learners in front of the class (using a girl for Busi and a boy for Thabo)
- As the story unfolds, ask the other learners:
  - *What happens next?*
  - *Who has more/less sticks?*
  - *How many sticks on Busi/Thabo's head?*
- Ask learners to place '**more**', '**less**', '**same**', '**equal =**' and numeral cards by the feet of the 2 chosen learners as the story continues.

**NOTES**:

## Busi, Thabo, the sticks and the fire continued



**Modelling the final page of the story with sticks (some time later i.e. a week)**

***For each learner, you need:***
- 5 brown popsicle sticks
- 5 green popsicle sticks
- Numeral cards

For this, extend the story by saying the following:

***Busi always brings dry sticks which are good for making a fire. Gogo always uses ALL Busi's sticks when she makes a fire before using any of Thabo's.***

Remind the learners, that in the story, Thabo's sticks were green. As the teacher, pretend to be Gogo. This means that you will always use all Busi's 5 *brown* sticks in the following scenarios. Make this clear to the learners as a rule: Gogo always uses Busi's sticks first.

Working with a small group of children on the mat, give each learner 5 *brown* sticks and 5 *green* sticks.

- Ask them to hold the 5 *brown* sticks in the left hand (Busi) and the 5 *green* ones in the right (Thabo).
- Say "*I want to build a fire with 8 sticks. Give me 8 sticks*"
  Learners should give you ALL 5 of the *brown* sticks and 3 of Thabo's *green* sticks.
  **NB**: If learners count the 5 brown sticks out in ones, remind them that we know that this bundle is 5.
  Get them to count on from 5: five, six, seven, eight
- Ask:
  *How many of Thabo's sticks do I use?* [3]
  *How many sticks will Thabo have left?* [2]
  *How many sticks altogether in my fire?* [8]
- Have the children use the 5 *brown* sticks from their left hand (Busi) and the correct amount of *green* ones from the right (Thabo) to show the sticks for the fire and to answer the questions.
- They can also find numeral cards to match the number of sticks used for the fire and the number Thabo has left over. e.g. 8 and 2
- Continue to work through different numbers of sticks for the fire: 7; 6; 9; 10; 5;
- At the end, build the bonds to 10:
  e.g. 8 sticks in the fire, 2 sticks left; 7 sticks in the fire, 3 sticks left and so on.

**Extension**

If you feel that some of the learners are ready, they can write all the ways that they made 10 using the sticks. You are looking for the combinations of: 5 and 5; 6 and 4; 7 and 3; 8 and 2; 9 and 1.

**NOTES:**