education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Foundation phase
Just-in-Time Training Workshop
2019: No. 3

Facilitator's Guide

MATHEMATICS

Jika iMfundo
what I do matters

Endorsed by:

SADTU   NAPTOSA   NATU

Jika iMfundo: Foundation Phase JIT Workshop 3 of 2019
Mathematics
Workshop guide for facilitators

In this workshop participants will be given the opportunity to think deeply about the concepts covered in the Space and Shape curriculum in the Foundation Phase. There is some content input which is given, since a deeper understanding of the content will enable more effective teaching of the topics. Links to the Jika iMfundo lesson plans on the topic of Space and Shape are also made. They will also find out more about language across the curriculum in the Foundation Phase.

Participants should work in groups on all of the activity questions. Time guidelines are given and you should facilitate the group discussions. If you have more time and want to continue the discussions for longer you are free to do so.

Time (Length of session)	Activity	Resources
30 min	**Session 1:** Arrival and distribution of materials for the workshop *Pre-workshop activity*	Facilitator's guide (leader) Participants guides (participants) *Pre-workshop activity*
90 min	**Session 2:** Space and Shape	Participants' handout. *Resources Handout*)
120 min	**Session 3:** Language across the curriculum	Participants' handout. *Resources Handout*)
60 min	**Session 4:** Dry run – preparation for training	Facilitator's guide and participants' handouts (participants)
30 min	**Session 5:** *Post-workshop activity*	*Post-workshop activity*
	END - Lunch	

NOTE:

There is an hour dedicated on the programme to allow for discussion of the activities and trialling them for yourselves as facilitators of the sessions when you go back to the district.

Session 1: Materials distribution and pre-workshop activity.

Distribute the pre-workshop activities and allow the participants to start writing. They have 30 min. for this activity.

Hand out all of the workshop materials quietly to the participants while they do the pre-workshop activity.

Take in the completed activity sheets when the writing time is up.

Session 2: Space and shape

In this session the following lesson plans from the Term 3 Jika iMfundo FP Maths materials are relevant:
- *Grade 1 Term 3 lessons 33 to 38.*
- *Grade 2 Term 3 lessons 15 to 17.*
- *Grade 3 Term 3 lessons 28 and 29 and 38 to 40.*

This activity involves sets of questions to guide the discussion for about 90 minutes. Your facilitator will guide you as you break into groups and have large group discussions throughout this time.

Warm up starter activity! Make shapes using your hands/arms/objects that you have with you. Here are some pictures of people doing this activity. Discuss the different shape that people make. This is a good activity in an FP maths class because it allows learners to be active and use their bodies to express ideas they have about shapes. This is known as a kinaesthetic activity, where the brain gets feedback from the muscles about body movements.

It is appropriate for young learners to study 3-D shapes (balls, boxes, cylinders, cones, pyramids, etc.) before they study 2-D shapes (squares, triangles, circles, etc.) because 3-D shapes can be represented more readily by real objects that learners see and experience in their environment. The 2-D shapes that can be noticed as 'making up' the 3-D shapes are more abstract and are therefore introduced later in the curriculum. This is a curriculum move from the more familiar and real shapes to the less familiar, abstract shapes.

Take time to speak about the information in the participants guide related to this activity. Prepare yourself well so that you can answer questions participants might have about it.
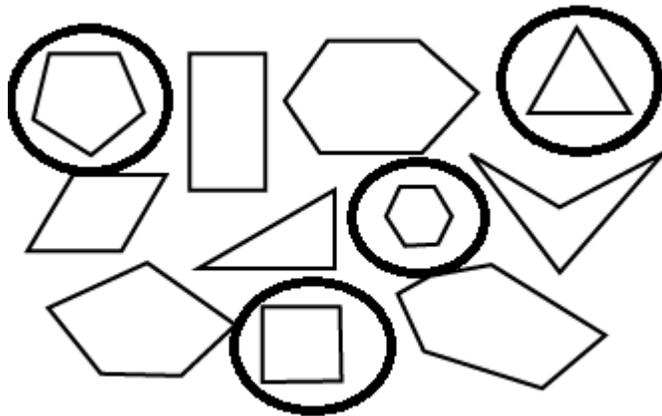

Activity 1

1. Draw three different types of each of the following shapes. Try to vary their sizes and orientations.
   Check that participants know the number of sides each types of shape must have. Drawings will differ. There should be some of different size (different lengths of sides) and different orientations (in different positions, not just in the familiar orientation.)

a. Quadrilaterals
   Must have 4 sides.
b. Hexagons
   Must have 6 sides.
c. Triangles
   Must have 3 sides.
d. Octagons
   Must have 8 sides.

2. Look at the drawings of shapes below and circle all of the regular polygons. (*The drawings might change when printed, but those which are circled are regular in the original. The word "regular" is often used carelessly – for mathematical shapes it has this particular meaning, it does not mean "common" or "often seen".*)

   NOTE: A rhombus is **not** a regular polygon because only its sides are equal, the angles are not all the same size (it has 2 pairs of equal sides). To be regular, both sides and angles must all be equal.

Take time to speak about the information in the participants guide related to this activity. Prepare yourself well so that you can answer questions participants might have about it.

Activity 2

1. What is useful about an activity like this for FP learners:
   Draw a house/person/animal using only geometric shapes. You should use at least 3 different kinds of shapes in your drawing.

   Drawings will differ. Allow sharing of creativity and encourage participants to name the shapes that they have used to draw their figures. This kind of activity is useful for FP learners because it gives them an opportunity to work with shapes. They can think about the names and characteristics of the shapes while they use the shapes to make the drawing. The will think about things such as round and straight sides, and lengths of sides. It gives them a creative opportunity to develop their knowledge of shape names and characteristics.

2. ENRICHMENT: *Refer to the information given above to answer these questions.* Most people know and agree that a rectangle can also be a parallelogram, but what about other relationships between shapes? Answer **SOMETIMES** or **ALWAYS** or **NEVER** to the following questions.

All teachers should be able to distinguish between shapes to and compare them according to their characteristics. This will help you to teach about the shapes more meaningfully.

a. When is a parallelogram a kite?
Sometimes – when it is a rhombus, or a square. Because then the adjacent pairs of sides are equal in length. A kite needs the adjacent pairs of sides equal in length.

b. When is a square a trapezium?
Always – a trapezium only needs to have one pair of opposite sides parallel and a square has both pairs of opposite sides parallel.

c. When is a kite a square?
Sometimes, when it has right angles, because if it has right angles, all of the sides will also be equal in length.

d. When is a rectangle a parallelogram?
Always because rectangle has both pairs of opposite sides parallel, so it is also a parallelogram.

e. When is a parallelogram a rhombus?
Sometimes – when all of its sides are equal in length.

f. When is a rectangle a trapezium?
Always – as for a square – a trapezium only needs to have one pair of opposite sides parallel and a rectangle has both pairs of opposite sides parallel.

g. When is a rhombus a square?
Sometimes – when it has right angles (because its sides are all equal in length always).

3. Why is it a useful activity for learners to think about the relationships between shapes?

It helps them to become more familiar with the shapes and their characteristics. It also develops their reasoning skills as they have to think deeply about the relationships between the definitions of the different shapes to decide on the relationships. At the level of FP learners, the discussion of the relationships between triangles, squares and circles is just as meaningful. How are they the same and how are they different? Comparisons are at the heart of the study of geometric shapes – looking for similarities and differences.

Take time to speak about the information in the participants guide related to this activity. Prepare yourself well so that you can answer questions participants might have about it.

Activity 3
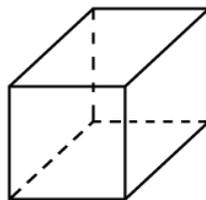
1. How many faces, edges and vertices does the shape have?
6 faces, 12 edges and 8 vertices (corners)

2. How would you name the shape? Give two possible names.
A cube or a hexahedron or a square prism.

3. What dimension is the shape?
3-dimensional.

Take time to speak about the information in the participants guide related to this activity. Prepare yourself well so that you can answer questions participants might have about it.
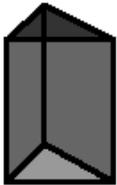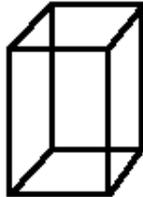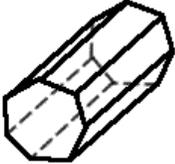

Activity 4

1. *Naming is given in the tables below:*

Pyramids:

Triangular pyramid Tetrahedron	Square pyramid Pentahedron	Pentagonal pyramid Hexahedron	Octagonal pyramid Nonahedron

Prisms

Triangular prism Pentahedron	Square prism Hexahedron	Pentagonal prism Heptahedron	Heptagonal prism Nonahedron

2. To sketch a pyramid, it is usually the easiest to draw the base, set the position of the apex, and drop down the edges where necessary. Draw each of the pyramids shown above yourself.
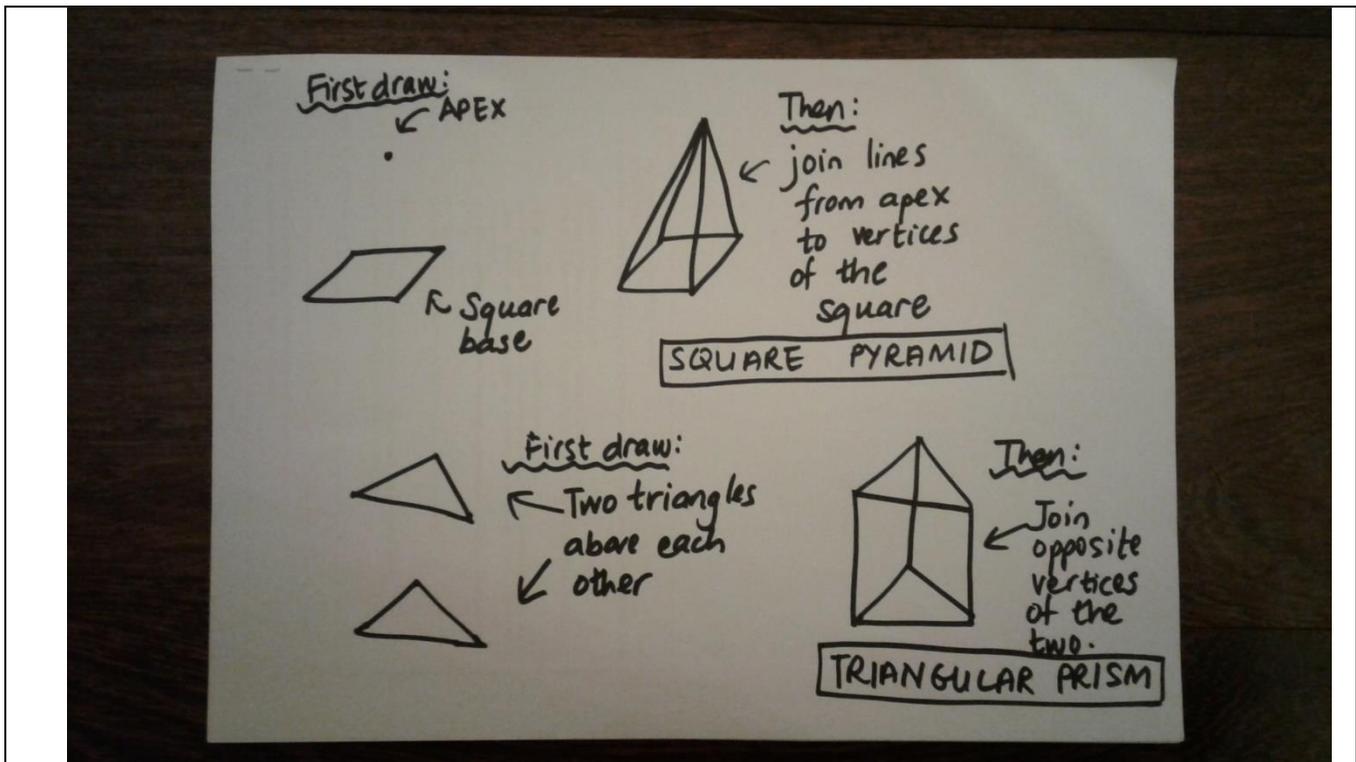
Participants practise drawing the shapes themselves.

3. To sketch a prism, it is usually the easiest to draw the bases which are the same (called ***congruent***), and then draw in the edges where necessary. Draw each of the pyramids shown above yourself.

    The word **congruent** is used in higher grades and is not part of the FP vocabulary, but teachers might like to know what it means. Congruent shapes are identical in every way. They are the same as each other.

Participants practise drawing the shapes themselves.

For example:

First draw:
APEX

Then:
join lines from apex to vertices of the square

Square base

SQUARE PYRAMID

First draw:
Two triangles above each other

Then:
Join opposite vertices of the two.

TRIANGULAR PRISM

Activity 5

Refer to the resources handout for the extracts from the Term 3 lessons on space and shape in the Jika iMfundo FP Mathematics materials:
- *Grade 1 Term 3 lesson 37.*
- *Grade 2 Term 3 lessons 16.*
- *Grade 3 Term 3 lessons 28 and 39.*

Analyse the activities and think about ways in which you would use these activities. How would you apply the knowledge gained in the content input in the teaching of these lessons?

For each of the activities, discuss:

> 1. What content is covered and how is it presented?
> 2. How does it relate to the CAPS content specifications?
> 3. How would you use the activity?
> 4. Would you add to/change the activity in any way and if so, how and why?

Discussion – facilitate group discussions and share good ideas from individual groups with the whole group. Facilitate the discussion and ensure all participants are actively involved. Allow report back to the bigger groups where good ideas can be shared more widely.

Point out that the Grade 1 lesson activity draws on less sophisticated knowledge of objects but by the time it gets to Grade 3, knowledge such as that given in the input would be very useful.

Lessons generally involve identification of shapes and comparison of shapes according to characteristics such as size, types of faces, colour, orientation, etc. The use of concrete objects in these lessons is vital.

Session 3: Language across the curriculum – maths vocabulary in *Number Patterns*

In this session the following lesson plans from the Term 3 Jika iMfundo FP Maths materials are relevant:
- *Grade 1 Term 3 lessons 27, 28, and 29.*
- *Grade 2 Term 3 lessons 22 and 23.*
- *Grade 3 Term 3 lessons 20 and 21.*

This activity involves sets of questions to guide the discussion for about 120 minutes. Your facilitator will guide you as you break into groups and have large group discussions throughout this time.

Refer to the extract from the dictionary in the resources handout for the following activities.

The activities in this session refer to the Dictionary, Lesson plans and CAPS. The focus varies in the different activities, so that by the end of the session participants will have broadened their understanding of the terminology of number patterns and how it is presented and used in these documents.

Activity 1

Discuss the following questions in your group. Use the dictionary extract to help you.

1. Think about the words "between" and "extend". How would you use the following methods to explain the meanings of these words to your learners?
   Ideas suggested by groups will vary. They need to be relevant to the mode of each representation.

   a. A gesture.
   "between" – You could hold out your hands and put one on either side of a desk.
   "extend" – You could put one hand down in a certain place and gesture using the other hand to show steps moving away from the stationary hand and then sweep it up to show the steps being "extended" further along.

   b. Real object(s).
   "between" – you could lay down three objects and talk about which one is between the other two.
   "extend" – you could lay out objects to make a pattern – book, pen, book, pen, book, pen, ... and ask what shapes you need to add to extend the pattern.

   c. A drawing.
   "between" – make a drawing of one thing between two others.
   "extend" – draw a length of string and then draw to show adding more to the length – making it longer, extending the length.

   d. A verbal explanation.
   "between" – explain that between means when something is in the middle, for example 4 is between 3 and 5 in the sequence 3, 4, 5.
   "extend" – if I add to or to make longer, for example the sequence 3, 4, 5, ... can be extended by adding the numbers 6, 7, 8.

   e. A written explanation. *Write up the verbal explanation. Diagrams could be added.*

2. Compare your ideas, thinking about the following:
   a. Did you find it easier to explain the word "between" or "extend"? If so, why?
   It may have been easier to explain the word "between" since between is something that can be shown concretely very clearly. Opinions will vary. The discussion of difficulty is productive – it does not matter if opinions vary.

b. In what way do gestures/objects/drawings/verbal/written explanations differ? How do the different methods complement each other?
Gestures can be used to "show" things physically while words are spoken. Words draw on language whereas gestures are unspoken means of communication. Gestures can be used together with spoken words to assist in giving an explanation. Objects can also be used together with spoken and written explanations to make the explanations more tangible. Drawings are more abstract but they can also be used to complement verbal and written explanations. Using different kinds of explanations is good since they reach learners with different styles of learning. Questions can also be used while explanations are given in order to check that learners are following the given explanation; they can also be used at the end to check that learners have understood the meaning of what has been said.

3. Are the words 'between' and 'extend' used only in mathematics or are they also used more generally? Where and how?
*Both of these words are used generally as well as in mathematics. The general meaning of the words does link to the mathematical meaning. Even in mathematics, the words have different meanings – in number patterns, time, space and shape (position) and so on. But in all contexts, the meanings are similar, not contradictory.*

The next activity gives participants some time to do hands-on maths – using ideas from the lesson plans. This is to show how the activities progress. It is also to show that they are linked to the CAPS.

Activity 2

1. Use the number line below to mark up the 2s number pattern, starting at zero. Explain to your group how to count along the number line.
They will complete the number line, starting at zero as instructed. The twos should be circled, or marked in some other way.
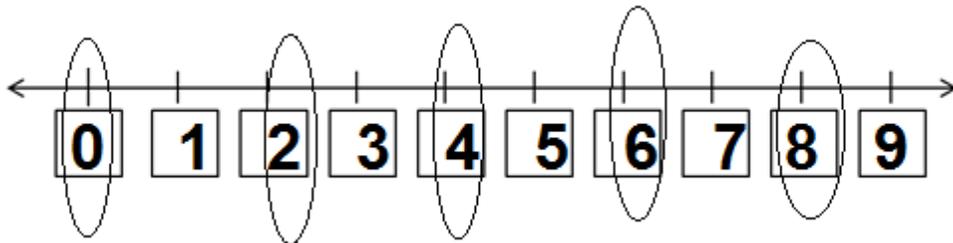
2. Use a 200 number board to circle all of the multiples of 2. (*See page at the end of this guide for a copy of a 200 number board.*) Discuss the pattern(s) that you notice in the numbers you have circled.
All of the multiples of 2 must have been marked.

*The **multiples** of 2 are 2, 4, 6, 8, 10, 12, 14, …*

*A **pattern** is something that is repetitive in a way that you can see and describe. For examples, the multiples of 2 make a pattern of numbers that increases by 2 every time.*

When you circle all of the multiples of 2 in a number board, you see a pattern in the way that the numbers are circled. You need to do the circling activity first in order to notice the pattern. The pattern is shown below using large loops around the multiples of 2 in every second column, to show the pattern. You might have circled each multiple of 2 one individually – and then noticed this pattern as well.

Some patterns that you notice are:
- *All of the numbers in the second, fourth, sixth, eighth and tenth columns have been circled.*
- *The second column has all of the multiples of 2 that end in a 2.*
- *The fourth column has all of the multiples of 2 that end in a 4.*
- *The sixth column has all of the multiples of 2 that end in a 6.*
- *All multiples of 2 end in a 2, 4, 6, 8 or 0.*
- *Etc.*

3. Look at these numbers. *They may not be in order and all the numbers in the sequence might not be there. Which one does not belong to the pattern? Why do you say that?*
   - o 210, 220, 203, 240, 250, 260 (203 does not belong to the 10s pattern)
   - o 365, 375, 385, 397, 405 (397 does not belong to the 5s pattern)

   This is an activity with higher order questions. The learners have to work out which numbers shown can be fitted into a pattern (by identifying a rule) and therefore work out which number does NOT fit in with the rule they have identified.

The next activity moves on to reflection on the lesson plan activities (extracts selected on number patterns topics) in the mathematics being covered in the activities.

Activity 3
1. Go through the activities from the Grade 1, 2 and 3 lesson plans in the resources handout and circle all of the vocabulary which has a particular meaning as a mathematical term in the context of the planned topic, *Number Patterns*. The Lesson Vocabulary list has also been given. Circle the number patterns terms.

   All vocabulary related to number patterns should be circulated. The following terms should have been circled:

   Grade 1 Term 3 Lesson 29
   Tens, twos, multiples of 10 (or 2), 10s, 2s.
   Note that the arrows on either end of the number line given in the classwork activity for this lesson show that the number line can be extended – it is just a section of a longer (infinite) line.

   Grade 2 Term 3 Lesson 23
   0–200 number board, 2s, multiple, backwards, multiples, number line, even numbers, odd numbers, twos

> *Grade 3 Term 3 Lesson 20*
> Pattern, 10s pattern, 5s pattern, 2s pattern, order, sequence.
>
> 2. Look over the terms you have circled. These are words that may have a special meaning in the context of maths.
>   a. Are the same words used in all three grades? What is the same/what is different?
>   *All of them use the notation 2s, 5s, 10s, grade 1 and 2 use the word multiple and number-line. Other words are not used across all these grades in these particular activities (but they might be used in other LP activities – these are very brief extracts).*
>
>   b. Compare the activities across the three grades. How do they show progression?
>   *The number ranges increase. The grade 3 questions where learners have to identify a number that "does not fit" are more difficult than the grade 1 and 2 questions in which learners simply have to continue an identified pattern.*

The next activity calls on participants to look carefully at the dictionary in order to see which of the terms they have found in the lesson plans are defined in the dictionary list. (NOTE that not all words are present. There could be a need to include more terms in the dictionary list.)

Activity 4

1. How many of the terms that you identified are included in the dictionary list?
    a. Which words are not there and would you like to see them there?
       Order, ...

    b. Read the given explanations (with diagrams/etc.). Are they helpful/not? Discuss.
       Opinions will differ.

2. If you did bring your dictionary with you, look through it and see if other words you identified are given and check the explanations.
   Participants discuss.

3. The dictionary provides bilingual terminology explanations.
    a. Are both languages useful and if so how?
       Opinions will differ.

    b. How could a teacher use the dictionary in lesson planning and preparation?
       Various suggestions possible. Look up meanings of words. Look up the examples and use them in lessons or to use them to make up own examples.

    c. Is there a use for the dictionary in a classroom and if so in what way?
       Various suggestions possible. Teachers and learners could refer to it to look for meanings of words and examples. They can also use it to look for translations in English and isiZulu.

The final activity in this session turns the focus onto the CAPS directly – this should be reviewed in the light of the Lesson Plan content.

Activity 5

1. Go through the CAPS extracts (from the overview for Term 3) in the resources handout.

   a. **C**ircle all of the vocabulary relating to the topic, *Number Patterns*.
   CAPS Grade 2 Term 3 Copy, extend, describe, number sequences, forwards, backwards, multiple, 1s, 10s, 5s, 2s, (up to 80), number patterns.
   CAPS Grade 2 Term 3 Copy, extend, describe, number sequences, forwards, backwards, multiple, 1s, 10s, 5s, 2s, 3s, 4s, (up to 180), number patterns.
   CAPS Grade 3 Term 3 Copy, extend, describe, number sequences, forwards, backwards, multiple, 20s, 25s, 50s,100s, (up to 1 000), number patterns.

   b. How does the curriculum show progression in for content area?
   The number of different patterns in which to count changes and the number range increases.

2. Compare the use of the terms across the three grades in the CAPS, Lesson Plans and Dictionaries.
   a. How are they the same? *Discuss. Some are the same, others not. They all call for counting in multiples.*
   b. How are they different? *The multiples change. Levels of difficulty change.*

   It is useful to look at vocabulary and content used across grades in order to see progression but also to enable standardisation of terms and explanations used. The dictionary can help to bring standardised examples and explanations.

Session 4: Discussion and dry run – preparation for training

Settle the group and allow them to discuss the following questions to recap on the workshop.

In this session you should wrap up the discussions you have had in this workshop. In your groups, discuss the following questions.
1. What is the most important idea you learnt about teaching Space and Shape and using the Jika iMfundo lesson plans to teach this topic in Session 2?
2. What is the most important idea you learnt about using language across the curriculum in Session 3?

Discussion – facilitate group discussions and share good ideas from individual groups with the whole group. Facilitate the discussion and ensure all participants are actively involved. Allow report back to the bigger groups where good ideas can be shared more widely. Allow about 15 minutes for this discussion and then take feedback from the groups so that they can learn from each other. Take about another 15 minutes of general discussion.
The next set of questions moves the participants to think about the work they will do going forwards based on the training at this workshop and to raise questions they still have that they would like to have answered.

3. How will you manage Session 2 in your district? Do you have questions about the content of Session 2? If so, what are they?
4. How will you manage Session 3 in your district? Do you have questions about the content of Session 3? If so, what are they?

Allow about 30 minutes for this discussion and report back. Discuss all important individual group questions with the large group.

Encourage participants from the same districts/schools to work together and support each other. Encourage them to make notes of things that work well and difficulties they have over the next term – these could be brought to the next training session for discussion.

Session 5: Post-workshop activity.

Distribute the post-workshop activity sheets and get participants writing. They have 30 min. to work on the activity.

Take in the activity sheets when the writing time is up.