

Renewing the Primary Framework for mathematics

Guidance paper

Day-to-day assessment in mathematics

Background and context

While the Primary Framework for mathematics has reduced the number of objectives from the 1999 Framework, it has retained the yearly teaching structure that is described by objectives. The objectives are organised under seven strands. These provide a simplified structure that informs planning and teaching, and support the assessment of children's learning.

For each year group, the seven strands have been organised into five blocks of work that are progressed over the year. Each block is organised into teaching units that cover two or three teaching weeks. Within each unit is contained the set of objectives that guide planning, teaching and children's learning. These units support an extended period of learning when children's progress can be assessed and those children who are not keeping up with their peers can receive the additional attention and support they need.

The teaching and learning cycle

Teaching a unit of work will need careful initial and ongoing planning, informed by an assessment of children's learning. A cycle that supports this process in the Primary Framework for mathematics is set out below.

assess – plan – teach – practise – apply – review

The cycle indicates the importance of undertaking some initial assessment at the start of the unit to monitor children's preparedness for the work. This initial assessment may indicate a need to revisit some earlier learning to refresh the knowledge, skills or understanding needed to ensure children cope with and make progress in the unit. Day-to-day assessment of children's achievements and progress over the unit will provide information about children's general attainment and progress and identify any children who might need additional support. Regular reviews provide opportunity to take stock of children's learning.

Reviews of learning are a key teaching and assessment tool. They can involve brief in-lesson pauses to determine whether children can recall some knowledge or a key idea, can share with one another the next steps in a calculation or can explain to their partner a strategy that demonstrates they are able to solve the problem. The reviews can be more substantial and take up a significant part of the lesson or form a plenary before some new learning is introduced. Such reviews are carefully planned with clear learning objectives in mind. The aim is to assess the depth of children's learning and use this information to plan the next steps. These reviews will involve probing questions, extended dialogue or a series of short activities that draw on past learning and incorporate use and application of the mathematics that has been taught.

Starting a unit of work

In each block, under the heading 'Building on previous learning', there is an indicative checklist of prior knowledge, skills and understanding that might be referred to for this purpose. It is not intended, nor will it be necessary, that each and every aspect of mathematics identified in the bullets should be assessed at the beginning of each unit. Select those that you think might be areas of concern for some children and prepare a series of probing questions to use, to establish whether it is an area of learning that needs revisiting.

An example from Year 3, block A is shown below. This identifies five mathematical areas of learning that children will draw upon and use in the unit and which has already been covered in earlier teaching.

Year 3

Block A: Counting, partitioning and calculating

Check that children can already:

- talk about their methods and solutions to one-step problems, identifying and recording the number sentences involved
- read, write, partition and order two-digit numbers, explaining what each digit represents
- recall all addition and subtraction facts for each number to at least 10, all pairs with totals to 20 and all pairs of multiples of 10 with totals up to 100
- add or subtract mentally pairs of one-digit numbers
- recall multiplication and division facts for the 2, 5 and 10 times tables.

To assess how well children cope with the problem-solving skills identified in bullet one, build a problem-solving activity into the first lesson in the unit that involves children discussing their methods and solutions in groups. Time spent in the lesson, working with particular groups of children about whom there may be concern, will help to identify the next steps needed to support any children who, without such support, are unlikely to make the progress expected.

To assess how well children can read and write numbers and understand and use place value (bullet two), build an oral and mental activity around place value into the lesson. A quick-fire activity might involve use of whiteboards, digit cards or number fans to see all children's responses and to identify those who are struggling and who can be followed up later in the lesson. A similar activity introduced into later lessons will help to assess the progress of all children, but particularly the supported children.

To assess children's knowledge and recall (bullets three and five), or mental calculation skills (bullet four), introduce paired or small-group activity that has children completing tasks that they recognise is assessing these skills. Before setting the task, share with children the reasons for giving them the work to do so they understand the assessment process and can become involved. For example, tell children that, working in pairs, they are to ask one another questions involving the addition and subtraction of a single-digit number to another single-digit number. They are to help one another to decide which

numbers they can add or subtract quickly, and others with which they have more difficulty, and you will ask children for these numbers after the task. When setting a task involving the 2, 5 or 10 times table, explain the success criteria. For example, explain that knowing the 5 times table means that they can work out quickly, in their heads, 5 multiplied by 7 and find a division fact involving the answer. You want to know if there are some facts they can remember more quickly than others.

The choice of the focus of the initial assessments and the activities used to assess will depend on how well you already know the children and their prior attainment. What is important is that the information required to inform future planning is gathered appropriately and quickly, so that work on the unit can be carefully planned and children who need extra support can receive it.

Ongoing assessment

Giving children regular opportunities to practise what they have been taught also provides time to focus on a target group of children who may need additional support, or a group who need less practice but some additional challenge to motivate them and to move their thinking on. These periods of practice should be used to monitor children's progress and to identify any particular or common difficulties that may need additional teaching.

Planning short, regular opportunities for practice helps children to acquire and hone their knowledge and skills; but repetition is only one aspect of learning. Children also need to use and apply what they have learned and to see how secure their understanding is when they meet some new context or follow a fresh line of enquiry. This helps children to make connections in mathematics, to refine their problem-solving skills and to reason, explain and communicate their thinking. The introduction of more sustained activity that gives children time to develop an idea, solve problems or follow a line of enquiry also provides an opportunity to assess the depth of children's understanding. Working alongside a group, listening to them explain their ideas and strategies and using a selection of open and closed questions to probe their ability to present their reasons for their choices and solutions, provides further assessment information.

Such day-to-day assessment is central to effective classroom practice. Much of the time, during interactions with individual children, groups or the whole class, there is some assessment being made. What children do or discuss is observed and listened to and then analysed against some set of criteria or expectations. This analysis is often carried out on the spot and later informs next steps in planning children's learning. This ongoing process of assessment for learning is central to identifying where children are in their learning, what they need to learn next and how to ensure that they are successful.

Using the blocks and units

The blocks are organised into three units. Each unit is designed to cover two or three weeks of work, as indicated. Within each unit is listed a set of objectives. The key objectives, now called the end-of-year expectations, appear in blue. These reflect the key objectives in the 1999 Framework and

have been aligned to the renewed set of objectives in the electronic Framework.

Below are two examples: one is from Year 2, block D, unit 1; the other is from Year 5, block D, unit 3. They both show how an objective, in this case an end-of-year objective, is presented and supported by assessment guidance. The objective is presented in a form and style that might be shared with children and appears in italics below the objective. In the right-hand column, labelled 'Assessment for learning', are some questions that might be built into lesson plans and used to probe children's understanding.

Year 2

Block D: *Calculating, measuring and understanding shape*

Unit 2D1

2 weeks

Objectives	Assessment for learning
<i>Children's learning outcomes in italic</i>	
<ul style="list-style-type: none"> Add or subtract mentally a one-digit number or a multiple of 10 to or from any two-digit number; use practical and informal written methods to add and subtract two-digit numbers <p><i>I can add and subtract some numbers in my head.</i></p>	<p>Look at the number line. It shows the sum that Fred did.</p>  <p>Which of these sums did Fred do?</p> <p> $5 + 7 + 2 = 14$ $5 + 6 + 3 = 14$ $5 + 5 + 4 = 14$ $5 + 8 + 1 = 14$ </p> <p>What is $34 + 8$? What number facts might you use to help you work this out? What do you need to add to 34 to get to the next multiple of 10? How might you partition 8 to help you?</p> <p>Find the answer for each of these. Explain how you worked out your answers.</p> <p> $58 + 9 =$ $35 + 40 =$ $72 - 8 =$ </p> <p>Find the missing number.</p> <p>$1 + \square + 5 = 35$</p>

Year 5

Block D: *Calculating, measuring and understanding shape*

Unit 5D3

2 weeks

Objectives	Assessment for learning
<i>Children's learning outcomes in italic</i>	
<ul style="list-style-type: none"> Use efficient written methods to add and subtract whole numbers and decimals with up to two places <p><i>I can add and subtract whole numbers and decimals with up to two places in columns.</i></p>	<p>Show me your method for solving these problems:</p> <p>Max jumped 2.35 metres on his second try at the long jump. This was 68 centimetres further than on his first try. How far, in metres, did he jump on his first try?</p> <p>Nasreen made some fruit punch. She poured 2.4 litres of water, 1.35 litres of pineapple juice and 780 ml of mango juice into a large bowl. How much fruit punch did she make?</p> <p>Did you make any estimates? Explain how you worked out the answers.</p>

The assessment questions can also be used as success criteria, which can be shared with children. In the case of the Year 2 example, the success criteria would indicate that children can add and subtract pairs of numbers such as 34 and 8 and can explain their method to others. For Year 5, the success criteria would be that children can interpret word problems involving the addition and subtraction of whole and decimal numbers, can use efficient written methods for pairs of numbers such as 2.35 and 0.85 and explain their methods and solutions to others.

The two objectives and the assessment questions show the progress expected of children over a period of three years and how this progress can involve children so they recognise what they have achieved and what they need to achieve next.

Assessment for learning

This term is now in common use and is well understood. Assessment for learning is a process of gathering and analysing information about achievement and progress to inform current and future learning. It is a process that involves both the teacher and the learner. It differs from assessment of learning, which is more frequently called summative assessment. This is a more comprehensive assessment of attainment, using level descriptions or an accepted assessment tool that is designed to give a quantitative measure based on performance. These assessments can, of course, be used in the assessment for learning process as the information they provide is interpreted and used to guide the decisions about the next stages in learning and the teaching strategies to use to help the learner.

Below are six key principles that guide assessment for learning. They are informed by research and an analysis of the positive impact that this process of assessment can have on children's learning. The principles are expanded and exemplified to help you to guide your planning and teaching and children's mathematical learning in the primary classroom. While the focus and context of this paper is on mathematics these six principles may be applied across the curriculum.

- ***Assessment for learning is part of the planning process***

Planning should be informed by the evidence that is sought and gathered about children's achievement and progress in meeting the intended learning objectives. In mathematics, children often make little or no progress because they did not understand something earlier. For example, children who have a poor understanding of place value are unlikely to use a partitioning strategy to add and subtract numbers.

Helping children to articulate what they can and cannot do makes it easier to assess their progress and to plan next steps and any support particular groups of children might need. One approach that can help children to acquire the language of learning is to share planning and learning expectations with the class at the start of a unit and display these for children to refer to. As children demonstrate that they have achieved the learning expected, review the plans with the class and update the

expectations so that children see what progress they have made and what they are expected to achieve next.

- ***Assessment for learning is informed by learning objectives***

Making an assessment of children's achievements and progress should be based on the expected learning outcomes identified through the learning objectives. In mathematics, assessing children's progress in a core strand of learning should be informed by the objectives in the strand. Where appropriate, the objectives should be tracked before and after the objectives for the particular year group, to identify any additional support and possible challenges and extensions to learning.

Sharing the expected learning outcomes and success criteria with children, using a vocabulary and language they understand, helps them to understand what they are learning. Ask children to look at examples of work that sets the pitch and scale of the expectations and to describe it in their own words. Use these responses to set out success criteria for the unit, keep these displayed during the course of the unit and refer to them when assessing children's progress.

- ***Assessment for learning engages children in the assessment process***

Children learn more effectively when they recognise what it is they are trying to achieve and what it looks like in practice. In mathematics, teaching children how to use a ruler to measure is helped if they understand that the purpose of this is to compare a length against the scale marked on the ruler. Explaining to children that they are learning how to add and subtract tens and ones so they are able to add and subtract 9 and 11 quickly in their heads makes sense to them. They can then be engaged in deciding if they have achieved the learning outcome.

As children become more aware of what they are trying to do and they understand, through examples and models they have been shown, what the intended outcome looks like they are better able to judge their own learning. Invite children to comment on examples of 'anonymised' work that demonstrates good features or some aspect that can be improved so they see how this can be achieved.

- ***Assessment for learning recognises the achievements of all children***

It is important that all children experience success and that success is identified and acknowledged. In mathematics, the most vocal children can appear to get the accolades and praise. Asking children to identify two numbers that have a given difference and to discuss this with a partner before any suggestions are collected from the class provides children with time to marshal their thoughts and prepare their responses. This means the children who are less likely to offer a response to a quick-fire question can be asked to contribute and their contribution can be recognised.

Children need time to think before they respond and setting up paired activities provides both time and support from which most children benefit. Give children a number of 'talk partners' so that they can discuss their ideas, reasoning and solutions, to build up the confidence and language

skills of all children. Help the process by modelling how to use the mathematical vocabulary and language of explanation or reasoning. As they become more confident at sharing with others what they know and understand, they will be better able to self-reflect and share their own assessments with you and with other adults too.

- ***Assessment for learning takes account of how children learn***

The assessment approach being used should be flexible and adaptable, to include different approaches that give children the opportunity to show what they know, understand and can do. In mathematics, seeing something written down or displayed as an image or as a diagram offers another way of interpreting a question or problem. Children who are not always good at visualising or carrying information in their heads may be able to give the answer to 24 divided by 6, but need to have the information presented visually or opportunity to use some resources. Seeing a shape being rotated about a point will, for some children, provide the stimulus they need to discuss what has changed and what has stayed the same and show that they understand. Help children to understand how they learn as they learn.

Planning assessment involves identifying what is being assessed and deciding how to assess it in a way that engages children. Displaying a lack of knowledge and little progress may reflect a lack of understanding of what is being asked as part of the assessment process. Starting with more open questions or situations with which children can engage provides a starting point from which more probing questions can be asked. Give children a number of alternative solutions to a question to select from. This provides them with the opportunity to discuss why one solution is correct and the others are incorrect; it also assesses their communication and reasoning skills. Show children objects that may or may not have the properties you want them to describe and invite them to use practical resources they can manipulate as they answer and demonstrate their understanding.

- ***Assessment for learning motivates learners***

Constructive feedback that identifies how children's work and responses have led to success gives a shared understanding of the achievements on which to build to make further progress. It helps children to see how the next steps take account of this success and are attainable. Positive and constructive feedback motivates children as they see how their learning is progressing. In mathematics, an assessment activity that asks children to determine if, for example, given numbers are multiples of 3, with numbers such as 61, 28 and 16 included, provides opportunity for success and positive feedback. Inviting children to explain how and why they chose the numbers ensures that constructive feedback can take account of the successes and guide children to the next steps by building on their success.

Provide children with feedback that they can act on straight away. Giving long-term guidance that children forget, or on which they cannot act in this or the next lesson, loses the impetus generated by the positive and

constructive feedback. Help children to recognise that they have met the learning target by providing examples they can use. Encourage children to help you set a target in their own words and to build the examples that provide success criteria for future assessments.

Next steps

- How well are you prepared to carry out effective assessment for learning?
- Do you feel confident in:
 - planning for the assessment of children’s achievements and progress in mathematics
 - observing learning and probing children’s mathematics learning, using open and closed questions and sustained dialogue
 - interpreting responses and analysing the information gathered, in order to decide what mathematics children have learned, the next steps in their learning and how to secure their progress
 - providing children with constructive and positive feedback on their achievement and progress
 - setting goals and success criteria that children understand and can use to guide and assess their own learning
 - engaging children in the assessment process so that they recognise the progress they are making and what they need to do to improve?
- What continuing professional development is planned for the school that will help to strengthen assessment for learning in mathematics?