

NON-STATUTORY GUIDANCE FOR ASSESSING USING MATHEMATICS

Key Stages 1 and 2





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Introduction

This guidance aims to support teachers in assessing the Cross-Curricular Skill of Using Mathematics. Using Mathematics is one of the three Cross-Curricular Skills assessed and reported on using the Levels of Progression.

The Northern Ireland Curriculum aims 'to empower young people to develop their potential and to make informed and responsible choices and decisions throughout their lives' (*The Northern Ireland Curriculum: Primary*, page 4). It sets out a flexible framework of knowledge, understanding, skills and capabilities. 'At the heart of the Curriculum lies an explicit emphasis on the development of skills and personal capabilities for lifelong learning and for operating effectively in society' (*The Northern Ireland Curriculum: Primary*, page 5).

Assessment is an integral part of the Northern Ireland Curriculum. It must reflect curriculum requirements and provide motivating and challenging experiences. It plays a crucial role in improving learning and raising standards. Assessment provides information that has a key role in knowing how pupils are performing and helping schools to improve outcomes.

Assessment should be part of the teaching and learning process that supports independent learning. It should give pupils a deeper appreciation of what they know and understand, their skills and capabilities and what their learning experiences enable them to do.

Principals, co-ordinators and teachers involved in the annual statutory assessment and in the end of key stage statutory assessments should ensure that they are familiar with this guidance.

Mathematics and Numeracy

Numeracy is the development and application of mathematics across the curriculum and in real life situations. Numeracy skills should help children to make informed and responsible choices and decisions throughout their lives.

Throughout primary school, pupils should engage in purposeful activities that involve them in different types of mathematical learning, including:

- playing;
- exploring and investigating;
- doing and observing;
- talking and listening;
- asking questions;
- reflecting;
- drafting;
- reading; and
- recording.

The Northern Ireland Curriculum: Primary, page 57

The Cross-Curricular Skill of Using Mathematics

Using Mathematics gives pupils the confidence and ability to apply mathematical knowledge and skills across a range of meaningful contexts. The Cross-Curricular Skill of Using Mathematics focuses on pupils' ability to transfer and use these skills effectively across the curriculum. Use the Cross-Curricular Skill of Using Mathematics to measure the standards of pupil competence in numeracy. You should use the Levels of Progression to assess and report annually on each pupil's progress in Using Mathematics.

You should develop and assess the core skill of Using Mathematics across the entire curriculum and not just within the Area of Learning of Mathematics and Numeracy that it is closely associated with.

You should also ensure your pupils have a range of learning opportunities to acquire and develop the Cross-Curricular Skill of Using Mathematics in a variety of contexts. Once your pupils have acquired and developed skills in Using Mathematics, encourage them to demonstrate these skills in a range of relevant and purposeful contexts.

Levels of Progression

The five Levels of Progression have two components: the Requirements and Knowledge and Understanding. These form the standards that you will use to make judgements about pupils' progress. The Levels of Progression set out a continuum of skills in the form of 'can do' statements. Pupils should be able to demonstrate these skills if they are to build the numeracy skills needed to function effectively in life and in the world of work.

To use the Requirements across the curriculum, at a level appropriate to their ability, you should enable your pupils to:

- choose the appropriate materials, equipment and mathematics to use in a particular situation;
- use mathematical knowledge and concepts accurately;
- work systematically and check their work;
- use mathematics to solve problems and make decisions;
- develop methods and strategies, including mental mathematics;
- explore ideas, make and test predictions, and think creatively;
- identify and collect information;
- read, interpret, organise and present information in mathematical formats;
- use mathematical understanding and language to ask and answer questions, talk about and discuss ideas and explain ways of working;
- develop financial capability; and
- use ICT to solve problems and/or present their work.

To demonstrate their skills in Using Mathematics, pupils should use their Knowledge and Understanding of:

- Number;
- Measures;
- Shape and Space; and
- Handling Data.

The requirements identify how pupils are able to use their Knowledge and Understanding, within Mathematics and across the curriculum, to:

- communicate;
- manage information;
- think critically;
- solve problems; and
- make decisions.

The Knowledge and Understanding component of the Levels of Progression focuses on mathematics that pupils can use across the curriculum. This includes a breadth of mathematical knowledge, encompassing Number, Measures, Shape and Space, and Handling Data. Knowledge and Understanding helps to determine what pupils know, understand and can do.

The skills within the Requirements are generic. You cannot view them in isolation. Pupils should demonstrate how they have met the Requirements by using the details specified in Knowledge and Understanding.

You must address both the Requirements and the Knowledge and Understanding components of Using Mathematics, when determining the level a pupil is working at.

Using a Range of Assessment Approaches

Throughout Key Stages 1 and 2 you should give your pupils a variety of motivating and challenging assessment opportunities in Using Mathematics through a range of assessment approaches that allow your pupils to demonstrate what they know, understand and can do. It is unlikely that one single method of assessment will provide a comprehensive or adequate profile of a pupil's learning. You should therefore try to use a broad range of assessment approaches, including:

- effective questioning during mathematical investigation;
- observing lessons incorporating Using Mathematics; and
- peer and self-assessment when carrying out mathematical activities.

Using a variety of assessment approaches is more likely to engage and motivate pupils. This also gives your pupils different opportunities to demonstrate their potential and achieve success. Pupils who may not perform well in certain types of assessment will have the opportunity to demonstrate their knowledge and skills in others.

Expansion of the Levels of Progression for Using Mathematics

We have developed and provided non-statutory guidance in Expansion of the Levels of Progression to help you to understand the progression statements at each level. This guidance gives detailed support to explain aspects of performance at each level within each requirement for Using Mathematics.

This also includes examples of how pupils can use aspects of Knowledge and Understanding at each level to demonstrate their Using Mathematics skills. These examples are neither prescriptive nor exhaustive.

Principles of Assessment

The following five Key Principles of Assessment underpin quality assessment. It should:

- be complementary to and supportive of learning;
- be valid and reliable;
- be fit for purpose and manageable;
- support teachers' professional judgement; and
- support accountability (be appropriate at all levels for system-wide accountability).

The Purposes of Assessment

Diagnostic Assessment

This normally takes place at the beginning of a learning programme. It involves working closely with the pupil to identify their strengths and areas for improvement within the Using Mathematics programme. You can use it to determine whether a pupil is having difficulty understanding an aspect of mathematics and to help you to decide what you need to do to help. You should share this information with the pupil to plan the next steps to improve their learning. For example, what do I need to do to help an individual or number of pupils with difficulty understanding place value to two decimal places?

‘Diagnostic assessment helps to identify specific learning strengths and needs. It determines learning targets and appropriate teaching and learning strategies to achieve them.’

Skills for Life Improvement Programme.

Formative Assessment (Assessment for Learning)

Formative assessment includes Assessment for Learning. It focuses on the learning process (rather than the end product) and attempts not to prove learning, but to improve it. It is a way to collect information during the learning process and helps to inform you about how the learning is progressing.

You could gather assessment information while your pupils are carrying out mathematical investigations. Although formative assessment is not statutory, it is good practice in schools.

Formative assessment is part of the everyday ongoing teaching and learning process. Log in to the CCEA online Exemplification Library to find the Duty Free Shopping assessment activity. In this activity, pupils work together to buy items in the Duty Free Shop. They record how much each item costs, making sure the total is no more than 50p. Observe your pupils as they work on mathematical problems and investigative activity. Listen to their discussions and ask them questions. For example, ‘is there a quick way of adding?’ or ‘what was the best way to work out the change?’ Gather evidence about each pupil’s learning by:

- observing;
- listening;
- questioning;
- discussing; and
- reviewing.

You can then use this evidence to:

- identify progress and gaps in learning;
- set learning goals and success criteria; and
- give pupils feedback.

Assessment for Learning is the process of seeking and interpreting evidence for learners and their teachers to decide where the learners are in their learning, where they need to go and how best to get there.

Assessment Reform Group (ARG), 2002

Use research-based Assessment for Learning to guide classroom practice. Assessment for Learning can help your pupils to build on their learning. Assessment for Learning is 'an on-going process that arises out of the interaction between teaching and learning'.

ARG, 2008; Black and William, 2009

The continuous process of dialogue and interaction between teachers, pupils and peers is an essential part of Assessment for Learning. It focuses on how pupils can improve their learning and involves peer and self-assessment.

The following ten guiding principles underpin Assessment for Learning. It should:

- be part of effective planning;
- focus on how pupils learn;
- be central to classroom practice;
- be a key professional skill;
- be sensitive and constructive;
- foster motivation;
- promote understanding of goals and criteria;
- help learners know how to improve;
- develop the capacity for self-assessment; and
- recognise all educational achievement.

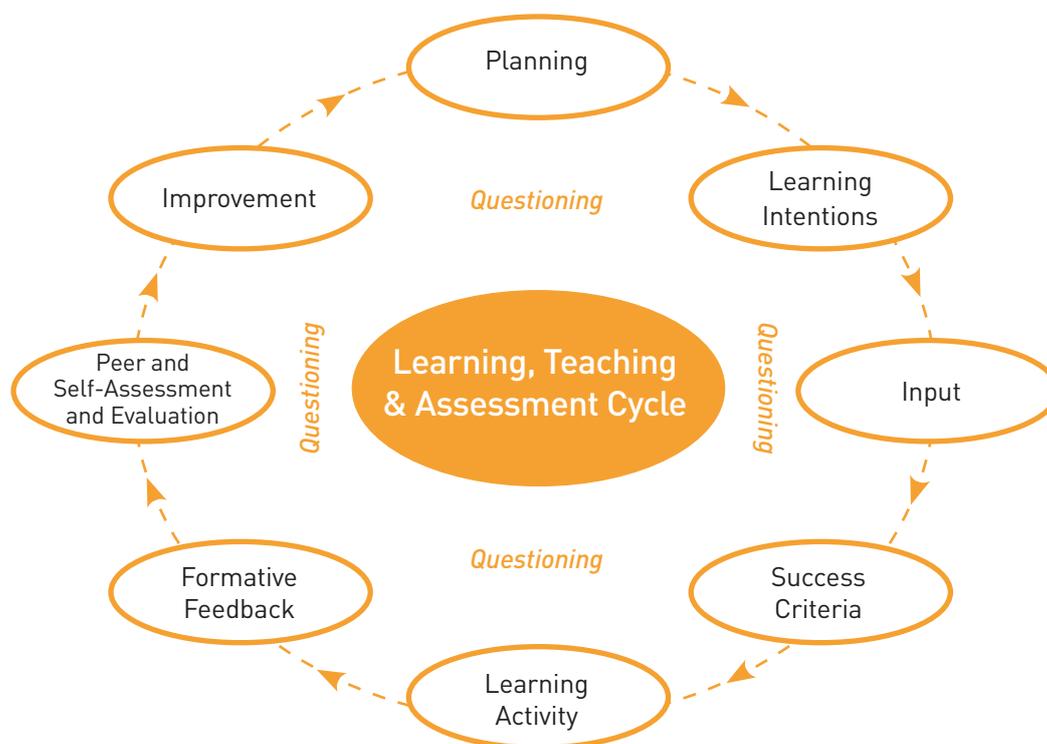
ARG, 2002

You should incorporate these principles into planning and classroom practice for Using Mathematics.

The Assessment for Learning strategies support these principles in classroom practice:

- **Learning Intentions and Success Criteria**
These allow pupils to understand what they are trying to learn, why, and what is expected of them;
- **Feedback**
This is about the quality of pupils' work and what they can do to make it better. You should give pupils information about the next steps they should take to improve their learning and motivate them;
- **Questioning**
This encourages pupils to think about their learning and creates a classroom climate where pupils come up with their own ideas, think aloud and explore their understanding; and
- **Peer and Self-Assessment and Self-Evaluation**
These enable pupils to recognise success in their own and others' work and to focus on how they are learning as well as what they are learning.

Providing good feedback that acknowledges pupils' achievements encourages and builds their confidence and self-esteem.



Formative assessment practices in the classroom give you the opportunity to integrate the Thinking Skills and Personal Capabilities across all areas of learning:

- Managing Information;
- Thinking, Problem-Solving and Decision-Making;
- Being Creative;
- Working with Others; and
- Self-Management.

Formative assessment links directly to Thinking Skills and Personal Capabilities. Both promote the following concepts in Using Mathematics:

- setting open-ended challenges;
- making thinking important;
- making thinking and learning explicit;
- effective questioning;
- enabling collaborative learning;
- promoting independent learning; and
- making connections.

There are opportunities to use Assessment for Learning strategies and Thinking Skills and Personal Capabilities in classroom practice, for example the Traffic Survey on page 17. This is a Using Mathematics activity where pupils work in pairs or small groups to complete a survey of vehicles passing the school entrance. Pupils present the results of their survey as a bar chart by drawing and labelling the axes and bars.

Give your pupils the opportunity to develop and demonstrate their Thinking Skills and Personal Capabilities. These are embedded and infused in all areas of the curriculum in everyday classwork at each Key Stage.

In the Volcano Expedition assessment activity, you can incorporate many aspects of Assessment for Learning and promote the Thinking Skills and Personal Capabilities. You can find the Volcano Expedition assessment activity by logging in to our Exemplification Library. You can, for example, ask open-ended questions, use peer and self-assessments and encourage thinking, problem-solving and decision-making, and working with others.

Formative assessment is an ongoing process of gathering assessment information. This helps you to make specific improvements in your pupils' learning. For example, is there a 'gap' in the learning programme? Have you placed enough emphasis on transferring skills across a range of contexts?

Formative assessment is part of the everyday teaching and learning process. Teachers identify strengths and learning needs and plan and develop programmes to address the learning difficulties identified.

The Curriculum objectives, as outlined in 'The Big Picture' of the curriculum at Key Stages 1 and 2, are infused through the Cross-Curricular Skill of Using Mathematics and across the Learning Area of Mathematics and Numeracy. These objectives incorporate Assessment for Learning, promoting and encouraging learning experiences, fostering positive attitudes and dispositions.

Summative Assessment

Summative assessment gives pupils, parents and teachers valuable information about a pupil's overall performance and achievement at a specific point in their learning. It provides information about a pupil's progress in the Cross-Curricular Skill of Using Mathematics in relation to the Requirements, Knowledge and Understanding and Thinking Skills and Personal Capabilities.

To make a summative judgement about the level a pupil has achieved, you must establish that the pupil has demonstrated competence across the breadth of the Requirements for Using Mathematics. They must demonstrate competence in most of the criteria in the Level you judge them to be working at.



The Volcano Expedition activity (can be accessed on the CCEA online Exemplification Library) offers pupils an opportunity to demonstrate their ability to:

- manage information;
- use a range of problem-solving strategies;
- work systematically;
- make choices about spending and value for money, using written, mental and calculator methods;
- make decisions;
- work with others, using appropriate mathematical language to discuss their work; and
- explain their thinking.

Pupils must also show they can apply and transfer these skills effectively.

Making Judgements

To help you to make accurate judgements, you should gather information about a pupil's Using Mathematics skills over time, within a range of curricular contexts, and across the full breadth of mathematical areas and concepts.

Different activities are likely to focus on different skills. The information gathered during a single activity will not be sufficient to determine the level a pupil is working at.

After gathering a range of information about a pupil's skills over time, you may wish to make a 'best fit' judgement, using the Levels of Progression to determine the pupil's progress.

Base your 'best fit' judgement on a pupil's ability to apply mathematical skills (The Requirements), in different contexts across the curriculum. It is unlikely that a pupil will have demonstrated all aspects of the mathematical skills at any particular level. However to confirm that a pupil is working comfortably within a level, you should ensure that the pupil has:

- a broad and secure grasp of mathematical knowledge and concepts at that level; and
- opportunities to use their mathematical knowledge, concepts and skills in different ways and in a variety of contexts.

Making a Summative Judgement/End of Key Stage Assessment

You should aim to make a summative assessment judgement that is based on:

- a range of existing evidence from school-based assessment activities;
- knowledge of how the pupil has performed in a range of contexts, in new and/or unfamiliar contexts as appropriate, and over a period of time;
- the standards set out in the Levels of Progression for Using Mathematics;
- evidence of pupil competence across the breadth of requirements for the Cross-Curricular Skill of Using Mathematics and in most of the criteria relating to the level you judge the pupil to be working at.

For example, if you decide that a pupil has achieved Level 4 this means that, according to your professional judgement, the pupil has solid achievement in Level 4 because he or she can:

- demonstrate competence across the breadth of requirements for the Cross-Curricular Skill of Using Mathematics and in most of the criteria relating to the Level across the range of work;
- demonstrate the ability to work consistently and independently in most aspects of the Level; and
- apply what he or she has learned in new and/or unfamiliar situations, as appropriate.



The purposes of assessment should interact closely to form a process or cycle of learning, teaching and assessment. The learning, teaching and assessment cycle is an interactive process of progression. You should give pupils opportunities for investigation and problem-solving that challenge what pupils know and understand, their thinking and decision-making, mathematical reasoning and communication skills.

Schools should take the different purposes of assessment into account when developing assessment policy and practices.

Classroom Practice

Creating Assessment Opportunities

Pupils should have a secure understanding of mathematics (Knowledge and Understanding) before you give them opportunities to apply this in unfamiliar situations (Using Mathematics). Activities to assess Using Mathematics should therefore ideally combine opportunities for pupils to demonstrate their:

- understanding of appropriate mathematical concept(s);
- ability to select and apply relevant procedures/skills in different contexts; and, where appropriate,
- ability to apply higher order thinking skills and to solve problems.

Open-ended opportunities provide information about a pupil's level of mathematical thinking. For example, asking 'How many ways can you make 15?' is 'open' as the pupil must explain their answer. Asking 'What is 7 plus 8?' is 'closed' as the pupil can answer with a single word and has no need to elaborate. Open questioning allows pupils to generate information, explain their thinking and demonstrate their ability to work systematically. Open-ended opportunities allow all pupils to engage with the activity or problem at their own level.

Give your pupils opportunities to work in pairs/small groups and encourage them to discuss ideas, listen to others' ideas and ask questions.

You should observe children during their discussions and support their learning by asking open-ended questions, for example 'Have you thought about trying...?' or 'What would happen if ...?'

You may gather assessment evidence from other areas of learning more likely to include oral work and practical activities. Introduce meaningful activities to assess pupils' ability to use and apply their knowledge. For example, organising a school trip to the Ulster Museum and planning how to get there provides a meaningful and real life context. Pupils could compare journey times and costs, make decisions about value for money and explain their choices. This gives pupils opportunities to select the mathematics/materials that are appropriate for the problem.

The information that you gather from assessment should inform your planning in the context of the Northern Ireland Curriculum. It can also help to determine ways to provide interesting and varied experiences and adapt your pupils' environment to meet their needs and support their learning.

As you develop long and short-term plans, ensure that your pupils and other adults have appropriate opportunities to participate in the planning process.

Observation during Using Mathematics Activities

Observation is a natural and essential part of effective assessment practice. Each observation should take place across a range of contexts. This helps to build up a comprehensive picture that will inform planning and teaching and enable you to take account of individual needs.

Planning for Observation

As observations are the key to effective planning and assessment, it is essential to take time to plan for them. However, because some of the most detailed insights into pupils' learning tend to come from their unpredictable reactions to their learning experiences, you should take a flexible approach. This allows for both planned and spontaneous observations.

When you plan, you may decide to observe a specific pupil or a group on particular days. Ensure that your observations over time include all pupils across a range of contexts.

Record your observations, including:

- planned and spontaneous observations;
- positive language, focusing on what the pupil can do or does know;
- how pupils describe what they did and, when appropriate, record the mathematical language that pupils used;
- information that is factual, specific and brief; and
- any follow-up action required.

Observations may also provide information that will help you to:

- identify pupils who may need additional mathematical challenges;
- identify pupils who may require additional or specialist attention; and
- consider which additional experiences or resources to provide and why.

School Planning

School planning should map out the range of activities across the year and across the curriculum. This provides a coherent programme of learning, teaching, and assessment to meet the statutory requirements for the core skill of Using Mathematics. Planning should take place at a whole-school level to ensure continuity and progression in Years 1–7 so that pupils experience a broad and balanced curriculum.

Effective whole-school planning will help to ensure that assessment is manageable and appropriately aligned with the core business of teaching and learning.

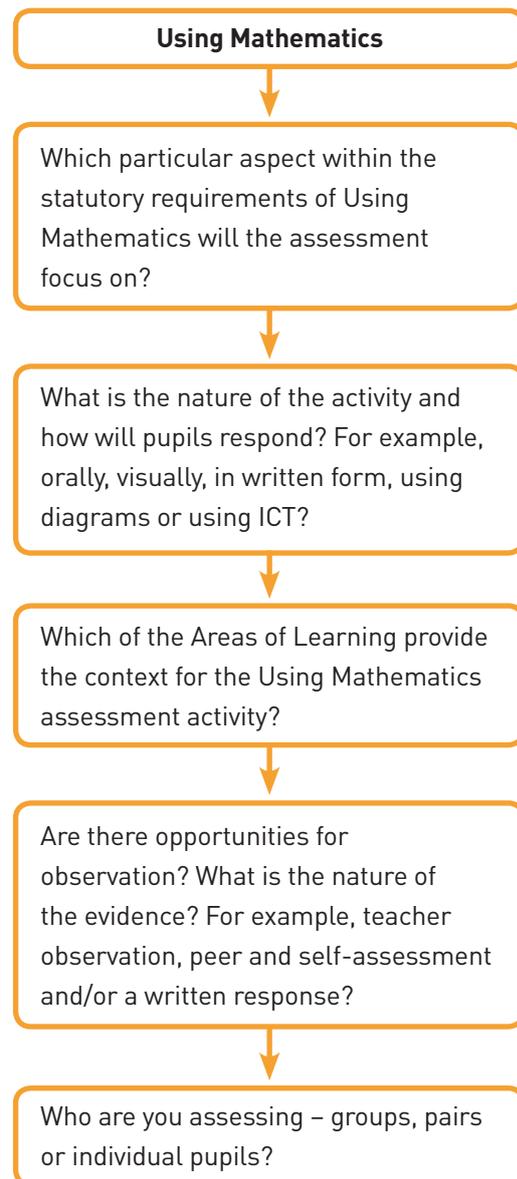
DENI, 2011

It will also monitor progression in Knowledge and Understanding, in the Thinking Skills and Personal Capabilities as well as the Cross-Curricular Skill of Using Mathematics.

When planning for assessment, you should:

- identify learning intentions that detail Knowledge and Understanding, skills, and connections across the Areas of Learning;
- use evidence from observation, assessment and evaluation;
- identify the teaching approaches that you will use;
- outline the experiences you have planned and the resources you will need;
- explain how you will differentiate between levels;
- involve your pupils and reflect their varying needs and interests;
- indicate opportunities for challenging and open-ended experiences; and
- evaluate your planning regularly to inform future planning.

When identifying assessment opportunities, at the planning stage you should think about:



When you plan for assessment, break your assessment opportunities into manageable steps to interest your pupils and meet their needs. You should ensure that a continuum of learning and assessment opportunities provides appropriate development for all pupils.

Using Mathematics Exemplar Activity – Level 4

This example activity provides an opportunity to connect pupils' learning by integrating the Requirements for Using Mathematics with Knowledge and Understanding and using Assessment for Learning strategies. It also provides a real life context for applying the Thinking Skills and Personal Capabilities.

'Children learn best when learning is connected'

The Northern Ireland Curriculum: Primary, page 10

Traffic Survey Activity

Pupils work in pairs/small groups to complete a traffic survey on vehicles passing the school gate. Pupils collect the information and present it by drawing and labelling the axes and completing the bar chart.

This activity connects pupil learning by integrating the following **Requirements** of Using Mathematics:

- solving problems and making decisions;
- using mathematical understanding and language to ask and answer questions, talk about and discuss ideas and explain ways of working; and
- reading, interpreting, organising and presenting information in mathematical formats.

Pupils use their **Knowledge and Understanding** (Handling Data, Number) to:

- collect, group, record and present data;
- present and interpret data using a bar chart; and
- add, subtract, multiply and divide whole numbers.

This activity also gives pupils a real-life context for applying the **Thinking Skills and Personal Capabilities** of:

- Managing Information;
- Thinking, Problem-Solving and Decision-Making; and
- Working with Others.

Prior Knowledge/Experience

To complete this assessment activity, pupils should have experience of:

- collecting, recording and grouping data for a given activity;
- explaining their way of working;
- presenting and interpreting data using a range of graphs, tables and diagrams; and
- using the four operations.

Suggested Success Criteria

You should discuss the success criteria for a specific activity with your pupils. Pupils can use the success criteria as a self-assessment checklist and refer to it during this activity to evaluate the outcome.

Remind your pupils to:

- check all the information collected and grouped;
- use the information to work out the scale for the vertical axis;
- label each bar on the horizontal axis;
- label both axes; and
- discuss their work and explain their thinking.

Gather evidence from each pupil completing the task, this can include:

- a bar chart drawn and labelled correctly; and/or
- observation of pupil discussion during class/group sessions.

This sample activity illustrates the opportunities to consider the Requirements, the Knowledge and Understanding, and the Thinking Skills and Personal Capabilities in one activity. You may wish to consider the flow chart on page 16 when developing your own activities. You may also find useful support in resources such as the Assessment for Learning resource, the Thinking Skills and Personal Capabilities Think Pack and microsite and the Thematic Units. You can find these resources on our website www.nicurriculum.org.uk

The Process of the Activity:

As a possible introductory activity, you can divide the class into pairs or groups.

If necessary, use some/or all of the following questions:

- What type of information will you collect? For example, range, colour or make of vehicle;
- How will you group the information? For example, a frequency table;
- How will you present the information?
- What information do you need? (scale on vertical axis);
- Which clues may help you find that information? (There are more white cars, so the tallest bar must be...);
- How will that information help you? (You can work out what each interval represents);

- How could you work out what each interval represents? (You divide the number of cars by the number of divisions on the axis); or
- What could you do next?

Class/Group Plenary

Give your pupils opportunities to explain how they completed the activity, including their understanding of simple scale, using appropriate mathematical language.

You can then ask questions, for example:

- Did anyone do it a different way or try a different method?
- How would you check your work?
- What other ways could you show this information?
- Why did you choose to present results/information in a particular way?
- What did you find out and what conclusions could you make?



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