



# Thomas Muir Primary School

## Numeracy and Mathematics

### Learning, Teaching and Assessment Policy



## Introduction

This policy was written by members of our Numeracy Working Party at Thomas Muir Primary. This group has worked together to develop effective learning, teaching and assessment approaches in the session 2018-2019 and will review and revise the policy in session 2021-2022. In the process of writing this policy, pupils who are part of our Learning Champions pupil focus group gave their views on what they enjoy about numeracy and mathematics and what helps them with their learning. It was also reviewed and agreed upon by members of our Parent Council.

The document has been written in line with Curriculum for Excellence, Numeracy and Mathematics Benchmarks (June 2017) and the Excellence in Mathematics Paper (Report from the Maths Excellence Group, 2011).

**Mathematics** is the study of the properties, relationships and patterns in number and shape, and it is the use of this knowledge to analyse, interpret, simplify and solve problems.

**Numeracy** promotes the development of the number-based skills that are needed regularly by everyone in their lives and is a part of Mathematics.

It is important that both of these areas are taught alongside each other, as they are inextricably linked. When a class, group or individual is learning about a specific area of mathematics, such as 2D shape, numeracy should still be taught; both through a Number Talk or other mental maths lesson, but, more importantly, as an integral part of the mathematics learning.



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## Rationale & Aims

*'To face the challenges of the 21st century, each young person needs to have confidence in using mathematical skills, and Scotland needs both specialist mathematicians and a highly numerate population.'*

Building the Curriculum 1, Scottish Executive 2006

*"—to help children and young people in Scotland to understand and value the power of mathematics, to equip them with the skills to contribute effectively in the world of work and in civil society, but also, and perhaps most importantly, to exercise greater control over their own lives."*

Dylan Wiliam, Co-chair, Mathematics Excellence Group

At Thomas Muir Primary School we aim:

- To develop a positive attitude to learning in numeracy and mathematics as an interesting and enjoyable curricular area where all learners experience success.
- To develop mathematical skills in relevant contexts, building knowledge and a quick recall of stage-appropriate facts.
- To teach numeracy and mathematics in a systematic and progressive way, taking into account children's individual strengths, interests and areas for development, making connections both within maths and to other curricular areas.
- To involve children in their own learning through the sharing and co-creation of Learning Intentions and Success Criteria.
- To enable children to use all forms of assessment to inform their next steps in learning.
- To create a learning environment which encourages learners to solve problems collaboratively, learn from one another and value the ideas and opinions of others.



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- To allow children to solve problems in different ways, teaching various strategies and to ultimately encourage children to use the strategy that works best for them.
- To develop confident learners who are not afraid to make mistakes, and understand that mistakes are simply part of the learning process.
- To enable learners to express themselves fluently, using correct mathematical language and vocabulary. Teachers can refer to the mathematical vocabulary guide saved in All Staff > Forward Planning > Numeracy.
- To continue to develop a reflective staff team of teachers, leadership and support staff who collaborate, share new ideas and learn from each other in the teaching and assessment of maths.

*'It's important to learn maths so you can do sums on your own.'*

P1 Learning Champion

*'It's important to learn maths so when you grow up you can teach it to your own children.'*

P2 Learning Champion

*'It's important because out of school you need to know how to pay for things in shops.'*

P4 Learning Champion

*'Maths helps you read your Fit Bit.'*

P5 Learning Champion

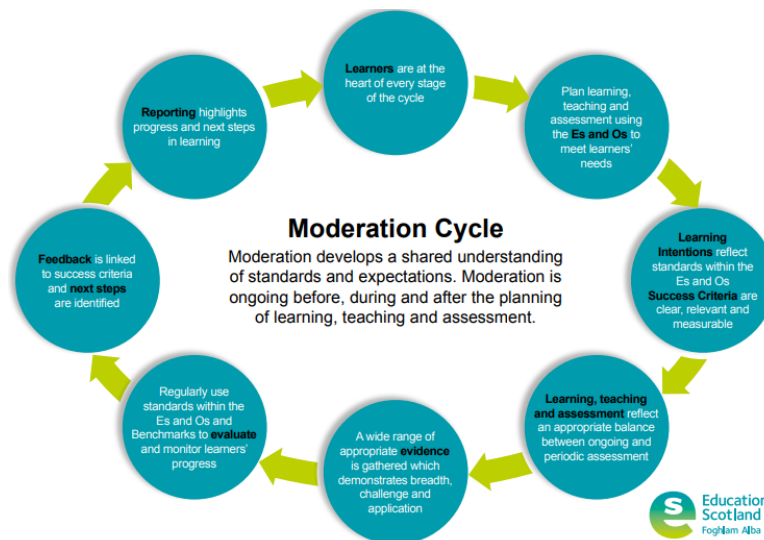


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## Learning, Teaching and Assessment



Children's learning in numeracy and mathematics is planned using our Numeracy and Mathematics Forward Planning documents, taking into account the above diagram from Education Scotland, outlining the Moderation Cycle.

Teachers across stages and levels work collaboratively to plan for groups and individuals, to ensure pace, challenge and breadth across a stage. They continually assess and reflect upon the planned learning and make any appropriate amendments to their planning. Teachers work together throughout the session to plan for assessment that measures learner's progress in the CfE Benchmarks, linked to the skills highlighted in the forward planning. The results of these assessments, and other information such as teacher observations, written work and ICT based learning will then be used to inform the next block of learning and teaching and/or transition documents which will be passed on to the next teacher(s).



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## Planning for Learning

Numeracy and Mathematics is split into three broad areas, which themselves include specific curricular organisers:

- Number, Money & Measure
- Shape, Position & Movement
- Information Handling

The Excellence in Mathematics Paper (2011) sets out key concepts and skills, essential for success in numeracy and mathematics, including:

- **Knowledge and understanding of number, the number system and its operations.** This includes a clear sense of counting and an understanding of how numbers relate to size, quantity and order.
- **Well developed skills in calculating mentally.** These skills are essential when using maths in daily life. Children need to be taught skills such as counting on/back using visual/concrete strategies such as number lines or cubes before they are able to progress to applying them mentally.
- **Understand and using inverse processes to simplify a problem.** For many learners, calculating  $32 \div 4$  can be daunting, but is much simplified on appreciating the relationship between  $32 \div 4$  and  $8 \times 4$ .
- **Skills in estimating appropriate quantities.** Estimation is something that learners often find difficult. This may be as a result of an over-emphasis on getting “the right answer” but of course, being able to decide if an answer is approximately correct is vital even where accuracy is important.
- **Recognising, working with, extending, and justifying patterns based on attributes and numbers.** Children and young people are often fascinated by patterns, including number patterns. A key skill that underpins mathematical and numerical development is the ability to spot a pattern, to continue and extend the pattern, to discover a rule governing it, and to provide a mathematical justification of why the pattern does, indeed, continue in the way described.



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- **A sound grasp of the concept of place value.** Understanding place value is absolutely essential to a firm grasp of number. The use of appropriate concrete resources will help learners to picture place value “in action” and improve their understanding.
- **A confidence in using appropriate mathematical language and notation.** The language of mathematics can be confusing to learners. For example, the terms ‘subtract, ‘minus’, ‘take away’ and ‘difference between’ all relate to the same process but many learners do not easily relate all these terms to that process. Children need to be introduced from early stages to mathematical language, to continue to develop that language appropriately throughout their learning and to use it confidently when explaining their thinking and answers to others.
- **Understanding and applying the concepts, notation and related operational skills of fractions, decimal fractions and percentages (and their interrelationships) and to be able to apply these skills in learning, life and the workplace.** Teachers can assist learners’ understanding of these concepts by ensuring that they are given a range of representations of fractions from the outset. For example, fractions can be shown not only showing fractions as segments of a ‘pizza’ or ‘cake’ or as part shadings of an area but also as points on the number line.
- **An ability to classify and relate 2D shapes and 3D objects using their key properties.** It is vital that learners understand the importance of investigating appropriately such properties as edges, faces, vertices, angles, symmetry, area and volume. Encourage learners to ‘play’ with shapes and objects by building and drawing them, comparing them (similar and congruent shapes), folding them (symmetry) and turning them (angle).
- **Being able to solve a wide range of problems, originating from real life or from within mathematics learning or from scenarios encountered across the curriculum areas.** Solving problems is an ideal environment in which children and young people can apply the mathematics they are learning.



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## Organising and Planning Teaching

Children should be taught a mathematics lesson daily, which should include most of the following features:

- A warm up focusing on mental maths skills. This could take the form of a Number Talk, use of Count On Us boards, a challenging question relating to prior learning, an ICT based task or any other activity that engages children and involves practise of appropriate numerical skills.
- Learning Intentions shared in child-friendly language.
- Clearly differentiated Success Criteria, shared and/or co-created with children.
- Differentiated activities clearly displayed on A3 task boards. These may include; direct interactive teaching from a teacher or support for learning assistant, paired or group work, individual written work, work with concrete materials, ICT based activities and self/peer/teacher assessment activities.
- Direct interactive teaching should include planned, effective questioning of learners, linked to Bloom's Taxonomy of Higher Order Thinking Skills. Teachers should also consider HOTS when planning lesson activities and plenary questions.
- Written work in jotters should reflect different ways of solving calculations. For example, addition using an empty number line should be taught and recorded in jotters alongside vertical algorithms.
- Textbook pages and worksheets should be used very selectively. For example, there would normally be no need for a child to complete every example on a page. The teacher should specify a selection to be completed and ensure that the child then has an opportunity to complete or create a word or visual problem, applying the skill.
- Problem solving should **not** be taught as a stand-alone area of the curriculum. Children should have the opportunity to solve problems in almost all maths lessons. It can be particularly effective to begin a lesson with a question using a real life context.



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- Effective plenaries can take place both throughout and at the end of a lesson or block of learning. They should allow children to demonstrate their understanding, share different strategies, assess themselves and their peers (if appropriate) using the Success Criteria and to discuss what their next steps in learning will be.
- Basic feedback: written work in jotters should be marked in good time, with a tick for a correct answer, and a dot for incorrect, which can then be turned into a C when corrected. Teachers in P1-2 may wish to use 'tickled pink' and 'green for growth' highlighter colours. It is important that children understand the code used by the teacher.
- Verbal and written feedback: pupils should receive encouragement and individual information about how they have performed in relation to the success criteria.
- Teachers should then reflect upon their observations, children's answers to questions, written work and any other assessment information to inform the next lesson or block of teaching.

### **Numeracy Jotters**

Most of children's learning in maths should be recorded in their Numeracy Jotters. This could take the form of work written directly into jotters, sheets, photographs or other activities stuck in or observations noted by the teacher. All jotters should be A4 size and the stages should use the following size boxes:

- Primary 1: blank, progressing to 2cm squared
- Primary 2-3: 1cm squared
- Primary 4-7: 7mm squared

Some children, working at different levels throughout the school, may require different sizes of jotters to provide support and challenge. All work in Numeracy Jotters should include:

- A short date, e.g. 21.05.19



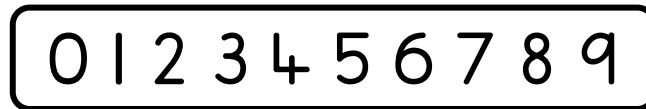


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- A title, relating to the learning taking place e.g. 'Addition on the Empty Number Line'. Teachers may also wish to ask children to record textbook pages for reference.
- Evidence of a variety of strategies taught throughout the year.
- Any lines drawn with a **ruler**.
- **One digit per box.**
- Numerals should be formed as follows:



- It is not necessary for children to record learning intentions or success criteria in jotters. They should be on display on task boards and/or other areas of the class base and the learning should be evident through the title and content of the recorded work.

**At the beginning of each session, teachers must explicitly model these expectations for classes and continue to reinforce them throughout the year.**

### Assessment

Assessment is an integral part of teaching and learning at Thomas Muir Primary School and is a continuous process. Information for assessment will be gathered in various ways; by talking to the children, observing their work, marking their work, Scottish National Standardised Assessments in P1, P4 and P7 and assessments drawn and adapted from resources, such as TeeJay.

Children are actively encouraged to participate in 'Assessment is for Learning' strategies, such as self and peer assessment, to help them understand and take ownership of their progress in mathematics. Information from these assessments will be used to: inform future planning, identify strengths and areas for development, provide individual and next steps and information for teachers and parents.



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There are four contexts of learning and these are utilised to help form **holistic assessments**,

- Life and ethos of the school as a community
- Curriculum areas and subjects
- Interdisciplinary learning
- Opportunities for personal achievement

Holistic assessment helps pupils to demonstrate a breadth of learning from across the Curriculum Experiences and Outcomes which link to the benchmarks. When creating termly, summative assessments teachers should look across the benchmarks covered and 'bundle' them together to allow children to demonstrate **application** of learning in new and unfamiliar situations.

Children will demonstrate challenge as they are asked to use a range of higher order thinking skills such as **analysis, evaluation, creation** through problem solving and tackling multi step tasks.

A variety of holistic assessment examples are saved in the All Staff area for teachers to refer to as examples of good practice.

Results of assessment should be shared with children, when appropriate, in order to prompt meaningful and reflective learning conversations with both pupils and parents. Children should be aware of their next steps in learning.

When tracking learner's progress across CfE levels and reporting to parents, teacher's professional judgement is of utmost importance and all assessment data provides additional evidence.



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### Resources and Strategies

At Thomas Muir Primary School, the teaching, learning and assessment of mathematics and numeracy is not resource led. In other words, our teachers do not follow schemes of work in textbooks. We work together to look carefully at the CfE Experiences and Outcomes and Benchmarks and decide how they can be achieved using a variety of teaching styles, questioning and resources. Below are some of the many resources and strategies that teachers employ to provide exciting and engaging learning experiences for our learners.

### **Stages of Early Arithmetical Learning (SEAL) and Maths Recovery**

Key to its success, SEAL provides a clear framework which makes it easier to pinpoint a child's numerical knowledge. By providing clear guidance in the teaching approaches and the key topics involved in early number SEAL gives significant depth to learning various strategies to embed number skills. This framework is used as a teaching guide in Early and First Level classes, alongside Heinemann and Teejay resources and activities.

Maths Recovery, which uses the SEAL framework to assess children who may have gaps in their mathematical learning, is used throughout the school to support individuals and groups of learners.

### **Number Talks**

Number Talks are short, daily exercises aimed at building number sense and encouraging children to use different strategies to solve problems. They develop children's ability to play with numbers meaning they can visualise problem solving, perform calculations quickly, and are flexible in their mathematical strategy.

*'Number Talks teach you different ways to do things.'*

P6 Learning Champion

*'We like talking about maths because you learn more and have more fun.'*

P7 Learning Champions

Resources to support Number Talks, such as printable hand signals, lists of strategies and Youtube links, are saved in All Staff > Forward Planning > Numeracy.



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#### Count On Us Boards

Purchased using Pupil Equity Funding to raise attainment in maths, 'Count On Us Boards' help develop a conceptual understanding of number and number processes. They are an excellent tool for deepening understanding and helping children take more responsibility for their own learning.

They include a 100 square, an empty 100 square, ten 10 Frames, an empty number line, two 10 Frames, a vertical number line and white space for demonstrating thinking skills. These are essential building blocks for a learner to make progress in numeracy and mathematics.

*'The Count On Us boards help us add with the dots.'*

P3 Learning Champion

*'I like using the Count On Us boards, they lay out the work for you.'*

P6 Learning Champion

#### ICT to Enhance Learning

As a school, we are fortunate to have 34 state of the art I-Pads which are used weekly by classes to enhance various areas of the curriculum. Many children benefit from playing maths based games on the I-Pads, laptop computers and interactive whiteboards which help them to increase their speed and fluency with number facts.

Our ICT resources have recently been employed to introduce coding as part of our Technologies curriculum. When children learn to code, they develop key skills like problem solving and practice algorithmic and computational thinking. These broad skill sets and ways of breaking down and analysing problems translate across the curriculum and are particularly helpful when it comes to numeracy and mathematics.



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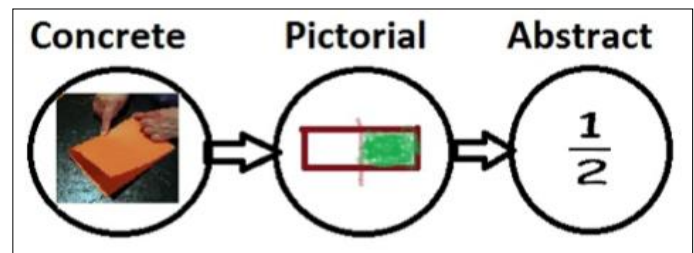


The staff shared drive also includes a variety of resources such as the EDC Maths Packs, EDC Interactive Resources and Nelson Thornes problem solving materials. To access these, click Start and click the Students folder.

### Concrete Materials and Class Base Resources

*Manipulative materials are objects designed to represent explicitly and concretely mathematical ideas that are abstract. They have both visual and tactile appeal and can be manipulated by learners through hands-on experiences. (Moyer, 2001)*

All areas of maths can be taught using concrete materials. Using concrete materials (e.g. cubes) allows children to progress to seeing representations of numbers (e.g. pictures of cubes) and eventually on to an abstract idea (e.g. using numbers only). The concept is illustrated here:



Primary 1-3 class bases have a box of concrete materials such as cubes, counters, dice and bead bars. These should be used regularly to introduce and reinforce concepts. Teachers in Primary 4-7 can access similar resources in the Numeracy Hub upstairs and the cupboard of additional resources in the Group Room downstairs.

### TeeJay Publishers

TeeJay Maths is the main textbook based resource that we use at Thomas Muir Primary School. The benefits of TeeJay resources are that they are written specifically with the Scottish Curriculum for Excellence in mind and activities within the textbooks and assessments link to Experiences and Outcomes.



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## **Partnership**

### **Transitions from Nursery and to High School**

Teachers and the leadership team work very closely with staff from both Auchinairn Early Learning and Childcare Centre, Cleddens Early Learning and Childcare Centre and other partnership nurseries to ensure that the transition from pre-school to Primary 1 is as smooth as possible and information about all children's progress in Early Level Numeracy and Mathematics is passed on.

We also work very closely with the Maths Department at Bishopbriggs Academy to ensure that information about all children's progress in Numeracy and Mathematics is passed on.

### **Partnership with Parents and Carers**

Parents and carers will be kept informed of children's achievement through end of year reports, parent consultations and parental engagement sessions such as the very successful 'Come Count With Me'. Regular home learning will also be provided in numeracy and mathematics. Its purpose will be to consolidate and extend skills already being developed at school.