How to use maths trails

Janet Rees considers some starting points for developing maths trails in or out of the school environment.

Careful planning of a maths trail can enable children to engage with mathematical experiences that complement and extend those on offer in the classroom. The following practical ideas, based on the key areas of maths – number and quantity, pattern, shape and space, and measurement – are offered as starting points for planning.

Developing a maths trail, either inside or outside the school building, puts maths where it belongs – in the real world! The trail need not be an extensive one – just within the confines of the classroom a trail can be rewarding. Children can be given opportunities to see the importance of maths, and how it is used, within an environment with which they are familiar. However, it is possible to widen the trail to include the whole school, (both buildings and people), the grounds and the larger community. Trails can be man-made, natural or a combination of the two.

Why are trails so useful?
A maths trail encourages both children and adults to look for, see and use the maths in the school environment, village or town. Children gain first-hand knowledge of how maths is used to interpret the world in which we live. A trail can provide a variety of contexts in which maths ideas can occur and help children to use and apply the maths already learned. A trail can also

- allow children to familiarise themselves with their school, which is particularly important for children new to the school, either in the early years or after moving to the area
- encourage children to work together, where they can discuss ideas and findings
- encourage children and parents or carers to work together in a non-threatening environment
- show that maths is more than just ‘sums’ (this is just as important for the children as for teachers and parents/carers)
- emphasise that maths is a whole and not a series of disconnected topics – we are being encouraged to view maths not only as a subject in its own right but also to look for connections with other subject areas and within maths itself
- emphasise the practical application of maths.

What can trails do?
Maths trails can

- encourage children to see how maths is used to interpret the world we live in
- help children to see the relevance of maths outside the classroom
- help children to see their school from a different viewpoint
- encourage children to see maths in their own environment
• introduce children to the wonder of maths.

*Organisation, planning and preparation*

**Getting started**
Make decisions early on about the involvement of adults and children.

**Who is going to be involved?**
Are the children going to be included in the decisions about the trail? Are they to be consulted, with their interests and aptitudes taken into consideration? Are the adults going to prepare the trail for the children? There are advantages to both. I would suggest that children may benefit from following a well-prepared trail before being asked to make one of their own.

**What are they going to do?**
Each person on the planning committee needs a specific role. In this way nothing gets left out and little gets duplicated. Someone needs to be in charge of the route while another looks after the maps and diagrams. Yet another needs to sort out what resources are needed. Is there anyone who can be responsible for illustrating the sheets or booklets? Whose responsibility is it to put the ideas together to make the final version of the trail?

**Where are they going to do it?**
Will there be a designated area in the school for people to pool ideas? If there is a lot of artwork or collating to do, find a corner of the school where the papers won’t get disturbed.

**When are they going to do it?**
Most of the work will probably be done during the school day when time is at a premium. Try using part of a staff meeting, a professional development day or a governors’ meeting.

**Why are they going to do it?**
Everyone involved must be aware of the ‘why’ of trails. There needs to be a clear understanding about the benefits for the children, the staff and the wider community. As well as these, consider the objectives as far as the maths is concerned. Be clear about whether the trail will cover one part of maths (in which case, don’t get sidetracked) or as many parts of the maths curriculum as possible.

**How are they going to do it?**
Is the trail to be followed by the whole school or just a part of it? Are other adults to be invited to share the trail?
Points to bear in mind

Writing a worthwhile and useful trail takes time. If possible, have two or more people involved so that there can be communication between them and they can bounce ideas off each other. This will also allow problems and difficulties to be shared. There are several considerations that the writers need to take into account.

- What is the age range of the people doing the trail? If young or less able children are to be involved, how will the instructions be communicated? Will there need to be a series of pictures, diagrams, arrows? Perhaps an audio tape would be appropriate?
- Where is the trail to be located? How long is it to last? If the trail is too short, interest and enthusiasm may not be generated – if the trail is too long, interest and enthusiasm may wane! If the trail is to cover a large area, are there enough adults, especially if the trail moves away from the school grounds? Will there be stopping places, either for regrouping, refreshments or stocking up on materials?
- What equipment will need to be provided? Does each group take equipment with them or will there be a selection at each stopping place so that children can choose the most appropriate piece for the task?
- Should the trail be trialled before being given to others to follow? How, when and by whom will this be done? The writers of the trail may not be the best people for this. A fresh pair of eyes may spot hidden problems.
- How will the trail be presented? Will there be individual sheets or booklets? Do they need to be re-used by another group?
- If the trail is to be a family event, there needs to be a range of questions.
- Clear instructions and clear layout are essential.
- What are the constraints of time, money and adult help?

Some suggestions for using trails

Trails can be an excellent opportunity for liaison between schools and/or classes. Children from one school or class can lead others round the trail, working in small groups. For children who have just started a new school, trails can allow them to become familiar with their new environment. You may want to consider school exchanges to allow children different experiences.

The best maths trails have a variety of activities that will involve as many children as possible. Within the trail, try to have some that can be solved on the spot without too much trouble as well as some that can be extended at a later date at home or in the classroom. This can also involve collecting data for later work.

Suggested activities with examples

1 Simple observations and identification. Naming shapes, sorting, counting, recognition of relationships, matching 1 to 1.
   ‘Find two circles, one inside the other’ (wheel, clock, window)
   ‘Where can you find a tessellating pattern?’ (Carpet, wall, pavement, windows, doors).
2 Calculation. Use the information available to calculate the length, total number, weight.
Following instructions and identifying the maths needed to obtain a solution to the problem.
‘Look at the diagram in the booklet. There are different ways to find the height of this tree. Using any apparatus that you think will help, estimate and then calculate the height of the tree.’

Gathering data to process later.
‘Collect the prices of six everyday food items from six different shops.’
This can lead to a more detailed shopping survey. What is the best buy?

Making comparisons of size, shape or time.
‘In which direction is the sundial facing? Can you tell the time?’
Children can make sundials for themselves and look at ways of measuring and recording the passage of time.

Finding relationships, distance and location.
‘Plan a route through the park so that you go along each pathway only once. Is it possible? How? Why not?’

Using estimation and approximating skills.
‘Use the metal grid and place it on the grass. Estimate how many grass plants are growing within the grid and how many broad-leafed plants are there. Count them and find a way to record your findings.’

The ‘how’ of trails
Writing a maths trail takes a fair amount of time and at least two people working together. It can be a great deal of fun, and writers are often surprised at how much maths there is in even the most seemingly boring landscape or building. Teachers that I have worked with have been amazed at the amount of maths they didn’t know was there!

If the trail is to take place in and around the school, you need to be aware of any disruption you may cause. For instance, going into classrooms to look at window shapes, the way the furniture is laid out, or to collect data, can interrupt other activities. Do make sure that all teachers are aware of the time you’re visiting, and the purposes of the visit. Also allow them time to inform the children, especially if they are going to be asked questions by the ‘trailers’.

If the trail is in the town or village centre, make sure that it doesn’t cross many roads. You may need to organise a crossing patrol, especially at busy times of the day or busy junctions. Remember to ask shopkeepers if they mind the children coming into the shops. There may be times of the day when it is more convenient than others. Ask if they would be willing to display clues in the window, or talk to the children. If going to a post office, avoid pension day!

Consider whether the clues on their own are sufficiently self-explanatory. If not you may need to supply a map. Put markers at key points to help children keep on track. These can be colour coded or numbered to match the clues on the trail.
Starting points

Decide whether the trail is to be about one part of maths – shape, number, measures, etc. – or the entire maths curriculum. Will it be used to reinforce some maths work that has already been taught, or will it be designed so that children are able to find out as much as they can about an area of maths through encountering, exploring and discussing?

Is the trail to bring in elements of cross-curricular work, such as maths and science, maths and art, maths and music?

Discuss simple rules of following a trail with the children. This must include general behaviour, treatment of resources, respect of property and people. If necessary, give each group a copy of the agreed rules to take with them.

Create as much motivation as possible. Make the trail into a giant game, or a treasure trail, with real treasure at the end. A pirate trail that I helped to put together gave the children bags of chocolate money when they had completed it. There was a great deal of motivation that day!

Location

This can be as varied as the imagination of the people writing the trail. At the beginning, if trails are a new venture, stick to the classroom, playground or hall. As you become more experienced at writing trails, and the children become more experienced at following them, trail further afield. Go outside the school – to the church, shop or precinct. If your school is in a village, explore the village green or common. Elsewhere, use the local park, garden or stately home. Once children become experienced followers of trails, they can begin to write their own. Start them off in their own home, involve the family if possible, and then encourage adults at home to work with the children to make trails to the shop, to school, to the bank – in fact, anywhere!

Variations

Use as many variations of the theme of maths trails as possible, in order to keep the interest and enthusiasm going. Here are some ideas that I have worked with.

• A senses trail. This can involve all five senses either separately or together. Look at textures of surfaces for touch, sounds that can be heard (natural or man-made) for hearing, herbs, flowers, vegetables for smell, activities that need to be discussed for speech and activities of the type ‘what can you see, describe it to someone else using mathematical vocabulary’ for sight. Use fabric samples, textured paper, sandpapers as samples.
• A picture trail, where children either follow an artist through early works to later, or put styles of painting in order from early Stone Age to modern day. Use pictures and posters with suitable captions.
• An in-class or homework trail that includes using resources such as catalogues (a shopping trail) holiday brochures (a holiday trail) or material from estate agents (buying a house).
• Visiting specialist places, such as museums, art galleries, zoos, records office, theme park, playground, forest, woodland, library, theatre, cinema, swimming pool, leisure centre, bus/rail station, airport, factory, industrial estate, market. The list is endless!

Be prepared for varying weather conditions. What do you do if an outside trail has been planned and the weather decides not to cooperate? Are there contingency plans in operation?

**Using the environment**

Look for particular features within the chosen environment. These can include doors, steps, floors, stairs, mats, windows, gardens, gates, paths, pillars, posts, fences, railings, walls, bricks, roofs, tiles, sheds, outbuildings, garages, chimneys.

Sometimes there will be special features that can be used. These can include such things as water features (bearing in mind safety) – fountains, pools, ponds, streams, rivers, lakes – trees, shrubs, hedges, statues, manholes, signs, labels, prices. The school carpark can give features such as wheels, hub-cap patterns, data relating to colour and make of cars, number plates and tax discs. And don’t forget litter bins and bus stops.

If there are few or none of the above, try creating your own. Enlist the help of any willing adult as well as the children. Design and make a mathematical garden. Put some sculptures in the garden, home-made as well as commercially produced. Use the markings on the playground such as squares, 100 squares, ladders, spirals, footprints, grids, trails, number lines, concentric circles, targets, hopscotch. And what about painting islands or planets?

Use benches or other seating, stepping stones over a painted pond. Build bridges from large construction materials. Plan paving areas, using different shapes and sizes of slabs. If necessary relocate existing features such as tubs, logs and tunnels. Make some raised beds using walls or railway sleepers.

**Tips for success**

• Don’t make it too long.
• Produce an attractive layout to stimulate interest.
• Include a wide variety of activities to maintain enjoyment and enthusiasm.
• Have clear sections.
• Don’t make it a race.
• Allow time for revisiting sections to improve or review.
• Set out the answer sheet to allow for working out, sketches and notes.
• Provide instructions that are short, clear and concise.
• Include both open and closed tasks and vary the level of difficulty to provide for the full age and ability range.
• Encourage discussion and sharing of ideas between groups after the trail.

**Finally...**
In the booklet designed for the trail, include an evaluation sheet that will allow both adults and children the opportunity to suggest improvements, changes, additions, modifications or extensions.

Invite a whole new audience to try the same trail. This can be part of a fun day, summer fair or autumn sale.

Give children the opportunity to plan an imaginary trail with given resources and criteria. The rules can be set by the teacher, which will make it a problem-solving exercise.

Make a trail that will last for no more than half an hour for a group of six 9-year-olds. You have an area the size of the football pitch and you can use any ten items from a given list, plus four items of your own choice. You also have four large sheets of paper and coloured pens available.

Start a trail and invite others to complete it. Share the different endings.

*Janet Rees is a freelance education consultant.*