

Maths talks

Talk is important in mathematical learning. It helps us to communicate our thinking to others and clarify our thinking for ourselves. Using mathematical words is important in concept formation. When we learn the word for 'under' and associate it with a range of experiences of 'under' then we form a firm concept of what 'under' means. It is important that children hear lots of maths talk in the early years of life and research shows that this makes a positive difference to their later maths learning (EIF, 2018). Gradually, they will begin to apply it to their play and everyday experiences, expressing mathematical ideas verbally or using mathematical talk in their heads. However, developing mathematical talk is so much more than learning mathematical vocabulary. For example, developing maths talk includes providing experiences that children want to talk about.

Often, young children's mathematical thinking will be more advanced and complex than they can express verbally. As practitioners, it is important to be playful with mathematical talk as we engage in activities with children. Children can use their own words (e.g. 'twizzle') as well as more mathematically recognised terms (e.g. 'turn'). They might use gestures and move objects to supplement their talk. It is important not to put pressure on children to talk in a specific (adult) way or to repeat words without knowing their meaning. We want children to be able to make sense of what they are seeing and hearing, and to talk about it in a way that makes sense to them.

On this page you will find information about creating and sustaining an environment which is conducive to mathematical talk, information about how to support children to 'notice' mathematically, ways to promote maths talk, and a deeper exploration of mathematical talk (with supporting research literature). You will also find a list of suggested resources, information about how to plan 'maths talks' sessions and three examples of number talks being used in early childhood settings.

Creating and sustaining a maths talk environment

The setting environment can offer enormous support for mathematical talk. Reggio Emilia identifies the environment as the third teacher, working with the child and adult (their other two 'teachers') to support learning. It is important to take account of children and their mathematical interests as we construct enabling maths-talk environments.

Emotional environment

A maths-talk environment is about much more than the physical space and resources. The emotional and social environment created by adults has an important part to play in developing positive attitudes towards mathematics. A positive emotional environment is one where maths-focused curiosity is encouraged, where everyone can notice something mathematical and where children are happy and motivated to explore, problem-solve and communicate their own ideas and discoveries. Positive adult-child relationships support children to feel safe to make suggestions or mistakes and to feel valued in the mathematical thinking that they share. Through relationships, adults can foster a sense of enjoyment of mathematics, for example when exploring new words and trying new things. Adults also need to be sensitive when modelling and extending children's mathematical thinking and offering appropriate challenge, being careful to maintain enjoyment. This impacts on children's attitudes to maths and on their sense of satisfaction and achievement.

Mathematical opportunities across the setting

Mathematical talk can take place in all areas of the classroom and there are many opportunities to incorporate maths across the setting when we tune into these. The mathematical potential of almost all areas of provision (indoors and outdoors) can be enhanced to create a climate for maths play, supporting learners to both think and talk mathematically during their interactions. A carefully thought-out environment can ensure that children frequently 'bump into' opportunities for maths-talk and this helps us as adults to draw attention to the mathematics in different situations. Here are a few examples:

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| <p>Routines (e.g. snack, tidying up, registration): offer opportunities to solve real problems using mathematical thinking and language</p> | <ul style="list-style-type: none"> • Explore the shapes of objects that have permanent silhouettes on shelves during tidy up time by asking “I wonder what object might fit here?,” or support positional language by asking, “What goes in between the glue sticks and the pencils?” • Use ten-frame self-registration to encourage the visual recognition of structured quantities, asking “I wonder how many children are here today? How do you know? I wonder how many children are off school today?” • Use the opportunity of snack time to explore numbers asking “How many more do we need? How many should there be? How many are missing? Are there more bananas or apples?” |
| <p>Roleplay or small world: offer the opportunity to re-enact everyday experiences using the numbers we see around us in everyday life.</p> | <ul style="list-style-type: none"> • Encourage numeral recognition by asking “What number bus should we catch?,” or support positional language development by asking “Where could we park the car?” in the transport small world. • Asking “How many more coins will we need to pay for that?” in the ice-cream parlour role-play, or “One scoop or two?” • In the farm shop roleplay, explore and match numerals on a shopping list to the number of vegetables you need to buy. |
| <p>Outdoor area: offer opportunities for physical play and the possibility of measuring or comparing</p> | <ul style="list-style-type: none"> • Compare distance or length. Describe and solve practical problems as they build obstacle courses (e.g. Which plank would fit here? How far apart should we place the obstacles?) • Support movement-based games involving hand-eye coordination and facilitate mathematical questioning (e.g. Who threw it the furthest? How could we measure?) • Encourage the language of size and capacity by emptying and filling different containers in the mud kitchen and during sand and water play. |
| <p>Construction: offer opportunities that facilitate spatial talk, using the language of shape, position and direction.</p> | <ul style="list-style-type: none"> • Explore shapes and their properties by seeing what will fit, turning blocks around and choosing blocks for a specific purpose (e.g. Which would be the best blocks to use to build a tall tower? How could we build a bridge to cross the river? Can we get two blocks to make the same shape? Can we find one big block to use instead of these two little ones?) • Investigate making enclosures with blocks, perhaps with a mat or carpet tile to build around (e.g. How can we make sure that the tiger doesn’t escape? What would fit inside the space?) |
| <p>Creative area: offer opportunities to use maths talk in the folding and reshaping of paper; manipulation of boxes and estimation of how much of a material will be needed.</p> | <ul style="list-style-type: none"> • Explore the language of size such as when folding paper or sticking boxes together (e.g. Can you fit that on this page? What shape will you get when it is cut in half? Which size box do we need?) • Investigate putting shapes together (composition) and taking them apart (decomposition) when sticking mosaic or collage pieces (e.g. What might it look like if we added this box too? What shapes have you used to make your rocket? Why?) |

Encouraging children to notice

'Noticing' is an essential part of maths talk. Mathematical noticing asks children:

- to stop and look at something very closely
- to think carefully and to make connections to what they already know
- to wonder and to question
- to communicate their thoughts

This is a lot to take on board and it can take time to develop such a broad range of skills. But there are lots of ways to support young children to notice and begin to make mathematical sense of what they are seeing. The most important of these is to model noticing. As adults, we need to notice the mathematics around us and talk about it in our everyday interactions with children. For example, at the snack table "I've taken a bite out of my round biscuit and now it looks like a moon".

A pedagogy of noticing involves encouraging playful curiosity and inquiry so that we are modelling how we explore mathematical ideas and investigate further but without this feeling pressured. For example, we might ponder "I wonder if an Emperor Penguin is taller or shorter than me?" Engaging children in mathematical talk and supporting their attempts to put a mathematical idea into words helps them gain confidence and enjoy doing so. Stimuli for mathematical talk could be anything from a photograph highlighting shape or number properties, to patterns in the world around us (such as an array of daisies on the grass, or an arrangement of leaves on a branch). The maths talk could be regular and planned-for, or in-the-moment.

We can continue to build children's confidence with open-ended questioning whilst engaging in maths talk. When noticing mathematics with children, there are no right or wrong answers as what one person notices might be completely different from another – all are valid and valuable. So, instead of asking closed and leading questions, such as "How many are there?" or "What shape is it?", we can ask "What do you notice?" or "What do you wonder?" The opportunity to focus on thinking and reasoning over 'correct' answers reveals much about the child's thinking and understanding, and may open up discussions about number, size, shape, pattern or position that were not even anticipated.

Episodes of mathematical interaction: Maths Talks

Maths talks are more successful when adults show genuine interest in the child's ideas and avoid showing disapproval or preferences for certain ideas over others. We need to follow

where the child leads with their thought process, using opportunities to introduce new vocabulary and engage in shared language development. In this way, maths talk is a journey of thinking where ideas are created and unfold as we talk. Provocations and prompt questions, such as “What is the same?”, “What is different?”, “What doesn’t belong? Why?” help to draw out children’s thinking and reasoning, for the benefit of the adult, the learner and any other children who happen to be listening. It is important to remember that communicating understanding is not always done through talk. We need to look out for learning being communicated through gesture (such as motioning to indicate size or shape, or fingers to communicate number.) or facial expression (such as surprise responses to size). With lots of opportunities, sophisticated discussions and interactions can soon emerge.

So, maths talks can happen at any time and in any environment. They might be planned by an adult but most occur spontaneously during play and everyday activities. Our everyday world is full of opportunities and possibilities for mathematics talk. Even walking down the street provides opportunities to talk about patterns in the railings or in the pavement as we walk along or to notice the shapes and sizes of windows and the number of plant pots on a window ledge. The early years setting has very many opportunities for maths talks.

Planning a maths talk session

In adult-prepared maths talks, adults intend to support children’s mathematical thinking through provision of a rich stimuli where children (and adults) are invited to consider and share the mathematics that that is apparent to them in the stimuli. A stimulus can be an image, object or video clip. The mathematics does not need to be obvious: in fact it is often better when there are multiple aspects of mathematics that an individual might focus on. A common strategy is to ask “What do you notice? What do you wonder?” and to allow time for children to think. When children begin to share what they have noticed, they experience a range of different ideas so can reflect upon or extend these, as well as offering their own. As well as talking, children can communicate through gesture and manipulating objects as well as through drawing and mark-making. This leads to mathematically rich interaction where ideas can bounce around, excitement can build and initial ideas can be significantly developed. Sometimes discussion can follow unanticipated directions and can lead to children following up the maths talk to take their thinking further.

Number talks are the most common type of maths talk that we have encountered but other areas of maths, such as shape, space, and pattern, can be the focus of a maths talk. Children (and adults) often bring their own mathematical thinking to a stimulus which may

include any aspect of mathematics so a number talk may include some aspects of shape, for example.

Resources

[Maths eyes](#) collections of mathematically rich images

[Which one doesn't belong?](#) and [Which one doesn't belong?](#) Collections of 4 objects where children decide which one doesn't belong and why

[Three act tasks](#) very short videos where children decide what they notice and what they wonder (the known and unknown) in the mathematical situation shown in the video clip

[Number talk images 1](#) and [Number talk images 2](#) include rich images to discuss number and the second website includes guidance for making your own custom number talk images

[How many?](#) Images to count, calculate and reason about number

[Number talk images to develop noticing skills](#)

Delving deeper

Our delving deeper guidance gives a little more detail and background to our understanding of mathematical talk.

Number talks

These are three examples of number talks in practice. Each is a one-page summary of an example of how children engaged in number talks in early childhood settings.

- Example of number talks in practice 1: Which one doesn't belong? With 4 to 5-year-olds
- Example of number talks in practice 2: Who can throw the highest number? With 4 to 5-year-olds
- Example of number talks in practice 3: Peas for snack with 3-year-olds

Example of number talks in practice 1:
Which one doesn't belong? With 4 to 5-year-olds



Image: wodb.ca/Andrew Gael

The children settled down for the weekly number talks session in their Reception class. They eagerly awaited today's image. Marie put today's image of five dice on the large screen and waited as the children's eyes darted around, observing their facial expressions and hand gestures. The children know to remain quiet to begin with to allow everyone a proper look and time to think about what they notice and how they would say this. When Marie decided everyone was ready, she asked children to share their thinking and asked other children if they agreed and could see what the other child saw:

Marie: Can anyone else show me a dice that does not belong and tell me why?

Jaiden: (pointing to the dice with a 5 numeral) This one has a number and the other ones have spots.

Marie: That is a really good reason. Well done! This dice shows a number using the numeral 5. All of the other dice use dot patterns to show their numbers. Is there another dice that doesn't belong and do you have a good reason why?

Mia: (pointing to the small dice) This is different because of size.

Marie: Can you describe why it is different because of its size?

Mia: It is only little.

Marie: And what about the other dice?

Mia: The other ones are bigger.

Example of number talks in practice 2:
Who can throw the highest number? With 4 to 5-year-olds



In the outdoor environment of the Reception class, there was a huge vertical number track on the wall from the ground to the roof, 1-20. One day, three children showed an interest in the number track and started to spontaneously throw beanbags, balls and quoits at it. They began by throwing them at any number, saying the numbers that they hit but soon got really excited about being able to hit the biggest number.

Jamal: "I'm going to get 15!"

Oliver: "I've got 12", "You got 13, you got one more than me!"

Carter: "Ohhh I only got 9".

They began predicting which number they would hit, adjusting their throwing technique to try to reach the larger numbers, which were higher up and nearer the roof. Some began trying overarm throws to see if that would help and adjusting their standing position to see which was most effective. The children remembered which numbers they had already hit and compared their number to their friends' or to their previous throw. The adult genently encouraged this, asking questions such as "Can anyone get 13?" and "Did you get more or less than your last go?"

Example of number talks in practice 3: Peas for snack with 3-year-olds



Image: ntimages.weebly.com

In Andrea's day nursery, she decided to put peas on the snack table and included a photograph on the table to help the children know how to get the peas out of the pods. Chanelle, Olivia and Casey went to get a snack.

Chanelle snapped open a pea pod, "Wow, I got 1, 2, 3, 4!" (touching and counting the peas)

Olivia: "I got 1, 2, 5, 7"

Andrea: "Ooooh let's check, count them with me, 1, 2, 3, 4. 4 peas, same as Chanelle"

Casey excitedly snapped open her pea pod "Oh, I've only got three" (showing three fingers when she said three), subitising the peas without needing to count them one-at-a-time.

Then she paused and looked at the other side of the pea pod, "Oh, Oh, there's two more on nuther bit". She help the pea pod up to show everyone her extra two peas that she had just discovered.

Andrea: "Let's look at this picture. How many are on here?"

Chanelle: "2 and 4, look!" (subitising the group of 2 peas and group of 4 peas)

Casey counted 1, 2, 3, 4, 5, 6. 6 peas!"