CENTRE FOR RESEARCH IN
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Learning-oriented talk: Professional learning resource 3

Maths and Science Talk

What is maths and science talk and why is it important?

Learning in maths and science is about making sense of the world and how it works. Young children use maths and science talk to describe and interpret what is happening in their environment. **Maths words** refer to quantity (e.g., *two* apples), shape (e.g., *it's a square*), measurement (e.g., *this one is bigger*), and space (e.g., *I'm under the table*). They often appear in **comparison talk**, where children explicitly compare one thing with another (e.g., *She has more than me*). **Science talk** includes technical terms that refer to the composition (parts) of things (e.g. 'roots', 'stem', 'leaves' of plants), general classes ('plants', 'animals', 'liquid'), and precise labels (e.g., *It's a T-Rex dinosaur*). Such terms are often combined in statements about how things in the world work (e.g. *Plants suck up water from their roots*). Science talk may also reflect scientific reasoning (e.g., *I wonder why that happened, Let's look closely and see what it does*). Talking about maths and science helps children to develop their understanding of abstract concepts (e.g. 'living vs. non-living things'), to make sense of their day-to-day experiences, and to build mathematical and scientific literacy.

When do children start to use Maths and Science Talk?

Children start to use maths talk quite early. Words like '*more*,' '*big*' and counting enter children's vocabulary before age 2. In Toddler TaLK, 75% of the children used maths talk at 2½ years, and all the children were observed to use maths talk by 3½. While maths words occur in a range of activities, including play (*I need three blocks*), routines (*You want more?*) and transitions (*You can go first*), science terms are more specialised. This is probably why only less than 40% of Toddler TaLK children used science words at age 2½ years. Use of science talk did increase steadily as the children got older. In Toddler TaLK, comparison talk was relatively rare, with only 40% of the children engaging in such talk by the time they reached 3½ years.
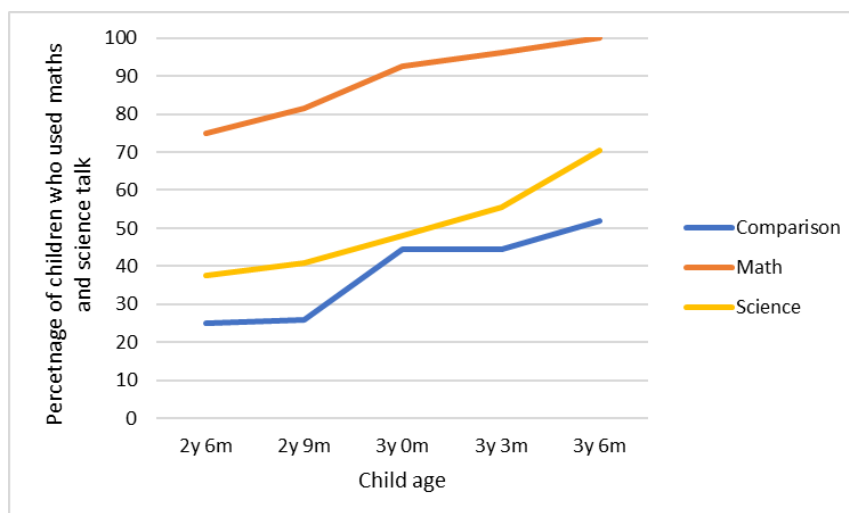

Figure 3:1. Development in Toddler TaLK children's use of maths & science talk from 2½ to 3½ years.

Children's use of maths and science talk in practice

Example 1	Interpretation
Aaron (2y 9m) is having some berries for lunch. Educator is sitting next to him. Aaron: Look, look, lots of blueberries. Educator: How many blueberries have you got, Aaron? Aaron: <u>One, two, three, four, five, six, seven.</u> (eats one) It's in my tummy. Educator: One is in your tummy already. And how many left? Six! How many pieces of strawberry? Aaron: <u>One, two, three, four.</u>	Aaron is using maths talk to count his blueberries. Aaron demonstrates that he is associating concrete objects with numbers. Aaron's use of maths talk is an example of children's "increasing understanding of measurement and number using vocabulary to describe size, length, volume, capacity and names of numbers" (EYLF, p. 58, Outcome 5).

Example 2	Interpretation
Alex (3y) is painting a picture. His educator is standing near the easel and takes a photo of Alex's picture. Alex: This is the apple. Educator: That's an apple. Looks like an apple. Alex: One apple. Educator: Delicious apple. Alex: This is a <u>Dilophosaurus</u>. He eats the apple. Educator: Wow. I think he is very big. He is eating that apple. A big mouth. Alex: He is a <u>T-Rex</u>. Educator: I know. I can see the T-Rex. He has very sharp teeth. Alex: He is so big. He walks on <u>lava.</u> We need more water and <u>lava</u>.	Alex is using technical terms, such as 'Dilophosaurus' and 'T-Rex', to label the species of dinosaur in his drawing, and 'lava' to describe part of the environment. These terms are associated with science disciplines such as palaeontology and geology. Such technical words reflect sophisticated educational knowledge that children build through experiences with non-fiction books, documentary films or visits to museums, zoos and galleries. This example illustrates Alex's capacity to "begin to sort, categorise, order and compare collections and events and attributes of objects and materials in their social and natural worlds" (EYLF, p. 62, Outcome 5).

Example 3	Interpretation
Owen (3y 3m), other toddlers and their educator are sitting on the floor in a circle with their legs stretched out. Educator: What do you think Owen, my feet are bigger or Emma's feet are bigger? Owen: Your ones are <u>bigger</u>. Educator: Yes, I think you are right. Well done. Can I try? Can you sit down and try? Let's size our shoes together. Let's see. Look, my shoes! Owen: My ones are <u>bigger</u>. My boots are <u>bigger</u>. Educator: Your boots are bigger! Are Emma's shoes bigger? Owen: Mine are <u>bigger</u>.	In this spontaneous conversation during play, Owen is using language to compare the size of objects. This shows his understanding of mathematical concepts (comparison of size and length). Owen's comparison is a more challenging task than younger Aaron's counting of objects in the example above. The example here also illustrates an educator's ability to encourage children to apply their mathematical thinking by drawing on "access to a wide range of everyday materials that they can use to create patterns and to sort, categorise, order and compare" (EYLF, p. 62, Outcome 5).

Educators can encourage children to use maths and science talk by:

- Helping children realise that maths and science are everywhere. Once they notice maths and science opportunities, educators can make use of everyday experiences to inject maths and science talk into the conversation.
- Including interesting maths and science experiences into the curriculum. Through the provision of relevant materials and books, educators can model and encourage children's use of maths and science talk.
- Creating a culture where maths and science exploration is encouraged rather than focusing on 'correct' answers. Use conversations to encourage children to express their ideas and current understandings, about objects or happenings. For example:

> Educator: (points out a millipede that is crawling in the sandpit) Look at this. I wonder what it is.
> Child: Um - a caterpillar
> Educator: It does look like a caterpillar. It's long and it crawls like a caterpillar. But look at all those legs. I am not sure that caterpillars have that many.
> Child: Maybe it grew lots of legs so it could go faster.
> Educator: Hmm maybe. We might need to find a book to look up what it is.

How does maths and science talk support learning in early childhood services?

Conversations that include maths and science talk allow children to "contribute to mathematical discussions and arguments" (EYLF, p. 53, Outcome 4: Children are confident and involved learners), to "demonstrate an increasing understanding of measurement and number using vocabulary to describe size, length, volume, capacity and names of numbers" and to "communicate thinking about quantities to describe attributes of objects and collections, and to explain mathematical ideas" (EYLF, p. 58, Outcome 5: Children are effective communicators). Educators can also create opportunities for children to engage in maths and science talk during shared book reading and play-based learning activities in which children "sort, categorise, order and compare collections and events and attributes of objects and materials" (EYLF, p. 62).

How does maths and science talk support learning when children start school?

In Early Stage 1, teachers aim to expand students' vocabulary beyond simple, everyday words (Tier 1), by explicitly teaching less frequently used, more precise words (Tier 2) and technical terms from key learning areas, including maths and science (Tier 3) (ENE-VOCAB-01). Knowledge of maths and science words also supports comprehension of many information, non-fiction texts (ENE-RECOM-01).

In Mathematics, children learn to count in whole numbers (MAO-WM-01) and use terms such as 'group', 'share', 'equal', 'pattern' and 'repeat' to demonstrate their ability to recognise and form patterns and groups (MAE-FG-01 and MAE-FG-02). They also learn to "reason about number relations" and "describe the action of combining, separating and comparing" (MAO-CSQ-01); describe position and give and follow directions (MAE-GM-01); describe lengths (MAE-GM-02); describe, name and compare two-dimensional shapes (MAE-2DS-01; MAE-2DS-02) and three-dimensional objects (MAE-3DS-01; MAE-3DS-02; MAE-NSM-01); and develop an understanding of language for talking about data and chance, by learning and using words such as 'information', 'group', 'collect', 'display' and 'objects' (MAE-DATA-01).