An overview of mathematics proficiency

The over-arching aim of the *Primary Mathematics Curriculum* is the development of mathematical proficiency. Mathematical proficiency encompasses conceptual understanding, procedural fluency, adaptive reasoning, strategic competence, and productive disposition (see Figure 1 below). Critically, all five aspects are interwoven and interdependent. As children develop proficiency in one aspect, there are developments in other aspects too. Mathematical proficiency becomes progressively more developed in children as their mathematical experiences become increasingly sophisticated and as they are exposed to good pedagogy. The curriculum supports teaching, learning and assessment that is congruent with this aim.

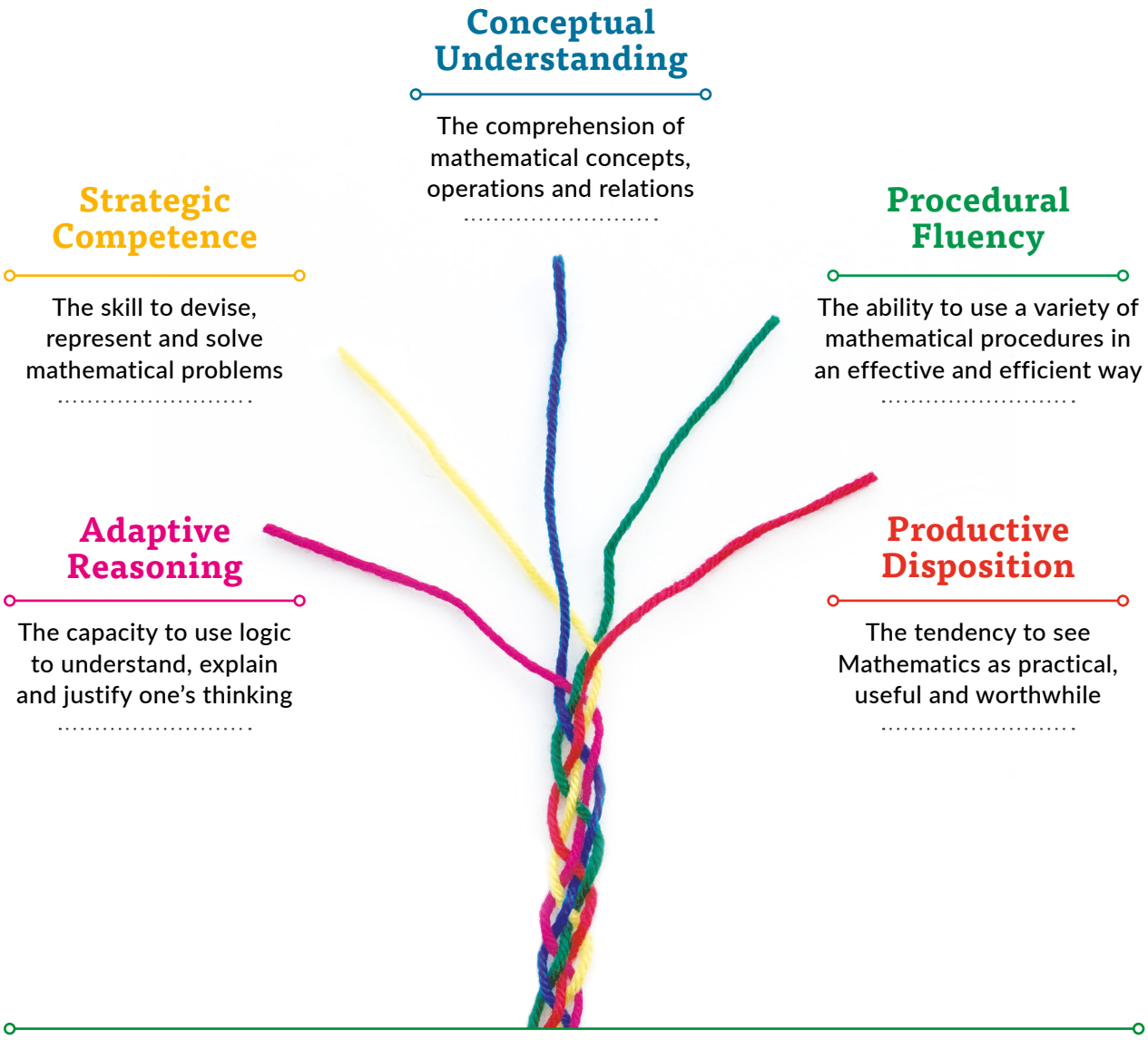

Figure 1: Five aspects of Mathematical Proficiency

Conceptual Understanding

The curriculum aims to help children to understand why mathematics ideas are important and the different ways they can use and apply these ideas. The curriculum aims to help children build on what they already know and to connect this with their new learning. This should make it easier for children to use their learning in different ways for different situations.

As well as supporting children to use mathematics in different ways, teachers should support children to represent how they understand mathematics in lots of different ways, such as using pictures or objects or by modelling, explaining and demonstrating it for their classmates. Having the opportunity to explore maths with others provides children with the opportunity to share and connect what they have learned, how they learned, and the different ways their learning can be useful.

Child

When I understand 'what' I am doing; 'how' I am doing it and; 'why' I am doing it, it makes my learning more real for me.

Parent

We can build our understanding by connecting different ideas and looking at what is similar or different about them and showing them in different ways.

Teacher

The more connections we can make, the more maths will make sense to us. When we describe our thinking and share our different ideas, it makes our learning stronger.

Productive Disposition

The curriculum aims to encourage children to be confident in their knowledge and ability. It supports them to see that with the appropriate experience and steady effort, mathematics is practical and can be understood.

With lots of opportunities to make sense of mathematics, to recognise the benefits of perseverance and to experience success in their learning, children should see that mathematics is really useful, engaging and motivating, and they should enjoy sharing their mathematical ideas with friends, family, teachers and others.

Teacher

With steady effort, everyone can be successful in maths.... And the effort really pays off!

Children

We use maths every day, we couldn't manage without it!

Engineer

Maths helps me design and build machines, engines and roads.

Chef

Maths helps me cook healthy meals.

Children

We are all mathematicians.

Parent

Maths tells me when school is over and it's time to pick you up.

Adaptive Reasoning

The curriculum aims to support children's capacity for logical thought, reflection, explanation, and justification. Through collaboration and a talk-friendly environment, teachers should enable children to reflect and navigate through the many concepts, solution methods, facts, and procedures they encounter so that they can see how mathematics fits together and makes sense.

Children should be encouraged to clarify and determine the legitimacy of their reasoning by discussing concepts and procedures; by representing problems, solutions and their understanding of mathematics in multiple ways; and by offering good reasons for the procedures and strategies they employ.

Child

... and to prove that what we worked out is right or wrong.

Children

We need to be able to show that we know what we are doing and why we are doing it in this way.

Child

... and to show the different ways that problems might be solved.

Teacher

That's why we need opportunities to organise and share our thoughts, and to see what others think so that we can refine and make our ideas even better.

Procedural Fluency

The curriculum aims to provide children with opportunities to create their own informal strategies and to integrate new concepts and maths procedures as they build on these strategies. It aims to support children to justify the use of commonly used mathematical procedures and informal strategies, and through this, to strengthen their understanding and skills.

Children should be encouraged to apply procedures accurately, efficiently and flexibly; to transfer procedures to different problems and contexts; to build or modify procedures from other procedures; and to recognise when one strategy or procedure is more appropriate to apply than another.

Parent

Different ways of doing maths might include recalling facts and definitions; devising clever plans to solve problems; choosing the best methods to help solve them; making good guesses and calculating answers.

Teacher

This will help us solve lots of different problems that we will meet in the real world.

Children

We need to know lots of different ways of doing maths; and how and when they can be most useful to us.

Strategic Competence

The curriculum aims to support children to become proficient problem solvers. Children should have the opportunity to formulate mathematical problems, represent them, and solve them in a variety of ways.

As well as needing a range of solution strategies, children should be facilitated in generating problem models where they first understand the problem or situation and its key features, and then framing or representing the problem mathematically.

Children should detect mathematical relationships and devise mental representations of problems by building mental images of the essential components of the problem (variables and relations) using a number of tools such as numbers, concrete materials, manipulatives, symbols, words or graphics.

Children should also be encouraged to demonstrate flexibility throughout the problem-solving process and broaden their knowledge through solving meaningful, real-life problems and through creating or adjusting appropriate methods to fit the requirements of unfamiliar situations.