

Maths is More

Maths is ...

Mentimeter



Menti created from participants' words about the nature of mathematics.

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Maths is More is a group of organisations and individuals sharing a view of the nature of mathematics as a creative and playful subject, and more than facts and procedures. We are a diverse group of experienced professionals involved in mathematics education as teachers, teacher educators, researchers, consultants and publishers who have been working together to build a shared view of mathematics education which is positive, empowering and based upon research evidence about effective teaching and learning.

We came together in the summer of 2021 as part of a community response to Ofsted's Review of Mathematics Education research (see ATM/MA 2021). Our concern was that a facts and procedures perception of mathematics, emerging from a narrow selection and interpretation of research, was becoming accepted and even perpetuated by influential organisations and individuals. Many colleagues were concerned about the way in which the work we had done in our own teaching, and in a wide range of research and development projects in mathematics education, was being portrayed. We wanted to voice our support for all teachers in emphasising a richer, evidence-informed approach both to mathematics and how it is taught and learned. To do this, we organised three online events exploring the nature of mathematics, what research tells us about how mathematics is learned, and how research can best support classroom practice. These three events were extremely well supported by over 3,000 attendees.

Here are the YouTube links to the three events:

Event 1: Maths is More: So what is maths?

<https://www.youtube.com/playlist?list=PLx4fiLCwHUZpyDwB4JaDfBl6Df8kpVWw>

The four speakers explored the nature of mathematics itself and how it is learned.

Event 2: Maths is More: So what does it look like in classrooms?

<https://www.youtube.com/playlist?list=PLx4fiLCwHUZqUDYqjyS62DgNlstQPX-GU>

This was split into primary/early years and secondary events. In both cases the speakers talked about examples from classroom practice that captured this rich view of mathematics..

Event 3: Maths is More: So what next?

<https://www.youtube.com/watch?v=MKSwnEIPBIs> This event took a broad view of research to demonstrate a range of ways in which research can be part of every classroom.

So what is maths?

The nature of mathematics

Our first event focused on the nature of mathematics as a subject, and presented evidence for the view that mathematics was a very long way from the impenetrable and exclusive subject that is often portrayed in the media. For example:

Math does make me think of a stainless steel wall – hard, cold, smooth, offering no handhold; all it does is glint back at me. I like the shine of it – it does look smart, intelligent in an icy way. But I resent its cold impenetrability, its supercilious glare. (Buerk, 1982; p. 19 quoted in Brown, 1996, pp. 1291–1292)

In contrast panellists across the three events presented rich and varied ideas of the nature of mathematics:

Maths is more than classroom and homework. Maths saves lives and time; maths brings progress and justice. Numbers, patterns, and probabilities are everywhere. Understanding maths empowers individuals' decision making, career choice and perseverance. Challenges in teaching and learning mathematics are multi-layered and require intricate solutions.

Flavia H. Santos
Assistant Professor and Ad
Astra Fellow at University
College Dublin

Alison Borthwick
Mathematics
education
consultant

For me ... maths is more than you think it is; it is so much more than numbers on a page or calculations we are asked to solve; maths is about thinking and reasoning and making decisions; it is not about getting the answer (whether this is right or wrong), but it is about how we approach the question; and just when you think you understand maths, you come across a problem that ambushes you, and we re-discover the amazing world of mathematics all over again.

I believe that mathematics is exciting and boring, challenging and easy, playful and useful, delightful and frustrating, in short, that as well as engaging our thinking, mathematics provokes emotional responses and that we need to acknowledge these, the negative as well as the positive, as neither is possible without the other.

Mike Askew

Professor of Education at Wits University,
Johannesburg, South Africa

My belief is that mathematics has thinking at its heart and therefore teaching mathematics is about developing mathematical thinkers. This starts from noticing, making connections with what you already understand and wondering, and involves grappling with ideas and representing them in different ways in order to make sense of them.

Ruth Trundley

Maths Adviser
Devon Education Services

Maths is more than just getting the right answer, it is also finding interesting questions of your own to ask and answer - what happens if I change this?

Livia Mitson

Mathematics Teacher,
Impington Village College

Maths is always more about building and enriching concepts than remembering facts and procedures.

Anne Watson

Professor Emerita Oxford
University

Mathematics is more than simply learning to associate each problem type with its appropriate method.

Paul Rowlandson

Lead teacher, Trinity Academy,
Halifax

Maths is more than applying formulae or learning procedures and mathematicians are more than lone white male geniuses that come along once a generation, and every pupil deserves to know this.

Lucy Rycroft Smith

researcher and designer at
Cambridge Mathematics

Maths is for more people - everyone is capable of thinking mathematically and entitled to interesting and varied opportunities to do so.

Tom Francome

Lecturer, Birmingham
University

Maths is about seeing the world in a mathematical way and combining skills, knowledge and understanding to make sense of it. Everyone has the capacity to do this given the right opportunities.

Camilla Gilmore

Professor of Mathematical
Cognition, Loughborough University

Working and learning together

As adults, sharing and learning from our classroom experiences can be a powerful way of finding what 'fits' us and our learners. It is helpful, nourishing even, to find people who share our passion for mathematics, and engage with them through social media, school and hub networks, teacher-facing communications and professional associations. Collaboration and dialogue can be powerful in developing and enjoying our practice as teachers, and in order to firmly root professional learning in the real and complex world of the classroom.

When working and learning together in the classroom, Tom Francome suggested that every pupil needs tasks where there's something mathematical to think about and where there's something worth talking about. Anne Watson pointed out that for any mathematical task for teachers and children, the first step is to know 'What is going on here?' and 'What does it mean?' before searching memory for something to adapt and expand and use. Articulating these questions, for learners, models approaches to problem solving that lifts it beyond the routine completion of a repetitive exercise. Question posing is a valuable way of pushing learning and understanding on. Livia Mitson proposed prompting students to ask questions and consider where to take it from here by saying things like: "What questions could you ask?" As teachers, if we are wonderers, thinkers and problem solvers then the children we teach will pick up these habits of mind from us; our classrooms will become a place of wonder and challenge.

Our own research

Camilla Gilmore focused on interactions that researchers and teachers can have to enhance learning in classrooms. When we pause, think and reflect on our teaching and our learners' responses, we are already researching our own classrooms. These thoughts and reflections can help us prioritise and evaluate what we might be told, and make us more able to make decisions that support us and the children we work with.

Research can be sought out to help us recognise persistent myths, understand problems we meet with teaching and learning and resist policies that appear without substantiating evidence. For example, Flavia Santos pointed out that there is significant research evidence to suggest that girls are just as capable of being good at achieving mathematically as boys, and yet the myth that they are not, persists. As Lucy Rycroft-Smith concluded, research can be a living, breathing source of power and emancipation, a way for teachers to connect with powerful ideas that support their professional knowledge and experience.

The weather in the classroom

Classrooms that are places of wondering, where learners and teachers make sense of mathematics and mathematical problems collaboratively, help to develop confident mathematicians. As teachers, we have control over the weather in the classroom. Even when external pressures from statutory testing regimes and accountability measures are beyond our control, we can provide the umbrella that protects the children, while helping them look for the rainbow. We hope that by drawing together a range of experienced voices from across the mathematics education world, we have encouraged a broader, research-informed view of what mathematics is and how it is learned and taught effectively. Rather than dramatically changing

what we do, we have focussed on empowerment: having faith in what we know about mathematics, trusting learners to learn.

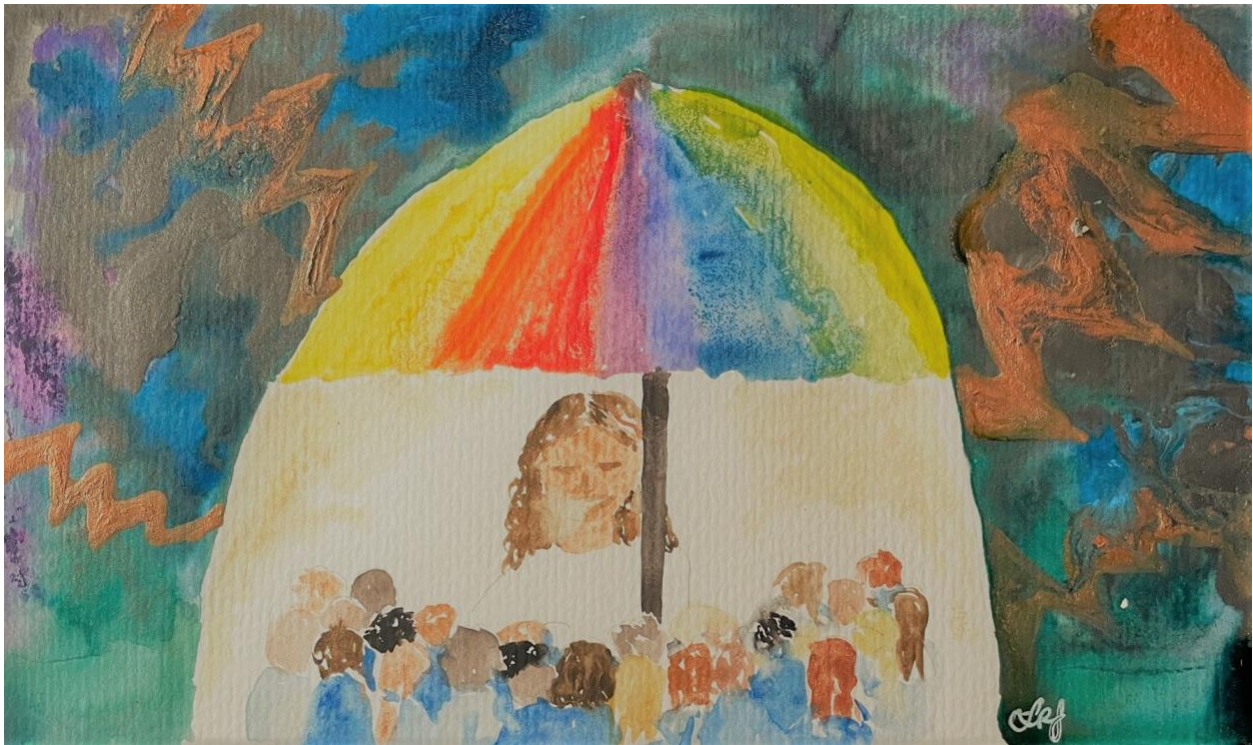


Illustration by Lucy Rycroft Smith

As Francis Su suggested, mathematics is essential for human flourishing. Even from the youngest age, we all think mathematically and can be fascinated by number and pattern, if it is relevant, accessible and we are offered the space to make sense of what we notice. Clare Christie emphasised noticing the children's need for experience of measuring in a practical context, and this led to both the children and teachers taking time to explore related ideas. Mike Askew emphasised the importance of taking account of the emotional aspects of learning and suggested we should think about our own emotional responses to learning mathematics - when did it feel good, when did it feel less than good? What might have made the difference? We all come to mathematics classrooms with a range of experiences from the whole of our lives, including our past schooling and this colours the way in which we teach and learn mathematics.

<https://www.youtube.com/playlist?list=PLx4filCwHUZpyDwB4JaDfBl6Df8kpVWon>

So what next?

Whilst our first event focused on the nature of mathematics as a rich and creative subject, the second examined some views of how that view looks in classrooms.

<https://www.youtube.com/playlist?list=PLx4filCwHUZqUDYqiyS62DgNlStQPX-GU>

In the third event we focussed on where we might take these ideas from here, discussed how research can inform our work, and collected together places and people who have similar values and interests to us, and which we think worth sharing.

<https://www.youtube.com/watch?v=MKSwnEIPBIs>

To find someone to collaborate with who shares your values and interests:

- Seek out the independent professional associations such as: The Mathematical Association <https://www.m-a.org.uk>; The Association of Teachers of Mathematics <https://www.atm.org.uk/Home>; and National Association of Mathematics Advisers <https://www.namamaths.org.uk>
- Follow the Maths Is More contributors' blogs or tweets. Search for #MathsIsMore or #MathsMore
- Seek out professional development opportunities such as your local Maths Hub <https://www.ncetm.org.uk/maths-hubs> to discover opportunities for you to develop your teaching and connect with other teachers in your area.
- Try to make time to play with mathematical ideas yourself to refresh your awareness of how it feels. Maths Jam might be a place to start <https://www.mathsjam.com> or the ATM Mathematical Snacks: <https://www.atm.org.uk/maths-teaching-resources/maths-snacks-videos>
- Talk to sympathetic colleagues about your learners' responses to mathematics tasks and try some ideas together. You might look on the NRICH website <https://nrich.maths.org> for tasks you might try.
- Explore accessible research, such as Cambridge Mathematics' Espressos: <https://www.cambridgemaths.org/espresso/>
- Read books about mathematics and classroom practice e.g. "I Can't Do Maths! Why children say it and how to make a difference." (Coles and Sinclair 2022) or Mathematics for Human Flourishing (Su 2020)

Finally, as Ruth Trundle suggested;

"Try something in your context that interests you, arising from what you have heard or read. Closely observe how your learners respond, the mathematical thinking provoked, capture your observations, and then reflect on them. If possible, share your reflections as part of a community which could be in your school, your locality, maths hub, maths association, through universities, through social media etc. – have a go, share and then decide what that means for you with your learners."

References

ATM and MA primary group (2021). *Responding to the 2021 Mathematics Ofsted Research Review: A practical guide for the classroom practitioner.*

<https://www.m-a.org.uk/resources/ATMMAFINALResponsetoOfstedResearchReview.pdf>

Brown, S. (1996). Towards humanistic mathematics education. In A. Bishop (Ed.), *First International Handbook in Mathematics Education* (pp. 1289–1331). Dordrecht: Kluwer Academic Publishers.

Coles, A. and Sinclair, N. (2022). *"I Can't Do Maths!" Why children say it and how to make a difference.* London: Bloomsbury

Su, F. with Jackson, C. (2020). *Mathematics for Human Flourishing.* New Haven: Yale University Press.

Acknowledgements

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