

## Mathematical Futures Programme Response

### 1. Do you support our vision for the future of mathematics and data education?

We broadly support the vision, and believe that the teaching of maths should be updated to stress the variety of applications it is used in, as well as noting modern study methods of students. Given the high-level nature of the proposal, there is little to disagree with. We would welcome the chance to comment again once a higher level of detail can be provided.

Our impression is that this change combines several disciplines rather than adds new content to the curriculum. We acknowledge the need for mathematics to change and remain in line with society, however, we are wary of diluting the curriculum or the fundamentals of maths by veering into too many other disciplinary areas or concentrating on any particular detail such as statistics or analysis.

In particular, we support mathematics and data education across the curriculum, and agree that this development should extend to Key Stages 3 and 4. However, this gives rise to questions around the linking of mathematics and coding/programming skills. In theory, we welcome the inclusion of coding and programming, but would like to see more information about how coding will be taught in the maths classroom, especially to students who don't take computer science. We feel that if attempting to keep the curriculum aligned with the 'in vogue' coding language at any given time might be a difficult task, but believe that the principles of coding are a good foundation for students to have.

We also agree that GQL (General Quantitative Literacy) is vital to the UK's mathematical future. We welcome all students being taught rigorous critical thinking skills, ideally including the need for a range of evidence/sources in evaluating or analysing a claim, and how to evaluate those sources and the plausibility of data. As the world appears to be more prone to conspiratorial thinking, inoculating students with robust critical thinking skills will become increasingly important. Teaching ways of thinking is perhaps more important than the skills taught at the same time.

The foundational and advanced mathematics are of the curriculum proposed is also positive. In our view, the COVID-19 pandemic illustrated that many people in society, including elected decision makers, are not as comfortable interpreting and making use of mathematical fundamentals, such as statistics (including means and weighted averages), percentages, ratios and exponentials.

In terms of the domain specific competencies, we would like to see decision/discrete maths being introduced back into the curriculum in areas other than in the Further Maths A Level, as the concepts included here, such as algorithms and mathematical problem solving, underpin careers in Operational Research and many other numerate careers.

### 2. Is this vision appropriate for all students?

We agree that multiple pathways for mathematics and data education is essential for providing all students the information they need to be mathematically literate citizens. We hope this provides an opportunity to revisit Core Maths. It is our view that this holds much potential as a foundational subject for mathematical literacy for all students, and is currently underused. Several roadblocks to more students taking Core Maths could be:

- The lower weighting of UCAS points will mean it remains less appealing than A Level maths for students aspiring to university
- In turn this could lead to a perception of it being a “second class” qualification, or less intellectually rigorous than its A Level equivalent.
- Employers and universities do not ask for a Core Maths qualification, which provides no incentive for students to take this over an A Level.

We speculate that making Core Maths compulsory would remove the stigma for students opting to study Core Maths over A Level. Further, could a version of Core Maths be offered alongside GCSE maths, further increasing the pathways into and accessibility of mathematical literacy? Alternatively, could a module following the aims/content of Core Maths be added to the GCSE curriculum?

Additional information on how the proposed changes will impact primary school students would be required for us to comment on whether the vision is appropriate for primary school learners. We note that GQL in particular should begin in primary school, as the rise of (mis)information being shared online means critical thinking should be taught at an early age.

### **3. Are there areas of our vision that need further development?**

We would welcome continued careful thought around digital technologies. In particular, we would agree that AI could be very beneficial for personalised learning. However, it is our view that large language models should be used with caution, and with robust safeguards built into the system.

We would also value continued exploration of the challenges around Core Maths, perhaps incorporating a wider number of universities (both Education and Maths faculties) and employers as stakeholders in the conversation.

An area we would like to see expanded on is what the implication of the overall mathematical futures programme, and specifically the use of AI in classrooms will be for schools and teachers? In particular, will it change overall workforce numbers or change the role of the teacher? How will they impact the recruitment of additional maths teachers if needed? We feel that continuing engagement with schools and teaching associations will be invaluable here.

We also note that while work that develops skills solely in the realm of mathematics is important, so too is work that teaches students how to move from the real world into the world of mathematical abstractions. Using mathematics to represent part of the world is not easy and we feel most students at school do not get enough exposure to it. Operational Research applications are one place where students move between the ‘maths world’ and the ‘real world’. Another source of exposure is in the A Level Mechanics modules, where solving the subsequent formulae/equations is easy compared with that extraordinary, abstracting step. We would be encouraged to see this transition step being kept ‘on the radar’ as new curriculums/competencies for students are developed.

### **4. What are the first steps needed to begin the process of change?**

We feel further consideration of the areas we identify in our response to question 3 would be strong first steps. In addition, addressing the maths teacher shortage alongside any curriculum changes may be essential to the success of this programme, although we note

this is a separate issue. Perhaps not a starting point, but the sustained programme for teacher' professional learning and new approach to teacher education should not be overlooked in the change process.

We note that there is a Maths Summit on 12 March 2024 and believe that continued involvement in this summit for the Royal Society/Mathematical Futures programme could be a good way to build cross-party support for curriculum reform, as many decision makers will be in attendance.