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LIFE BEYOND GCSE MATHEMATICS

CLAIRE BALDWIN AND PAUL GLAISTER ON WHY MORE MATHS AND WHAT'S ON OFFER?

Mathematical, quantitative, analytical and problem-solving skills are in great demand in the workplace and are essential for a wide range of careers. It is therefore important that career development practitioners are fully aware of the options for Level 3 mathematics qualifications offered in schools and colleges in England.

So, what are the options?
In England these include AS and A level mathematics, AS and A level further mathematics and Core Maths. All build upon GCSE mathematics.

Students who do not achieve a grade 4 or above in GCSE mathematics are required, as a condition of post-16 funding to either resit their GCSE or study towards a Level 2 functional skills qualification.

Students who are on track to achieve GCSE mathematics at grade 4 or above should not be thinking "*should* I study maths post-16?"; instead, they should be encouraged to think "*which* maths should I study post-16?". Staff in school should ensure that they are aware of the full range of Level 3 maths qualifications, and their benefits for students.

Core Maths is a relatively new qualification which is designed to prepare students for the varied contexts they are likely to encounter in both vocational and academic study, and in future employment and life, for example, financial modelling and analysis of data trends (Glaister & Hughes, 2016). Core Maths has a strong emphasis on contextualised problem-solving in real-life scenarios.

Core Maths is ideal for students who plan to progress to a career or future study in fields such as geography, social sciences or business, and many more besides. The *UK Industrial Strategy* (BEIS, 2017) and Smith review of post-16 mathematics (DfE, 2017) both highlight that Core Maths has been 'publically endorsed by a large number of universities, including many in the Russell Group' (Glaister, 2020) (STEM Learning, 2020).

Whilst students are introduced to some new topics, much of the focus builds on GCSE mathematics by deepening competence in selecting and applying mathematical methods and techniques, developing confidence in representing and analysing authentic situations mathematically, and building skills in mathematical thinking, reasoning and communication.

Twitter is an excellent way of keeping up-to-date with resources, links, discussion, and exchange of ideas within the Core Maths community (#CoreMaths).

A level mathematics has been the most popular A level choice for several years, with over 90,000 UK entries in summer 2019. Two-thirds of the subject content is pure maths, starting with familiar algebraic and graphical topics from higher tier GCSE and progressing to new topics, including calculus. The other one-third of the content is split between:

- statistics – probability, modelling, analysing and testing data to make inferences
- mechanics – calculations and graphs relating to the movement of objects.

AS mathematics content is a subset of that for A level. Whilst AS numbers are falling, studying AS mathematics over one or two years is a great way for students to maintain and develop their previous mathematical knowledge and skills. While many university courses prefer A level, some may accept AS as an alternative.

AS and A levels in mathematics support students' mathematical needs across a broad range of other subjects at this level and provide a basis for subsequent quantitative work in a wide range of higher education courses and careers, with a strong emphasis on proof, modelling, mathematical and statistical problem solving, but particularly on the use of real, large data sets, which is intended to permeate the teaching, learning and assessment of statistics.

AS or A level mathematics would normally be the recommended choice for students progressing to degree courses in engineering, chemistry, computer science, physics and other STEM subjects that require, or benefit from, good algebraic skills. A grade 5 or higher at GCSE may be needed for accessing the course – students should research carefully the entry requirements for their local schools and colleges.

AS and A level further mathematics are taken alongside A level mathematics. They allow for greater depth and breadth of mathematical study. AS/A level further mathematics would normally be recommended to students planning to take a degree in maths, physics or a related subject such as engineering. Students should be made aware that some university courses *require* a further mathematics qualification. A grade 6 or higher is likely to be needed for accessing this course – again students should research the entry requirements locally.

Funding
The Advanced Maths Premium (AMP) (DfE, 2019a) provides for funding to schools and colleges to support increased numbers studying Level 3 maths. In addition, the High Value Courses Premium (HVCP) (DfE, 2019b)

supports engagement in STEM subjects as part of the drive to develop a more productive economy, as outlined in the UK Industrial Strategy (BEIS, 2017).

Aspiration

In order for students to reach their potential it is crucial not only that they have ambitious aspirations but also that they understand what will support them to achieve those aspirations. They should understand why maths is important for them and how studying maths post-16 can help them to achieve their goals.

Currently, female students make up around 45% of the Core Maths cohort and make up 40% and 30% of the A level mathematics and further mathematics cohorts respectively. A level mathematics and further mathematics participation rates vary significantly by region with the highest level of participation in London and generally lower rates in the north of England. Increasing participation in post-16 maths education from female students and from students in disadvantaged areas would extend opportunities, help to address social inequality and the STEM skills gap, and increase diversity in the STEM workforce.

Research evidence (FMSP, 2016) indicates that engagement with parents/carers, clear and accurate careers and transition advice, and the role of the teacher in providing individual encouragement to students are all vital in raising the aspirations of both boys and girls. Embedding a school-wide culture of teachers in all subject areas promoting mathematics throughout key stages 3 and 4 and linking to real-life contexts is also key.

Fortunately there is not a shortage of opportunities to bring real-life contexts into the classroom - we live in a world where so much relies on mathematics, much of which can be explained at a level appropriate for students, even if only when used for motivational purposes for current studies, or to open students' eyes to future career options and the importance and relevance of the mathematics they are studying. Many sources and resources exist for this purpose as news items on topics where mathematics is key appear on a daily basis in the media. Many motivational hooks for post-16 mathematics lessons can be found for this (Glaister, 2019), many of which rely on students being confident and competent in using and applying GCSE mathematics which is precisely what Core Maths is all about!

Information and support

The Advanced Maths Support Programme (AMSP) is a government-funded initiative, led by the mathematics education charity, MEI. This national programme provides support for teachers and students in state-funded schools and colleges across England, with additional support offered in areas of low social mobility. The intention is that, whatever their gender, background or location, all young people can choose the best post-16 maths pathway for them. Students can read more about what qualification is right for them on the AMSP website (AMSP, 2020a) and career guidance professionals can see how engaging with them helps schools achieve the Gatsby Benchmarks (AMSP, 2020b).

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