

Breaking down the barriers to offering Level 3 Core Maths: Findings from interviews with large A level providers

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Almost 12,000 students in over 600 schools/colleges now study Level 3 Core Maths. The uptake has grown steadily since its inception in 2016, but there continues to be barriers for some institutions to offering the post-16 qualification. As part of the work of the Advanced Mathematics Support Programme, a small-scale study was conducted into ‘large A level providers’ who didn’t offer Core Maths. 66 large A level providers were in scope of the study, and this paper reports on feedback received from 20 interviews and 10 survey responses. Findings show that a major barrier within this type of institution is that many students are already taking alternate level 3 mathematics qualifications, i.e. A level Mathematics. Other hurdles are connected to this, such as timetabling and teacher shortages. Two additional concerns centered on the funding associated with the qualifications, as well as a lack of university recognition for Core Maths.

Keywords: Core Maths; post 16; curriculum; barriers.

Background to Core Maths qualifications

In their publication ‘Post-16 Mathematics: A strategy for improving provision and participation’, the Advisory Committee on Mathematics Education (ACME) indicated that around 250,000 young people who obtain at least a GCSE grade C in Mathematics in England do not choose to study the subject at AS/A level (2012, p.1). It recommended that new level 3 (post 16) Core Maths qualifications be developed and aimed at this group of students. For clarity it should be noted that GCSE Mathematics, the qualification students aged 15/16 study in England, was revised for first examination in 2017. A grade C in GCSE Mathematics from 2012 is equivalent to a grade 4 in the revised GCSE Mathematics. Similarly, over this time period AS/A levels (the main qualifications taken by students in England post 16) were revised, with first teaching for Mathematics being in 2017. Technical guidance from the Department for Education sets out the purpose for the qualifications (2018a, p.4):

Core Maths qualifications should consolidate and build on students’ mathematical understanding and develop further mathematical understanding and skills in the application of maths to authentic problems, thereby offering progression from GCSE mathematics. Qualifications should provide a sound basis for the mathematical demands that students will face at university and within employment across a broad range of academic, professional and technical fields.

Level 3 Core Maths qualifications have the same guided learning hours (160) and UCAS tariff points (grade A is 20 points, B-16, C-12, D-10, E-6) as an AS level and may be studied over one or two years. They can be taken alongside A levels or other level 3 qualifications. Full details of a current specification is available from the Assessment and Qualifications Alliance (AQA, 2020).

Uptake of Level 3 Core Maths

An external review into post-16 mathematics, undertaken by Professor Sir Adrian Smith in 2016, declared in its final report that all schools/colleges should be able to offer Core Maths (2017, p.7):

Recommendation 1: The Department for Education should seek to ensure that schools and colleges are able to offer all students on academic routes and potentially students on other level 3 programmes access to a core maths qualification.

Level 3 Core Maths was first examined in 2016. Around 150 ‘early adopter’ schools/colleges resulted in 3000 entries that year. Both the number of schools/colleges offering Core Maths, and the number of students studying it, have since increased steadily – in 2020 there were approximately 12,000 students in over 600 schools/colleges (MEI, 2020, p.1). The proportion of students studying Core Maths who are female has increased from 33.9% in 2016 to 46.8% in 2020 (MEI, 2020, p.1). However, although the number of students and schools/colleges offering Core Maths has increased since its launch, it is still far short from the original expectation for the number of students the qualification should be of value to.

Study of ‘large A level providers’ who don’t offer level 3 Core Maths

The government funded Advanced Mathematics Support Programme (AMSP), managed by the charity Mathematics in Education and Industry (MEI) has an aim to ‘increase participation in Core Maths’. The AMSP offers extensive support for Core Maths, e.g., Lee and Dawson (2020), Lee et al. (2020). To potentially increase the availability and numbers studying Core Maths the AMSP identified a small project to focus on ‘large providers’ who didn’t offer Core Maths. The AMSP could establish what barriers there were and what might be needed to overcome them.

The explicit criteria for inclusion in this ‘large providers’ study was that an institution had no Core Maths enrolments in 2019/20, but had at least 200 A level Mathematics enrolments. This figure was somewhat arbitrary but was chosen so that a manageable number of institutions would be included in order that an insightful review could be produced – the AMSP has a finite amount of resource (staff/time/funds), but these criteria produced a list of 66 institutions which was practicable. For the study there was a three-stage process:

- Stage 1 – Soft intelligence (on the 66 schools/colleges)
- Stage 2 – Interviews (20 responded to participate in an online discussion)
- Stage 3 – Questionnaire (10 responded to an online survey)

The AMSP has a structure of local Area Coordinators, managed by a team of Regional Leads, with a national team providing strategy and specific support, e.g. admin. This meant that in addition to the ‘hard data’ used as the main selection criteria, there was other information available from within the AMSP, including previous interactions with the programme. Where a pre-existing relationship was identified (in nearly 50% of the 66 schools/colleges), contact was made through an introduction by the Area Coordinator, rather than from an ‘unknown’ person undertaking this work within the wider AMSP. The AMSP also maintains a list of those in schools/colleges who have given permission for direct contact. This prior relationship, and permission to contact schools/colleges was a key reason that enabled for a successful recruitment to the interviews and survey.

Of the 66 institutions in scope, and who were invited to take part in an interview, 20 institutions went ahead (stage 2). For those where this was not possible, or who

didn't respond to the invitation, they were asked if they would be willing to complete an equivalent online survey. A further 10 institutions completed this survey (stage 3). As this work took place during the COVID-19 pandemic the interviews were conducted online, rather than in person. The discussions lasted up to 45 minutes and were recorded to enable accurate writing-up of the conversation, before the recording was then destroyed.

General information on those who participated and had they considered offering Core Maths

A total of 30 schools/colleges participated in the study. Meetings were held with 20 of these and a further 10 completed the questionnaire. After multiple attempts to make contact, there was no response from 36 schools/colleges. This was considered to be a successful recruitment for the study.

The 66 institutions were selected solely on the 200+ A level Mathematics but no Core Maths enrolment criteria and in no relation to where they were located, or type of institution – other aspects of the AMSP's support used such metrics to engage schools/colleges more widely. However, these factors were considered for the responses, in respect to the sample itself. Accordingly, both the location and type were similar in nature within the 30 as from the original 66. There were 10 schools/colleges from the London and South East region, 9 from the South and 6 from the East of England, with 10 Academy converters, 9 Further Education providers and 4 Voluntary Aided Schools being the highest number of responses in each category.

One of the main background questions that was asked, sought to establish if Core Maths had been considered in the school/college. There were 12 institutions who reported that they had considered offering Core Maths, but 13 indicated that they hadn't considered it. This underlines one of the main objectives of the study, which was to instigate a discussion around the subject of Core Maths. So, even if there was no immediate uptake, a conversation with senior leaders would raise awareness of the qualification and make them aware that support was available for Core Maths from the AMSP.

Barriers to offering Core Maths

Figure 1 shows the main barriers to offering level 3 Core Maths and the percentage who reported it from the 30 schools/colleges who participated in the study.

| Rank | Barrier | % (of 30 responses) |
|-------------|-----------------------------|--------------------------------|
| 1 | Large A level Maths cohorts | 50% |
| =2 | Student recruitment | 43% |
| =2 | Teacher shortage | 43% |
| 4 | Timetabling | 40% |
| 5 | Funding | 27% |
| 6 | University recognition | 23% |

Figure 1: main barriers to offering level 3 Core Maths in 'large A level providers'

Although participants in the study could indicate more than one, exactly 50% of schools/colleges identified their large A level Mathematics cohort as a barrier to offering Core Maths. In some cases, it was suggested that there were too few non-AS/A

level Mathematics students to warrant an additional course being offered, e.g. one participant said: “Many of our sixth form students take four A levels, with 85% taking A Level Mathematics and 20% also taking A Level Further Mathematics.”. This may be a result of the specific sample in the study, but a key point is that Core Maths is intended for level 3 students who are not choosing AS/A level Mathematics, and these students should have the opportunity to study Core Maths regardless of how many it might be, i.e. a small cohort studying Core Maths will bring about benefit to that group of students.

Student recruitment was the equal second most common barrier identified. However, it was not always clear from responses whether this was based on their experience of trying to recruit students to study Core Maths, or whether/how they had promoted Core Maths to potential students, e.g. one participant said: “Having offered Core Maths two years ago and despite having a small number of students expressing an interest, no one ended up opting for it.”. Various reasons were given as to why the course wasn’t attractive to students, but the main one was lack of recognition – students typically want to focus on their next stage, such as getting to university, and without the recognition of Core Maths by universities on a par with qualifications like the Extended Project Qualification (EPQ), it seems unlikely it will gain the desired traction. In some of the schools/colleges teachers themselves did not appreciate the value of Core Maths and were less likely to be able to promote it effectively or to steer students towards it, e.g. one participant said: “It’s difficult to work out the value of the course and the selling point for us.”

The shortage of mathematics teachers as a barrier was often mentioned alongside timetabling, showing their interdependence. This issue is illustrated with comments such as: “It is hard to see how we could offer Core Maths without recruiting more staff. Timetabling would be tricky, as would rooming.” and “Teaching staff do not have capacity and timetable does not have enough slack to introduce Core Maths.”. This barrier is reflective of the wider landscape of mathematics teacher recruitment. Some schools/colleges struggle to recruit specialist mathematics teachers, and this can restrict provision. However, there is scope for mathematics departments to work in cooperation with other subject departments to offer Core Maths. Timetabling barriers could certainly be overcome. Until quite recently (2016/17) it was the norm for schools/colleges to offer four AS level subjects in year 12, with students dropping one subject at the end of year 12 and going on to complete A levels in the remaining three subjects in year 13. This meant many students did three A levels and one AS level over years 12 and 13. Core Maths is the same size as an AS level, so offering students three A levels plus Core Maths would take up the same timetable space.

Another barrier cited by more than a quarter of participants in the study was funding. Post 16 funding is quite complex, but additional incentives have been initiated by the government in recent years, though some of these were on a temporary basis. Incentives include: the Advanced Maths Premium (AMP), the Large Programme Uplift, and the High Value Course Premium. The AMP is the primary one designed to encourage greater participation in advanced maths qualifications, including Core Maths, AS/A level Mathematics/Further Mathematics (DfE, 2018b). Several participants commented that the AMP offered little incentive as the mathematics department did not directly benefit from the funding. Some were surprised at the funding their institution had received as they (head of department) had not been informed about it. The baseline used for the AMP was noted on several occasions as being an issue for their school/college, in some case due to a legacy ‘Use of Maths’ qualification that no longer exists being included in the baseline.

A further barrier cited by around a quarter of participants was university recognition for Core Maths. Some participants cited that Core Maths was seen as a lesser qualification, being not of high value and not widely recognised by universities, which can have a detrimental effect on recruiting students. There are a small number of universities that actively state alternative entry requirements for those with Core Maths. For example, at time of writing, University of Bath states on their alternative offers webpage: “in Degrees where A level Mathematics is not required - if Mathematics is not an essential subject for your degree, you can be eligible for an alternative offer based on grade B in any Core Maths qualification”. Thus, they are signalling the value of such qualifications by giving an alternate, revised offer.

Enablers to offering Core Maths

When asked for suggestions of ways in which the DfE or the AMSP could support schools/colleges in offering Core Maths, participants cited (in order of frequency):

- Specific funding for schools/colleges to support the delivery of Core Maths as an additional qualification for full time students, independent of previous uptake.
- Greater university recognition for Core Maths, on a par with the EPQ.
- Promoting Core Maths by raising awareness amongst teachers of other subjects and career advisors.
- Make Core Maths part of a mandatory portfolio of courses to sit alongside options like EPQ (for comparison: in 2019 EPQs were studied by 39,000 students compared to 9,000 students who studied Core Maths).

Observations and concluding remarks

The barriers observed for large A level providers to offer Core Maths in this study show that many are ‘system wide’ issues, including teacher shortages, timetabling and post 16 funding. Alongside these there are subject specific issues like student recruitment (understanding the value of the qualification) and university recognition for Core Maths. The findings suggest that further work is required to raise the profile of Core Maths with students, teachers, and universities, so that it is at least recognised on a par with EPQ. The disparity in UCAS points between an EPQ and Core Maths is not helpful. Whilst it is noted that a small number of universities had introduced reduced offers for students with Core Maths, the Royal Society is clear that Core Maths should be more widely acknowledged by universities (2020, p.4):

University departments whose undergraduate degree courses do not require level 3 mathematics qualifications should promote the value of Core Maths as a complement to a student’s level 3 choices.

For a number of the schools/colleges in this study the AMP has not incentivised the provision of Core Maths. Specific funding for Core Maths, not linked to a baseline, would make provision more attractive and financially viable for schools/colleges.

Concluding remarks

Promotion of Core Maths and suitable recognition by higher education, as well as the funding available for the qualifications are three of the main barriers to overcome to further support a growth in the numbers studying Core Maths. This study provides additional evidence, and builds upon the work of Homer et al., (2020, p.3) who found

that “Core Maths courses are valued by teachers and students who have experienced them”, but that funding and recognition are key issues to overcome:

New qualifications take time to gain recognition and currency. Government-funded efforts to support Core Maths uptake, including the Advanced Mathematics Premium, must be intensified, and should include consideration of direct funding. Ongoing work to encourage more higher education institutions to signal the value of Core Maths as part of entry to their programmes should also continue.

Core Maths numbers have been increasing steadily since the qualification was introduced. However, to reach anywhere near the stated potential cohort size of over 200,000 students who would benefit from studying Core Maths in their post 16 education, there are system wide barriers, which need to be overcome.

References

- Advisory Committee on Mathematics Education. (2012). *Post-16 Mathematics: A strategy for improving provision and participation*. ACME.
- AQA. (2020). *Level 3 Mathematical Studies*.
<https://filestore.aqa.org.uk/resources/mathematics/specifications/AQA-1350-SP-2014.PDF>
- Department for Education. (2018a). *Core maths qualifications: technical guidance*. (Cm. DFE-00240-2018). Her Majesty's Stationery Office.
- Department for Education. (2018b). *16 to 19 funding: advanced maths premium*.
<https://www.gov.uk/guidance/16-to-19-funding-advanced-maths-premium>
- Homer, M., Mathieson, R., Tasara, I. & Banner, I. (2020). *The early take-up of Core Maths: successes and challenges*. Nuffield Foundation.
- Lee, S. & Dawson, T. (2020). Enhancing teacher pedagogy of a post-16 maths qualification via an online ‘Core Maths’ platform. *Impact, Journal of the Chartered College of Teaching*, Issue 10 (Autumn 2020).
<https://impact.chartered.college/article/enhancing-teacher-pedagogy-post-16-maths-qualification-online-core-platform/>
- Lee, S., Rainbow, T., Van Saarloos, C., Landon, R. & Stripp, C. (2020). Teacher engagement with online professional development – A case study of a ‘Core Maths Festival’. *Proceedings of the British Society for Research into Learning Mathematics*, 40(3), 1-6. <https://bsrlm.org.uk/wp-content/uploads/2021/02/BSRLM-CP-40-3-06.pdf>
- MEI. (2020). *Summary of core maths entries and results*.
<https://mei.org.uk/files/pdf/Summary-of-Core-Maths-entries-and-results-2020.pdf>
- Royal Society. (2020). *Signalling the value of studying mathematics post-16: time for a concerted and sustained boost*. <https://royalsociety.org/-/media/policy/topics/education-skills/Maths/Commentary.pdf>
- Smith, A. (2017). *Report of Professor Sir Adrian Smith’s review of post-16 mathematics*. Her Majesty’s Stationary Office.