Breaking down the barriers to offering Level 3 Core Maths: Findings from interviews with Further Education Colleges

Stephen Lee[1], Iram Hussain[2], Jo Deko[2]

[1]*Mathematics in Education and Industry,* [2]*Tribal Education Ltd*

More than 12,000 students in over 650 state schools/colleges now study Level 3 Core Maths. Entries have grown steadily from 2930 in the first year (2016), but there remain barriers for some institutions to offering it. As part of the work of the Advanced Mathematics Support Programme, a study was conducted into all (100) Further Education (FE) Colleges that didn't have A level Mathematics entries to consider their Core Maths provision. Phase one of the work involved the 15 FE Colleges who did have Core Maths entries and phase two involved the 85 FE Colleges who didn't. This paper reports on feedback from interviews with 18 institutions and 4 survey responses. Findings from phase one were used in the discussions with FE Colleges in phase two. Timetabling, student recruitment and retention, along with a lack of teacher expertise, familiarity and awareness of Core Maths were the main barriers identified.

Keywords: core maths; post 16; further education colleges; barriers

Background on Level 3 Core Maths qualifications

In 2012 the Advisory Committee on Mathematics Education (ACME) published a report entitled 'Post-16 Mathematics: A strategy for improving provision and participation'. This noted around a quarter of a million young people in England who obtain at least a GCSE grade C in Mathematics choose not to study the subject at AS/A level (ACME, 2012, p.1). It recommended that a new mathematical qualification, based on problem solving in realistic contexts, should be developed to meet the needs of these young people. This recommendation was fulfilled when Level 3 (post 16) Core Maths qualifications were accredited for first examination in summer 2016. The Department for Education sets out the purpose of these qualifications in its technical guidance (2018, p.4):

> Core Maths courses should prepare students for the varied contexts they are likely to encounter in vocational and academic study and in future employment and life, for example, financial modelling and analysis of data trends…Core Maths is likely to be particularly valuable for students progressing to higher education courses with a distinct mathematical or statistical element such as psychology, geography, business and management…

Information on content, structure and assessment can be seen in Awarding Organisation's specification documents, such as that from the Assessment and Qualifications Alliance (AQA, 2020).

Level 3 Core Maths availability and uptake

A review into post-16 mathematics conducted by Professor Sir Adrian Smith (2017, p.44) had as 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." with recommendation 2 stating that "The Department for Education and Ofqual should consider how the core maths brand could be strengthened with the aim of improving awareness and take-up of the qualification.".

Core Maths qualifications were first examined in 2016, with 2930 entries from approximately 150 schools/colleges, see Table I from MEI (2021, p.1). Table I also shows that the number of entries has increased year-on-year to 12,116 in 2021. However, even though student numbers have quadrupled since 2016, it is still far short of the potential number of students these qualifications would be of value to.

	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Entries	2930	5376	6849	9027	11792	12116
% female	*33.9*	*41.2*	*42.9*	*45.2*	*46.8*	*47.0*
% male	*66.1*	*58.8*	*57.1*	*54.8*	*53.2*	*53.0*

Table I – Core Maths entries 2016 to 2021, including breakdown by gender – data collated from Awarding Organisations by MEI.

Table I also shows that the proportion of entries from female students has increased considerably, from 33.9% in 2016 to 47.0% in 2021. This gender balance compares favourably with A level Mathematics (approximately 40% of entries each year from female students), and A level Further Mathematics (approximately 30% of entries each year from female students).

Outline of new research into Core Maths involving FE Colleges

The Advanced Mathematics Support Programme (AMSP) has been funded by the Department for Education since 2018. It is managed by the charity Mathematics in Education and Industry (MEI) and one of its aims is to increase participation in Core Maths. Extensive support is offered for Core Maths by the AMSP, e.g., Lee et al. (2020), Lee and Dawson (2020).

In 2021 the AMSP undertook a small piece of research focussing on the provision of Core Maths in FE colleges that didn't have A level Mathematics entries. The project aimed to identify barriers experienced in offering Core Maths and identify how they might be overcome. This work built upon research undertaken in the three-year Nuffield funded 'Mathematics in Further Education Colleges' project, which included the following summary of the varied mathematics provision within FE colleges, Noyes and Dalby (2020, p.18):

> The mathematics offer in FE colleges ranges from Entry level to level 3, though most providers without A-level provision do not offer level 3 mathematics qualifications. Mathematics includes stand-alone qualifications (e.g., GCSE, A level, Core Maths), modules within vocational qualifications (e.g., Engineering, Applied Science, Business) and embedded mathematics within vocational learning. Core Maths is offered by some colleges but usually to very small numbers of students.

The project was conducted in two phases. Using enrolment data provided by the DfE, it was established that a total of 100 FE Colleges had no A level Mathematics entries in 2020-21. Of these, phase one involved the 15 FE colleges who did have Core Maths entries, whilst phase two involved the 85 FE colleges who didn't have Core Maths entries. The methodology was done this way so that findings from phase one, relating to FE Colleges which have Core Maths entries but no A level Mathematics entries, could be used in the discussions with phase two FE colleges, which have neither

A level Mathematics entries nor Core Maths entries. Table II provides a summary of the criteria for inclusion.

PHASE ONE	PHASE TWO
2020-21 **No** A level Mathematics enrolments **Some** Core Maths enrolments	2020-21 **No** A level Mathematics enrolments **No** Core Maths enrolments
Of all FE Colleges **15** met these criteria	Of all FE Colleges **85** met these criteria

Table II – criteria for inclusion of FE Colleges for each phase of the study

FE colleges' feedback on barriers and enablers to offering Core Maths

Of the 100 FE colleges that contact was sought with, 18 agreed to take part in an interview (six from phase one and 12 from phase two), with a further four from phase two completing an equivalent survey as an alternative option.

Feedback given during the six interviews conducted with FE colleges in phase one, included:

- All spoke positively about Core Maths and what it offered.
- All mentioned timetabling as a challenge and five of the six mentioned student recruitment as a barrier.
- All had switched to teaching Core Maths in one year, due to dropout between Year 12 and Year 13.
- Teaching staff were (maths) subject specialists, but it was acknowledged by some that there were maths teacher shortages

Headline feedback from phase two interviews indicated that the value of Core Maths was understood by the majority, but that support was needed to introduce Core Maths, e.g., "The college would really appreciate help with resources and training for Core Maths. The college does offer T Levels and recognises that Core Maths is useful for these students".

Table III shows in more detail the barriers to offering Core Maths that were reported – these are broken down by each phase and an overall total is also given.

Barrier	Phase one responses (of 6)	Phase two responses (of 16)	Total responses (of 22)	% (of 22 responses)
Student recruitment	5	9	14	64%
Timetabling	6	5	11	50%
Lack of expertise	0	6	6	27%
Student retention	3	3	6	27%
Lack of awareness by Senior Leadership	0	5	5	23%
Not familiar with the course	0	5	5	23%
Getting other subject tutors to support	3	2	5	23%

Table III - main barriers to offering Core Maths in FE Colleges

Almost two-thirds of those that gave feedback identified student recruitment as a barrier to offering Core Maths, indicating that many students who would be eligible for the qualification did not choose it as part of their programme of study. However, it was not always clear whether this was based on the college's experience of trying to recruit students to study Core Maths, or whether they had promoted Core Maths to all potential students. Many of the colleges were targeting students in certain vocational areas to participate and so may not have made all students, who the qualification could have been of value to, aware of it. One interviewee noted that "Most students had no idea what Core Maths was before it was mentioned to them".

Timetabling was a significant barrier, cited by half of those that gave feedback, e.g.:

> The challenge after recruiting students is finding a time – they all come from different vocational areas and finding a slot on everyone's timetable that fits is very difficult. It's almost impossible…we've had to turn down students for Core Maths because it simply wouldn't fit the timetable.

Timetabling issues are more of a challenge in FE colleges due to the nature of vocational courses. The phase one interviews were informative in providing some possible solutions for colleges facing similar timetabling issues, e.g., "Main obstacle however was timetabling. Because of introducing extra hours for these students into an already busy timetable. So, Technical Baccalaureate became a 4-day course compared to 3-day for regular Level 3 extended diploma."

Lack of expertise and student retention were barriers that were reported equal third most often. However, there was a clear disparity here between phase one and phase two responses. None of those in phase one cited lack of expertise as a barrier (but six of the sixteen responses from phase two did), whereas an equal number from both phases cited student retention as a barrier.

Two of the barriers that were equal fifth were again exclusively reported by those in phase two, namely lack of awareness by senior leadership and not being familiar with the course, e.g., "The barriers seen: Getting SLT onboard. Need to sell the course to them." and "There is not much awareness of Core Maths in vocational areas – they don't know about the support it can provide to other courses."

Summary of findings

When seeking to offer Core Maths, key barriers experienced by FE colleges identified by this study include some 'structural' issues, such as timetabling constraints, and others that are 'subject specific'. Subject specific barriers include student recruitment and retention, and a lack of teacher expertise, familiarity and awareness of Core Maths and its value.

The findings suggest that further work is required to raise the profile of Core Maths with FE colleges, so that it is recognised as a useful qualification that will support students' studies across a wide range of vocational/technical programmes. The lack of recognition by some FE College's senior leadership teams is not helpful. Having the backing of senior leadership was crucial to the successful implementation of Core Maths in the FE colleges where it is offered.

Although the obvious place to raise the profile of Core Maths in FE colleges is with teachers and senior leaders, communicating suitable information to prospective students and their parents should also be a priority – this could be through use of enrichment and taster sessions and working with pre-16 institutions to ensure suitable pathways are clearly promoted.

Concluding remarks

This study builds upon and provides additional evidence to 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 there are various issues that thwart take-up:

> …six years on from first teaching, national take-up of Core Maths remains relatively low. The nature of Core Maths, designed to sit alongside main programmes, does not easily fit into the new per-student funding regime. Institutions struggle to find attractive and cost-effective ways of including Core Maths in their curriculum provision. In addition, the continuing lack of recognition of the qualification by higher education and employers limits its appeal to students.

The number of students taking Core Maths has increased year-on-year since the qualifications were first introduced. However, for provision to expand to a level where all students who would benefit from studying Core Maths in their post-16 education have the opportunity to do so, there are on-going barriers that need to be overcome, including within FE colleges. The recent joint statement from the Royal Society and British Academy (2022) highlights the growing recognition of the importance of Core Maths and the need to address barriers to uptake.

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