

The NCETM Maths Podcast Episode 90

Core Maths: Then, Now and Next

Intro: Hello, and welcome to the NCETM Maths Podcast. In this episode, **Howard Astley-Jones [HAJ]**, Assistant Director for Secondary at the NCETM, talks to **Professor Paul Glaister CBE [PG]**, one of the leading figures behind the development and growth of Core Maths. Together, they look back at why the post-16 Core Maths qualification was introduced, how it has evolved over the past decade, and why it matters more than ever for young people, higher education settings, employers, and the wider economy.

They also explore the future for Core Maths and why Maths to 18 remains an important ambition. Whether you're already teaching Core Maths, thinking about introducing it in your school or college, or simply want to understand what the qualification offers, this conversation provides valuable insight.

We hope you enjoy the conversation.

HAJ: Hello and welcome to the NCETM Podcast. I'm Howard Astley-Jones, Assistant Director and Level 3 Coordinator at the NCETM. In this episode, we're reflecting on the introduction, development, and progress of the Level 3 qualification, Core Maths, since its introduction, and also to hear about the new Association for Mathematics in Education with, I'm delighted to say, Professor Paul Glaister CBE, who is Professor of Mathematics and Mathematics Education at the University of Reading.

Welcome, Paul. Could you tell us a little bit about who you are and what you do?

PG: First of all, hello to everyone listening. It's lovely to have this opportunity to speak with you all, and thank you very much to Howard and the NCETM for the invitation.

My background has been in mathematics for quite a while.

I've been teaching for over 40 years, mostly at the University of Reading in the Department of Mathematics and Statistics, where, as Howard said, I'm a professor of mathematics and mathematics education, and I'm passionate about anything that involves mathematics. I got involved with qualification reform, and that particularly includes Core Maths, obviously, in the mid-2010s which we will go on to a bit more as we proceed.

HAJ: Thank you, Paul. So as you just said, you were involved with much of the early work in the development and introduction of Core Maths. I thought it'd be helpful for listeners to hear how Core Maths all started initially in those early years.

PG: First of all, I got involved with qualification reform in December 2013 on the reformed 2017 A levels in Mathematics and Further Mathematics, which I spent quite a lot of time working on and continue to do so today. One month later, I was then asked if I'd be

interested to be involved with something called Core Maths, which I must admit at that time I hadn't heard of.

I was told that the decision had been taken to have a more problem-based course, post-16, that encourages mathematical thinking alongside skills and knowledge. Of course, A level does that to some extent based on the content that's in there, but the vision was something quite different and it's what we now see today.

Back in December 2013, there was a government policy document, 16 to 18 Core Maths Qualifications, where the government set out an ambition for the overwhelming majority of young people in England to study maths at least to age 18 by 2020. This is something that Michael Gove was quite passionate about, and something he spoke at The Royal Society about, and they've been heavily involved in Core Maths throughout.

The government policy document said, 'We lag behind our competitors internationally, both in the proportion of students studying maths to age 18 and in the proportion studying the subject to advanced levels.' But these skills, of course, are increasingly essential to higher education, study, and young people's future careers and the economy more generally.

Of course, that remains true today, if not more so. The Royal Society wrote a report from an expert panel on core mathematics in October 2013, which led to the development of that government policy document a few months later. The report from the expert panel focused on Core Maths, particularly post-16 maths qualifications, and stated that they should be developed for the large number of students who are ready to progress beyond GCSE Mathematics but, of course, were not wanting to study A level Mathematics.

And the report includes clear guidance and elements, in support of these qualifications, to guide their work for the wide range of students going into HE, vocational training, or business and industry. But there were two influential reports which also assisted the government in their policy work on this.

One is the famous, infamous should I say, Nuffield report from 2010, 'Is the UK an Outlier?', an international comparison of upper secondary maths education, where it showed that the UK was very much an outlier, lagging behind much of the rest of the world. The second report was the Mathematical Transitions Report from the Higher Education Academy that engaged in a large-scale study with higher education to find out the mathematical and statistical needs of students taking undergraduate studies in a variety of disciplines.

Again, that said that we needed many more students doing maths post 16 of the type we're talking about. Then there was a launch in 2014 of the technical guidance document, which is the government document to which awarding organisations had to satisfy the requirements in order to be accepted as a Core Maths qualification.

There was a launch of those qualifications subsequently later in the year, which I was heavily involved in because I was part of that government expert panel that decided which qualifications should be allowed to be Core Maths qualifications, and then much more on university and other work beyond that, which we'll talk about later on.

HAIJ: Thank you Paul. That's a really interesting background there for the listeners. You've been such a strong advocate of Core Maths over the past 10 to 15 years. What is it about the qualification that makes you so passionate about it?

PG: When I was first asked in January 2014 if I would be interested in being involved in this, and was not told some of the stuff I've just talked to you about, in terms of how we compared with the rest of the world. I was aware that in my own institution, and in many other institutions, students lacked the necessary skills and knowledge, but particularly the approach to problem-solving in their own individual subjects, which was quite different from what you would normally expect for students who needed to do A level Mathematics.

So we're not talking about physics, for example, or not a maths degree. But at the time, I said, "Yes, I would like to be involved with this." I didn't know the scale of the challenge, and I didn't know what the qualifications would comprise. But then over that period of time, as you say, the last 10 to 15 years, I've learnt much more about that.

Everywhere I've gone, particularly in higher education but also in employment, there's this crying need for students and all those in the world of work to have a much better attitude and understanding of the nature of the mathematical and data education that they need in order to meet the challenges.

Of course, those students who stop doing maths at age 16 with GCSE now have a large gap between that, 12 years of study of mathematics and then when they go into HE or work, the Core Maths qualification is evidently required to plug that gap if I can put it in that way.

What it comprises is a really strong grounding for students to be able to make that transition from GCSE Mathematics to further study, further training, and obviously the world of work.

HAI: Do you think there's anything teachers or leaderships in school misunderstand about it, Paul?

PG: I think when it came in it was good news in that it wasn't called an AS, so it's exactly the same level as an AS; it attracts the same UCAS points; it's on the same grading.

But given that AS has not thrived and it's really a three A level model for most schools and colleges, I was quite relieved in hindsight that it wasn't an AS because it might have suffered in the same way that the other ASs have, particularly given that it then didn't lead on to a full A level.

But I think at the time it was introduced when there was funding per qualification that was really much in favour of ASs and Core Maths, and then that was removed. So I think many schools and colleges, and I understand that they have challenges with teacher retention and recruitment, but I think that the fact that one could deliver a programme with three A levels sent the wrong signals that was all that one needed to offer.

So there was opportunity there for gathering momentum, which was slightly lost. and I think we're still in some sense overcoming that. The other issue with schools and colleges, of course they're led very much by what's the next step for their learners, and we still don't have as much buy-in, particularly from universities, in signalling the value of Core Maths.

We do have a lot of strong statements in that direction, but for universities which are large, complex organisations that have had many challenges over the last 10 years, is that however high it is on their agenda, it hasn't got to the top of the agenda because of how it sits as an additional qualification to the regular study.

That doesn't mean to say that it hasn't become popular in many institutions. We do have quite wide coverage, it's just slightly frustrating that we don't have universal coverage, which I think we should do. And to be honest with you, as a leader, if they're adamant that they're not going to do it, they're not going to do it.

So you have to make the case that this is of value to the students, that you are in some senses disadvantaging them by not allowing them to do that, but saying that in the nicest possible way.

HAI: Oh, yes, because there you brought up a thought as well that Core Maths actually is supportive of disadvantaged students in the education system and their opportunity to do a Level 3 maths qualification as well.

PG: I would hope that every young person has the opportunity. I realise that there are challenges in some areas through teacher recruitment, retention, funding and so on, but obviously you want to have access to all young people, to all the possible options that one could take. But that is particularly true for qualifications in mathematics or mathematical and data education, because that's hugely important for their future.

I don't deny that there are other important things that they should be offered. If you go to Adrian Smith's review, which was the post-16 maths review, he had 18 recommendations. The very first one of which was 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.

Now, it's no surprise that for Adrian and myself and the Department for Education, that recommendation one is there for a reason. I think disadvantaged students, all students, it should be an entitlement for something that's a government mission and hugely important to all of us, that it's there.

And it's happening, but it could happen more quickly, of course.

HAI: Yes, thank you. I'm just going to share with Paul, and I'll describe it for the listeners, a graph of the Core Maths entries over the years. The graph shows in 2016, the first year Core Maths was examined with an entry of 2,931 students, which has increased in a reasonably linear manner to 11,792 in 2020.

That's where it plateaued, increased slightly each year until 2024 at 12,810 entries. Then there was a significant increase to 15,327 entries last year. Clearly one of the factors in the reduced rate over time was COVID in 2020. The recent increase has coincided with the introduction of the Core Maths Premium, which is funding to encourage the provision of Core Maths qualifications and expand maths education for students up to the age of 18.

The funding rate for a student studying Core Maths is £900 for one year only, so this recent increase in entries is very encouraging. What would be your ambition or hope for the development and take-up of Core Maths in, say, the next five years, Paul?

PG: What I'd like to see - and what we might see - are obviously possibly not going to be the same thing.

This is really positive news, of course. One would like to think we've got some increases there for which it might be a funding decision. Who knows? You don't know how this evolves, how it builds. I will come back onto the numbers, but if I just go back to 2015 when I got involved with briefing universities. All universities were asked as part of qualification reform work back in 2015 to engage with the Level 3 reforms of which there are quite a few, but particularly on Core Maths.

Two ministers explicitly wrote to all university vice chancellors with a briefing paper I wrote, outlining all of the arguments to why we should be doing this, drawing on the two reports I mentioned earlier, and then for the opportunity to brief them. I did go to 60 plus of these universities. But it's important to keep the momentum going, so I've done my level best to keep that momentum going.

Although we've always had positive, strong support from governments since this was first launched, and that's true of the current ministerial team and previously, we are hugely reliant on universities. They're not the only players in this, but they send the signals to schools and colleges.

Every initial increase helps, but they also rely on that increase in order to be able to move from their current position. We have many universities (which I will claim the credit for) who signalled very strongly back then the overwhelming value that Core Maths offered.

But with 2 or 3,000 at the time, that's quite difficult to make anything other than positive, strong statements. To formally include this in admissions requirements is very difficult, and they need to be fair to students in doing so. If you don't have access to a Core Maths qualification but you want to do psychology at university X, how can you make sure that you not only encourage more students to do Core Maths because it will help their programme, but without disadvantaging all those students that don't have that opportunity?

There will come at some point a tipping point where the numbers will hopefully increase significantly. I don't think we've got quite there yet. But one can understand their situation, that they say, "you offer us more students, we'll be able to signal more strongly." I think we just have to keep at it, and the fact that the numbers continue to grow and there's still strong government support is helpful.

I think the only thing that was a bit of a glitch in the past was we had an industrial strategy document in 2017, and there were a number of pages in it driving up the study of maths that Adrian Smith will take quite a lot of credit for, quite rightly, and many of the programmes we see now on A levels and further education and so on, all have all come out of that.

But I have to say, it made my life a little bit more difficult when I was engaging with universities, when they wanted to see yet more positive news, and it wasn't just about the numbers, it was more about constantly signalling elsewhere, and government also has a lot of other things to do.

Nevertheless, I think we're getting there, but in terms of the numbers I think it will still continue to be a slow burn, I wouldn't want it mandated. The Advanced British Standard gave us a window where there would've been a broader curriculum. That didn't happen, but Core Maths was very firmly on that agenda had it been the case.

I think it will continue to be a slow burn, and I think it genuinely has to be demand-led rather than mandated. So whilst the Advanced British Standard gave us a window where we would've been able to more readily identify how Core Maths fitted into a broader qualification framework, it wouldn't have been a requirement I'm sure, and I wouldn't want post-16 maths to be mandated now.

I think you have to win the argument about how it's important to young people for them to want to do it and signalling from universities, yes. But if you just force people to do certain things, I don't think it necessarily works. And obviously most students have to take GCSE Mathematics and some maybe are not so inclined to enjoy it, but we still need all of them to be engaged with maths in some shape or form, and Core Maths is a large part of that in the future.

So I would like it to be universal provision, and then it turns out everyone's already wanting to do it and so you don't have to mandate it.

HAJ: Thank you, Paul. You've mentioned some key organisations there. Are there any other organisations that have been really supportive or interested in Core Maths?

PG: I work quite closely with learning societies and subject associations, and you already mentioned at the outset about AMiE, and we'll come onto that at the end.

But the London Mathematical Society, the Institute of Mathematics and its Applications, the Royal Statistical Society, and now the Academy for Mathematical Sciences are all strongly in support of Core Maths. And through my journey with Core Maths, I've seen in all of the committees and groups that I've been involved with, continued support for Core Maths.

And they'd like to see much more than I would, in the sense that they'd like a lot more agitation. I'm not one for agitation, I'm more for advocating. You mentioned about the funding. I was involved with the Advanced Maths Premium work and also the Core Maths Premium work, which is fantastic.

When we can get these organisations supporting what is the NCETM's mission regarding Core Maths, it's fantastic. Everywhere I go now, when we talk about maths education, Core Maths is very high on the agenda, and sometimes the events just seem to be all about Core Maths. There was a time when it was quite hard to get it on the agenda or for one to be able to say what one wanted.

But the Royal Society has been particularly supportive. As I mentioned earlier, the Royal Society's Advisory Committee on Mathematics Education, originally led by Adrian Smith, was involved from the early days. Adrian has worked in both government and universities, has a strong background in mathematics and data education, and has been a strong supporter throughout.

So he was very keen to work on the post-16 review. He didn't know much about Core Maths at the time, but learned quite a lot, and has since then made many strong statements about the importance of it. And in the Royal Society's most recent Mathematical and Data Education Report, where they envisage a broader curriculum, and pathways for young people right through, particularly 14 to 19, Core Maths is very high on that agenda.

He was blown away by how valuable it is. So the report says in his introduction, 'We need to work with teachers to create a new curriculum that combines mathematics as we know it with data, computing, and AI, that places maths in real-world contexts. Core Maths is an excellent ready-made stepping stone to achieve this.'

So there is no greater person in the UK qualified to say anything like that and he specifically said that.

HAIJ: Thank you, Paul. What is Core Maths?

PG: It was a fairly steep learning curve, back in 2014, when I knew what it should look like, when I spoke at the launch along with Liz Truss, who was the schools minister at the time. All I knew then, is the large gap at that point between what students - and I think it's much the same now - were able to do when they passed their GCSE Mathematics, and what they needed to be able to do when they started their further or higher education study. There wasn't a huge amount of mathematical, quantitative, statistical study in other A levels at the time, apart from obviously A level Mathematics.

But I learned then that there was a very strict technical guidance document, which I'll talk about in a moment, which was the Department for Education's, 'mission' and what qualifications were accepted by Ofqual as Level 3 qualifications.

So they became Level 3 certificates equivalent to the AS, as I've said previously and graded similarly. Also, in order to satisfy the Core Maths technical guidance, they had to be scrutinised against that, and that was what was required for them to be included in league tables and other published documents, but particularly to attract the Advanced Maths Premium and then the Core Maths Premium.

So that's the broad outline. Now, what's in there? I'd encourage all listeners who are not aware of what is in Core Maths to go to what are the three qualifications that are currently on offer. Pearson's qualification is called Mathematics in Context; OCR have two qualifications they call Core Maths A and Core Maths B now.

Both have Introduction to Quantitative Reasoning as a compulsory element, and then Core Maths A has Critical Maths, and Core Maths B has Statistical Problem Solving. These are all the study of topics, but also problems and also context that students typically won't be doing in GCSE maths, and on the whole, typically, in their further study in school or college unless they're doing mathematics, in which case they wouldn't be doing any of this because A level Mathematics doesn't look like that.

But then beyond that, when they go into higher education, of course, it could be in any discipline where there's a quantitative statistical or mathematical element, so a broad background in that is crucial. The last one of those Core Maths branded qualifications is the AQA Mathematical Studies for which there's three options.

All of them have a common core, and then there's one on statistical techniques, one on critical path and risk analysis, and one on graphical techniques. But before I go into the technical guidance, I will say that whenever I talk to universities, and it doesn't matter whether it's at high level, low level or whatever colleagues involved in policy work or whether it's involved on the ground in teaching students and in schools and colleges, when they first find out about what this involves, they are really hugely impressed.

This is what students need to be able to do if they're going to go off in each of these different directions. So anyone listening who doesn't know what Core Maths is, I think if you look, you will be pleasantly surprised that there is this on offer, and hopefully you'll also be minded to support students who don't have the opportunity to engage in that type of study, but the three key elements in the technical guidance are the following: to deepen competence in the selection and use of mathematical methods and techniques. It's that's about building on GCSE, but also being able to look at problems for which there's no obvious solution, where you can bring together the techniques and skills that you've learned.

Secondly, develop confidence in representing and analysing authentic situations mathematically and applying mathematics to address related questions and issues which are certainly not something that one would ordinarily study in a current 11-16 curriculum, I think. And then thirdly, to build skills in mathematical reasoning, which will be based on the content that you have in A level, but not specifically on what you might see as the content and what I've just described for Core Maths, and communication.

So communication is hugely important. A great Core Maths lesson will involve a lot of discussion with students bringing different ideas from their different disciplines to address problems. And there's so much out there in the world to be able to look at in this regard. We have a very rich source of materials, and so on, to be able to do this, Howard is going to talk a bit more about that shortly.

HAJ: Just before we look at that, why do you think it is important? Why is Core Maths important?

PJ: At the time when it was first introduced, there was a clear gap between what we do in the UK - less so I think in Scotland now, because they do have a mathematical qualification post-16 which looks quite similar to what's offered in Core Maths as part of their Highers.

But the world has changed considerably. Data is ever more prevalent everywhere, much more use of statistical techniques and so on. The case then was very strong. The case is much stronger now, if that's possible, and everywhere else in the world is moving on in this regard, so we need to do so as well.

If you read the Royal Society's Mathematical Data Education report, I think if you're not persuaded by that, then I would be very surprised.

HAJ: Thank you, Paul. As you just said, I'll just talk through the Core Maths support offered by the AMSP in partnership with Maths Hubs.

The support offered for teachers to engage with by the AMSP in partnership with Maths Hubs is broad, with a central pipeline of teacher professional development, depending on whether you are planning to teach Core Maths, with a [Getting Started with Core Maths webinar](#) and a [Preparing to Teach Core Maths](#) short course available.

Once teaching Core Maths, a [New to Teaching Core Maths programme](#) to support teachers in the first two years, particularly with the ethos, as Paul mentioned there, of this discussion-based lesson. And following that, for teachers with a few years more experience joining [Developing Core Maths Pedagogy](#) Work Groups.

So that's the central core of the PD support for offering Core Maths for teachers. But this central pipeline is wrapped around with regular [specification network meetings](#). As Paul mentioned, there's three different boards offering Core Maths. [Pre-release meetings](#) in the spring, as well as subject knowledge live or on-demand courses and through the year [Core Maths conferences](#).

And we'll provide a link to the [AMSP Core Maths PD pages](#) in the podcast notes. Just before we move on, just listening to you talk about AMiE, are there any last thoughts on Core Maths you'd like to add, Paul?

PG: My concluding remarks are as follows. First of all, find out what Core Maths is about if you don't know about it, and certainly before you have a possibly a negative view about it.

Find out for yourself, and hopefully this podcast has spurred you on to think about it if you don't already do so. But secondly, we talked about this entitlement. Now, there are many strong advocates for Core Maths in many areas, but particularly in schools and colleges. So it is important to find out what's happening in your local area on Core Maths, and one way of doing that is through the offers that Howard has just alluded to.

But I'm going to cite, for example, Colchester Sixth Form College, not that I know them well, although their decision to embrace Core Maths was quite influential on one of the university alternative offers that I won't name. But this was all done before the Advanced Maths Premium and the Core Maths Premium.

This was when Core Maths was just part of the offer that was delivered. And now the fact that one can get £900 per student seems to be a bit of a no-brainer to me. But Colchester Sixth Form College, it, as of this morning as I looked again at their website, said they say that all taking A levels in the following subjects will benefit from taking a fourth course of Core Maths.

Now, at Colchester Sixth Form College, you do three A levels - typically, there are other offers, and then something else. So they're saying for accounting, biology, business, chemistry, computing, economics, electronics, environmental science, geography, geology, product design, psychology. Of course, it would've been easier to list the ones that it doesn't say that for. But they'll find Core Maths a beneficial fourth course. So if we go to A level Biology, and this is in common with all the other A levels, Core Maths offers a complementary course to this subject, and is strongly recommended as a further course choice if not taking A level Mathematics or A level Statistics options.

I think anyone who finds out what Core Maths is about and who is positively inclined to it, has then to try and see it through to the next level and get it on the timetable. The funding changes that happened some while ago didn't help, but it hasn't made any difference to those schools and colleges.

They've continued with it, and the fact that there's now additional funding has just made it an even more attractive option financially, but that is not what drives them. It's about offering opportunities to young people who we should offer them to, because they're only going to get this one chance.

HAI: Thank you, Paul. I quite agree.

So finally, on a slightly different tangent, but quite a significant change, you were the last president of the Mathematical Association and are the first president of the new [Association for Mathematics in Education, AMiE](#), which has brought together the leading mathematics education associations to create a shared home for everyone involved in mathematics education.

What are your thoughts and hopes for this exciting new development?

PG: Let me first of all say what an honour it has been to be president of the Mathematical Association, a long esteemed history. Sad in some ways that I was the last one, but that's not the reason that they merged. But I'm very positive about being the first president of AMiE and everything that was great about the Mathematical Association and the other four organisations will remain within AMiE and become even better.

So their mission is the following: to foster lifelong skills, promote collaboration, and make mathematics accessible, relevant, and engaging for all. Who in mathematics education wouldn't want that to happen? And how can you help contribute to that? I think everyone who's working in or with an interest in mathematics education in the UK, maybe beyond, should become a member of AMiE.

I think we can achieve so much if we all work together in support of providing the best possible mathematics education in all settings. And by collaborating as we have done to combine to become one organisation with an extraordinarily strong leadership, I hope that sends the signals to all of those who are not currently engaged in a professional subject association with this mission, then to do so you only need to look at the member interest communities that they've set up. I will list them: Primary and Early Years, Secondary, Post-16, Level 3 education, FE and lifelong learning, learners and learning inclusion, ITE, initial teacher education, professional development providers, and technology for learning community.

And of course, those may grow. I'm pretty sure everyone listening who has an interest in, or is working in, mathematics education can find a home in at least one of those. So I would strongly urge everyone listening to consider taking up the offer and joining and being part of a great learning community.

And the breadth of opportunities that they have there will help the community deliver on what is our mission.

HAI: Thank you, Paul, and of course all of the resources of all the previous organisations are still accessible, aren't they?

PG: Yes. Once you're a member of AMiE, you have access to all the resources that have been made available to each of the individual organisations, but you now become part of that one global entity.

HAI: Lovely. Thank you very much, Paul. It's been a pleasure having you come and talk to us, and I really appreciate the time, and thank you.

PG: And thank you very much to you, Howard, again, and to the NCETM for this opportunity.

As you mentioned at the beginning, I first got to know you at a national Maths Hub Leads conference when we were all together looking at the post-16 Level 3 activities, and we've stayed in touch ever since. And I wish you all the best in all your work in that area and you, and hopefully everyone else, on this Core Maths journey.

End: Thank you for listening to this episode of the NCETM Maths Podcast. If you'd like to find out more, you'll find links to the resources and information mentioned in this episode in the show notes. You can also search Core Maths on the NCETM website to discover articles, podcasts, classroom case studies, and professional development opportunities, including examples of how schools and colleges across England are successfully teaching the qualification.

Thanks for listening. Until next time.