

GCSE mathematics: understanding schools' approaches to tiering



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Executive summary

Reformed GCSE mathematics qualifications will be awarded for the first time in summer 2017. These qualifications include new and more demanding content and are graded from 9 to 1, with 9 being the highest grade. Like the legacy qualifications, the reformed GCSE mathematics qualifications use a two-tier assessment model. However, there are differences in the content and demand of both the higher and foundation tiers. These differences are likely to influence schools' tier entry approaches.

In preparation for the summer 2017 exam series, we conducted interviews with 12 schools in England to discuss tier entry choices for the reformed qualifications. Schools were asked about their perceptions of the reformed qualifications compared to the legacy qualifications, their intended approach to tier entry for the reformed qualifications compared to the legacy qualifications, and other changes that the school/department were implementing in light of the reforms.

The findings suggest that schools are carefully considering their tier entry choices ahead of the summer 2017 series. The majority of surveyed schools were intending to enter a greater proportion of their students into the foundation tier in summer 2017 than they had in previous exam series. This was primarily due to both the higher and foundation tiers being more challenging in the reformed qualifications.

Schools reported that they would continue to use information such as a students' prior attainment and expected achievement at GCSE to inform tier entry, but they were conscious that there was less information available about the qualifications, for example, past exam papers and their associated grade boundaries. Schools also reported that in future years, as more information became available, they would become more confident in their tier entry choices and might enter more students into the higher tier.

The findings are based on a small number of schools and are not necessarily representative of all schools in England. They suggest, however, that schools have a good understanding of the differences between the new higher and foundation tiers in maths and are reconsidering their entry approaches accordingly.

Introduction

Reformed GCSE qualifications in English language, English literature and mathematics will be examined for the first time this summer. These reformed GCSEs have new and more demanding content developed by government and exam boards (Gove, 2013), and are graded from 9 to 1, with 9 being the highest grade. While there are more grades available in the new structure to allow greater differentiation between high achieving students, there are some common anchor points to the existing scale, at grades 7/A, 4/C and 1/G (see Figure 1).



Grading new GCSEs from 2017

New grading structure	Current grading structure
9	
8	A*
7	A
6	B
5	C
4	C
3	D
2	E
1	F
1	G
U	U

Figure 1. *Grading reformed GCSEs from 2017* (Ofqual, 2016a)

The reformed GCSE mathematics qualifications use tiered assessment in much the same way as legacy¹ qualifications, with students of different abilities assessed through different tasks. The legacy GCSE mathematics specifications are structured into two tiers, such that students entering the higher tier can access grades A* to D (with an allowed grade E for students scoring a small number of marks below the grade D boundary) and students entering the foundation tier can access grades C to G. The grading scale therefore overlaps between grades C to E.

Students entering the higher tier in the reformed qualifications are able to access grades 9 to 4 (with an allowed grade 3 for students scoring a small number of marks below the grade 4 boundary), and students entering the foundation tier are able to access grades 5 to 1. The tiers of the reformed qualifications will therefore overlap at grades 5 to 3, and there is a requirement for at least 20% of the marks on the papers to be common across the two tiers.

¹ The term 'legacy' qualifications is used throughout this report to refer to the qualifications that were available prior to the current round of reforms.

While on the surface the tiering model for the legacy and reformed qualifications is similar, there are some key differences relating to the demand of the assessments. The reformed qualifications include a greater focus on problem solving and there is additional content in both the higher and foundation tiers (Ofqual, 2013, 2016b). As such, the content and demand of each tier differs for the reformed qualifications compared to the legacy qualifications. Furthermore, the range of grades available at each tier is also changing. The top grade on the reformed foundation tier (grade 5) is higher than the top grade on the legacy foundation tier, grade C (see Figure 1). Similarly, the bottom grade of the reformed higher tier (the allowed grade 3) is higher than the bottom grade on the legacy higher tier (the allowed grade E - see Figure 1).

It is likely that some schools will adapt their approaches to entering students to the foundation or higher tier as a result of these changes. Around a third of students are currently entered for the foundation tier, with two thirds entered for the higher tier². However, this might change following the introduction of the reformed qualifications. We were interested in the extent to which schools were reconsidering their tier entry choices in light of the changes to the qualifications.

The following section provides a brief overview of recent research that has considered schools' approaches to tier entry in GCSE mathematics. While this provides some indication of the factors that influence tier entry, much of this research was not conducted during a period of reform.

Overview of previous research

Previous studies have considered the factors that influence tier entry choices in GCSE mathematics assessments (Dunne, Humphreys, & Sebba, 2007; Gillborn & Youdell, 2000; Wilson & Gill, 2014). These studies have generally found that tier entry choices are influenced by two key factors: the prior attainment of students, and the expected achievement of students at GCSE. In these studies, schools reported that they typically set students into ability groups based on their prior attainment, with the intention that some groups would enter the higher tier and some groups would enter the foundation tier. Teachers then monitored students' progress to inform final tier entries. Consequently, tier entry choices were usually made quite early in a student's GCSE course, and, although movement between tiers was possible, it was relatively rare (Wilson & Gill, 2014). Where students did move between ability groups and tiers, this was typically from a higher set to a lower set: from higher to foundation, rather than the other way round (Wilson & Gill, 2014).

In addition to what might be described as academic factors, previous research suggests that tier entry choices can also be influenced by the characteristics of the

² These are UK figures for the linear qualifications of AQA, OCR, Pearson and WJEC; approximately 700,000 entries.

students. Wilson & Gill (2014) found that a student's ability to handle written examinations or a student's ambitions might be influential, whilst Gillborn & Youdell (2000) reported that some teachers chose to enter students to a particular tier (generally the foundation tier) if they considered that the student would benefit from sitting a paper that would boost their confidence.

While academic and student characteristics are clearly influential in tier entry choices, decisions about which tier to enter students can also be influenced by external factors such as those relating to school accountability measures. Schools were primarily judged by the percentage of their students that achieved five GCSEs at grades A*-C (including English and mathematics) prior to summer 2016. This threshold measure was considered to encourage schools to disproportionately focus attention and resources on students at the grade C borderline (see Perryman, Ball, Maguire & Braun, 2011; Gillborn & Youdell, 2000; Taylor, 2016), a grade that was available on both the higher and foundation tiers in the legacy specifications. As such, there were some interactions between accountability measures and schools' decisions about which tier was most suitable for a student (Gillborn & Youdell, 2000; Taylor, 2016; Wilson & Gill, 2014). Both Taylor (2016) and Wilson and Gill (2014) found that some schools considered it easier to obtain a grade C on the higher tier due to the lower grade boundaries³, a factor that then influenced tier entry choices⁴.

The key accountability measure at GCSE changed in summer 2016 from the five A* to C measure to Progress 8, a measure of progress from key stage 2 to key stage 4 in eight subjects, with mathematics (and the better of English language/English literature) counting double (Department for Education, 2014). While the change to Progress 8 as the headline accountability measure might dissipate the focus on one specific grade, external accountability measures might continue to influence tier entry choices in some way.

³ Grade C is a lower grade on the higher tier and a higher grade on the foundation tier, hence the different position of the grade boundaries.

⁴ In practice, exam boards align the standards for grades that are common to both tiers. For the reformed specifications, 20% of the marks on the exam papers will be common to both tiers. This will help exam boards ensure that it is no more or less difficult to achieve the same grade on each tier.

Methodology

Design

A qualitative approach was favoured for this research. This facilitated in-depth discussions relating to the extent to which schools were reconsidering their entry choices in light of the changes to the qualifications.

Semi-structured interviews were used to allow specific topics of interest to be discussed with each school, while also allowing digressions from the interview schedule to follow up points of interest. The use of qualitative methods necessarily limits the scope of this study, since it is only possible to include a small number of schools. Nonetheless, steps were taken to include a range of schools.

Participants and recruitment

Twelve schools were recruited through email invitations which briefly described the research and its aims. Schools with a variety of admissions policies and achievement levels (measured by the previous year's five GCSEs at grades A*-C %) were targeted in order to gather a range of views. We requested that someone who was involved in making decisions about tier entry be present at the interview, as well as any other member(s) of staff that the school thought would be in a position to contribute to the discussion. The interviews included six one-to-one interviews, five with two participants, and one with five members of staff, resulting in a total of 21 participants. Twelve of the participants were heads of department (HoD) and the remaining nine participants were mathematics teachers. Nine of the interviews were conducted face-to-face and the remaining three were conducted on the telephone. The length of the interviews ranged from 18 to 92 minutes.

Table 1 displays some of the demographics for the final sample of schools. The percentage of students at the schools achieving at least five GCSEs at grades A*-C (including mathematics and English) in 2015 ranged from 55% to 100%.⁵ The majority of schools were academy converters, although the admissions policies for these schools varied. The geographical area covered included the West Midlands, the south-west, East Midlands, Yorkshire, and London.

This sample is unlikely to be representative of all schools in England, despite it including a variety of school types with a range of student achievement and geographical location. Our findings should be considered with this in mind.

⁵ The national average for this measure is approximately 65%.

Table 1: *Features of the schools interviewed*

	School type	Admissions policy ⁶	% five GCSEs A* to C 2015
School 1	Academy Converter	Comprehensive	60
School 2	Academy Converter	Comprehensive	74
School 3	Academy Converter	Comprehensive	73
School 4	Community School	Comprehensive	55
School 5	Foundation School	Comprehensive	73
School 6	Academy Converter	Modern	63
School 7	Academy Sponsor Led	Comprehensive	84
School 8	Academy Converter	Comprehensive	77
School 9	Academy Converter	Selective	100
School 10	Academy Converter	Comprehensive	62
School 11	Academy Converter	Modern	64
School 12	Academy Converter	Comprehensive	57

Interview schedule

The full interview schedule can be found in Appendix A. Questions focused on:

- perceived differences between the legacy and reformed GCSE qualifications;
- approaches to tier entry pre- and post-reform and beyond summer 2017;
- other actions being taken to prepare for the reformed mathematics qualifications.

The intention of the research was to focus on tier entry choices, yet a discussion of this was not possible without considering the context within which these choices were being made. As such, the discussions included a consideration of the changes to the reformed qualifications and other changes that schools were implementing in response to the reforms, such as changes to teaching approaches.

Analysis

Audio recordings of the interviews were transcribed by an external company and the transcripts were analysed by two researchers. The 12 transcripts were initially read and re-read by both researchers to ensure familiarity with the content. The data were analysed with specific questions in mind rather than using a more 'bottom-up' approach to qualitative data exploration such as thematic analysis or grounded theory. The findings are therefore reported in line with these key topics, using supporting quotes from respondents.

⁶ Comprehensive and modern schools generally take all pupils regardless of ability or aptitude; selective schools take pupils depending on their ability or aptitude.

Results

The views of the teachers are reported under the key areas that were explored in the interviews. It is important to bear in mind that the results discuss the views of the individuals involved in this research, and do not necessarily represent the views of all mathematics teachers/departments.

Perceived differences between the legacy and reformed GCSE qualifications

All of the teachers interviewed agreed that the reformed GCSE specifications were notably different to the legacy specifications, and the reasons for this could be split into three broad categories: the structure of the assessment; the content of the syllabus; and the examination questioning styles. Whether these differences were considered as positive, negative, or neutral varied amongst the schools.

A number of schools highlighted the changes to the structure of the examined assessment as one of the key differences between the legacy and reformed qualifications. The minimum assessment time specified by the mathematics requirements for the reformed GCSE is set at four and a half hours, with between a third and half of the assessment to be completed without a calculator (Ofqual, 2016b). Each exam board used by the interviewed schools (AQA, OCR, and Edexcel) had chosen to structure their assessment into three examination papers, each lasting one and a half hours, with one paper being non-calculator.

This means that students in some of the schools will be required to sit more examination papers for the reformed qualifications than their counterparts had done in previous years. There was some concern that this may lead to increased pressure on students and teachers in terms of the time spent taking the examinations, revising, and preparing and marking mock examination papers, but other schools believed that the increased assessment time and number of papers could have a positive impact.

School 4, community school, comprehensive

It's the three exams as well. It's the pressure ... some of the pupils that come out today you've got elated to destroyed and it's kind of then putting that pressure on to say right well you've got to go again and do it again...

School 2, academy converter, comprehensive

... three papers, more marks available ... that structure sounds more as if [question writers] will be able to get a good broad range of questions, so they can think about progression through the paper as well as getting content coverage.

A second difference between the legacy and reformed qualifications related to the amount of content that had been included in both the higher and foundation tiers. Respondents considered that this would result in both the higher and the foundation tiers becoming more challenging.

School 1, academy converter, comprehensive

...there is additional content in both higher and foundation which would improve the standard, because obviously they've got to have more knowledge just at a very base level.

Some schools believed that the changes to the content were negative and that some students would not be able to cope with the additional challenge. The increase in content was thought to be particularly challenging for certain students, like those with special educational needs.

School 5, foundation school, comprehensive

We've also got concerns at the bottom end about how suitable the reformed GCSEs are for some of our weaker pupils. We host a specialist unit for the pupils with autism and at the moment most of them can cope with the current GCSE and they'll come out with a G or an F, generally, but I'm not convinced that they're going to be able to cope...

However, there was also a belief that the increased challenge would be a positive change for a lot of students. Schools thought that the additional content at the foundation tier would provide sufficient challenge to some students who would have previously been entered into the higher tier to ensure that they were adequately stretched. It was also thought that students sitting the reformed mathematics GCSE would be leaving key stage 4 with more mathematical knowledge than previous cohorts, and that the assessment would better differentiate the range of abilities of students.

School 3, academy converter, comprehensive

I just think it's quite a lot more demanding in terms of the content that they have to cover... And hopefully ... putting the 4 and 5 in will differentiate between, you know, those pupils that are really supported to get to that grade C compared to the pupils who were really secure and might have achieved it on a higher paper.

Teachers' views about the increased challenge and extra content tended to be influenced by the relative ability of the students that they were teaching. The increased challenge was generally thought to be positive, but only where the new qualification appeared to be accessible for the students in question.

School 10, academy converter, comprehensive

I don't know whether I think it's necessarily an improvement. I think it requires them to have a deeper understanding of maths so in that way I would say yes it's an improvement. But I couldn't say whether it was genuinely an improvement until we knew some idea of grade boundaries and standards that we would be expected to achieve. You know, it's not an improvement if everybody then gets it all wrong.

A final difference identified by respondents between the legacy and reformed qualifications related to the style of the questions. One of the aims of the reformed qualification is to encourage students' development of problem-solving skills, and this is reflected in the way that the questions are worded and structured in the assessment. Some teachers thought that, for the legacy qualification, there were certain topics that were assessed in a predictable and formulaic way, meaning that students might answer the question correctly with limited mathematical understanding. Respondents thought that this would need to change with the reformed GCSE.

School 7, academy sponsor led, comprehensive

... it doesn't feel like you can train students to answer questions that they don't really understand. So like as an example you previously could probably teach quite low attaining students to answer a cumulative frequency question and get seven or eight marks; whereas it feels like it would be very unlikely now to get such a straightforward question... So I think there's more to learn, but it's more that we have to be teaching it in a way that they actually understand...

Many teachers thought that the format of the more open ended problem-solving questions would necessitate teaching mathematics in a way that promoted a deeper and more genuine understanding of the mathematics, and differentiate the top-ability students more effectively.

School 9, academy converter, selective

We have high expectations of the problem solving aspect that it's going to actually differentiate between those that can just learn the knowledge and those that can apply...

Respondents had some concerns about whether teachers and students had the resources available to adjust successfully to the changes, and whether this would affect the students' performance in the examinations. Teachers were concerned that students taking their GCSE in the first two cohorts (in summer 2017 and 2018) would be disadvantaged because the changes to the qualifications would make it difficult for them to demonstrate their mathematical ability in the same way that they would have been able to in the legacy GCSE. Any perceived disadvantage would be lessened for later cohorts as they would have the opportunity to benefit from the adapted key stage 3 syllabus, teachers would be more experienced, and there would be more past papers available⁷.

School 4, community school, comprehensive

So it's not the mathematical knowledge because if I give them the old style questions they're getting A after A after A. So they're able to do the maths ... it's the understanding of the questions in the new format and what it's asking them to do.

Approaches to tier entry

Schools were asked about the number and type of students that they entered into each tier, how these decisions were made, and the information that these decisions were based on – in relation to both the legacy and reformed qualifications. This section considers separately schools' approaches to legacy qualifications, reformed qualifications in 2017, and reformed qualifications beyond 2017.

⁷ It should be noted that the comparable outcomes approach, used in GCSE awarding, compensates for any dips in performance resulting from the introduction of new specifications, known as the 'sawtooth effect' (see Ofqual 2016c).

Tier entry in legacy qualifications

The schools all reported that they tended to enter a larger proportion of students into the higher tier than the foundation tier in legacy GCSEs. The schools estimated that their higher tier entry ranged from 60% to 100% of the total cohort. Only one school reported having entered 100% of their key stage 4 cohort into the higher tier, but had done so for a number of years. This school was high achieving with a selective intake, so their tier entry approaches are perhaps not surprising (see Wilson & Gill, 2014). The final decision about which students were entered into each tier was, in the majority of cases, made by the classroom teacher, although the HoD often had some input in terms of agreeing the final entries.

The schools in this study referred to the way in which they used ability grouping to inform tiering decisions for students. The schools tended to allocate students into ability groups during key stage 3, and these groups continued into key stage 4. Initial grouping was based on a number of sources of data about prior attainment such as attainment in key stage 2 tests (taken at age 11), key stage 3 performance data, cognitive ability tests, and baseline tests sat on entry into the school. These ability groups then determined the syllabus that the students were taught, and ultimately, the assessment tier that they were entered for. This approach echoes previous research findings (for example, see Dunne, Humphreys, & Sebba, 2007; Wilson & Gill, 2014).

Students in the top ability groups tended to sit the higher tier in the majority of schools, and students in the lower ability groups tended to sit the foundation tier. However, the actual number of groups sitting each tier tended to vary among schools. Although some schools stressed that they aimed to keep tiering decisions as fluid as possible to avoid holding students back, for the 'top' and 'bottom' ability groups, decisions tended to be made at a whole class level and were unlikely to change.

School 6, academy converter, modern

Because we set our pupils, we decide which tier. Because we set them, we've already decided if they're in that set they do it. Before we do the exam entries we do consult with each teacher and say "is there anyone that you wish to move to a different tier?" And we base it on the teachers' judgement. But generally, if they're in set 1 to 4 they do higher, if they're in set 5 they do foundation, unless the teacher recommends otherwise.

While tiering decisions were therefore generally quite straightforward for the highest and lowest ability students, for the remaining middle ability students, respondents acknowledged that it was sometimes less obvious which tier would be most appropriate for the student. Tier entry choices in these cases were likely to be made at an individual student level.

Many schools reported that middle ability students tended to be taught the higher syllabus content initially, allowing them the chance to be entered into the higher assessment tier. Some students were later moved onto the foundation syllabus depending on their progress. This approach was adopted to avoid situations where a student might change from the foundation to the higher tier, but did not have enough time to study the additional content.

School 12, academy converter, comprehensive

...there tends to be a borderline group where, as we get close to the exam, I see that actually some of these can and some of these can't... So there will always be one group where there's a split made. But in that case it will be more that the teaching was aimed at the higher and I withdrew some kids to do foundation because they were at risk.

Despite this, it was also apparent that the final tier entry choices for the middle ability students differed amongst schools, even if they were anticipated to achieve the same grade: some schools opted to enter the students to the foundation tier, and others chose the higher tier.

School 3, academy converter, comprehensive

So pupils who we're sort of confident are going to get a C halfway through year 10 we put them in for the higher paper. And then if we're monitoring them and they're not getting that C then we put them in for foundation. But we don't enter pupils – which I think is quite common in other schools – we don't enter our pupils aiming for a C for higher; we only enter pupils who are going to get a C and potentially get a B for higher, at the moment.

School 12, academy converter, comprehensive

We use the past exams to judge where they're at and then we say that anybody who is at a D grade, is getting consistently D grades or higher up on the higher paper, they're going to do the higher paper. Anyone who is borderline getting a D, in truth we will probably enter them for higher as well.

Schools were generally willing to be more flexible about the timing of making the final decisions for the middle ability students, and decisions sometimes involved discussions with the student and their parents/guardians. Respondents reported that sometimes tier entries were changed right up to the day of the examination, but that this was usually only in special circumstances, such as when the student had had an unanticipated period of absence from lessons.

School 1, academy converter, comprehensive

Very flexible...there are circumstances which dictate that students might need to have their tier changed. Particularly those students that ... go on reduced timetables or don't quite make it to the end of year 11...

Student progress was monitored throughout key stage 4 to support tiering decisions. This was considered important in terms of being able to predict students' expected performance at GCSE, and therefore which tier was most appropriate.

School 5, foundation school, comprehensive

... we just kind of track them as they're going through with the current year's GCSE exam papers, seven, eight times during doing key stage 4 course to monitor whereabouts they're at, how comfortable they are with the questions...

Teachers mentioned a number of ways in which they tracked students' progress, such as monitoring their performance on examination-style questions, full mock examinations, diagnostic tests, end-of-chapter tests, termly assessments and graded exercises (from textbooks or websites). More evidence about each student's potential mathematical achievement at GCSE was obtained as students advanced through key stages 3 and 4. This meant that for the majority of students the decision about which assessment tier was most appropriate was considered to be well informed, meaning that teachers felt confident in their choices. These decisions were supported by the use of past examination papers that were available from the exam boards, for which the grade boundaries were known.

School 8, academy converter, comprehensive

... at the moment I think we are supremely confident that when we make a decision on a tier of entry for a student ... we've got the evidence to back that up ... we can talk and justify our actions to the students ... we track them all the way through and even at our key stage 3 we use past paper GCSE questions to assess our kids on particular topics ... and the final decision comes from past exam papers because we know they if they'd have taken their GCSE on that paper, they would have got that grade; those are the grade boundaries, off they go!

Many schools also reported that their students sat a final mock examination in the autumn term of year 11. This mock acted as confirmation of the most appropriate tier of entry for most students, since they had been following the relevant syllabus for

almost two years. The students for which this mock was most useful in determining tier entry was the middle ability group.

Tier entry in reformed qualifications

The majority of the schools reported that there would be changes to the way that they entered their students into the higher and foundation tiers for the reformed GCSE in summer 2017. There were two key changes: entering a larger proportion of students into the foundation tier, and allowing greater flexibility in terms of when decisions were made and in using the information that tier entry decisions were based on.

Each of the schools was asked to report the approximate percentage of students that they were planning to enter for the higher and foundation tiers in summer 2017, as well as how many students they had entered for each tier in previous years (see earlier discussion). Table 2 shows this information reported as a percentage of the school's overall key stage 4 cohort, and includes the changes at foundation tier between the reformed and legacy qualifications. The schools were only able to estimate the percentage of their students that they would enter to each tier in summer 2017 because the interviews were conducted around nine months before final entries were to be made. It is therefore possible that these figures will change nearer the time of the assessments, but they provide an indication of how the split between entry to the higher and foundation tiers might change, relative to the legacy specifications.

Nine of the 12 schools interviewed were able to make predictions about the percentage of students that they would enter into the higher and foundation tiers for the reformed GCSE qualification in summer 2017, and were able to estimate the percentage of students that they typically entered to each tier for the legacy specifications. Eight of these nine schools stated that they were planning to enter a larger proportion of students than previous years into the foundation tier in summer 2017, and one school predicted no change. The latter school was the selective academy converter school, which was, as highlighted earlier, a high achieving school that had not entered any students into the foundation tier for a number of years.

The eight other schools predicted that they would be entering between 9% and 25% more of their key stage 4 cohort into the foundation tier compared to previous years. Two of the three schools that could not make a prediction stated that they were more closely monitoring the progress of students with the expectation that more students may be entered for the foundation tier than in previous years, while the other school did not have a key stage 4 cohort taking the legacy specification and so was unable to make a comparison. These interviews suggest that there could be a larger percentage of students entered into the foundation tier in 2017 than in recent years, although it is difficult to generalise from this small sample that may not be representative of all schools in England.

Table 2: *Pre- and estimated post-reform tier entries (% of key stage 4 cohort)*

	Pre-reform entries		Estimated post-reform entries (2017)		Change (foundation entries), pp
	Higher	Foundation	Higher	Foundation	
School 1	82	18	59	41	+23pp
School 2	69	31	-	-	NA
School 3	74	26	63	37	+11pp
School 4	45	55	35	65	+10pp
School 5	74	26	65	35	+9pp
School 6	81	19	57	43	+24pp
School 7	-	-	80	20	NA
School 8	60	40	50	50	+10pp
School 9	100	0	100	0	0
School 10	67	33	42	58	+25pp
School 11	77	23	57	43	+20pp
School 12	88	12	-	-	NA

pp – percentage points

Despite the intention to enter more students to the foundation tier for the reformed qualifications, teachers were aware of the potential of capping the achievement of students by entering them into the foundation tier and were keen to avoid this. For example, there were concerns that entry approaches for the first cohort of students in summer 2017 might be 'over-cautious'.

School 4, community school, comprehensive

I think because there's the element of you don't know what's going to happen, or you don't know what you're going to see, you will be inclined to stick with, if you're unsure, foundation because we don't know and that is stopping them from achieving higher ... and I think that's a shame that because we don't know we're stopping some kids from achieving more than they could be because we don't want to take that risk.

The teachers in this study reported that they were a lot more hesitant about making tier entry decisions for the reformed GCSE qualifications. Teachers considered that they would have to be more flexible about when they made tier entry choices, as there was less information upon which to base their decisions. Tier entry choices were therefore likely to be made later in the year.

School 1, academy converter, comprehensive

... towards the end of year 10 we will [have been] starting to make final decisions with the legacy. Obviously with the new spec that isn't going to be the case because it's still very fluid, there's only one set of papers out.

Schools would also spend more time considering how information such as prior attainment data and the tracking of progress would inform tier entries. Although this information would still be important, schools perceived that they would use this information in a more flexible way.

School 1, academy converter, comprehensive

I think we'll use very similar processes because they are effective, but I think at the moment we might be in a situation where we put more in foundation and then move up to higher, whereas currently more stay on higher and then if we think that they're not accessing it or being successful we'd go to foundation, so I think it might spin the other way in the first instance.

Some of the sources of evidence that teachers relied upon when making tier entry choices for students on the legacy GCSE were considered to be less useful in informing decisions about tier entry in the reformed qualifications. While prior attainment and continual monitoring of progress could help to place students into a rank order, teachers believed that predictions about actual grades could not be made, making decisions about which tier to enter more difficult.

School 2, academy converter, comprehensive

... we will use some old GCSE well ahead of time just to ... test the content, it will do something for them ... but it's not going to be a very satisfactory process, because every time you're marking a paper, you're handing it back to kids who, they're going "what grade is this, Miss?" you're going "I don't know, I'll give you my best guess ... here's your percentage and here's what you can't do and that's that.

A number of the schools were disappointed that there was not more guidance on the likely position of grade boundaries on the reformed qualifications, but they also understood that this level of information was not possible to provide before the first awards. In contrast, others felt that this information had been intentionally withheld.

School 8, academy converter, comprehensive

Because I know we've got all the [sample papers] and we say to [the exam board] "right, well if they scored 60% in that, what is that grade?" And they're refusing, they said they can't give us it. They said things would be coming from Ofqual, well, or from the government.

There was also a belief amongst the schools that the resources that they had access to, such as specimen assessment materials, might not be a fully accurate portrayal of the examination that the students would actually sit in summer 2017.

School 3, academy converter, comprehensive

... it's really difficult, because I think obviously the specimen papers have sort of been drip fed and then they've ... sort of been altered throughout as well. ... historically the specimen papers haven't been a really good indication of what the papers are going to end up being like so that causes a little bit of fear.

Despite the uncertainty, schools were investing considerable thought and time into deciding on their tier entry approaches to ensure that students were entered into the most appropriate tier in summer 2017. Schools had been considering the issues for a long time, and reported that they would continue to do so until the final decisions about tier entry needed to be made.

School 1, academy converter, comprehensive

I lead the heads of maths across the city, so it's been on our agenda quite regularly and we've been feeding back and sharing what each school is doing in terms of what they're doing for their mock exams, what they're doing for grading students, what they're doing in terms of data to parents, what they're doing for internal tracking, and that's been really useful. And that will continue next year as we progress.

Perceived approaches to tier entry beyond summer 2017

Schools were also asked whether they foresaw their approaches to tier entry changing after the first cohort in summer 2017. The majority of respondents said that they intended to wait and see how things went in 2017, but that they were likely to continue to be more flexible about when and how they made their decisions. Schools noted that they expected there to be changes to their approaches as a result of the additional information that they would have after summer 2017, such as the demand

of the live papers and the grade boundaries, and the way in which certain groups of students performed.

School 6, academy converter, modern

Yeah, very flexible really. We're going to change each year according to what the results are, what the grade boundaries are. We have talked about starting to teach the course in year 9, rather than just 10 and 11, so extend it to a three-year course. But for the moment we're just going to get the current year 10s through and see what happens with them really, and then we'll make more plans based on that.

Schools suggested that there may be a shift in tier entries as the reformed qualification becomes more familiar to students and teachers, with the possibility of more students being entered into the higher tier.

School 4, community school, comprehensive

If we look longer term though, with the basis that we've worked with key stage 3, I would be optimistic that that would change. By ... three years' time the cohort should be stronger in their maths. They should be able to put a higher percentage into the higher paper because they've had that background of doing problem solving every lesson because it's been more integrated to them about that sort of working.

Schools also mentioned that their decisions about tier entry in the future might be influenced by government decisions and others' views about the relative importance of grades 4 and 5⁸. As such, the importance attached to these thresholds, and how this evolves over time, was thought by the schools to potentially affect decisions about tier entry for students.

School 8, academy converter, comprehensive

... if the government decide that the grade 5 is the tipping point from the point of view of a good pass then that will, that will be our benchmark and I mean we do think what is a child's best chance of getting a C and we tier them accordingly. And so if the benchmark fluctuates between the 4 and a 5 that will be another factor in our decision of tier of entry will be what the whole school is being judged on.

⁸ It is noted that grades 4 and 5 are available on both tiers.

Other actions being taken to prepare for the reformed mathematics qualifications

The final discussions related to other changes that schools were making in response to the introduction of the reformed mathematics qualifications. Each of the schools was asked whether they intended to allocate any extra resources to the reformed mathematics GCSE. Eight schools reported increasing their teaching time each week⁹, citing the changes to the qualifications, including the additional content and the double counting of mathematics grades in the calculation of Progress 8 (Department for Education, 2014), as reasons.

School 5, foundation school, comprehensive

As a school, we've also moved now that year 9, 10 and 11 have got eight hours of maths over a fortnight, whereas previously they only had seven.

Respondents also reported that they were rewriting schemes of work, for both key stage 3 and 4. They considered this important, not only to include the extra content of the qualification, but also to reflect the shift of focus towards more independent problem-solving skills. Therefore, changes to the key stage 3 schemes of work, and the way in which these fed into the key stage 4 schemes of work, were considered to be key. This was an ongoing process for some schools, which had already started, and would continue to be rolled-out over coming years.

School 4, community school, comprehensive

... we've already changed our syllabus and we're a second year through down in lower school so that we're making sure that we do problem solving questions and more wordy type questions with our current year 7s who are now in year 8. ... our students as they move through the school will be so much more ready to adapt to the problem solving type and multi-layer questions that we're anticipating.

Other ways in which the schools were adapting to the reformed GCSE included commissioning mathematics experts to help create resources and train staff on some of the additional higher tier topics that they had not previously taught. They also mentioned that they had purchased new textbooks that were written specifically for the reformed qualification, had held additional meetings and INSETs¹⁰ focused on

⁹ One school did not previously have a key stage 4 cohort so could not make comparisons, and the other schools reported making no changes to their teaching time or had done so prior to the introduction of the reformed qualifications.

¹⁰ IN Service Training days

how to teach the new content, and had started to set up intervention sessions for struggling students at earlier points in the academic year.

Summary

This research aimed to consider the extent to which schools were reconsidering their tier entry choices in light of the changes to the reformed GCSE mathematics qualifications. The findings provide an indication of the way that tier entries could change for the reformed qualifications.

The main finding suggests that schools are carefully considering their tier entry choices ahead of summer 2017 in light of the changes to the qualifications. Schools were generally intending to enter a higher proportion of students into the foundation tier for the reformed qualifications compared to the legacy qualifications. This was primarily due to changes in the content and challenge of the qualifications. It was thought that the increased challenge of the foundation tier of the reformed qualifications would make this tier suitable for a wider range of students of different abilities. It was also thought that the increased demand of the higher tier in the reformed qualifications would make this tier too challenging for some students who would have previously been entered in the legacy specification.

The approaches to tier entry were primarily based on students' prior attainment and their expected performance at GCSE, a finding that is consistent with previous research (see Dunne, Humphreys, & Sebba, 2007; Wilson & Gill, 2014). However, in the context of reform, teachers were less certain about their decisions due to the changes to the qualifications. Respondents thought that their tier entry choices might change as the reformed qualifications become more established and more information is available (for example, past papers and grade boundaries), such that more students might be entered into the higher tier in future years.

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Appendix A – interview schedule

THEME	PROMPTS
<p>General questions about the changes to maths GCSE/tiering approaches</p>	<ul style="list-style-type: none"> • At present, how do you decide which tier students should be entered for? • Are you anticipating any changes to the way in which these decisions will be made for the reformed GCSE? • What do you think are the biggest differences between the legacy and reformed specifications (also specifically in terms of the tiering of foundation and higher)? • How different do you expect the examination papers will be? • Do you expect the proportions of students that you enter into each tier to change? • Do you consider the reformed maths GCSE specifications to be of a 'higher standard'? In what ways?
<p>How are decisions being made about what changes to make?</p>	<ul style="list-style-type: none"> • How do you currently make your decisions about which tier to enter a student? Such as key stage 2 data, mock exams... • In what way do you track students through the school? • How might this change for the reformed GCSE? • What information have you used to guide the decisions that you have made? <ul style="list-style-type: none"> ○ Exam board websites ○ Ofqual website ○ Preparing to teach courses ○ Reformed specification contents ○ Structure of units ○ Any other information (please state) ○ What weight have you given to each? ○ Mock exams? • What other information would be useful in order to inform your decisions about tiering? • Who does/will make the decisions about tier entry? • Will these decisions be more or less flexible than they were? • What time of year do they happen? Will this change? • Are the decisions made for whole classes, or individuals? Will this change?

<p>In what ways will your teaching of GCSE maths change?</p>	<ul style="list-style-type: none"> • To what extent have you and will you be teaching foundation and higher students in mixed classes? • Have you/will you be allocating a different timetable and/or revision schedule for the reformed GCSE? • Have you/will you dedicate reformed resources to teaching the reformed specifications at either tier? • Have you/will you arrange staff training for teaching the reformed specifications at either tier? • Have you/ will you make changes prior to key stage 4?
<p>The future of your approach to maths GCSE tiering</p>	<ul style="list-style-type: none"> • Do you see your approaches developing and changing over the next few years? • In what ways? • In what ways will you continue to use the information that you mentioned earlier (for example, exam board websites or whatever they have mentioned) to inform the decisions that you make? • How flexible is your plan for the future?

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