CAMBRIDGE ASSESSMENT

Entry for tiers in Science and Mathematics GCSEs: teachers' views.

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Executive Summary

Tiering aims to provide assessments which are tailored to students' ability levels, so that they do not spend excessive time answering questions which are too easy, or face too many questions which are not accessible.

Currently, GCSEs in Science and Mathematics use a two tiered model, with a higher tier which targets grades A*-D(E), and a foundation tier which targets grades C-G.

For tiering to be successful, students must be entered for the tier which allows them to perform to the best of their ability. However, previous research has indicated that students are not always entered for the most appropriate tier.

This study had two main aims:

- To explore current practices relating to tier entry in GCSE Mathematics and Science, by investigating the link between tier entry and ability grouping, and exploring the factors which affect how students are entered for tiers.
- To examine the possible impact of planned reforms to GCSE Mathematics and Science on the way that students will be entered for tiers.

Methodology

Two online questionnaires were designed and piloted; one was sent to Science teachers, and the other to Mathematics teachers. The questionnaires contained some questions which were common to both subjects, and some subject specific questions. Responses were received from 171 Mathematics teachers, and 178 Science teachers.

Results

Setting by ability frequently occurs early in a student's secondary school career, particularly in Mathematics. These ability sets are linked to tier entry, and to a greater extent in Mathematics compared to Science. This is likely to be due to the fact that there are greater differences in content between foundation and higher tier in Mathematics compared to Science.

Science teachers thought that it was possible to make final tier entry decisions later than Mathematics teachers. However, very few students seem to move between tiers during their GCSE course in either subject.

Department policy and the judgement of the individual teacher provided the most important input into tier entry decisions, though it was common for both students and their parents to be involved in the decision.

The factors most likely to be considered important in deciding tier entry were student prior or current attainment, predicted attainment, and the ability to cope with written examinations.

Other factors thought to be important included the student's aspirations and opinion. The pressure to "ensure" a grade C, the perceived relative difficulty of grade C on each tier, and the recent performance of previous borderline candidates were also considered to be important or very important by about 70% of respondents.

For Science teachers, a student's literacy level was considered to be important, though this was not the case in Mathematics.

Independent/selective schools were more likely to enter students for the higher tier than comprehensive schools, even at relatively low levels of expected attainment.

For Mathematics, many colleges reported that they entered all students for the foundation tier, unless individual students specifically needed a grade B or better.

Some teachers indicated that they thought that it was easier to achieve a grade C on the higher tier because the higher tier grade boundaries were so low. However, other teachers indicated that the pressure to achieve a grade C for accountability measures made them more likely to enter students for the foundation tier.

Overall, teachers felt that the move to linear assessment, and changes to accountability measures for schools will have relatively little impact on tier entry decisions.

Both Science and Mathematics teachers indicated that increasing the maximum grade available on the foundation tier would lead to fewer students being entered for the higher tier. The opposite was the case if the maximum grade on the foundation tier were reduced.

Implications

- In Science, students may be taught in ability sets which enter students for a mixture of tiers, so teaching resources should allow for differentiation across tiers. In Mathematics there is a stronger link between ability setting and tiers, and more separate content across tiers, so resources which allow differentiation across tiers may be less useful.

- Teachers use performance on past GCSE papers to inform tier entry decisions. Provision of high quality tests, such as the Stage tests produced for OCR GCSE Mathematics J567, by awarding bodies will help teachers to make appropriate decisions. This is particularly important given the introduction of a modified tiering model and more demanding examination papers.

- Low grade boundaries on the higher tier can encourage teachers to enter students for the higher tier who might be better suited for the foundation tier. If more demanding higher tier papers lead to lower grade boundaries, then this problem may be exacerbated.

- The tiering model will be reformed, so that the highest grade available on the foundation tier (grade 5) will represent a higher standard of performance than the current grade C. This is likely to lead to more students being entered for the foundation tier.

- Changes to accountability measures (introduction of Progress 8) are unlikely to have a large impact on tier entry decisions, though a small proportion of teachers may enter more students for the higher tier.

- The move to 100% terminal assessment is likely to have a small impact on tier entry decisions, with a slight increase in the number of students entered for the foundation tier.

- Different types of institution weight factors differently when making tier entry decisions. In independent/selective schools, this may lead to some students being entered for the higher tier when the foundation tier would be more appropriate. Despite the recent focus on capping of achievement, it is also important to consider students who are inappropriately entered for the higher tier.

1 Introduction

The GCSE (General Certificate of Secondary Education) was intended to provide a single qualification which could meet the needs of students with a wide range of abilities. Assessments were designed to allow students to demonstrate positive achievement and allow them to perform to the best of their ability (Bishop, Bullock, Martin, & Thompson, 1999). In some subjects it was possible to use a single assessment, accessible to all students, and which allowed differentiation in terms of the student response to the assessment task (differentiation by outcome). In many other subjects, however, assessments targeting different grades were used (Wilson & Dhawan, 2013), requiring teachers to choose which assessments were most suitable for each student. The use of assessments targeted at different abilities aimed to improve students' experience of assessment, by ensuring that they did not spend time answering questions that were either too easy or too difficult for their ability level. In the early years of the GCSE, several different models of differentiated assessment were used; over time these have become harmonised so that all GCSE subjects which use tiering now use the same two tiered model[1]. This model allows teachers and students to choose between a higher tier paper targeting grades A*-D(E), and a foundation tier paper targeting grades C-G, so that the tiers overlap at grades C and D. The higher tier offers an allowed grade E for candidates who narrowly miss the grade D. Candidates entered for the foundation tier can at best obtain a grade C, regardless of how well they perform in the assessment.

Criticism of the tiering model used at GCSE has typically focused on two areas. Firstly, the overlap between tiers means that there are two routes to some grades, leading to comparability issues (Dhawan, 2012; Dhawan & Wilson, 2013; Wheadon & Béguin, 2010) at these grades. For example, it is not clear whether a good performance on a less demanding assessment of a restricted set of content is comparable to a weaker performance on a more demanding assessment of more content. Secondly, the success of the model is dependent on teachers' ability to select the appropriate tier for their students. The grade C is considered to be the minimum grade for a "good pass" for students, and is an important threshold grade in school accountability measures (Acquah, 2013). If students are entered for the higher tier, they have the opportunity to achieve the highest grades, but risk achieving no grade at all if their performance is not sufficient for one of the grades available on the higher tier. If students are entered for the foundation tier, they may benefit from the confidence derived from sitting a less demanding paper, and still be able to achieve the key threshold grade C, but not a higher grade which would allow progression in that subject. Teachers must therefore balance the relative advantages and disadvantages of each tier when deciding which tier is most suitable for each student. This decision may be made more complex since in some subjects, such as Science and Mathematics (Ofqual, 2011a, 2011b, 2011c), additional content is assessed on the higher tier, entailing that decisions on tier entry must be made sufficiently early to ensure that students entered for the higher tier have been taught sufficient higher tier content.

Research on students' entry for tiers presents a mixed picture on teachers' ability to enter students appropriately for tiers. Wilson and Dhawan (2013) found little evidence that students who were entered for the foundation tier in unitised GCSEs had their achievement capped, while Benton (2013) concluded that entry for foundation or higher tier had little impact on student aspirations once other biographical factors were taken into account. However, gender, ethnicity and socio-economic status have been found to affect the likelihood that a student is entered for the foundation tier, even when prior attainment has been taken into account (Elwood, 2005; Elwood & Murphy, 2002; Gillborn, 2010; Strand,

[1] In 1998 the majority of tiered subjects were required to use the same two tiered model. Mathematics retained a three tiered model until 2006, after which it moved to the same two tiered model as other subjects.

2012; Wilson & Dhawan, 2013). Furthermore, Wilson and Dhawan (Ibid) found that linear assessments were more likely to lead to capping of achievement.

In response to concerns that some students' achievement and aspirations may be capped by entry to the foundation tier, there are currently plans to reform tiering at GCSE by removing it from most GCSE subjects. However, it will be retained in Mathematics and the Sciences[2], because it is not considered possible to use one question paper to target all grades in these subjects, since the most demanding questions would be inaccessible to the least able students. Reforms to tiering at GCSE will interact with changes to the grading system. Currently eight grades (A*-G) are used at GCSE. Reformed GCSEs will use nine grades (1-9, with 9 as the highest grade). The new foundation tier will span grades 1-5, and the higher tier grades 4-9, so that the overlap is at grades 4 and 5 (Ofqual, 2013c). Furthermore, at least for the first year of awarding, the standard of the bottom of the new grade 4 will be tied to the bottom of the current grade C, with grade 5 roughly the same standard as a high grade C and a low grade B. Furthermore, changes to the accountability measures used to assess school performance will reduce the focus on the grade C, or its replacement, and instead measure students' progress from Key Stage 2 in their best eight GCSE subjects (Department for Education, 2013).

There has been relatively little recent research investigating how teachers make decisions about tier entry since the studies conducted by Gillborn and Youdell (2000) and Baird et al. (2001). These were both conducted during, or soon after, changes to tiering arrangements in many subjects, and before the more recent (2006) move to a two tiered model for Mathematics. Furthermore, it seems plausible that the planned reforms to GCSE will have an impact on the way in which factors such as student achievement and aspiration interact with other contextual factors, such as school accountability measures. This study investigated how GCSE Science and Mathematics teachers currently decide how and when teachers make decisions about entry for tiers, and explored how the proposed reforms to GCSEs may affect the proportion of students entered for each tier.

This report is structured as follows. In Section 2 we present a brief literature review examining the factors which affect how students are entered for tiers. In Section 3 we discuss the methodology used. We then present the results for Science (Section 4) and Mathematics (Section 5) separately, followed by a comparison of the findings across subjects (Section 6). We then discuss these findings, and the implications for the reformed GCSEs.

[2] It is probable that tiering will also be retained in modern foreign languages and classical languages.

2 Background

2.1 Tiering in Mathematics and Science

When GCSEs were first introduced, a wide range of differentiation strategies were used for GCSE assessments (Long, 1990), resulting in different assessment structures both between subjects and across awarding bodies for the same subjects. For GCSE assessments from 1994 more specific guidelines were introduced, leading to a more widespread use of tiering (School Examinations and Assessment Council, 1992). However, there was still some scope for flexibility. In Mathematics and Science GCSEs there had to be at least three tiers, and each tier had to span between two and four National Curriculum levels, but the precise position and overlap of each tier was not specified. In 1998, a further reform of differentiated assessment at GCSE harmonised tiering arrangements further, such that most of the subjects which used differentiated assessment, including Science, moved towards the current two tiered model (Table 1).

Table 1: Tiering design specified for GCSEs in Science and Mathematics.

Grade	Science (from 1998) and Mathematics (from 2006)			Mathematics (1998-2006)		
	F	H		F	I	H
A*						
A						
B						
C						
D						
E						
F						
G						

Mathematics retained a three tiered model until 2006 (Table 1), because it was considered that certain topics would not be accessible to less able students, so that more differentiation was necessary than in other subjects. The intermediate tier did not assess some of the more demanding topics in algebra and geometry which were considered necessary for progression to A level. This led to difficulties with respect to the interpretation of the grade B: while a grade B from either intermediate or the higher tier should have been considered equivalent, in practice many schools required students to have obtained a grade B or above on the higher tier to allow progression to A level Mathematics. Furthermore, the foundation tier was considered to be demotivating for students, because they were not able to achieve a grade C (Smith, 2004). As a result of these concerns, GCSE Mathematics moved to the two tiered model used in other subjects, after a pilot study which considered a two tiered approach and an adjacent levels model (Bramley, 2014; Stobart, Bibby, Goldstein, Schagen, & Treadaway, 2005).

Both Science and Mathematics assess a restricted subset of content at foundation tier. For Mathematics, this is specified by Ofqual (Ofqual, 2011b). For Science, this is not the case, but there is a broad consensus among awarding bodies with respect to the content which should not be assessed at foundation tier (AQA, 2011; Edexcel, 2011; OCR, 2009a, 2009b; WJEC, 2009). However, Ofqual does specify different Mathematics requirements for GCSEs in Science across tiers (Ofqual, 2011a). The way in which content is distributed across tiers has implications for teaching arrangements, and may have an impact on the timing of decisions relating to tier entry. If there are large differences in content between

tiers, then it may be necessary to make decisions early in the course to ensure that students have studied the higher tier content.

2.2 Entry for tiers[3]

Tiering aims to provide assessments which are tailored to students' ability levels, so that they do not spend excessive time answering questions which are too easy, or face questions which are too demanding and not accessible. However, for tiering to be successful, students must be entered for the tier which allows them to perform to the best of their ability. In an early study on differentiated assessment, Good and Cresswell (1988) investigated whether teachers were able to enter students for the appropriate assessment, and found evidence to suggest that teachers were able to predict student performance with a reasonable level of accuracy. However, this study did not investigate entry decisions for the model of tiering currently used, nor were teachers in the study subject to the accountability measures which are currently used. In this section we review the literature relating to how decisions about entry for tiers are made, and whether particular groups of students are potentially disadvantaged by these decisions.

In preparation for the move to a standardised two tier model (except for Mathematics) in 1996, the School Curriculum and Assessment Authority (SCAA) published guidelines to help teachers enter students for the appropriate tier (SCAA, 1996). The guidelines suggested that students who were expected to achieve a grade C or above should normally be entered for the higher tier, but acknowledged that some students might find the style or presentation of the higher tier examinations challenging, and recommended the foundation tier for these students. The foundation tier was recommended for students who were anticipated to obtain grade D or below. However, in a case study of two schools, Gillborn and Youdell (2000) found that English teachers were encouraged by their schools to enter only students who they thought would achieve a grade B or above for the higher tier to reduce the risk that students would miss the grade C, or be ungraded. Furthermore, only students who were considered to have both high levels of ability and motivation were entered for the higher tier. Under this system, it seems likely that some students who might have been able to achieve a grade B or above would have had their achievement capped at grade C, satisfying school accountability measures, but limiting those students' opportunities to progress to further education in that subject. Similarly, for Mathematics[4], Gillborn and Youdell (ibid.) found that while SCAA guidance suggested that candidates who were predicted to achieve a grade B or above should be entered for the higher tier, in practice only those students whom teachers were confident would obtain a grade A or A* were entered for the higher tier. For both English and Mathematics, the perception that a grade obtained on a lower tier would be easier to achieve contributed to the idea that entering students for a lower tier would increase students' chances of achieving their target grade. More recently, Wilson (2013) investigated the relationship between forecast grades and entry for tiers in GCSE Core Science (J630) and GCSE Mathematics (J562 and J567) in 2012. For Core Science, approximately half of candidates forecast a grade C were entered for the higher tier. In Mathematics, in contrast, only about a fifth (J567) and a third (J562) of candidates forecast a grade C were entered for the higher tier. However, it is not clear to what extent the forecast grades represented a true prediction of student performance. Overall, forecast grades tended to be optimistic; this suggests that it is possible that candidates were forecast grades which represented the maximum which teachers felt that they were capable of achieving.

[3] This section was adapted from Section 3.4 of Wilson and Dhawan (2013), and updated to include more recent studies.

[4] At the time, Mathematics used a three tier system with tiers targeted at A*-C, B-E and D-G.

In a linear GCSE course, students are only formally entered for a particular tier in February for a June examination series[5]. The SCAA School Curriculum and Assessment Authority (1996) guidance on tier entry stated that teachers should be fully aware of students' abilities by that stage in the GCSE course, allowing teachers to make appropriate entries for their students. However, for subjects which have additional content specified for the higher tier, it may be necessary to decide whether students should follow the foundation or higher tier curriculum much earlier. Gillborn and Youdell (2000) and Baird et al. (2001) found that in practice, tier of entry was often linked to setting practices within schools, with students often put into ability sets in year 9 or below. Furthermore, movement between ability sets was rare; where it did occur, it typically involved movement from a higher ability set to a lower ability set. Movement to a higher ability set was considered difficult, because a student from a lower ability set would not have studied the same curriculum as students in a higher set. More recently, Dunne et al. (2007) found that in some schools, and in some subjects (e.g. Mathematics), students are put into sets as early as year 7, and by the beginning of year 10, setting is common in English, Mathematics and Science, driven in part by the need to study different curricula for different tiers at GCSE. In some schools, initial decisions about the tier of entry for students at GCSE were made in year 10. Compared to a linear specification, in a unitised specification, initial entry decisions for units need to be made much earlier in the course, because units may be taken in January of year 10. However, because students can typically take units from a mixture of tiers, and have the opportunity to re-sit units, entry decisions are much lower risk in unitised specifications.

In a questionnaire study, Baird et al. (2001) found that Mathematics and Science teachers based their decisions on tier of entry on a combination of academic and behavioural factors. Gillborn and Youdell (2000) reported that teachers might enter some students for the foundation tier if they felt that they would benefit from starting an examination paper with the easier questions on this tier, which would increase their confidence, rather than starting with more challenging questions on the higher tier. However, both of these arguments rely on the fact that easier questions occur towards the beginning of the paper, which is not always the case (Dhawan & Wilson, 2013). Dunne et al. (2007) note that while teachers report using prior attainment to allocate students to sets, behavioural and personality factors (e.g. confidence) as well as practical timetabling constraints also affect setting. Students of lower socio-economic status were also found to be more likely to be allocated to lower sets. If students are placed in lower sets for reasons which do not reflect their ability, or potential ability, and are then limited to the foundation tier, then it is possible that their achievement may be capped. However, Dunne et al. also report that teachers make decisions on set placement to maximise students' achievements; it is possible, for example, that a student may perform better in a lower set due to differences in pedagogy and the support which is available in that set.

Critics of tiering argue that it may disadvantage some groups of students. Gillborn and Youdell (2000) found that black students and those on free school meals were less likely to be entered for the higher tier than others. However, Gillborn and Youdell (ibid.) did not take prior achievement into account; it is possible that these groups may have lower prior achievement due to disadvantages earlier in their education. Strand (2012) found that even when prior attainment and socioeconomic status were taken into account, Black-Caribbean students were more likely to be entered for lower tiers for Science and Mathematics KS3 examinations taken at age 14. For OCR GCSEs in Core and Additional Science, and Mathematics (in June 2012), Wilson and Dhawan (2013) found that once prior attainment was taken into account, students from more deprived backgrounds were more likely to be entered for the foundation tier. Furthermore, this effect was stronger for linear specifications than unitised specifications, perhaps indicating that the higher stakes associated with

[5] We use the term *series* rather than *session* to reflect current usage.

entering students for 100% of the qualification at one time led to an increase in the number of students entered for the foundation tier.

Gillborn and Youdell (2000) also investigated entry for tiers by gender in Mathematics. They found that girls were overrepresented in the intermediate tier compared to boys, but the reverse was true of the foundation tier. However, there was little difference between genders for the higher tier. Elwood and Murphy (2002), citing Stobart, Elwood, and Quinlan (1992) report a similar finding, and note that boys entered for the foundation tier (which allowed a maximum grade D at the time) were more disaffected than girls entered for the foundation tier. However, it is not clear whether boys were more likely to have been entered for the foundation tier because they were already less motivated than girls. Unlike Gillborn and Youdell (2000), Elwood and Murphy (ibid.) found that more boys were entered for the higher tier than girls, which they suggest was caused by the fact that girls were considered to become anxious in high ability sets, due to the pace and pressure to achieve the correct answer. As a result, girls were more likely to be entered for the intermediate tier. Wilson and Dhawan (2013) investigated the effect of gender on entry for tiers in GCSE Mathematics under the two tiered model; overall girls were less likely to be entered for the foundation tier than boys, once prior attainment was controlled for. This suggests that the move to a two tiered model might have been beneficial for higher achieving girls, because girls who previously would have been entered for the intermediate tier would now be entered for the higher tier, and thus had access to the highest grades. However, while the increase in the grades available on the foundation tier (up to grade C) may have had benefits for students who would previously have been entered for the foundation tier, and been restricted to a maximum grade D, some students may now be entered for the foundation tier who would previously had been entered for the intermediate tier, which allowed a maximum grade B.

To summarise, it seems plausible that gender, ethnicity and socioeconomic status may influence entry into different tiers, even when prior attainment has been controlled for. However, it is not clear what the relative effect of these factors is, nor their importance in current models of GCSE tiering.

2.3 Aims

This study had two main aims. Firstly, it aimed to explore current practices relating to tier entry in GCSE Mathematics and Science, by investigating the link between tier entry and ability grouping, and exploring the factors which affect how students are entered for tiers. Secondly, the study examined the possible impact of planned reforms to GCSE Mathematics and Science on the way that students will be entered for tiers.

3 Method

Two questionnaires were developed, one for Mathematics teachers, and one targeted at Science teachers. A list of topics was developed in consultation with the GCSE subject reform teams in Mathematics and Science. Some of these topics were common to both subjects, while others were subject specific. Questionnaire items were drafted by the researchers. Where topics were common across subjects, identical, or parallel (asking about the same issue, but with subject specific variation) items were used, to allow the findings to be compared across subjects. The draft questionnaires were reviewed by both the subject teams and other researchers within ARD. The questionnaires were piloted with two Science teachers, and three Mathematics teachers, and modified to take their suggestions into account.

Both questionnaires took approximately 15 minutes to complete, and were completed online.

3.1 Recruitment and Participants

Participants were recruited from among 3,201 institutions offering OCR qualifications in Science, and 1,857 institutions offering OCR qualifications in Mathematics.

The questionnaires were also publicised in other venues. The Science questionnaire was advertised in *Science Spotlight* (OCR, 2014), a termly newsletter sent to institutions offering OCR qualifications in Science. Both questionnaires were advertised on the OCR Science and Mathematics Twitter feeds, the OCR Facebook page, an OCR social networking site for assessors (who are frequently practising teachers), and the OCR website. Due to the sampling approach taken, it was not possible to determine exact response rates for either questionnaire. Participants were offered the opportunity to enter a prize draw to win a £50 Amazon voucher. It is possible that some respondents were not Science or Mathematics teachers; however, given the low reward for participation, and the subject matter of the questionnaire, it was considered unlikely that people outwith the target group would respond to the questionnaire.

171 respondents completed the Mathematics questionnaire, and 178 completed the Science questionnaire.

3.2 Analysis

A simple descriptive analysis was undertaken for each questionnaire item, with counts and percentages of schools giving each response. Then, for most of the items a further analysis was undertaken by school type. It was hypothesised that different types of institution, operating in different educational contexts, might behave differently with respect to entry for tiers. For this purpose, schools were grouped into three categories based on their response to the second item in the questionnaire (*What type of school/college do you teach in?*). The categories are described in Table 2. For Science, results for comprehensives and independent/selective schools are shown. For Mathematics, although the number of teachers responding from colleges was small, these results are included, because it is planned that students who do not achieve a grade C or higher at GCSE will have to continue the subject until age 18, or they achieve a grade C (or equivalent). As such, it is likely that the number of students studying mathematics in FE colleges and sixth form colleges will increase in future.

Table 2: Percentage of respondents in each type of institution

Category	Institution types	Number of institutions (Mathematics)	Number of Institutions (Science)
Comprehensive	Comprehensive, secondary modern, academy[6]	97 (56.7%)	107 (60.1%)
Independent/Selective	Secondary selective, independent	48 (28.1%)	43 (24.2%)
FE Institution	FE college, sixth form college	15 (8.8%)	16 (9.0%)

[6] 'Academy school' was not one of the available responses to this item, but several schools that responded 'Other' then described their school as an academy. Since academies are usually former comprehensives it was decided to include them in this category.

4 Science Results

4.1 Participants

Just over half of the respondents taught in comprehensive schools (55.6%), with 17.4% in independent schools and just under 7% in selective schools. Around 9% taught in colleges, either FE or sixth form (Fig. S1, Table S1). The most common courses taught were GCSEs in Core Science, Additional Science, Biology, Chemistry and Physics (between 75% and 80% of schools). A levels in Biology, Chemistry and Physics were also very popular (taught in 70-75% of schools) (Fig. S2). The new GCSE in further Additional Science was taught in 18% of schools.

4.1.1 What type of school/college do you teach in?

Over half of participants taught in comprehensive schools, with independent schools as the second largest group of respondents.

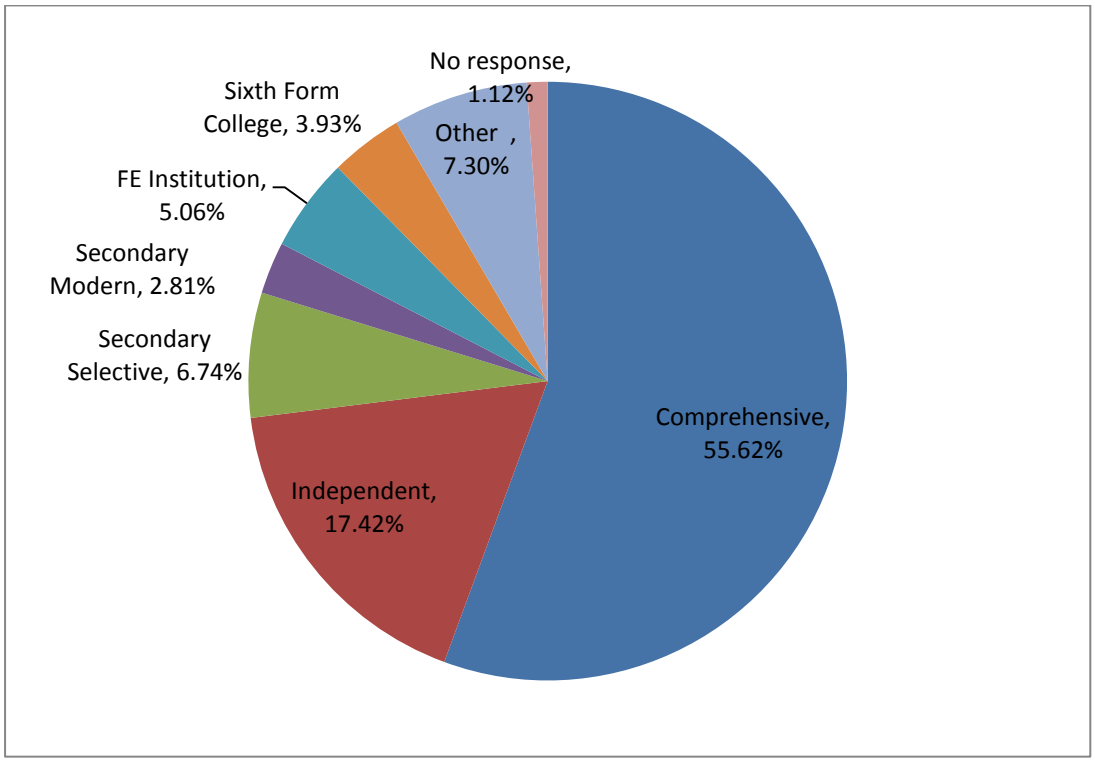


Figure S1: Type of institution.

Table S1: Type of institution.

Institution type	Percentage	n
Comprehensive	55.6%	99
Independent	17.4%	31
Secondary Selective	6.7%	12
Secondary Modern	2.8%	5
FE Institution	5.1%	9
Sixth Form College	3.9%	7
Other	7.3%	13
No response	1.1%	2

4.1.2 Which Science courses are taught in your school/college?

Respondents indicated that a wide range of GCSE and A level science courses were taught in their institutions (Fig. S2, Table S2).

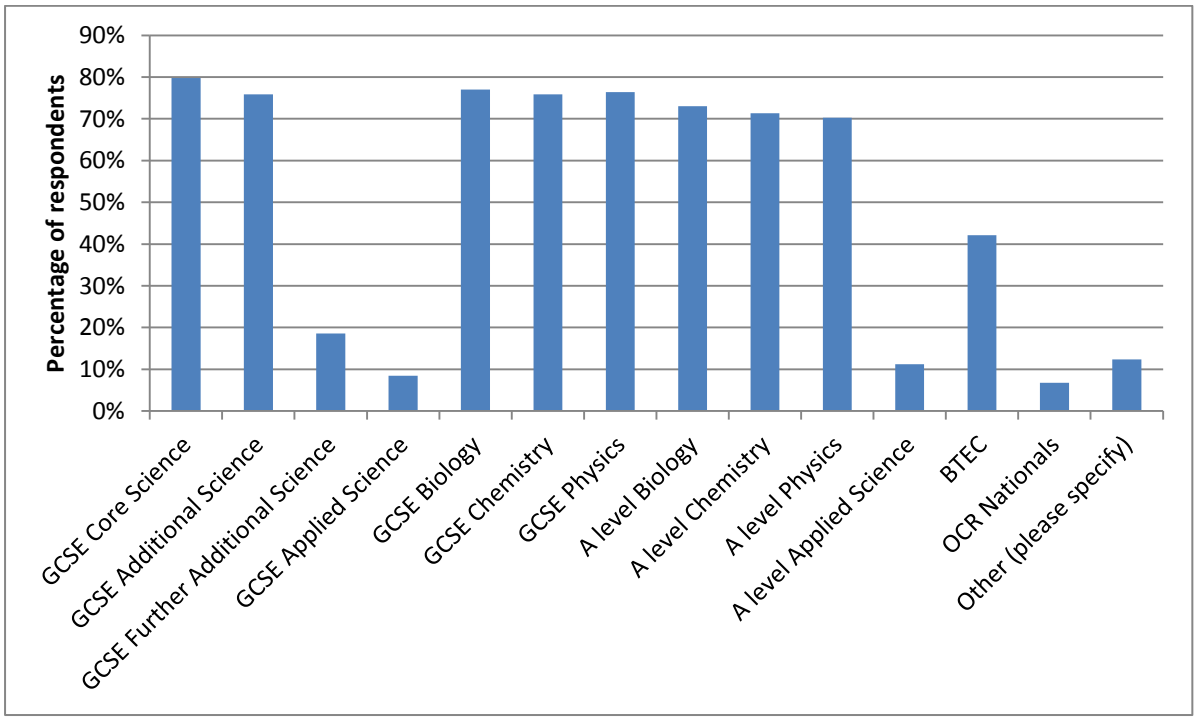


Figure S2: Science courses taught in respondents' school/colleges.

Table S2: Science courses taught in respondents' schools/colleges.

Course	Percentage	n
GCSE Core Science	79.8%	142
GCSE Additional Science	75.8%	135
GCSE Further Additional Science	18.5%	33
GCSE Applied Science	8.4%	15
GCSE Biology	77.0%	137
GCSE Chemistry	75.8%	135
GCSE Physics	76.4%	136
A level Biology	73.0%	130
A level Chemistry	71.4%	127
A level Physics	70.2%	125
A level Applied Science	11.2%	20
BTEC	42.1%	75
OCR Nationals	6.7%	12
Other	12.4%	22

4.1.3 Approximately what percentage of students does your school/college currently enter for the higher tier in each of GCSE combined Science and GCSE separate Sciences?

In terms of the percentage of students entered for higher tier (Fig. S3) there was a wide range of responses for Core and Additional Sciences, from <10% to all students. The modal group was 70-79% for Core Science and 60-69% for Additional Science. However, very few schools entered fewer than 80% of separate Science students for the higher tier, with 29% entering all students and 20% entering 90-99%. For each of the subjects, independent and selective schools tended to enter higher percentages for the higher tier (Figs. S4-S6).

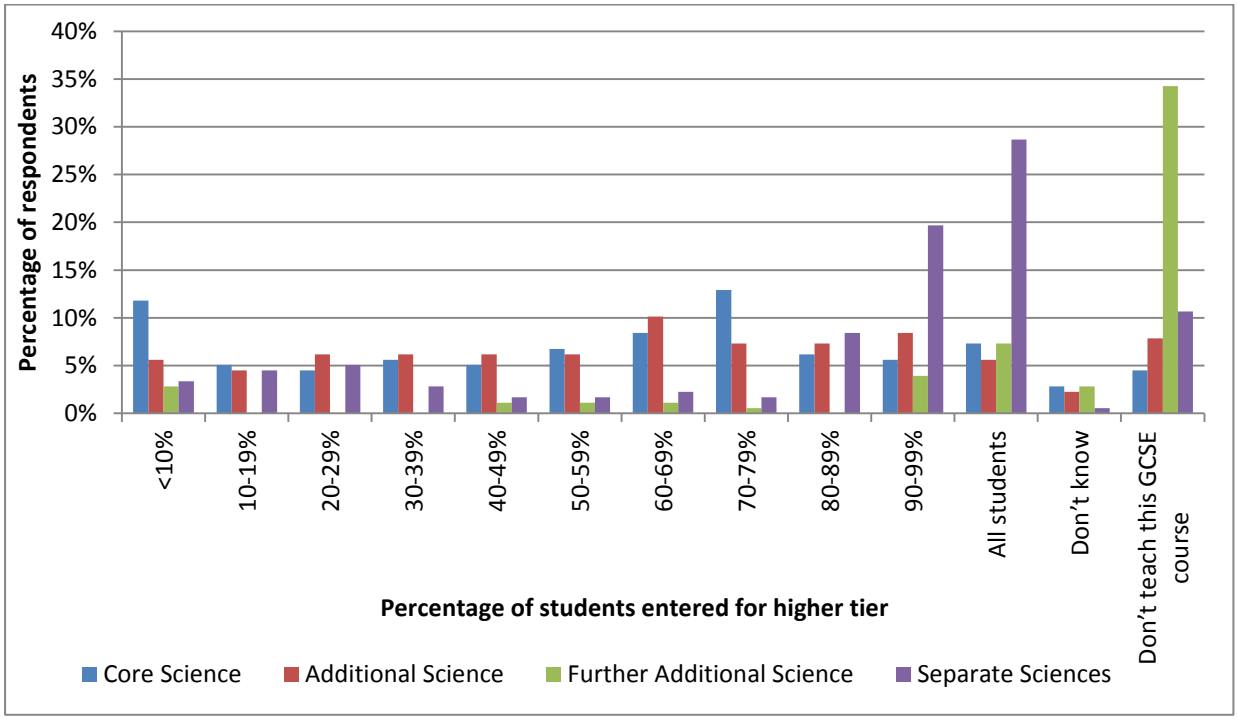


Figure S3: Percentage of students entered for the higher tier.

By school type

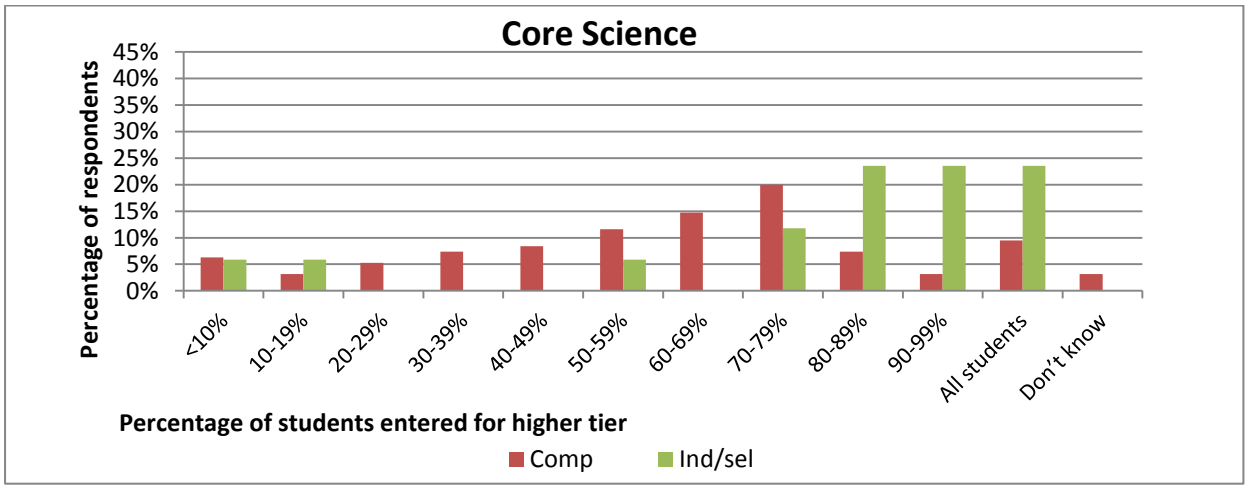


Figure S4: Percentage of students entered for the higher tier by school type (Core Science).

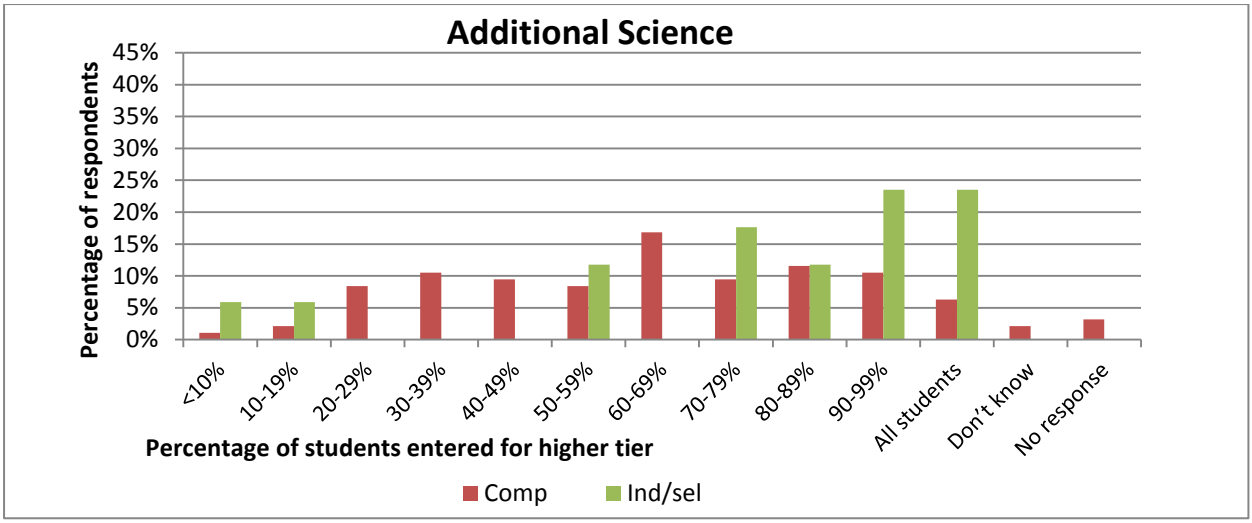


Figure S5: Percentage of students entered for the higher tier by school type (Additional Science).

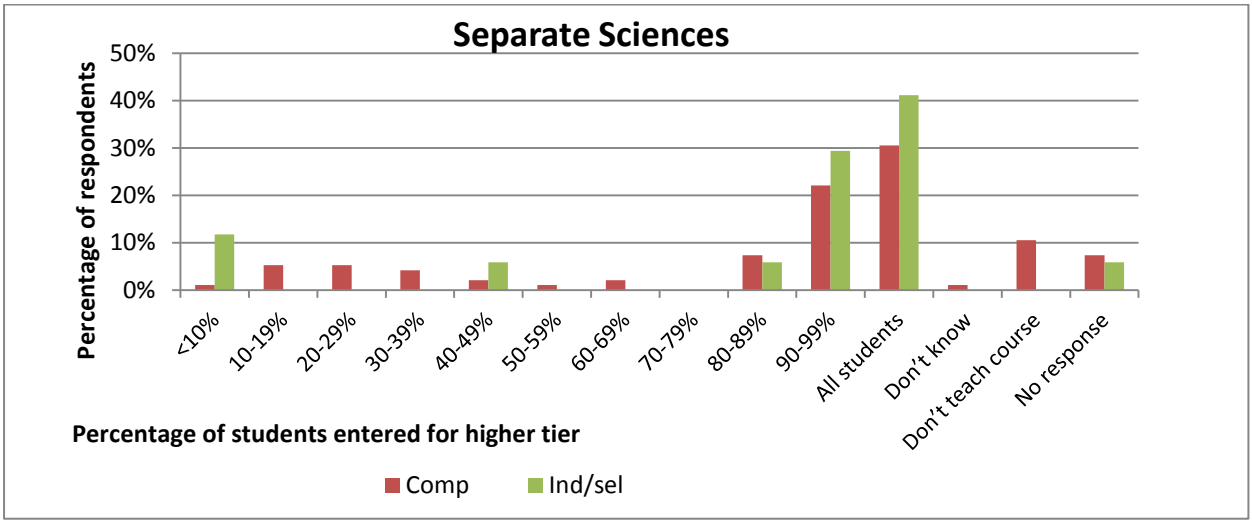


Figure S6: Percentage of students entered for the higher tier by school type (separate Sciences).

Table S3: Percentage of students entered for the higher tier.

Percentage of all respondents	Core Science	Additional Science	Further Additional Science	Separate Sciences
<10%	11.8%	5.6%	2.8%	3.4%
	21	10	5	6
10-19%	5.1%	4.5%	0.0%	4.5%
	9	8	0	8
20-29%	4.5%	6.2%	0.0%	5.1%
	8	11	0	9
30-39%	5.6%	6.2%	0.0%	2.8%
	10	11		5
40-49%	5.1%	6.2%	1.1%	1.7%
	9	11	2	3
50-59%	6.7%	6.2%	1.1%	1.7%
	12	11	2	3
60-69%	8.4%	10.1%	1.1%	2.3%
	15	18	2	4
70-79%	12.9%	7.3%	0.6%	1.7%
	23	13	1	3
80-89%	6.2%	7.3%	0.0%	8.4%
	11	13	0	15
90-99%	5.6%	8.4%	3.9%	19.7%
	10	15	7	35
All students	7.3%	5.6%	7.3%	28.7%
	13	10	13	51
Don't know	2.8%	2.3%	2.8%	0.6%
	5	4	5	1
Don't teach this GCSE course	4.5%	7.9%	34.3%	10.7%
	8	14	61	19
No response	13.5%	16.3%	44.9%	9.0%
	24	29	80	16

4.2 The relationship between tiering and ability sets

As expected, there was a link between tiering and ability sets; this interacted with the GCSE Science course which students followed. Students were typically placed in ability sets at, or before, the start of the GCSE course. However, it was not uncommon for students in one ability set to be entered for a mixture of tiers, indicating that some flexibility was possible, even after students were put into ability sets.

4.2.1 When does your school/college currently start teaching the GCSE specifications?

For Core Science, over 50% of schools started teaching the GCSE specification in year 9, with just over 20% in year 10. Around 40% of schools started teaching Additional Science in year 10, and just over 20% in year 11 (Fig. S7, Table S4). For the separate Sciences, year 9 was the most popular starting year (41%), followed by year 10 (25%). The school type differences (Figs. S8-10) were generally quite small, although independent/selective schools were more likely than comprehensive schools to start Additional Science in year 10 and less likely to start it in year 11.

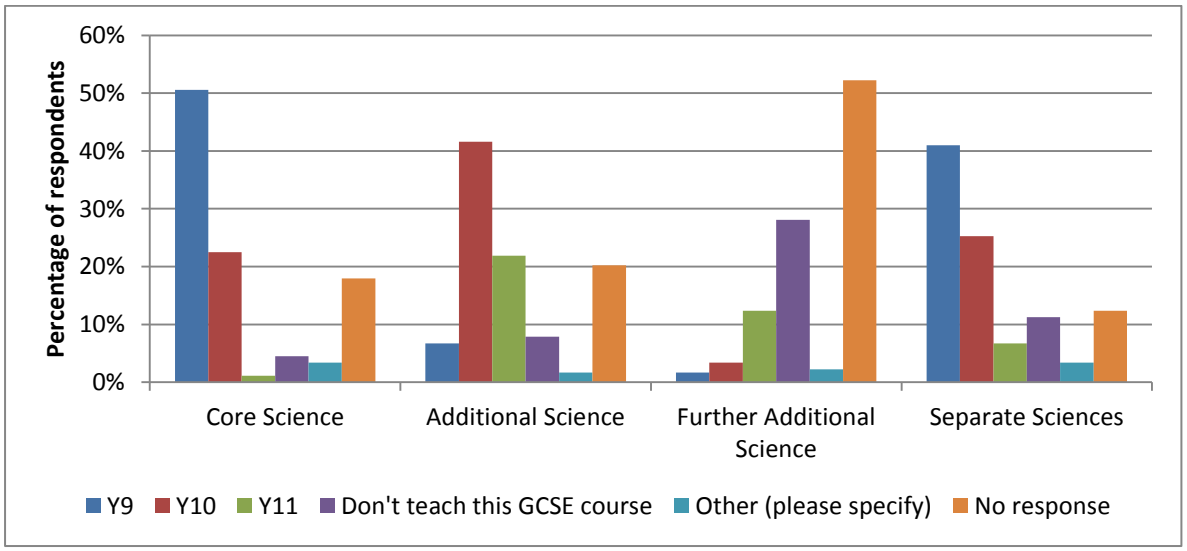


Figure S7: When does your school/college currently start teaching the GCSE specifications?

By school type

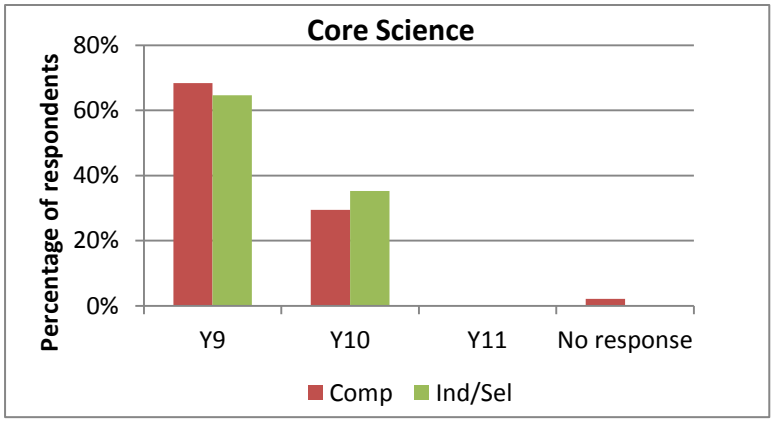


Figure S8: When does your school/college currently start teaching the GCSE specifications, by school type (Core Science)?

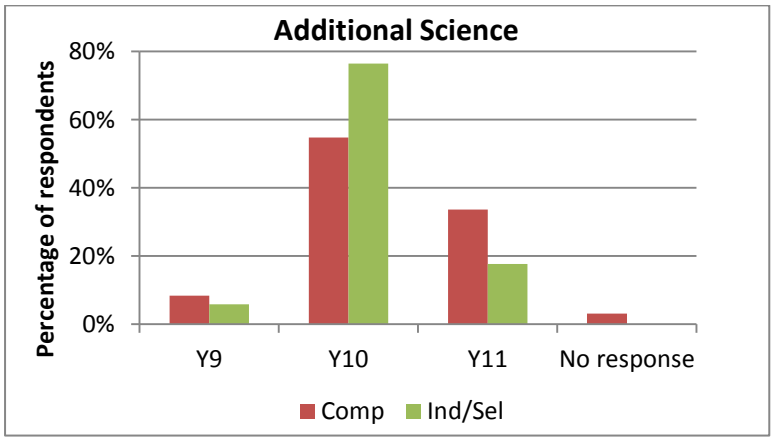


Figure S9: When does your school/college currently start teaching the GCSE specifications, by school type (Additional Science)?

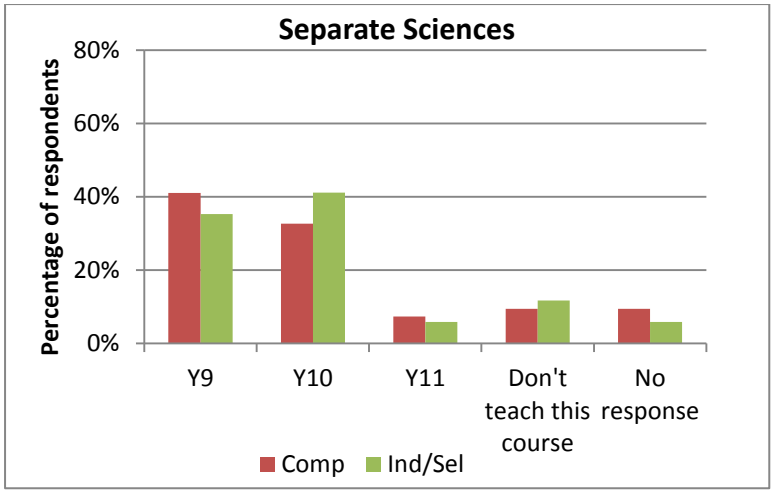


Figure S10: When does your school/college currently start teaching the GCSE specifications, by school type (separate Sciences)?

Table S4: School year in which GCSE specifications are first taught.

Year	Core Science	Additional Science	Further Additional Science	Separate Sciences
Y9	50.6% 90	6.7% 12	1.7% 3	41.0% 73
Y10	22.5% 40	41.6% 74	3.4% 6	25.3% 45
Y11	1.1% 2	21.9% 39	12.4% 22	6.7% 12
Don't teach this GCSE course	4.5% 8	7.9% 14	28.1% 50	11.2% 20
Other (please specify)	3.4% 6	1.7% 3	2.3% 4	3.4% 6
No response	18.0% 32	20.2% 36	52.3% 93	12.4% 22

4.2.2 If your school/college teaches GCSE Core Science, please respond to the remaining questions with respect to Core Science. If your school/college does not offer GCSE Core Science, please respond with respect to separate Science GCSEs

Some schools teach predominantly Dual Award (Core and Additional) GCSE Sciences, while other schools enter the majority of students for Triple Award (separate Science). Since it is likely that tier entry practices will be different for Dual and Triple award, respondents were asked to answer the remaining questions with respect to either GCSE Core Science, or GCSEs in separate Sciences. The majority of respondents chose to respond in terms of their tier entry practices for separate Sciences.

Table S5: Type of science GCSE on which questionnaire responses are based.

Core Science	129	72.5%
Separate Sciences	34	19.1%
No response	15	8.4%

4.2.3 In which school year does your institution first put students into sets/groups by ability in Science?

Schools teaching Core Science were most likely to put students into sets in year 7 and much more likely to than those teaching separate Sciences only (Fig. S11, Table S6). Separate Science schools were most likely not to set by ability and if they did tended to do so in years 10 or 9. The school type breakdown (Fig. S12, for Core Science) shows that comprehensive schools were much more likely than independent/selective schools to set in year 7. Independent/selective schools were most likely not to set at all, or only set in years 10 or 9.

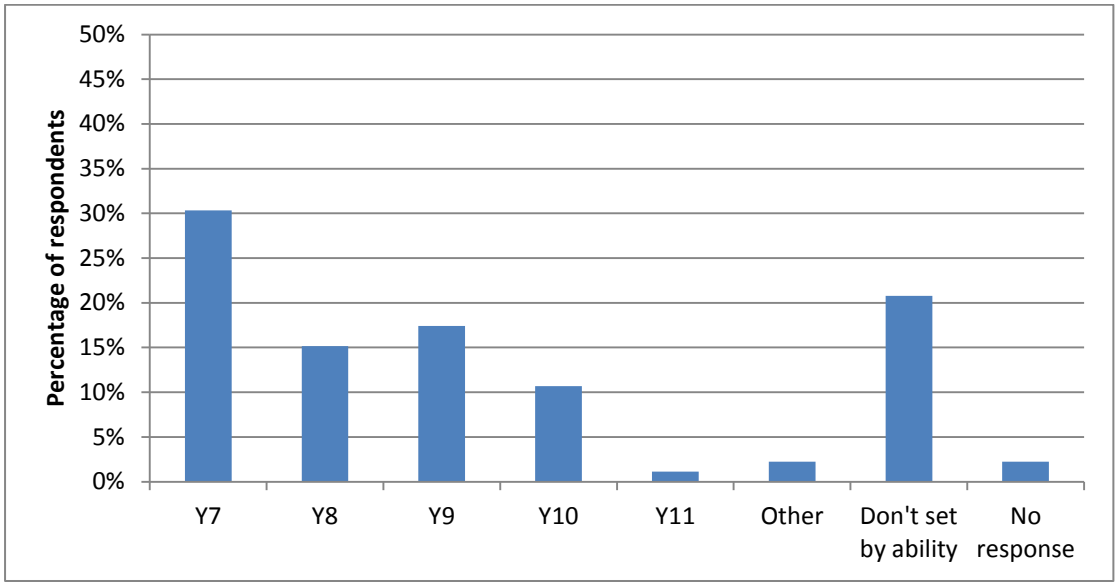


Figure S11: School year in which schools/colleges first put Science students into sets/groups by ability.

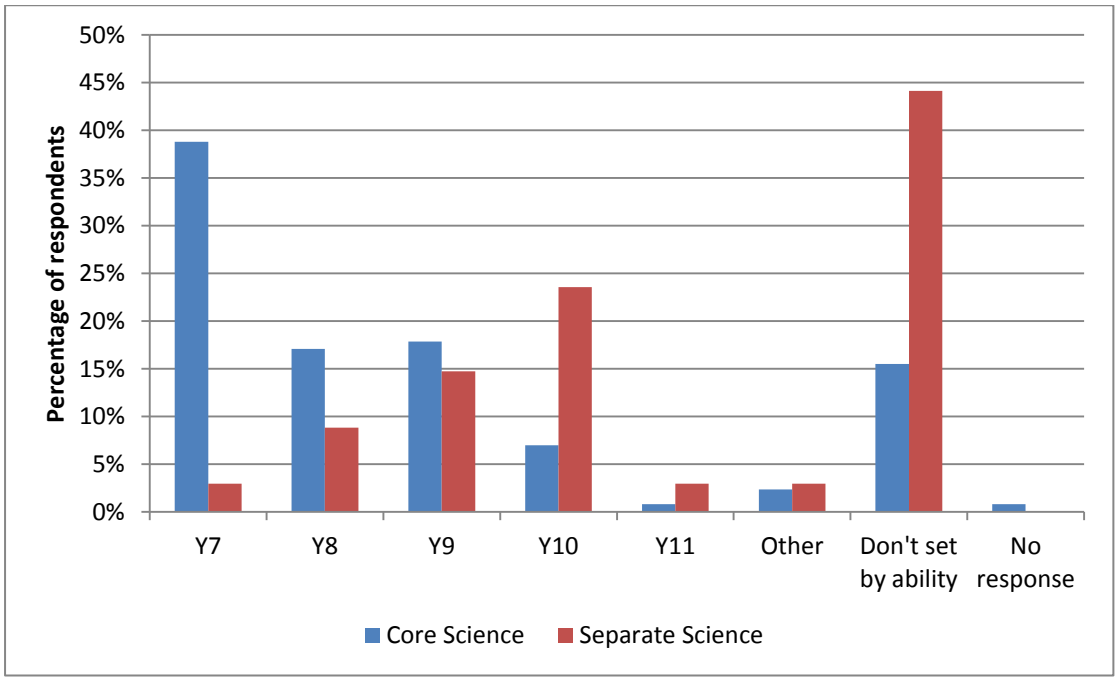


Figure S12: School year in which schools/colleges first put Science students into sets/groups by ability.

By school type

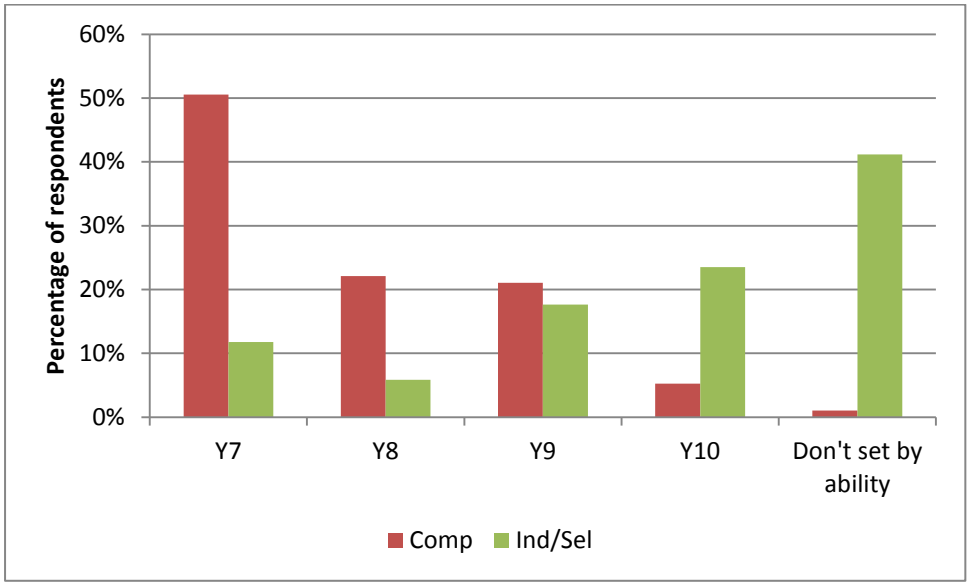


Figure S13: School year in which schools/colleges first put Science students into sets/groups by ability (by school type).

Table S6: School year in which schools/colleges first put Science students into sets/groups by ability.

Year	Percentage	n
7	30.3%	54
8	15.2%	27
9	17.4%	31
10	10.7%	19
11	1.1%	2
Don't set by ability	20.8%	37
Other	2.3%	4

4.2.4 In your school how many GCSE sets/ability groups contain some students entering for foundation tier and some for higher tier?

The majority of respondents indicated that at least some of the ability sets in their institution enter students for both tiers (Fig. S14, Table S7). 21.9% of respondents reported not setting by ability. (N.B. this is a slightly different percentage to the response in the previous question, see Figure S11.)

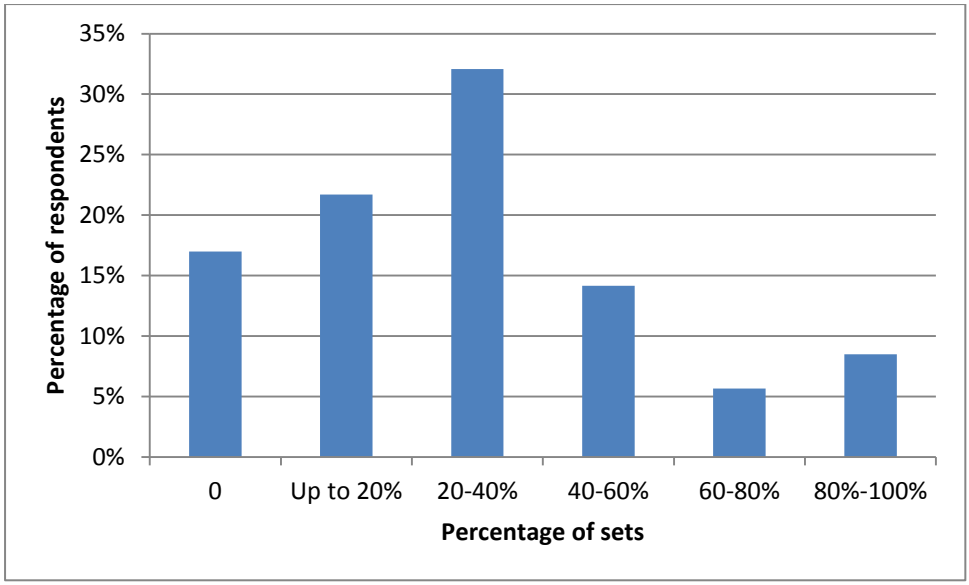


Figure S14: Proportion of sets which have students entered for both tiers.

Table S7: Proportion of sets which have students entered for both tiers.

Proportion of mixed sets	Percentage	n (105 respondents)
0	17%	18
Up to 20%	22%	23
20-40%	32%	34
40-60%	14%	15
60-80%	6%	6
80%-100%	8%	9

4.2.5 What is the latest point during a GCSE course that you think it is possible to decide to enter a student for the higher tier, and ensure that they have covered sufficient higher tier content?

A majority of schools offering Core Science thought that it was possible to decide to enter students for the higher tier more than half way through the course or at the end (Fig. S14). Fewer (though still more than 40%) separate Science schools thought this was the case. Interestingly independent schools were much more likely to think it was possible to decide to enter for the higher tier at the end of the course (Fig. S15, Table S8).

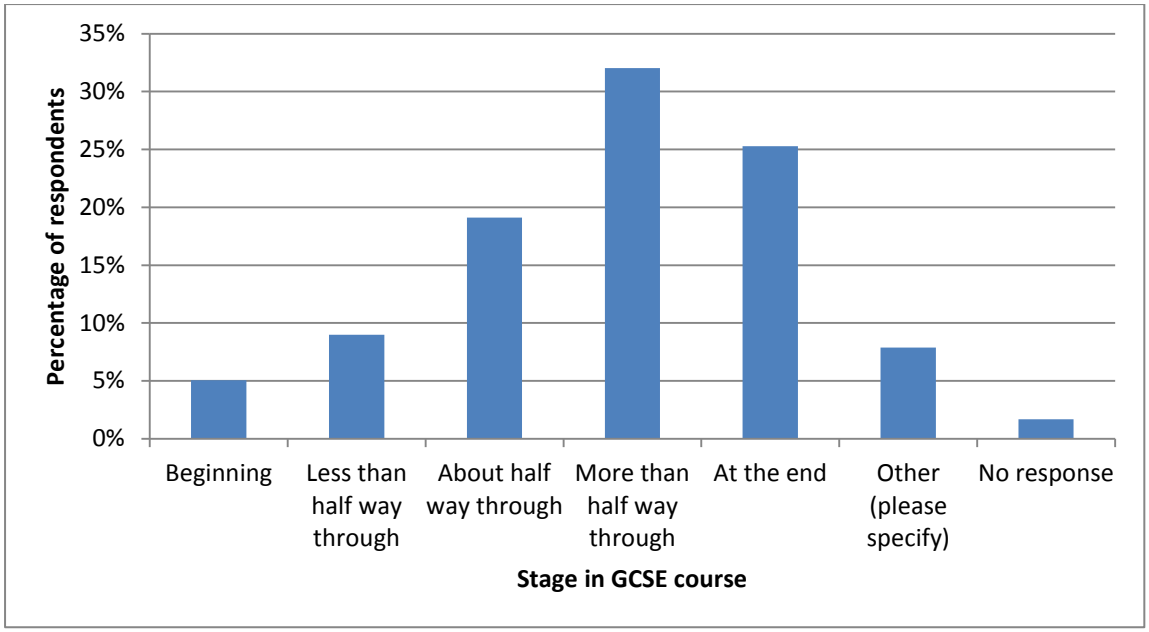


Figure S15: The latest point during a GCSE course that it is possible to decide to enter a student for the higher tier.

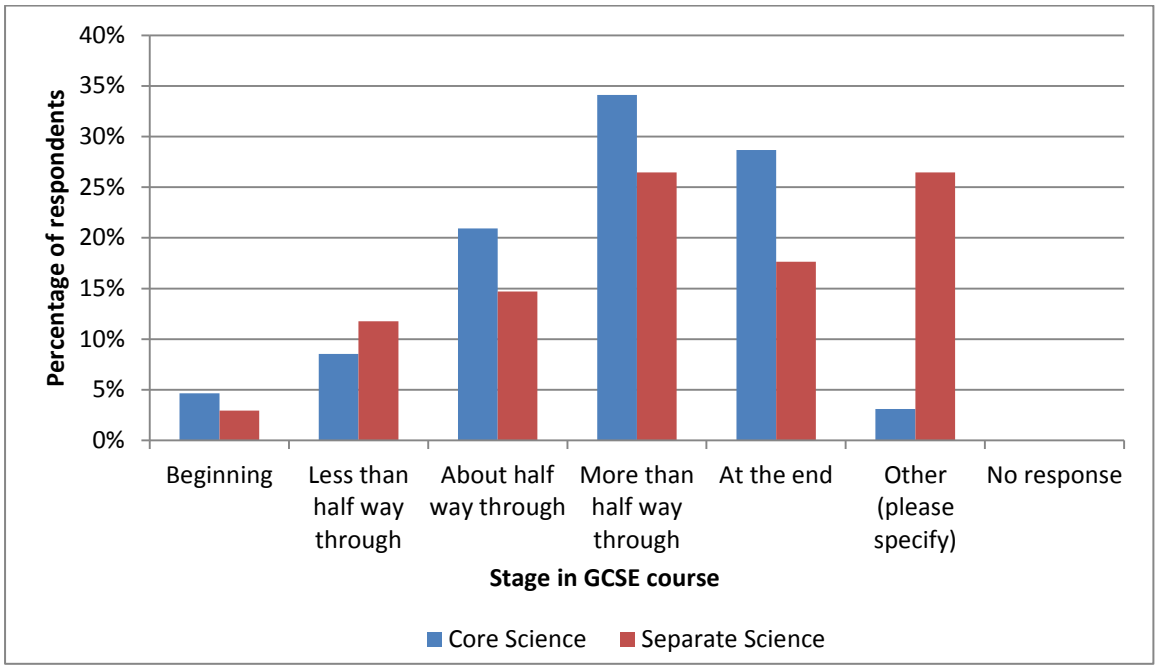


Figure S16: The latest point during a GCSE course that it is possible to decide to enter a student for the higher tier (by Science course).

By school type

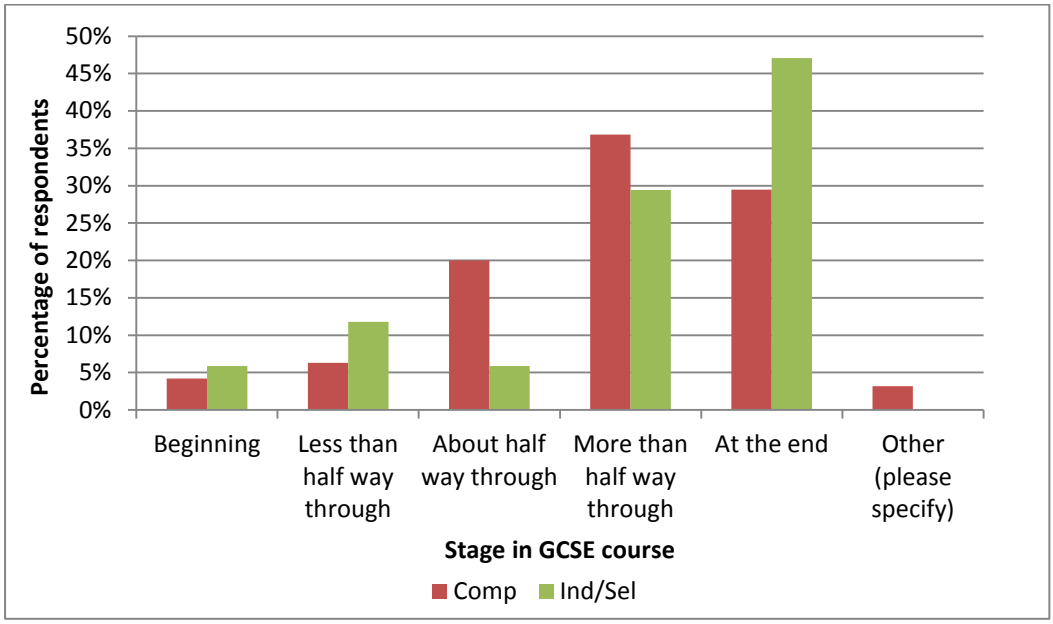


Figure S17: The latest point during a GCSE course that it is possible to decide to enter a student for the higher tier (by school type).

Table S8: The latest point during a GCSE course that it is possible to decide to enter a student for the higher tier.

	Percentage	n
Beginning	5.1%	9
Less than half way through	9.0%	16
About half way through	19.1%	34
More than half way through	32.0%	57
At the end	25.3%	45
Other (please specify)	7.9%	14
No response	1.7%	3

4.2.6 Approximately what proportion of the students in your school/college move between the foundation tier and the higher tier curriculum during the GCSE course (and in which direction)?

A majority of schools moved fewer than 10% of their students between tiers, in either direction (Fig. S18, Table S9). Slightly more students moved from higher to foundation than foundation to higher. Schools teaching Core Science were more likely to move students than those teaching separate Sciences only (Fig. S19-S20); this is likely to be at least partly a result of the fact that schools which teach separate Sciences only were more likely to only enter students for the higher tier. Comprehensive schools were much more likely to move (Core Science) students than independent/selective schools (in both directions, Figures S21-S22).

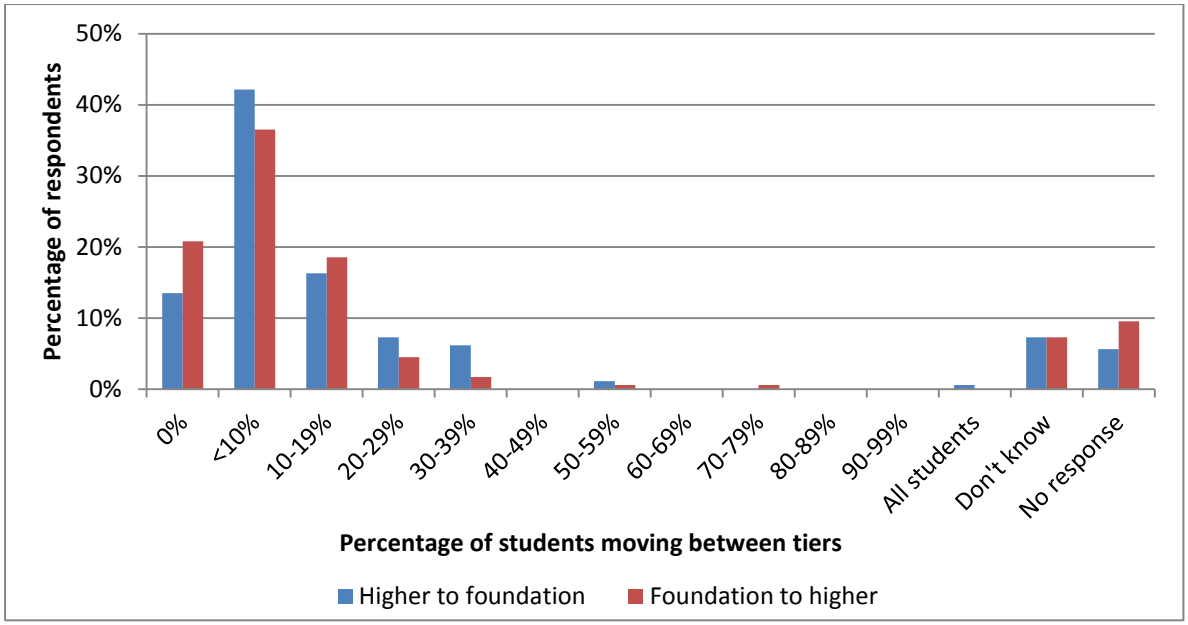


Figure S18: Percentage of students moving between tiers.

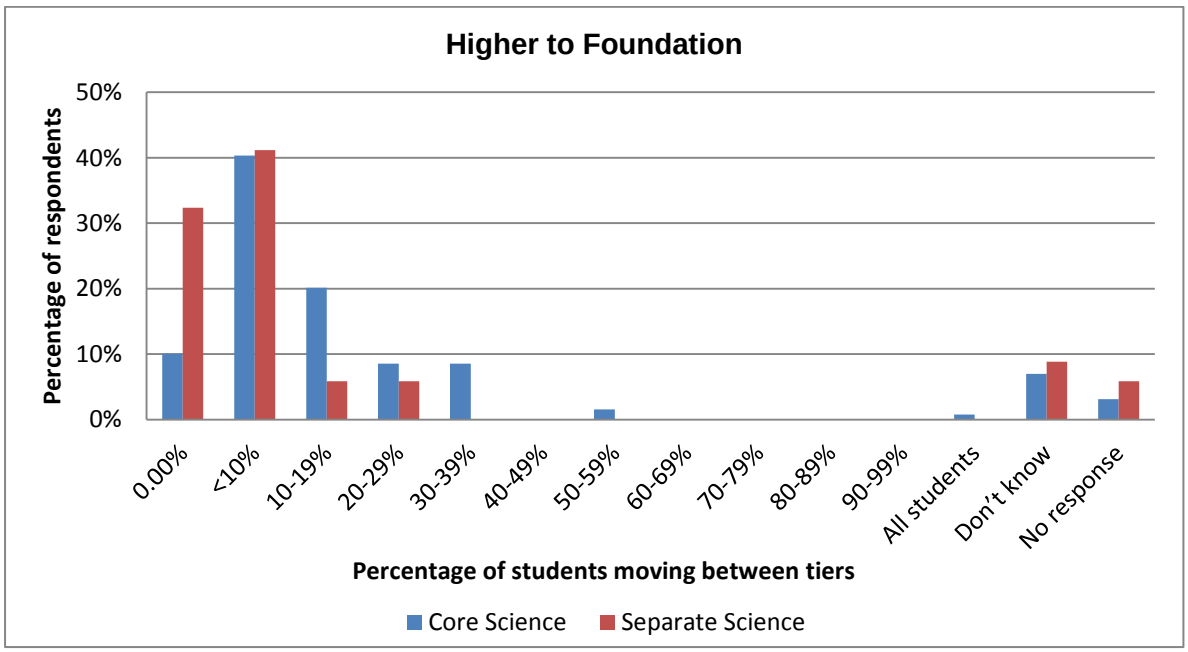


Figure S19: Percentage of students moving from higher to foundation tier by Science course.

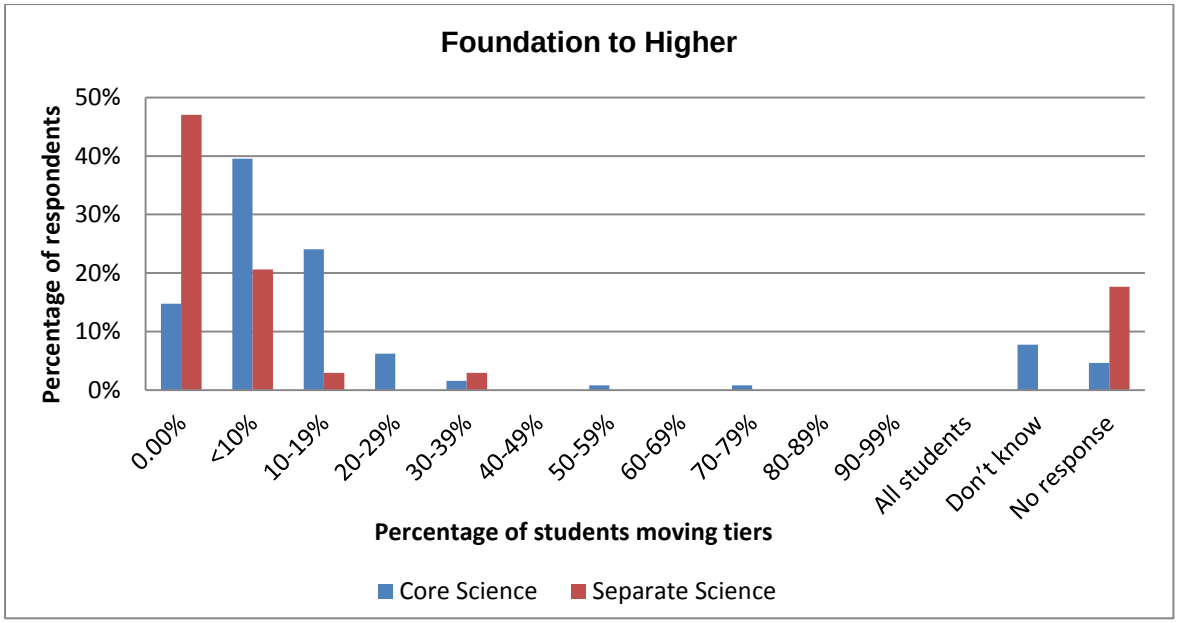


Figure S20: Percentage of students moving from foundation to higher tier (by Science course).

By school type

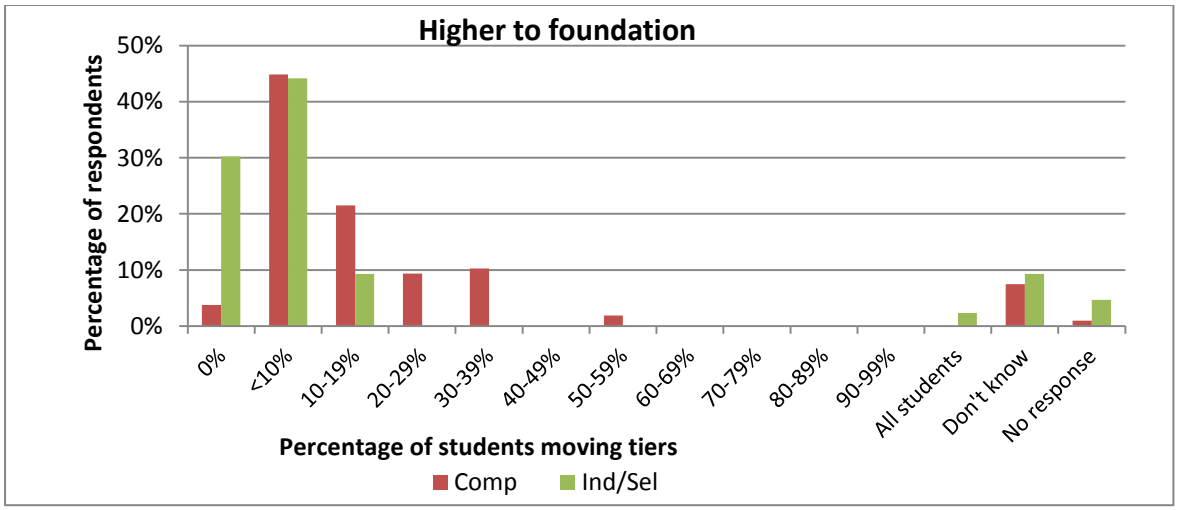


Figure S21: Percentage of students moving from higher to foundation tier (by school type).

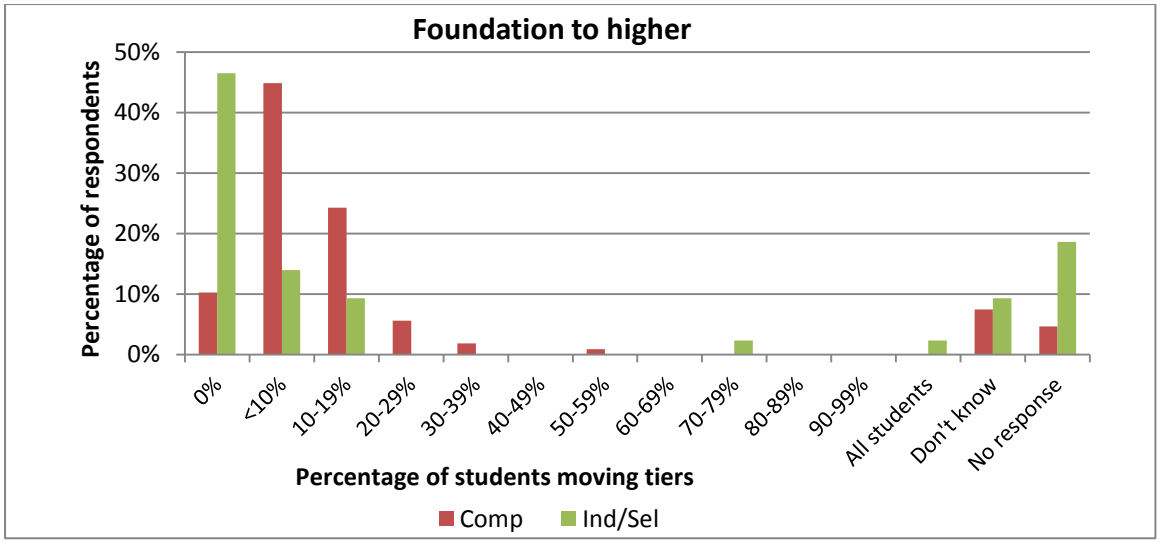


Figure S22: Percentage of students moving from foundation to higher tier (by school type).

Table S9: Percentage of students moving between tier.

	Higher to foundation		Foundation to higher	
	Percentage	n	Percentage	n
0%	13.5%	24	20.8%	37
<10%	42.1%	75	36.5%	65
10-19%	16.3%	29	18.5%	33
20-29%	7.3%	13	4.5%	8
30-39%	6.2%	11	1.7%	3
40-49%	0.0%	0	0.0%	0
50-59%	1.1%	2	0.6%	1
60-69%	0.0%	0	0.0%	0
70-79%	0.0%	0	0.6%	1
80-89%	0.0%	0	0.0%	0
90-99%	0.0%	0	0.0%	0
All students	0.6%	1	0.0%	0
Don't know	7.3%	13	7.3%	13
No response	5.6%	10	9.6%	17

4.3 Factors affecting entry for tiers

4.3.1 How often would you be likely to enter students for each tier who fit the following description? (please tick one per line)

The expected performance of students has a strong influence on the tier they will be entered for (Fig. S23, Table S10). For both subjects almost all schools said they would enter students predicted to get a grade B for the higher tier all or most of the time (Figs. S24 and S25). About 60% indicated that students predicted to get a grade C would be entered for the higher tier all or most of the time. There were only small differences between the subjects, but separate Science schools were slightly more likely to enter students (of the same predicted performance) for the higher tier. In terms of school type (Fig. S26), independent/selective schools were more likely to enter students for the higher tier (in Core Science) than comprehensive schools.

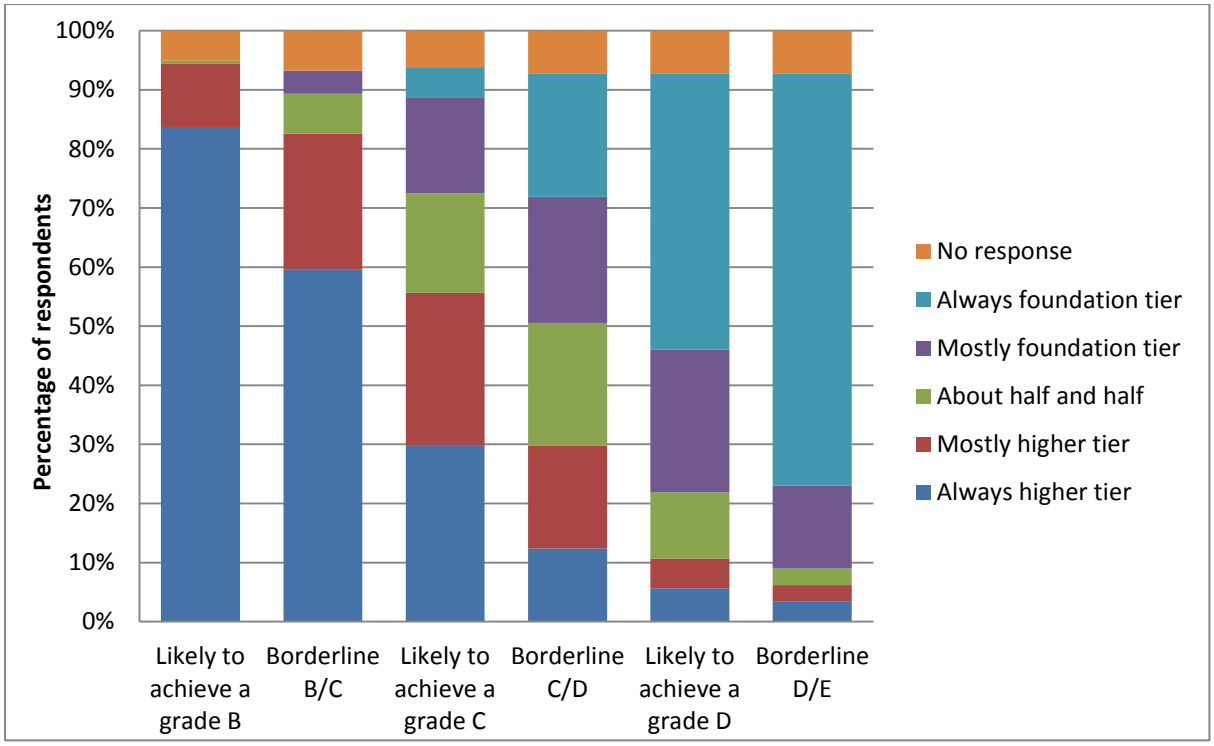


Figure S23: Likelihood of entry for each tier (by predicted attainment).

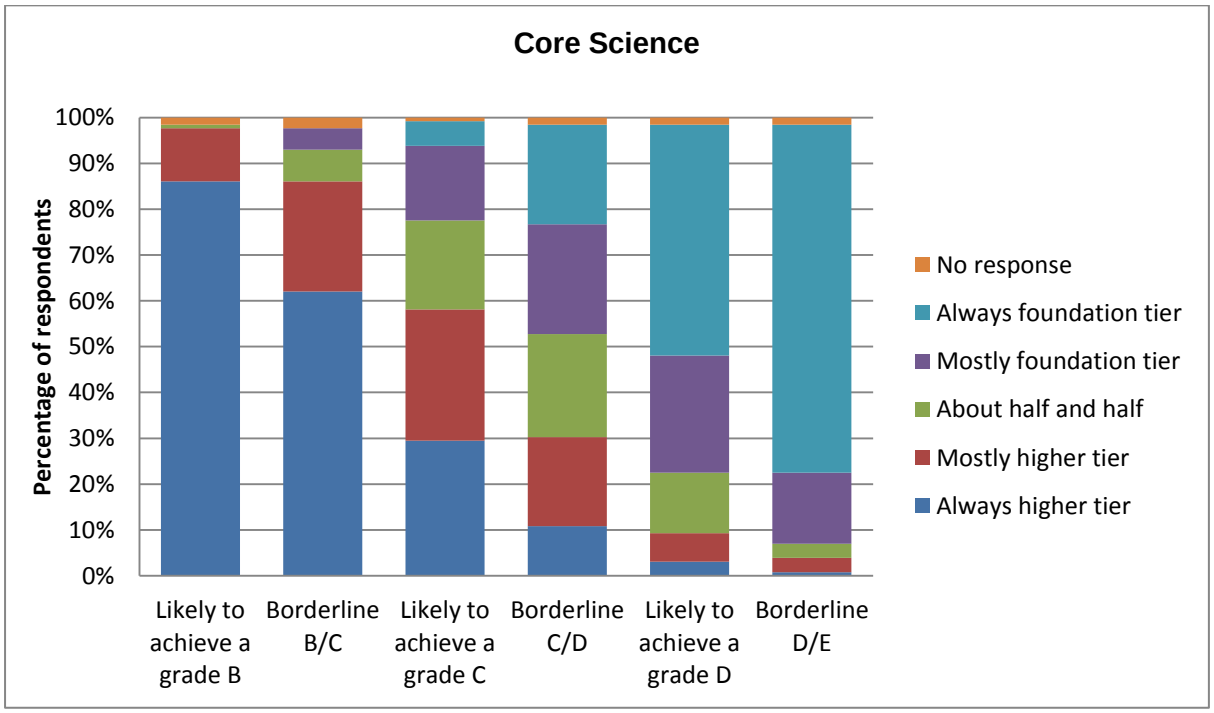


Figure S24: Likelihood of entry for each tier by predicted attainment (Core Science).

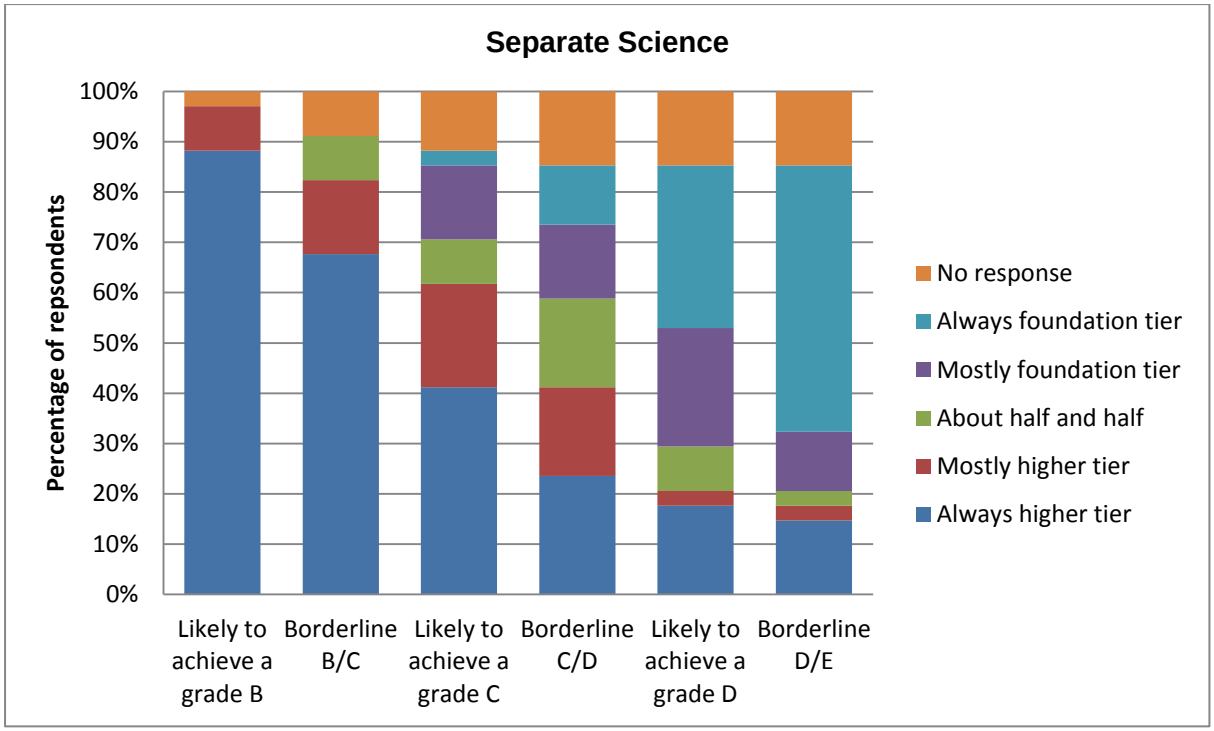


Figure S25: Likelihood of entry for each tier by predicted attainment (separate Sciences).

By school type

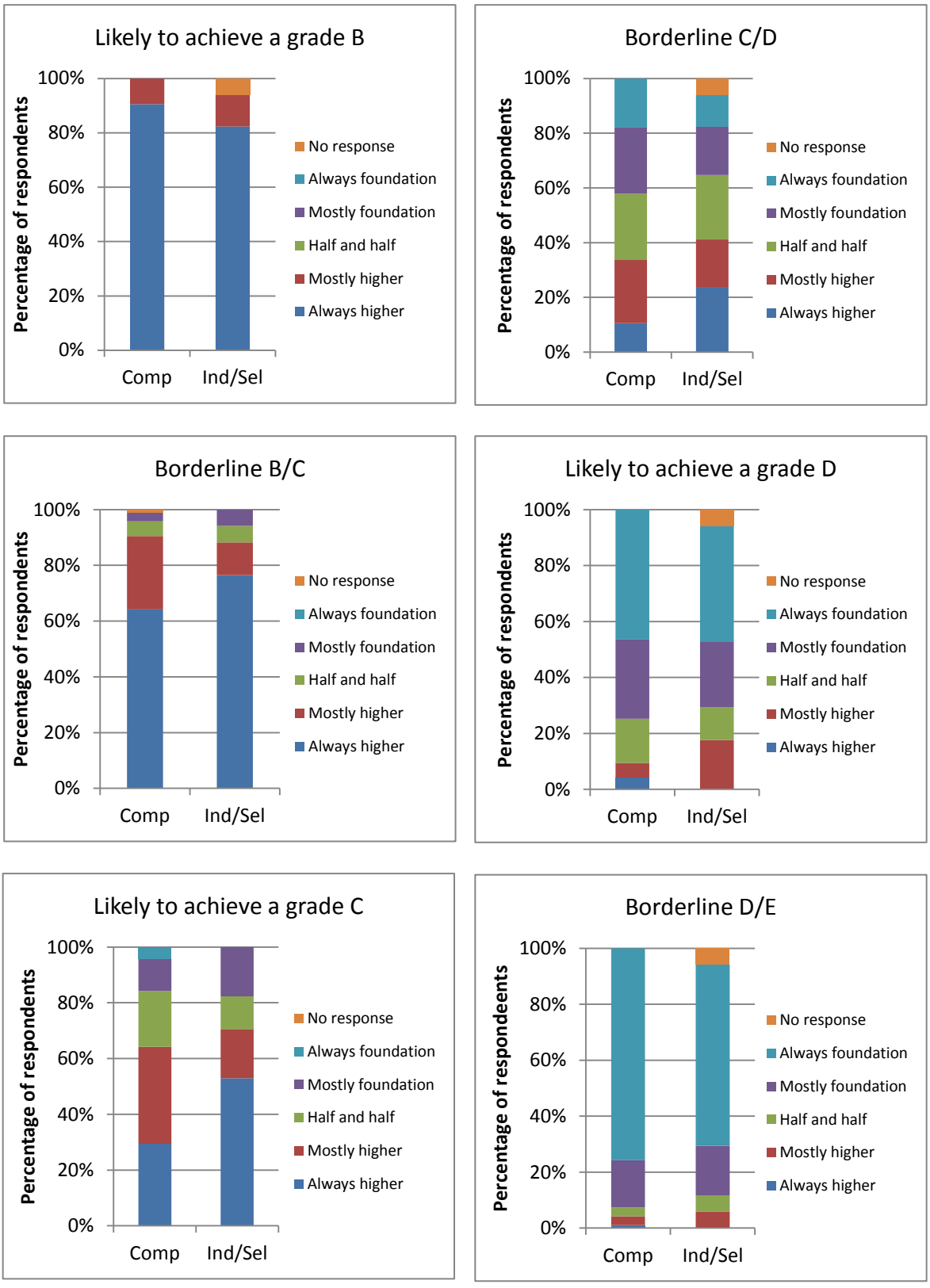


Figure S26: Likelihood of entry for each tier (by predicted attainment and school type).

Table S10: Likelihood of entry for each tier by predicted attainment.

All respondents	Likely to achieve a grade B	Borderline B/C	Likely to achieve a grade C	Borderline C/D	Likely to achieve a grade D	Borderline D/E
Always higher tier	83.7%	59.6%	29.8%	12.3%	5.6%	3.4%
	149	106	53	22	10	6
Mostly higher tier	10.7%	23.0%	25.8%	17.4%	5.1%	2.8%
	19	41	46	31	9	5
About half and half	0.6%	6.7%	16.9%	20.8%	11.2%	2.8%
	1	12	30	37	20	5
Mostly foundation tier	0.0%	3.9%	16.3%	21.4%	24.2%	14.0%
	0	7	29	38	43	25
Always foundation tier	0.0%	0.0%	5.1%	20.8%	46.6%	69.7%
	0		9	37	83	124
No response	5.1%	6.7%	6.2%	7.3%	7.3%	7.3%
	9	12	11	13	13	13

4.3.2 Who is involved in the decision about which tier a student should be entered for, and how important is this input?

Individual teachers and department policy had the most important input into making the decision about which tier a student is entered for. However, students, and their parents, to a lesser extent are also involved in the decision (Fig S27, Table S11). There was some variation between school types; teachers from comprehensive schools were more likely to say that department policy was more important, and less likely to say that parents or students were important in the decision than teachers from independent/selective schools.

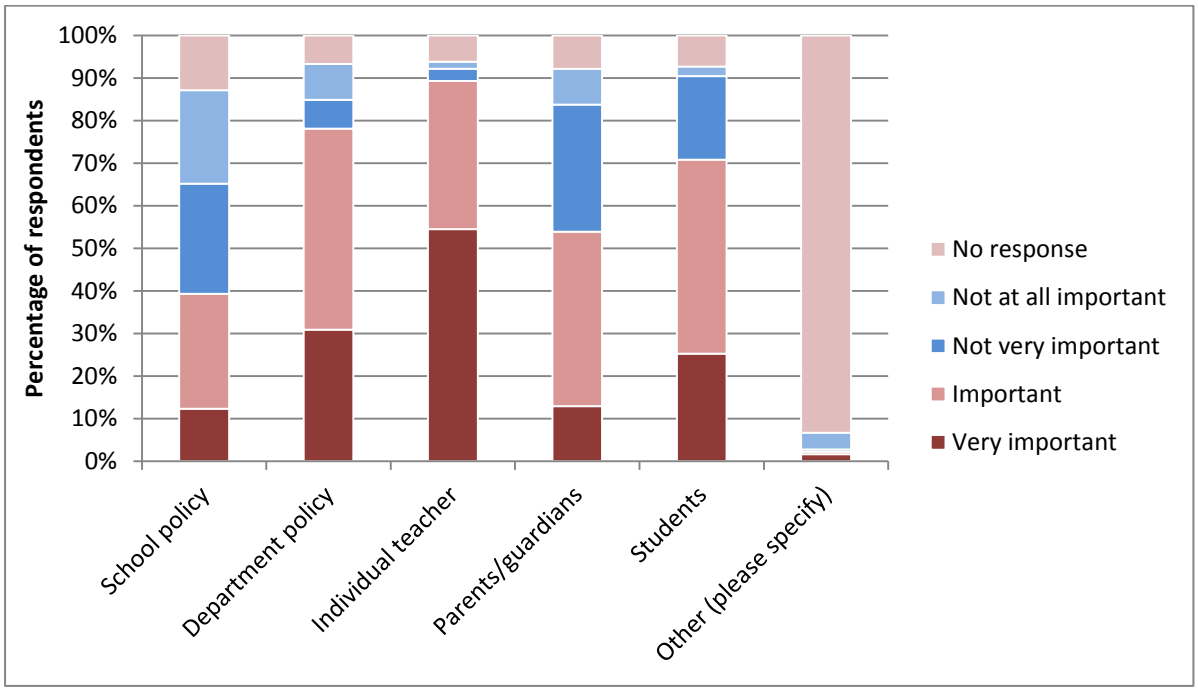


Figure S27: Importance of input from difference sources about tier entry.

By school type

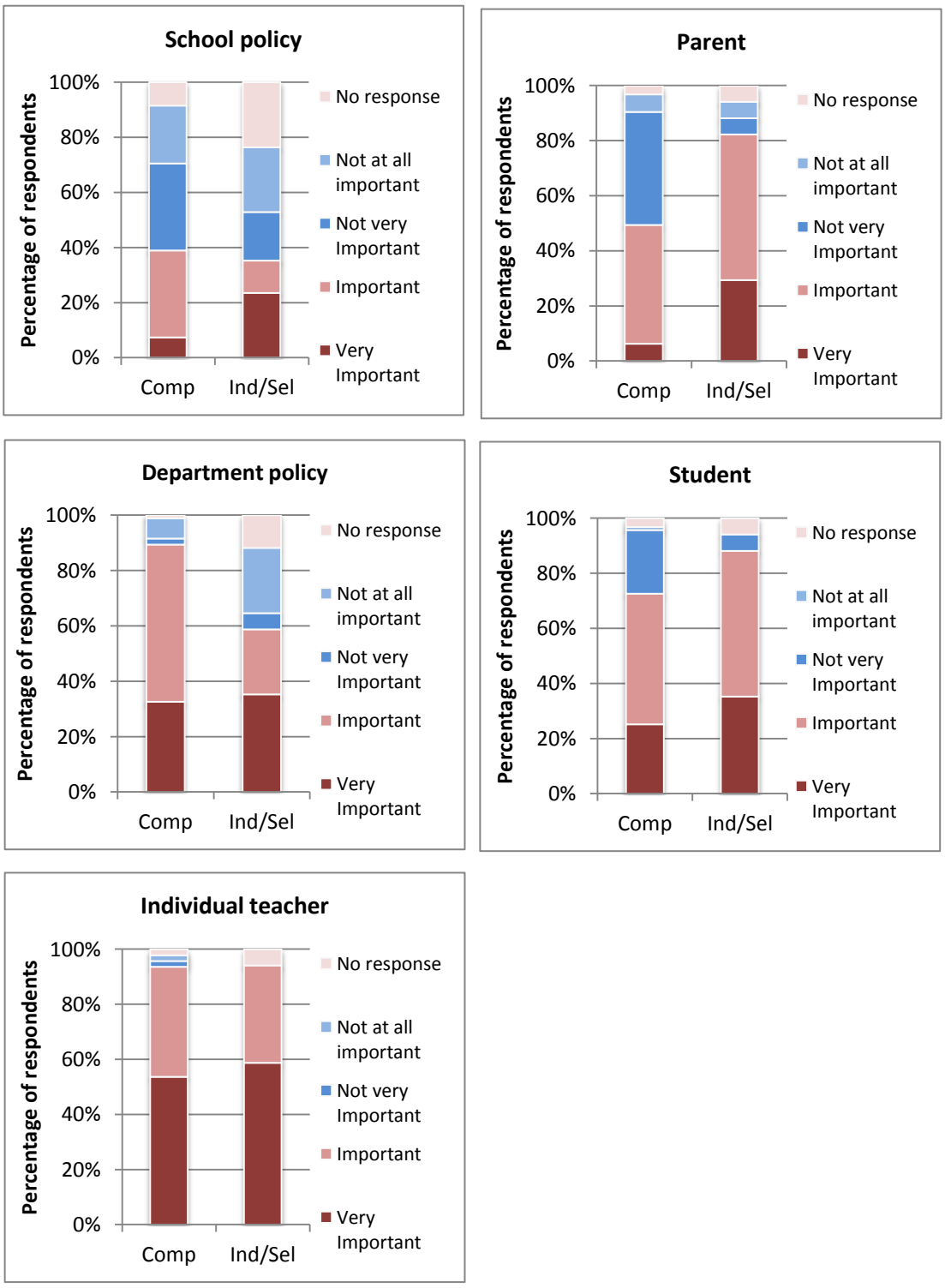


Figure S28: Importance of input from difference sources about tier entry, by school type.

Table S11: Importance of input from difference sources about tier entry.

	School policy	Department policy	Individual teacher	Parents/ guardians	Students	Other
Very important	12.4%	30.9%	54.5%	12.9%	25.3%	1.7%
	22	55	97	23	45	3
Important	27.0%	47.2%	34.8%	41.0%	45.5%	0.6%
	48	84	62	73	81	1
Not very important	25.8%	6.7%	2.8%	29.8%	19.7%	0.6%
	46	12	5	53	35	1
Not at all important	21.9%	8.4%	1.7%	8.4%	2.3%	3.9%
	39	15	3	15	4	7
No response	12.9%	6.7%	6.2%	7.9%	7.3%	93.3%
	23	12	11	14	13	166

4.3.3 For students who are 'borderline' for the foundation or higher tier, how important are the following factors for determining tier entry?

The most important factors were current and predicted attainment and the ability to cope with written exams (Fig. S29, Table S12). Writing skills and literacy level were also important, as were the recent performance of borderline candidates, the perceived relative difficulty of grade C on higher tier and the student's opinion and aspirations, all slightly more so for Core Science (Figs. S30 and S31). Gender, performance in other subjects and ability set were deemed to be the least important factors. There were some interesting school type differences (Figs. S32 and S33) with comprehensive schools more likely than independent/selective schools to say that the recent performance of borderline candidates and writing skills and literacy level were important. Independent/selective schools were more likely to take account of student opinion and parental pressure.

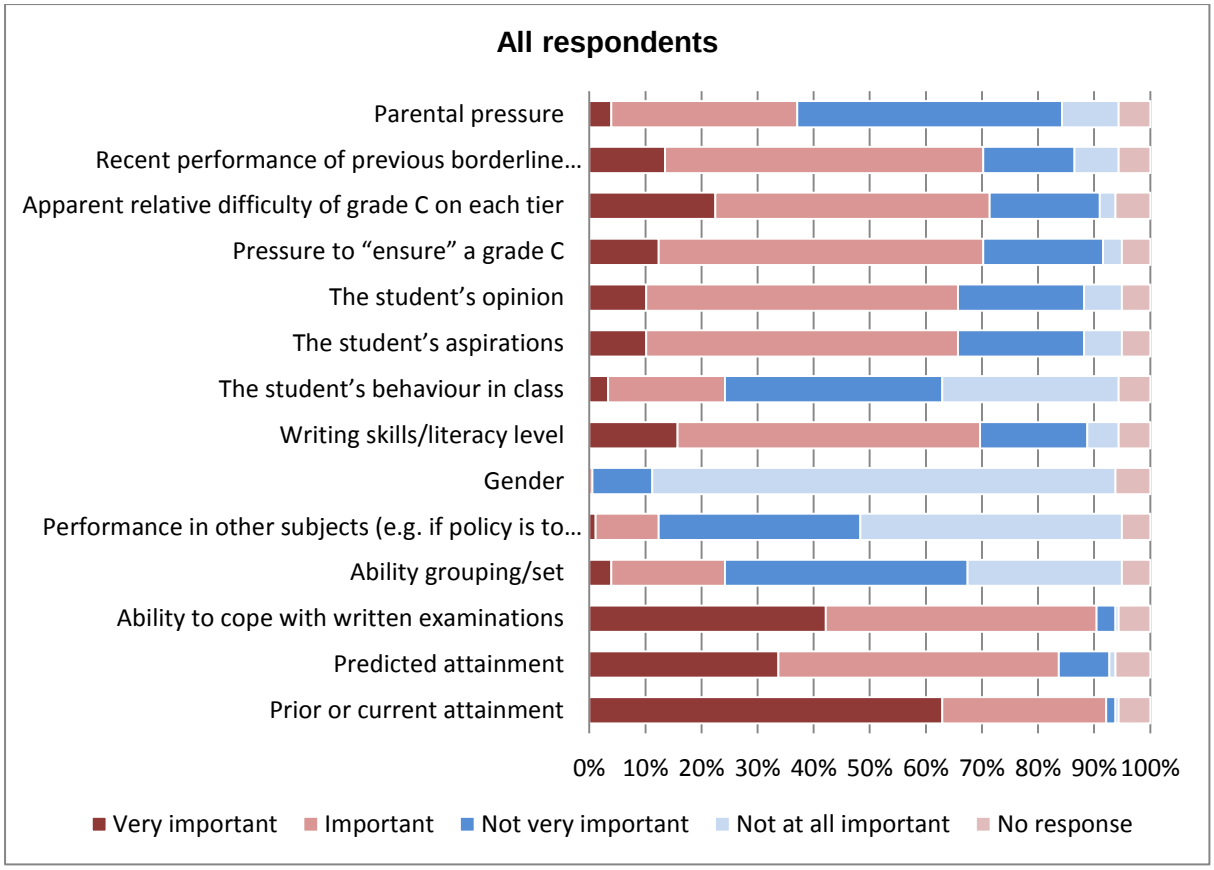


Figure S29: Importance of factors for deciding tier entry for borderline students.

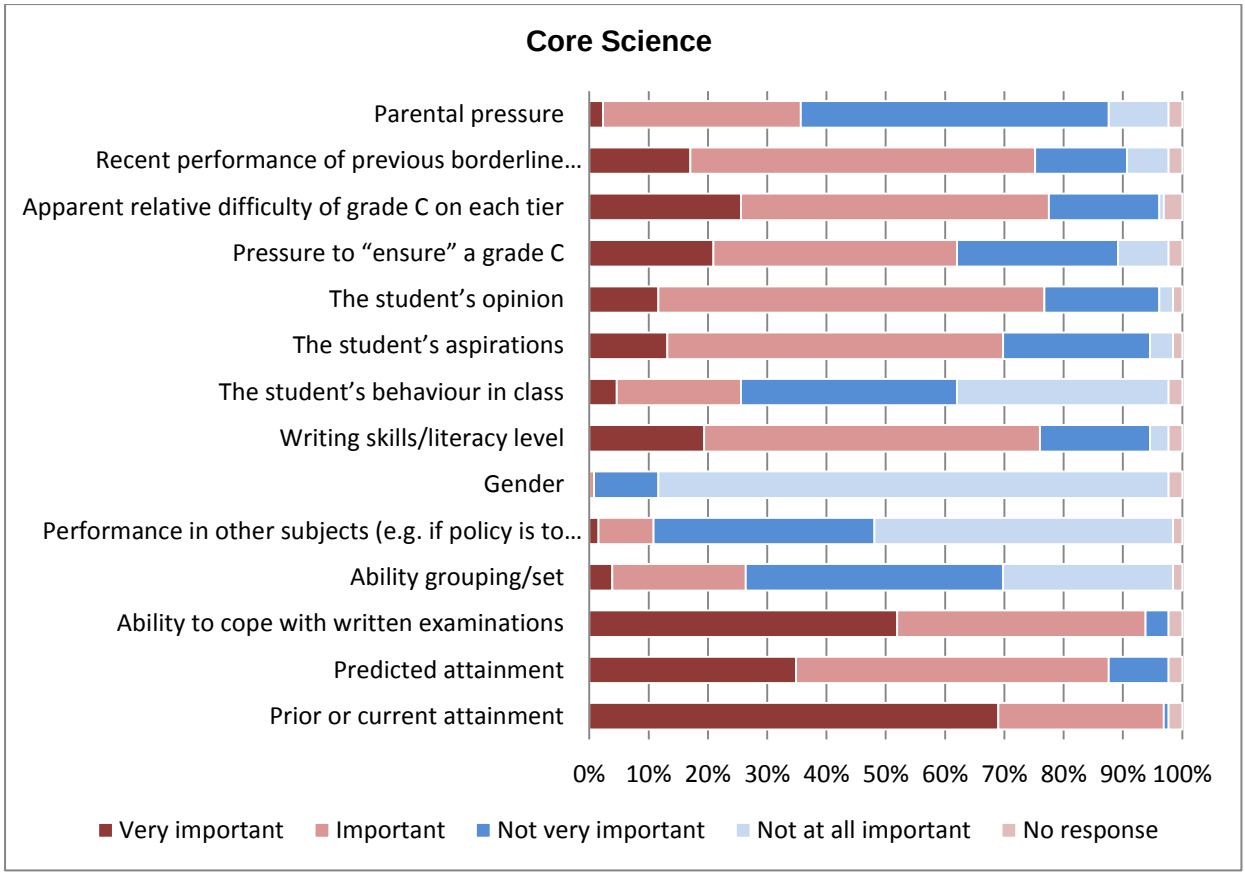


Figure S30: Importance of factors for deciding tier entry for borderline students (Core Science).

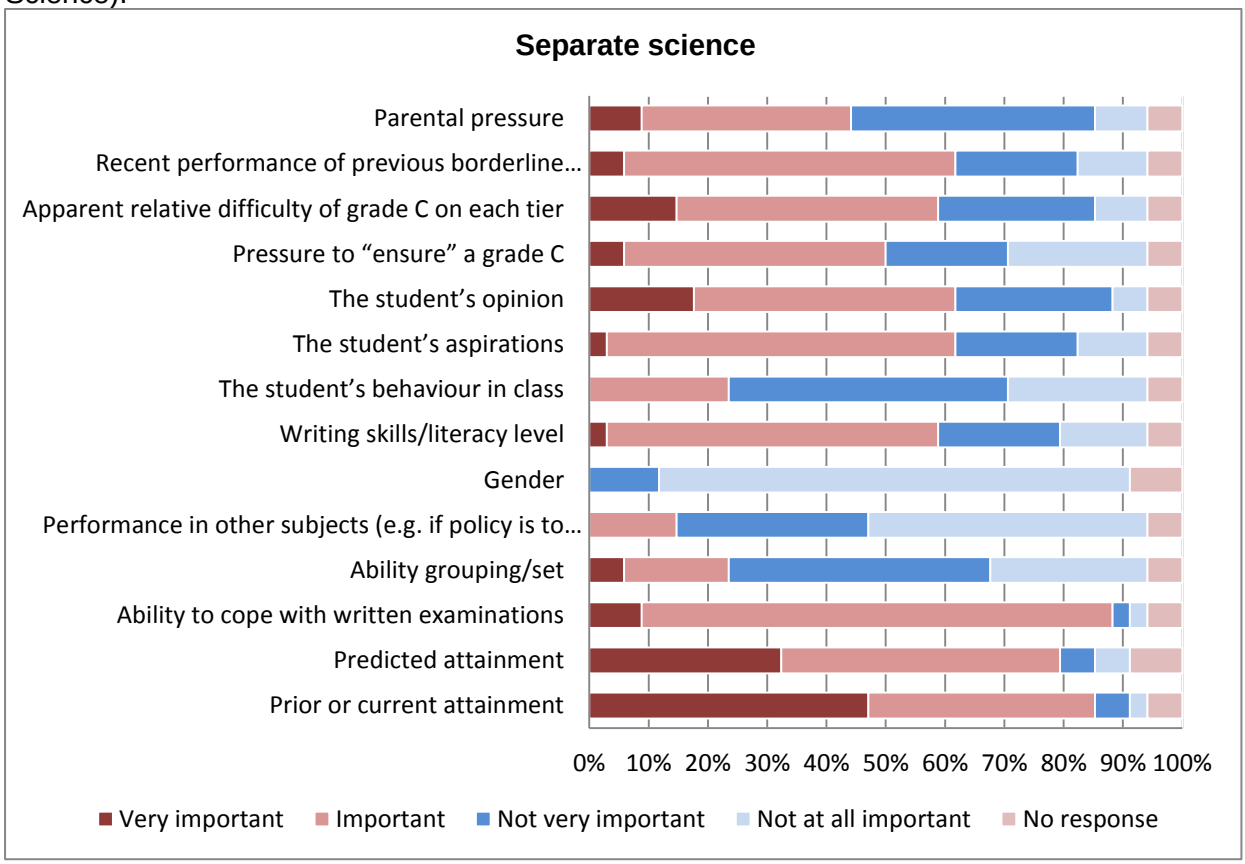


Figure S31: Importance of factors for deciding tier entry for borderline students (separate Sciences).

By school type

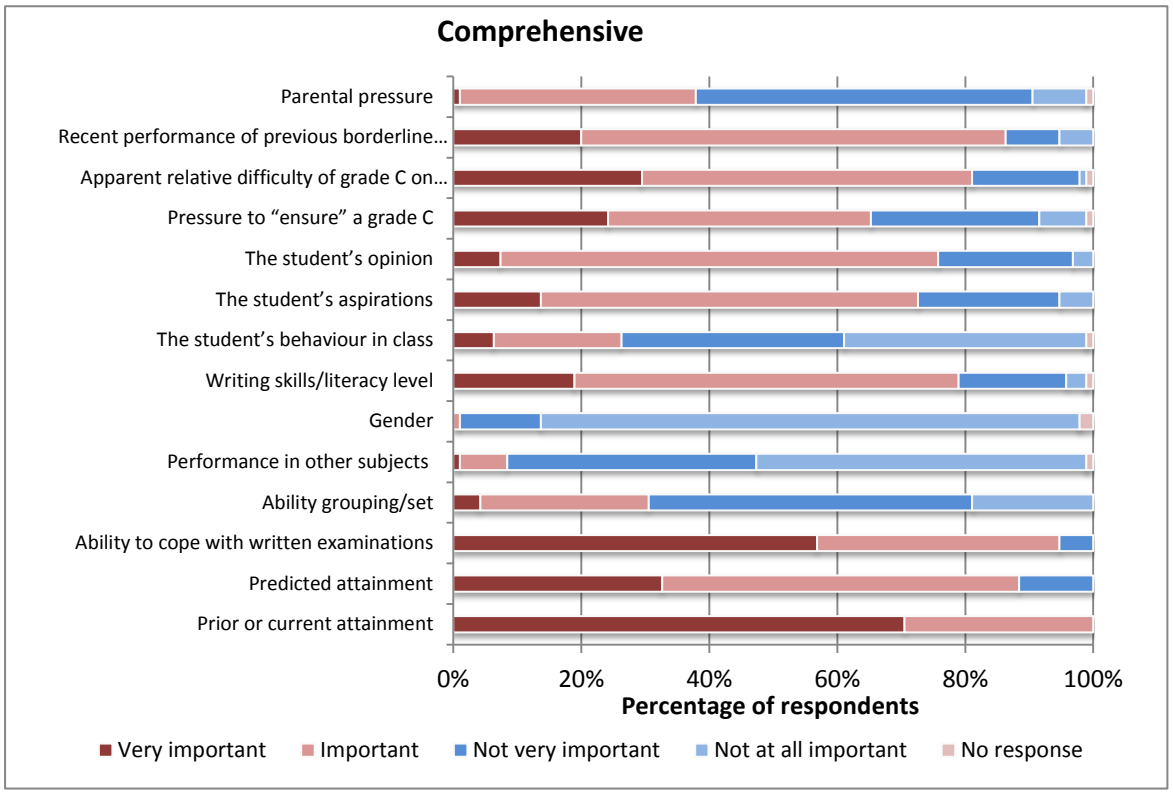


Figure S32: Importance of factors for deciding tier entry for borderline students (comprehensive schools).

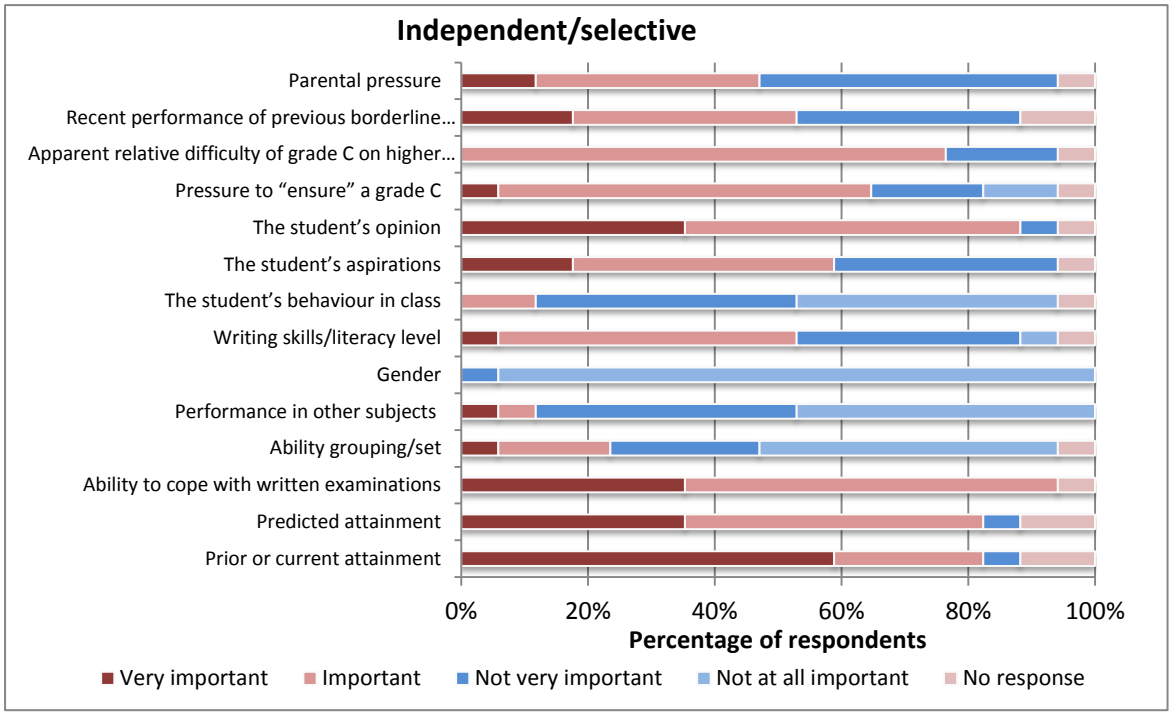


Figure S33: Importance of factors for deciding tier entry for borderline students (independent/selective schools).

Table S12: Importance of factors for deciding tier entry for borderline students

	Very important	Important	Not very important	Not at all important	No response
Prior or current attainment	62.9%	29.2%	1.7%	0.6%	5.6%
	112	52	3	1	10
Predicted attainment	33.7%	50.0%	9.0%	1.1%	6.2%
	60	89	16	2	11
Ability to cope with written examinations	42.1%	48.3%	3.4%	0.6%	5.6%
	75	86	6	1	10
Ability grouping/set	3.9%	20.2%	43.3%	27.5%	5.1%
	7	36	77	49	9
Performance in other subjects (e.g. if policy is to enter students for same tiers in Mathematics and Science)	1.1%	11.2%	36.0%	46.6%	5.1%
	2	20	64	83	9
Gender	0.0%	0.6%	10.7%	82.6%	6.2%
	0	1	19	147	11
Writing skills/literacy level	15.7%	53.9%	19.1%	5.6%	5.6%
	28	96	34	10	10
The student's behaviour in class	3.4%	20.8%	38.8%	31.5%	5.6%
	6	37	69	56	10
The student's aspirations	10.1%	55.6%	22.5%	6.7%	5.1%
	18	99	40	12	9
The student's opinion	10.1%	55.6%	22.5%	6.7%	5.1%
	18	99	40	12	9
Pressure to "ensure" a grade C	12.4%	57.9%	21.4%	3.4%	5.1%
	22	103	38	6	9
Perceived relative difficulty of grade C on higher vs foundation tier	22.5%	48.9%	19.7%	2.8%	6.2%
	40	87	35	5	11
Recent performance of previous borderline students on each tier	13.5%	56.7%	16.3%	7.9%	5.6%
	24	101	29	14	10
Parental pressure	3.9%	33.2%	47.2%	10.1%	5.6%
	7	59	84	18	10
Other (please specify)	0.6%	0.6%	0.6%	2.8%	95.5%
	1	1	1	5	170

4.3.4 Do you have any other comments about how you decide which tier a student should be entered for?

Further comments about how decisions on tier entry are made were provided by 48 respondents. Each comment is labelled with an identification number for the respondent, and the type of institution where the respondent teaches.

Several teachers indicated that they used past papers, often in combination with topic tests to determine tier entry.

> *Tiers are set based on students grades in mock exams and end of topic tests taken throughout the year students scoring an average of a B go on higher those who score C or less go on foundation. Sometimes a late mock will be used if students feel*

that they should be on higher tier and we have not put them there. We usually agree to move the student if they can obtain a solid B on this test. Occasionally we have students who have already obtained a C grade at a previous school and are retaking these individuals always go on the higher tier to give them the chance to improve. (63, teacher, College)

Some respondents indicated that their students tried past papers at both tiers to see which one led to a better result.

Try them on the same past paper at both levels and see on which they do best. (65, teacher, independent school)

Largely based on UMS scores attained on practice HT and FT past papers. (2, teacher, comprehensive school)

Some teachers took advantage of the fact that students can be entered for different tiers in different Sciences, depending on their strengths.

We look at students individually and enter them for the tier that they seem capable of achieving well on based on evidence from past papers shortly before the exams. Pupils may take a combination of foundation and higher tier papers in the biology, chemistry and physics modules depending on their strengths. (104, teacher, comprehensive school)

Teachers reported using evidence about a student's past performance when discussing the tier entry with the student, and sometimes their parents.

The decision to enter students on tiers is do [sic] as a learning conversation between the teacher and the student. The students is very much involved in the decision and presented with all the data and evidence and guided towards a decision they sign off. (53, teacher, comprehensive school)

Entry based on performance in class, homework, tests and mock exam. Discussed with students and occasionally parents. (141 Teacher, sixth form college)

The ability of a student to cope with each tier is also discussed with the student.

We aim for most to sit the higher tiers, but where a student is a borderline C and lacking in confidence, then we agree between us which tier is best. (149, teacher, independent school)

Student aspirations were also considered important by some respondents.

Occasionally if we know they need a B to do the college course they need, and we feel they are prepared to work hard enough that they might achieve it, we will put them into higher. (152 teacher, comprehensive school)

One respondent reported using the predicted grade based on a student's KS2 performance to decide tier entry.

Essentially by grade as predicted from KS2 performance. (96, teacher, comprehensive school)

One teacher reported that they taught the higher tier content to all students initially, to prevent students' achievement and aspiration being capped. This meant that the decision on tier entry could be made relatively late.

> *Students start course on higher (ie aiming for highest grades) to promote aspiration and so as not to limit students based on prior performance (they grow in different ways) and through the course they are supported appropriately. The exam tier is decided after some mock exams provide evidence to work alongside prior performance for the best tier for each child. (144, teacher, comprehensive school)*

Some respondents expressed frustration with the process of deciding a student's tier.

> *It tends to be a decision made by the Head of Science in discussion with the KS4 co-ordinate. This can be over-ruled by senior management and we are not allowed to know why. (5, teacher, comprehensive school)*

> *I find deciding tier of entry one of the most onerous things and wish I didn't have to do it. (137, teacher, comprehensive school)*

The style of assessments, particularly the literacy demands at each tier also play a role in tier entry.

> *The current foundation tier questions are written with too high an expectation of literacy for grade D students to access. (108, teacher, comprehensive school)*

> *In the papers before 2013 it seemed there was not much difference between the foundation and higher tier papers (especially in terms of literacy required). The grade boundaries were very different though so we entered as many as possible for the higher tier. In 2013 it seemed that the foundation paper was significantly easier and during mocks we had quite a few U's in the higher tier so now we are confused as to which tier to enter students for. Historically we would have entered them for the higher tier but we have never had Us before. (133, teacher, comprehensive school)*

> *The problematic ones are the "almost certainly a C could just scrape a B on a good day with a following wind but might be daunted by the harder questions in a higher tier paper". I have had a number of students where poor literacy (including severe dyslexia) has pushed me towards foundation just in order to give them fewer words to read. (134, teacher in a unit for children with emotional difficulties)*

Several respondents indicated that they thought that it was easier to get a grade C on the higher tier because the grade boundaries are so low.

> *Recent [exam board x] grade boundaries pretty much ensure that all pupils will achieve a higher grade on a Higher tier paper than on a Foundation tier one. Is ridiculous. (21, teacher, comprehensive school)*

> *Previous policy was a grade C. I believe it is easier for students to get higher grades on the higher tier. (117, teacher, comprehensive school)*

> *As you can get a C on higher tier with almost no marks we often go for this choice. (161, teacher, comprehensive school)*

> *We enter everyone for higher tier. Of all the [exam board x] past papers, for [component a], [component b] and [component c], there have been just two ([component a], June 2013) and [component b] (Jan 2012) where pupils have*

needed more than one third of the marks to get a C. For A-G pupils, the higher seems a better choice as you often need 1 or 2 out of 60 for a G (as UMS still counts even though grade says U). (168, teacher, comprehensive school)*

4.3.5 If you use prior attainment to decide on the tier of entry, how do you measure prior attainment?

Most teachers reported using past GCSE papers, judgment of classwork, or tests developed by themselves or colleagues (Fig. S34, Table 13). Only a minority used past KS3 papers. Comprehensive schools were slightly more likely to use tests developed by teachers, independent and selective schools more likely to use tests developed by publishers (Fig. S35). This may be because independent schools tend to have more money so are more able to pay for such resources.

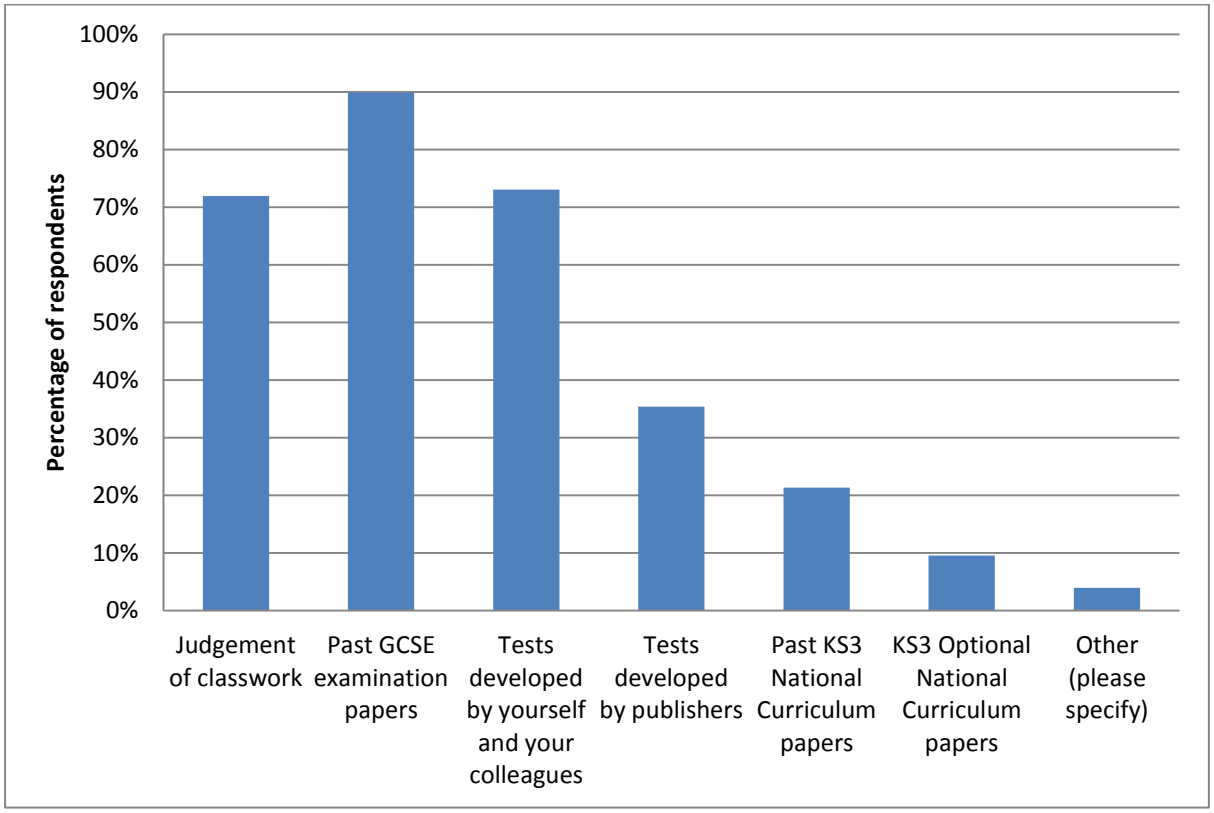


Figure S34: Measures of prior attainment used.

There was little difference between Core and Separate Science respondents, so only overall results are shown.

By school type

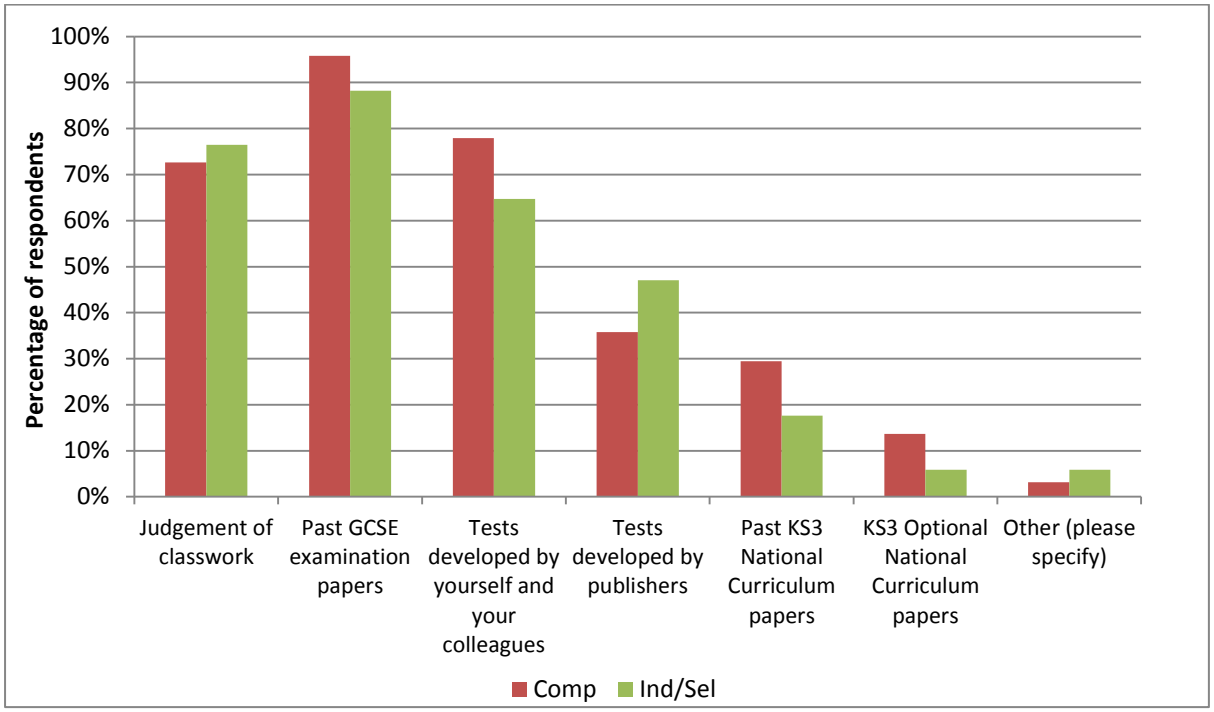


Figure S35: Measures of prior attainment used (by school type).

Table S13: Measures of prior attainment used.

	Percentage	n
Judgement of classwork	71.9%	128
Past GCSE examination papers	89.9%	160
Tests developed by yourself and your colleagues	73.0%	130
Tests developed by publishers	35.4%	63
Past KS3 National Curriculum papers	21.4%	38
KS3 Optional National Curriculum papers	9.6%	17
Other (please specify)	3.9%	7

4.4 Terminal assessment and accountability measures

4.4.1 All GCSE assessments must now be taken at the end of the course. Has the move to 100% terminal assessment at GCSE made you more or less likely to enter students for the higher tier?

Schools were most likely to say that the move to linear assessment will not change their tiering decisions (Fig. S36, Table 14). However, there were clear differences in relation to the science course, with Core Science schools more likely to change their behaviour following the move to linear (Fig. S37). They were more likely to enter more for foundation tier (27.1%) than enter more for higher tier (9.3%). Separate Science schools were more likely to say the change would make no difference (70.59%). Independent/selective schools were more likely than comprehensives to say the change would make no difference (Fig S38). Of those respondents who answered “other”, one commented that many of her students (in a school for the deaf), who had memory, language and other learning difficulties would struggle with the more intense workload at the end of the course, so would be entered

for the foundation tier rather than the higher tier to reduce the pressure. Another teacher noted that the number of students doing separate Sciences had halved with the move to 100% terminal assessment.

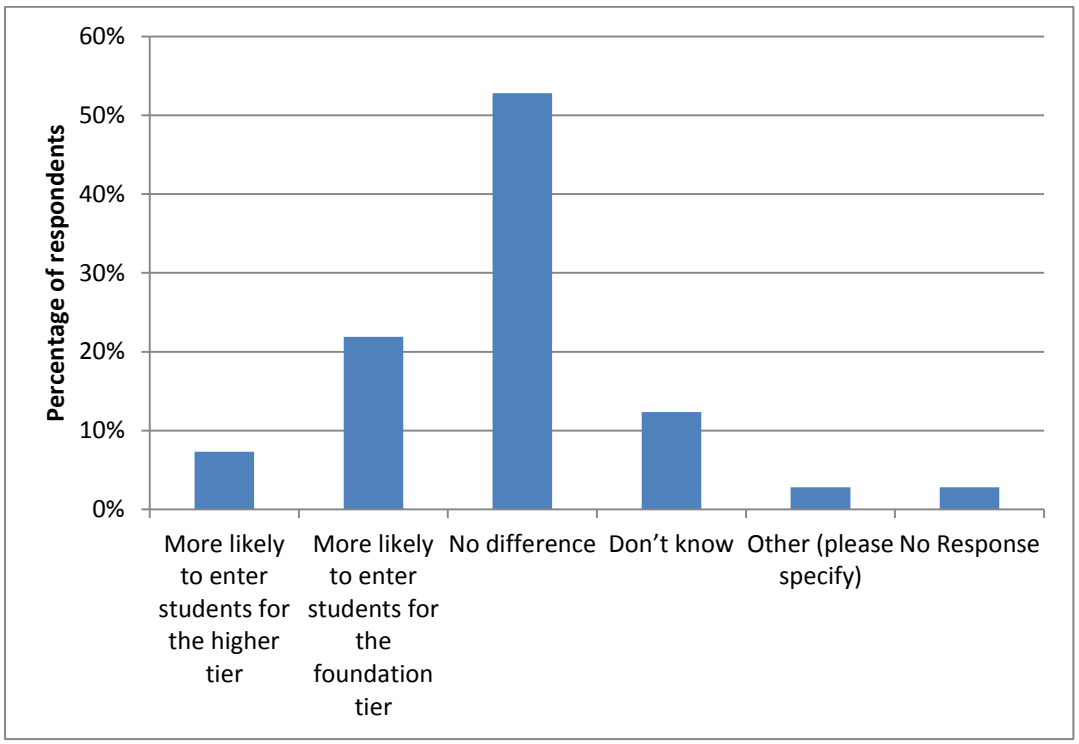


Figure S36: Impact of the move to 100% terminal assessment on tier entry.

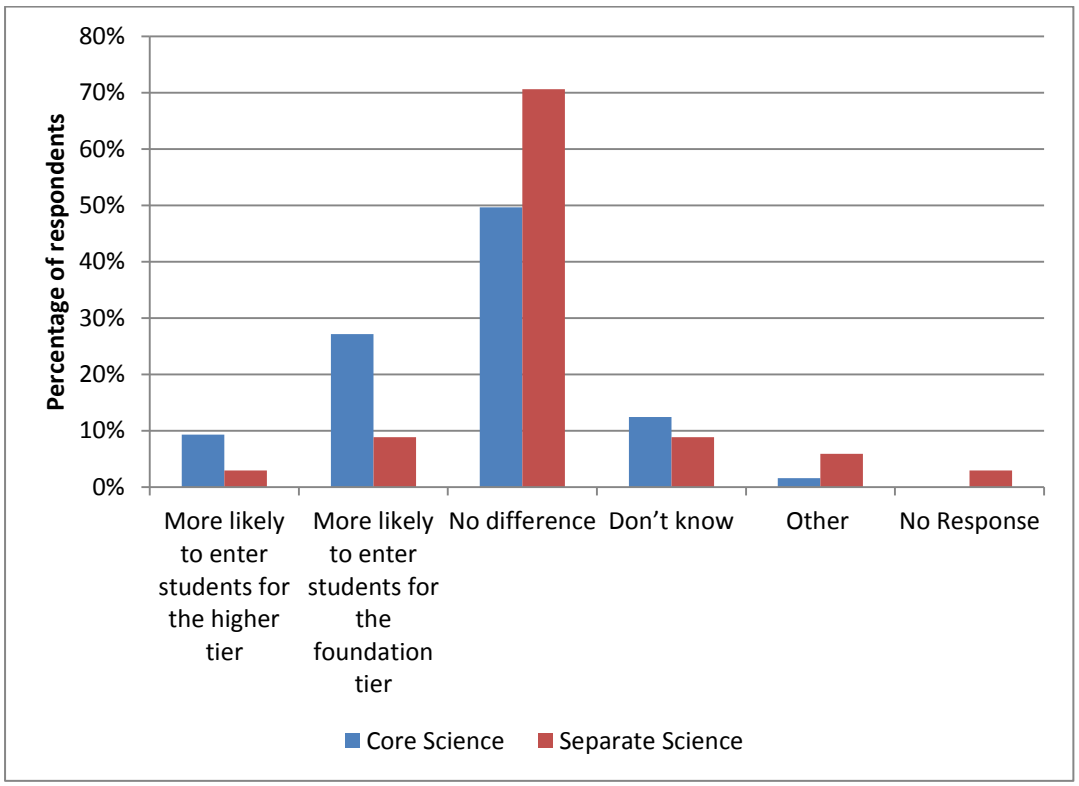


Figure S37: Impact of the move to 100% terminal assessment on tier entry (by Science course).

By school type

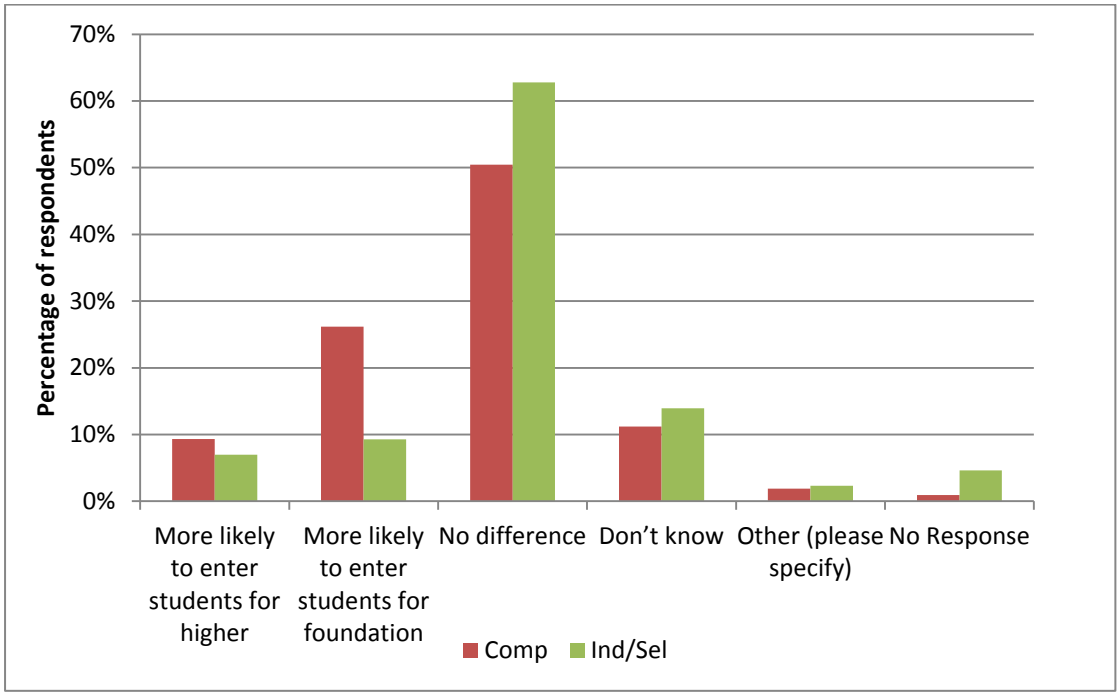


Figure S38: Impact of the move to 100% terminal assessment on tier entry (by school type).

Table S14: Impact of the move to 100% terminal assessment on tier entry.

	Percentage	n
More likely to enter students for the higher tier	7.3%	13
More likely to enter students for the foundation tier	21.9%	39
No difference	52.8%	94
Don't know	12.4%	22
Other	2.8%	5
No Response	2.8%	5

4.4.2 Currently the grade C is an important grade for accountability measures, and is considered to be a "good pass". What impact does this emphasis on obtaining a grade C have on the likelihood that a student will be entered for each tier?

There was quite an even split between those saying this makes no difference and those saying it increases the likelihood of foundation tier entry or increases the likelihood of higher tier entry (Fig. S39, Table 15). However, separate Science schools were much more likely to say this makes no difference (Fig S40). In terms of school type (Fig. S41), the importance of grade C is more likely to lead comprehensive schools than independent/selective schools to enter students for the higher tier, and more likely to lead independent/selective schools to enter students for the foundation tier.

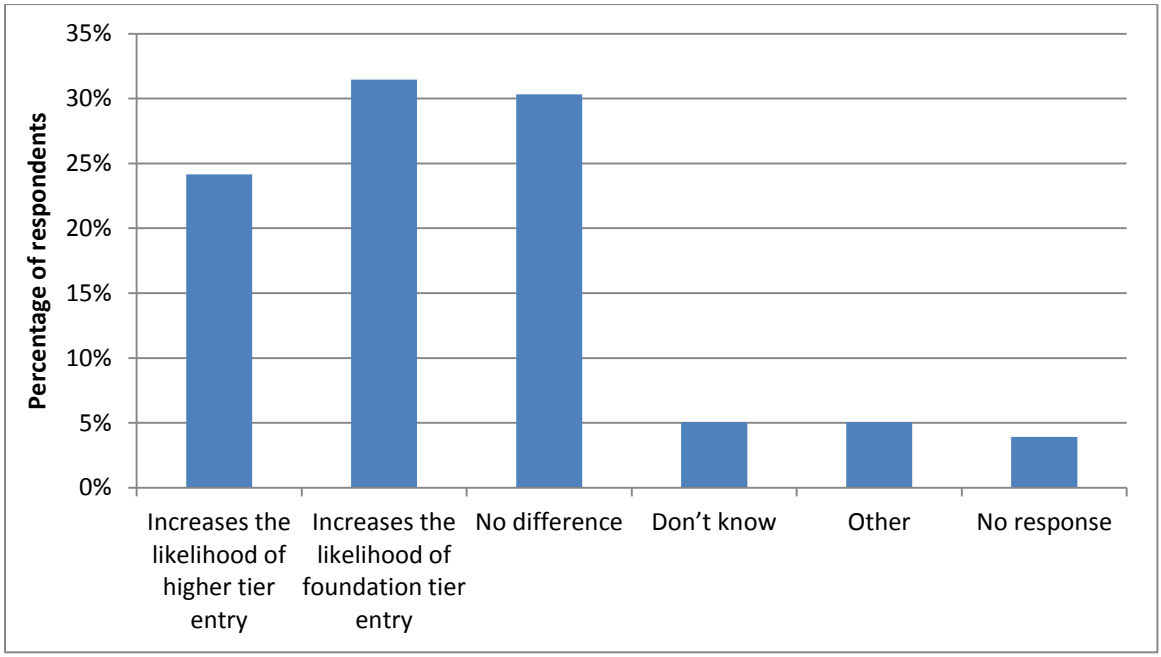


Figure S39: Impact of accountability measures on entry for tiers.

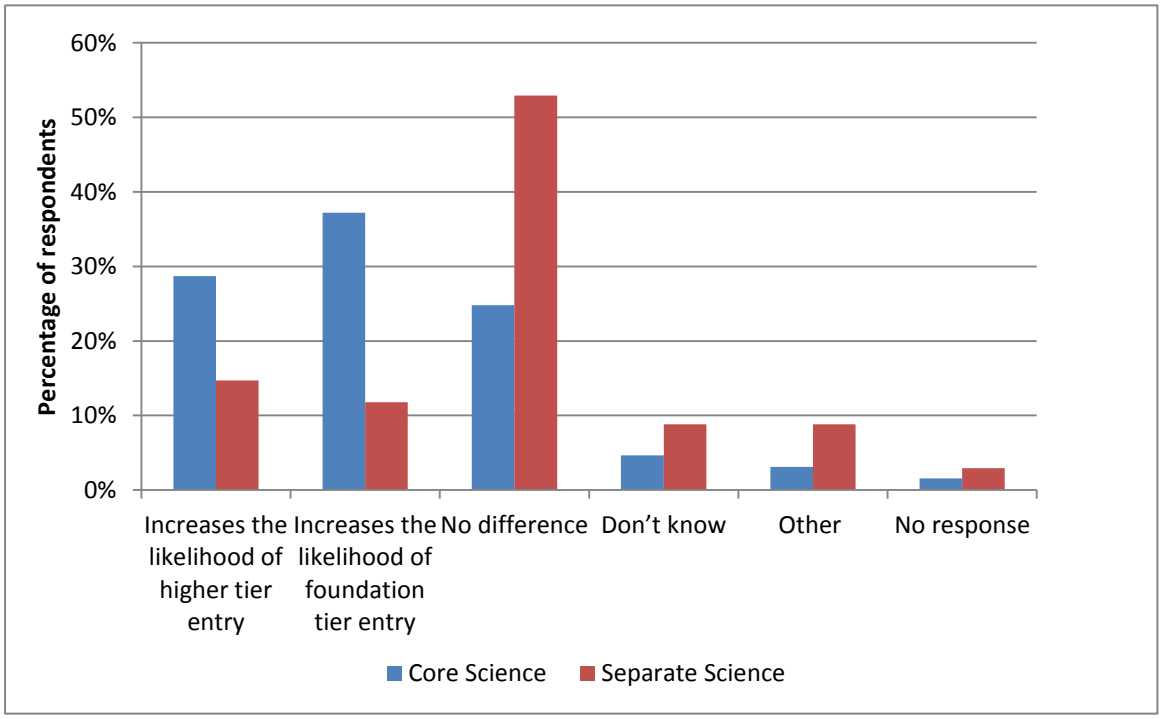


Figure S40: Impact of accountability measures on entry for tiers.

By school type

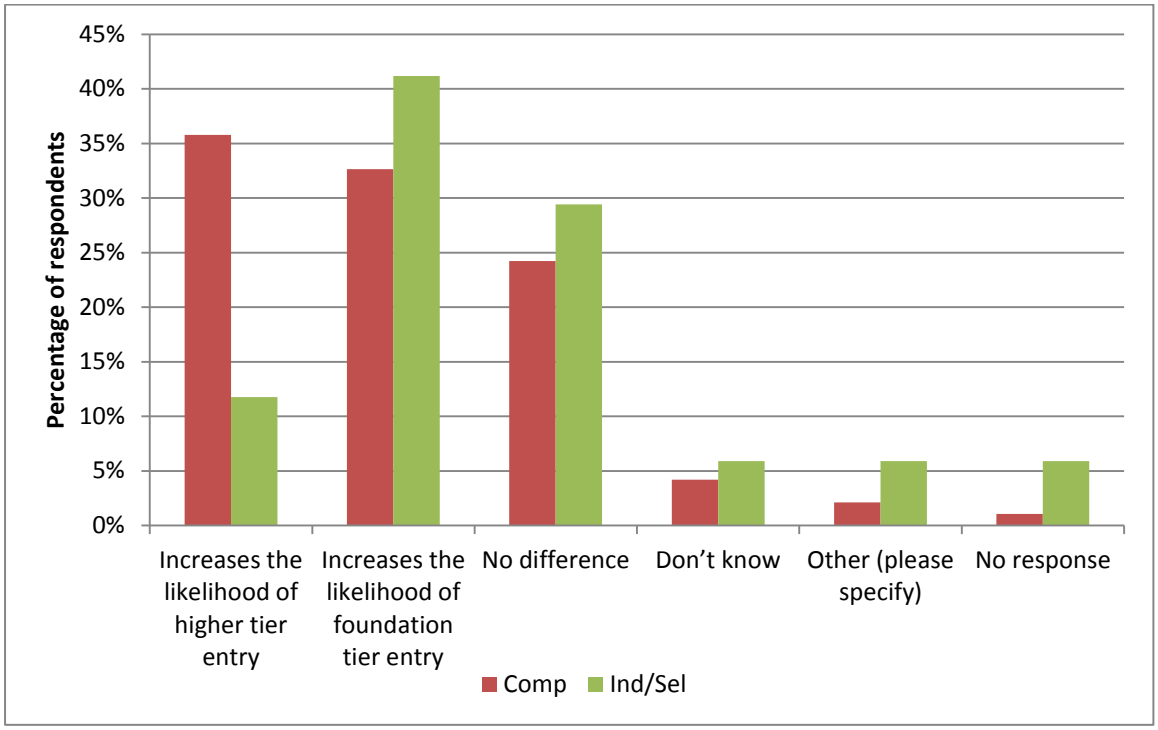


Figure S41: Impact of accountability measures on entry for tiers, by school type.

Table S15: Impact of accountability measures on entry for tiers.

	Percentage	n
Increases the likelihood of higher tier entry	24.2%	43
Increases the likelihood of foundation tier entry	31.5%	56
No difference	30.3%	54
Don't know	5.1%	9
Other	5.1%	9
No response	3.9%	7

4.5 Views about proposed changes to tiering arrangements

4.5.1 The new performance measures for schools will focus on progress in the best 8 GCSE subjects, rather than on the grade C as a threshold measure. Will these new performance indicators make a difference to the proportion of students whom you expect to enter for each tier?

The majority of respondents (about 60% in Core Science schools and about 80% in separate Science schools) felt that this change will make no difference (Figs. S42–S44, Table S16). Independent/selective schools were more likely than comprehensive schools to say it would make no difference (for Core Science only).

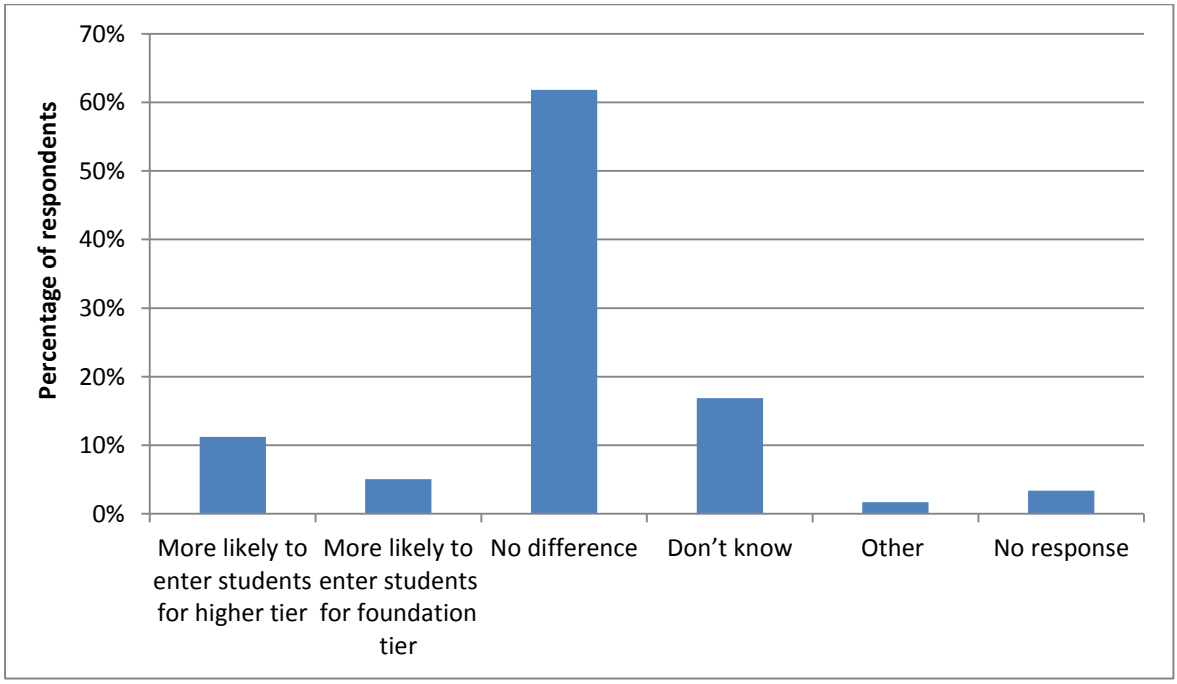


Figure S42: Expected impact of new accountability measures for tier entry.

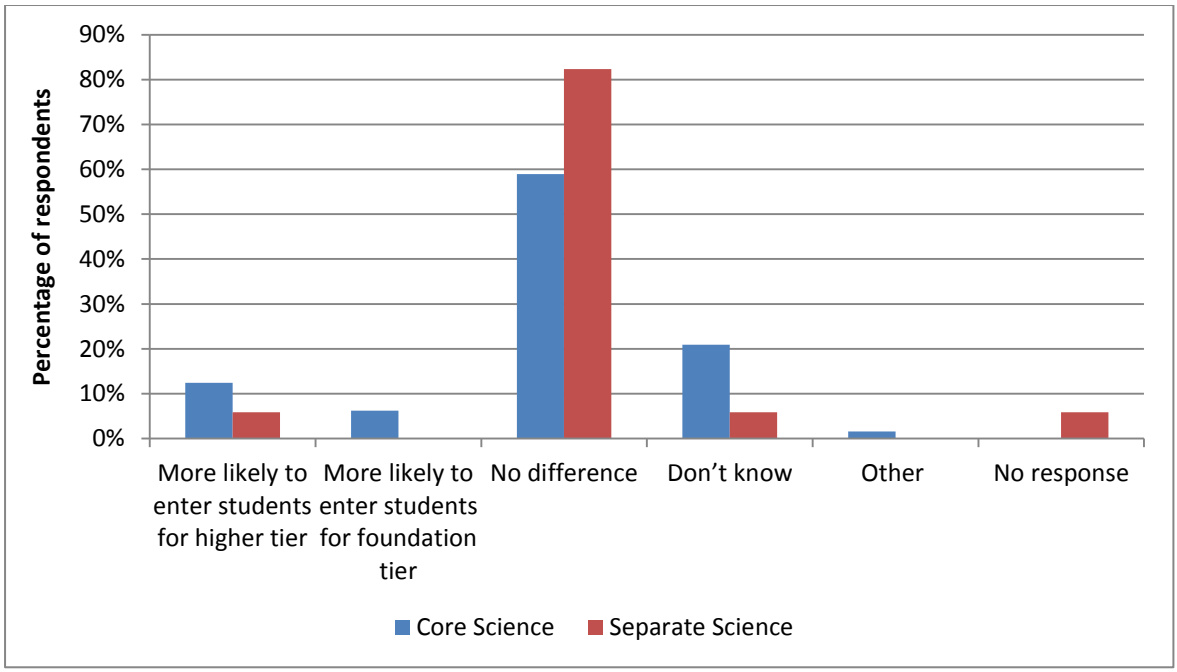


Figure S43: Expected impact of new accountability measures for tier entry by Science course.

By school type

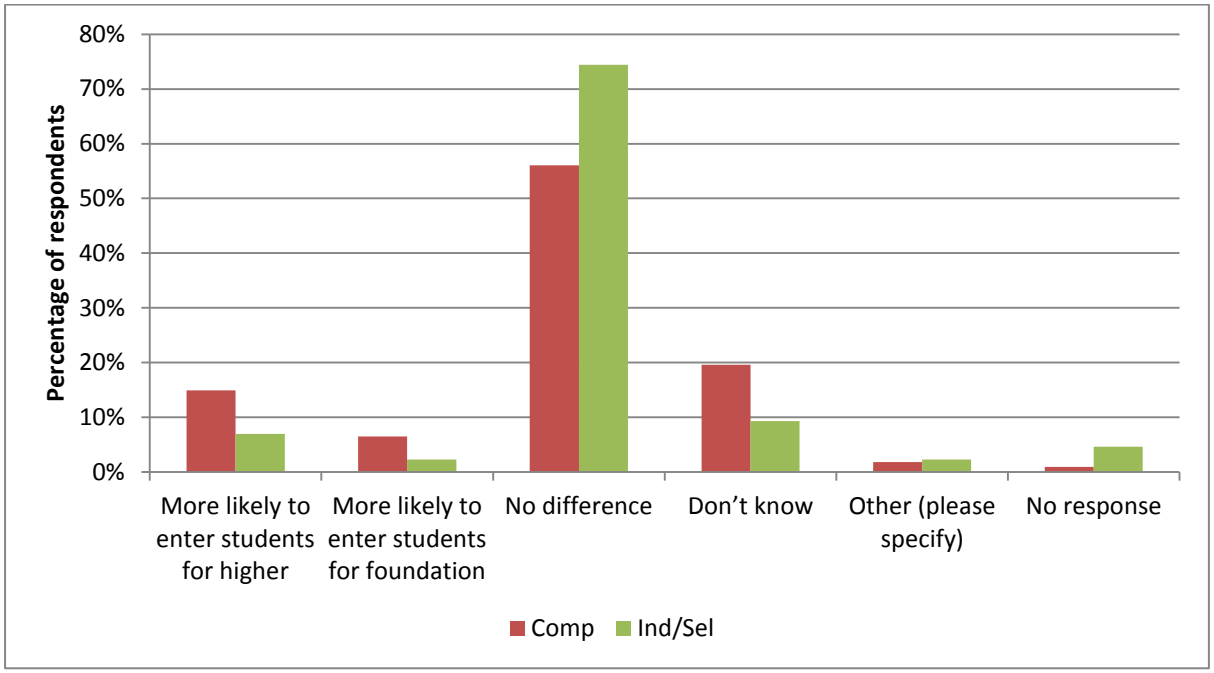


Figure S44: Expected impact of new accountability measures for tier entry, by school type.

Table S16: Expected impact of new accountability measures for tier entry.

	Percentage	n
More likely to enter students for higher tier	11.2%	20
More likely to enter students for foundation tier	5.1%	9
No difference	61.8%	110
Don't know	16.9%	30
Other	1.7%	3
No response	3.4%	6

4.5.2 The tiering model used at GCSE has changed since its introduction. Reforms to the GCSE grading system by Ofqual in the future may change the maximum grade available on the foundation tier. If the maximum grade available on the foundation tier increased so that the highest grade available was B, and the minimum grade available on the higher tier also increased to a grade C (with an allowed grade D), how often would you be likely to enter students for each tier who fit the following description?

Not surprisingly, increasing the highest available grade to a B would increase the likelihood of schools entering students for foundation tier, in comparison to the current system (see Figs S23 and S45, Table 17). However, comparing students likely to achieve the highest grade on the foundation tier (whether a C as present, or the hypothesised B), a much higher proportion of schools would enter students for the higher tier if the proposed changes were made, than with the current system. This was the case for both Core and separate Sciences (Figs. S46 and S47). For example, for Core Science 58.1% would enter students for the higher tier most or all of the time if they were expected to get a grade C in the current system. However, with a grade B available on foundation tier 79.84% would enter a student for the higher tier most or all of the time if they were expected to get a grade B. This suggests that, although raising the foundation tier to a grade B would decrease the number of students entered for the higher tier overall, it might not do so as much as expected. This pattern also holds across school types although, as with the current system, comprehensive schools would tend to be more cautious than independent or selective schools (Fig. 48).

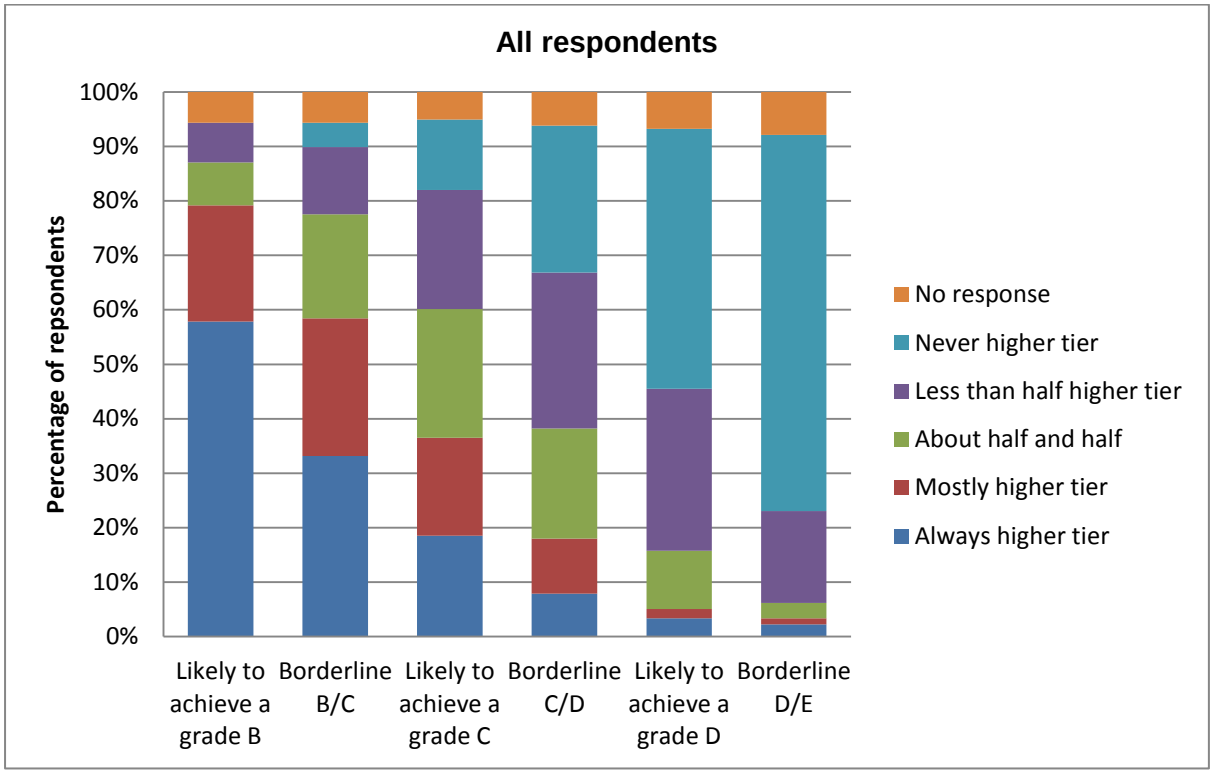


Figure S45: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade B.

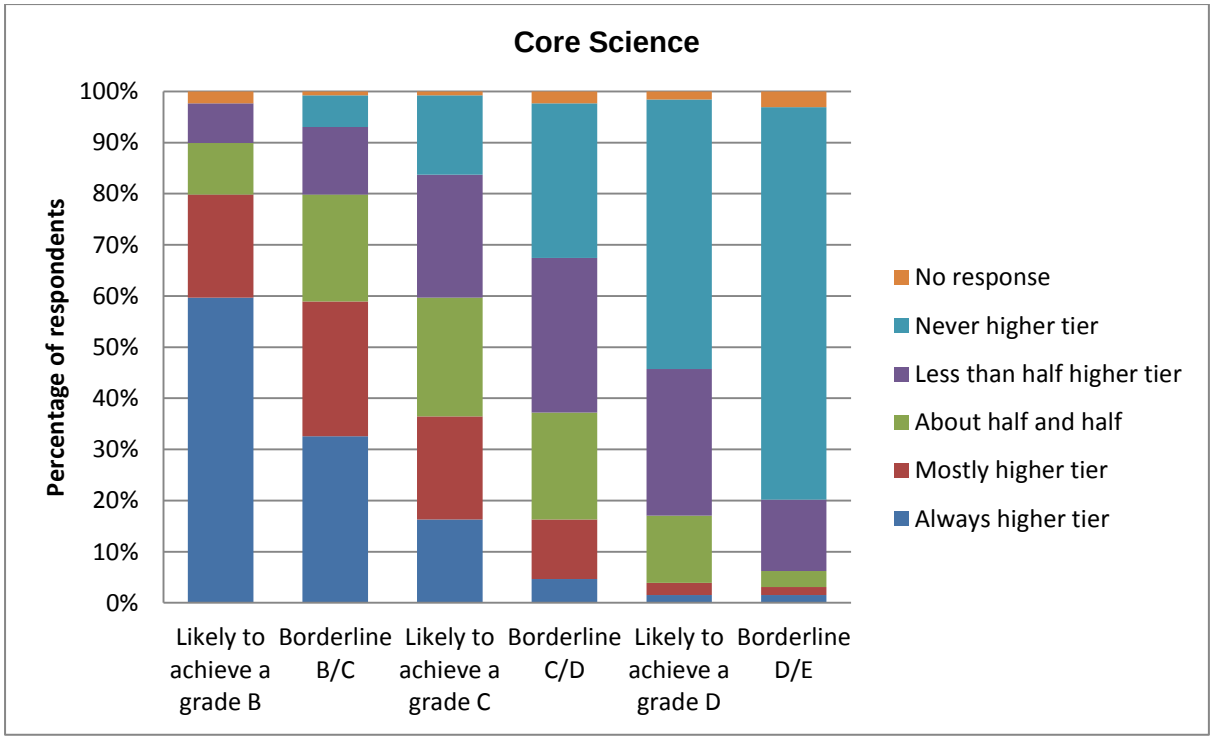


Figure S46: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade B (Core Science).

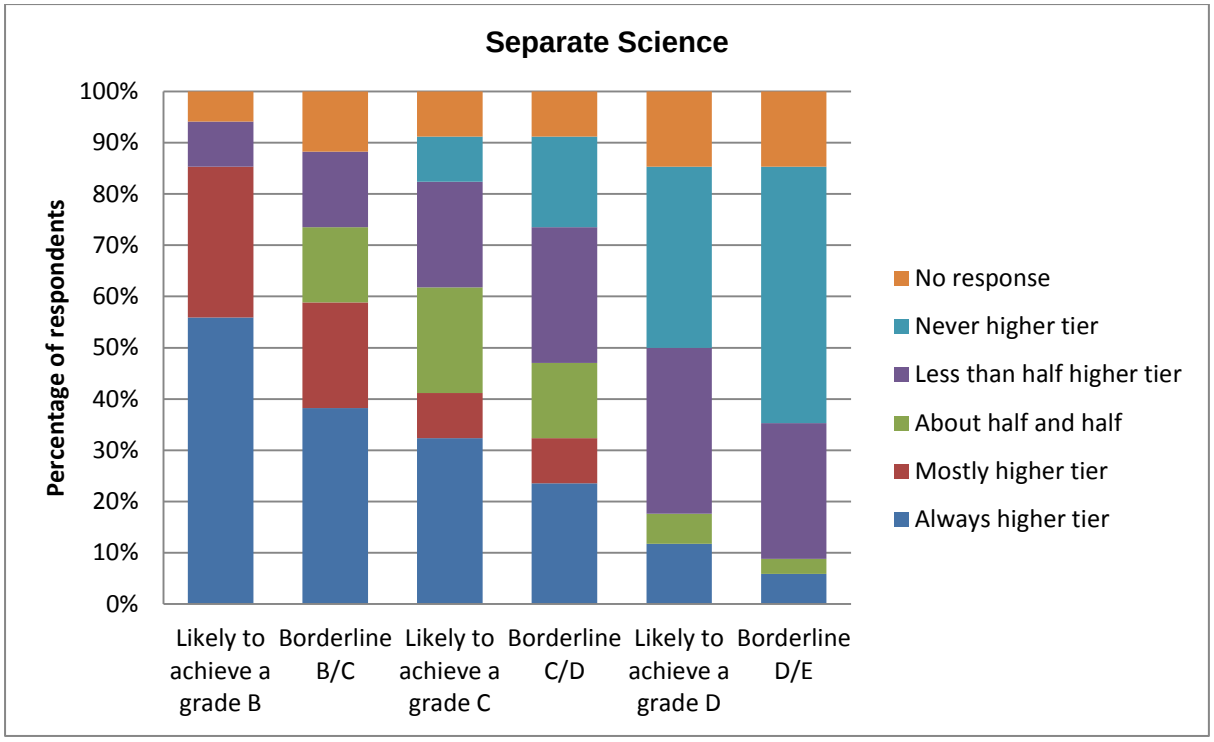
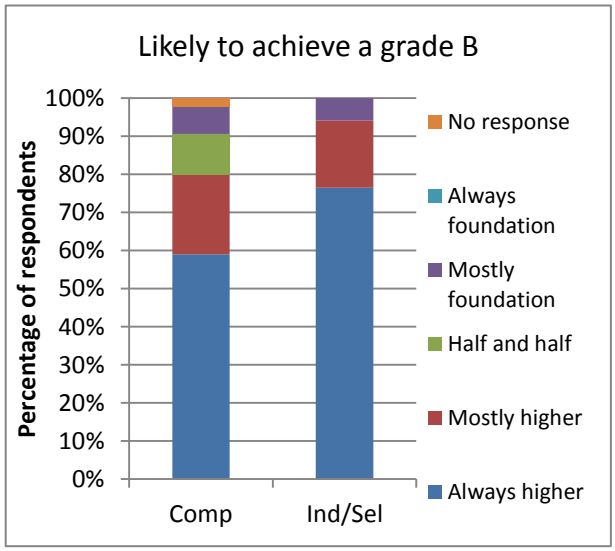
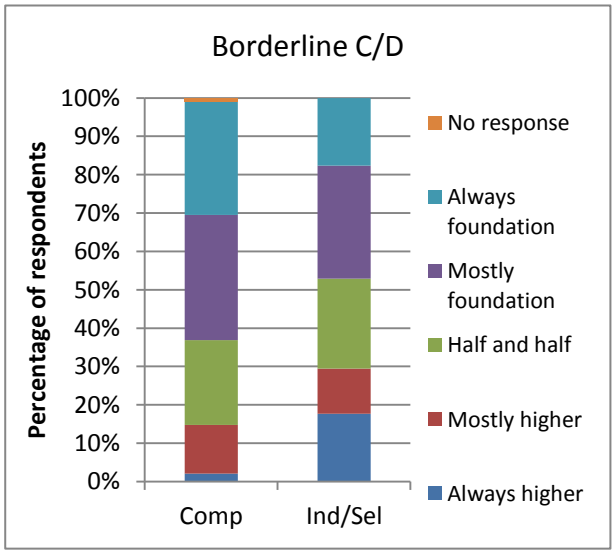
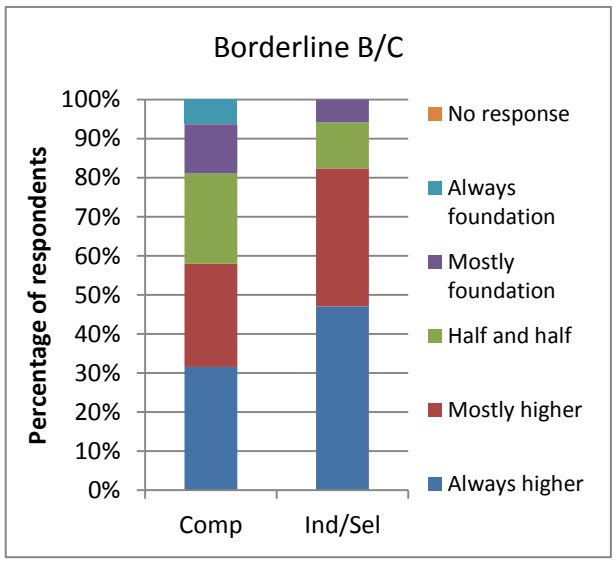


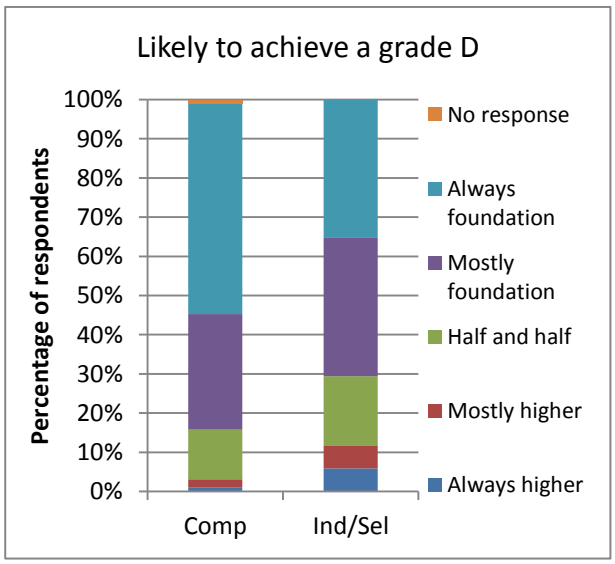
Figure S47: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade B (Separate Sciences).

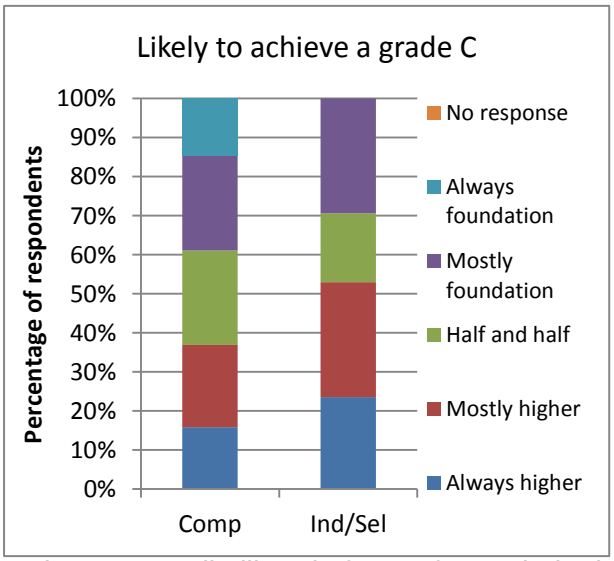
By school type











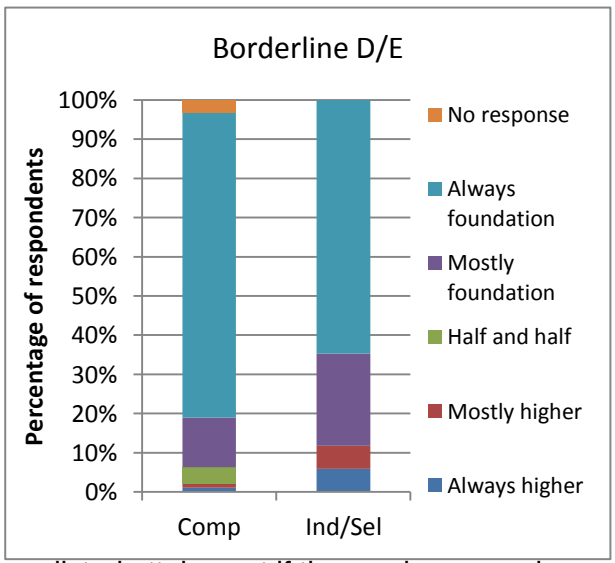


Figure S48: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade B, by school type.

Table S17: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade B.

All respondents	Likely to achieve a grade B	Borderline B/C	Likely to achieve a grade C	Borderline C/D	Likely to achieve a grade D	Borderline D/E
Always higher tier	57.9%	33.2%	18.5%	7.9%	3.4%	2.3%
	103	59	33	14	6	4
Mostly higher tier	21.4%	25.3%	18.0%	10.1%	1.7%	1.1%
	38	45	32	18	3	2
About half and half	7.9%	19.1%	23.6%	20.2%	10.7%	2.8%
	14	34	42	36	19	5
Less than half higher tier	7.3%	12.4%	21.9%	28.7%	29.8%	16.9%
	13	22	39	51	53	30
Never higher tier	0.0%	4.5%	12.9%	27.0%	47.8%	69.1%
	0	8	23	48	85	123
No response	5.6%	5.6%	5.1%	6.2%	6.7%	7.9%
	10	10	9	11	12	14

4.5.3 If the maximum grade available on the foundation tier increased so that the highest grade available was a grade B on the foundation tier, which options would you expect to allow progression to A level sciences?

Only a minority of schools believed that the foundation tier (for both combined Science and separate Sciences) would be sufficient to allow progression to A level Sciences (Fig. S49, Table 18). More schools believed that this would be sufficient for separate Sciences than for combined. However, a higher percentage of the schools that teach Core Sciences believed that foundation tier (in either subject) would be sufficient (Fig. S50) than the percentage of schools teaching separate Sciences only (Fig. S51). The school type differences were small (Fig S52 and S53).

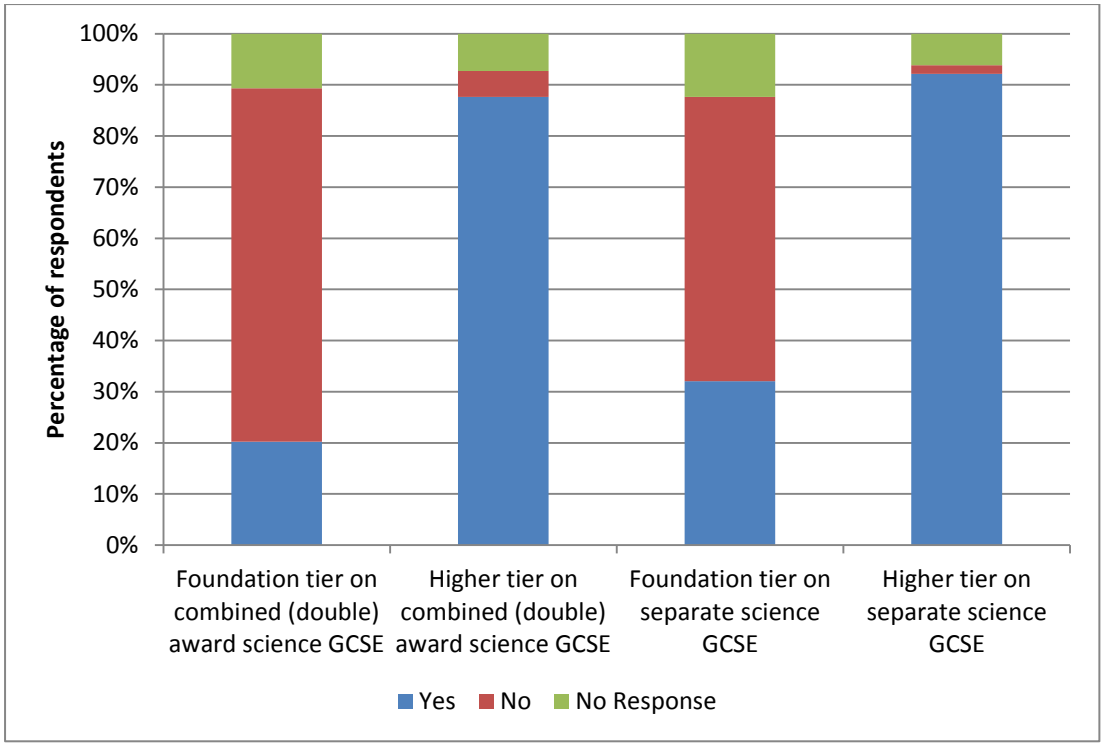


Figure S49: Suitability of different tiers and Science routes for progression to A level.

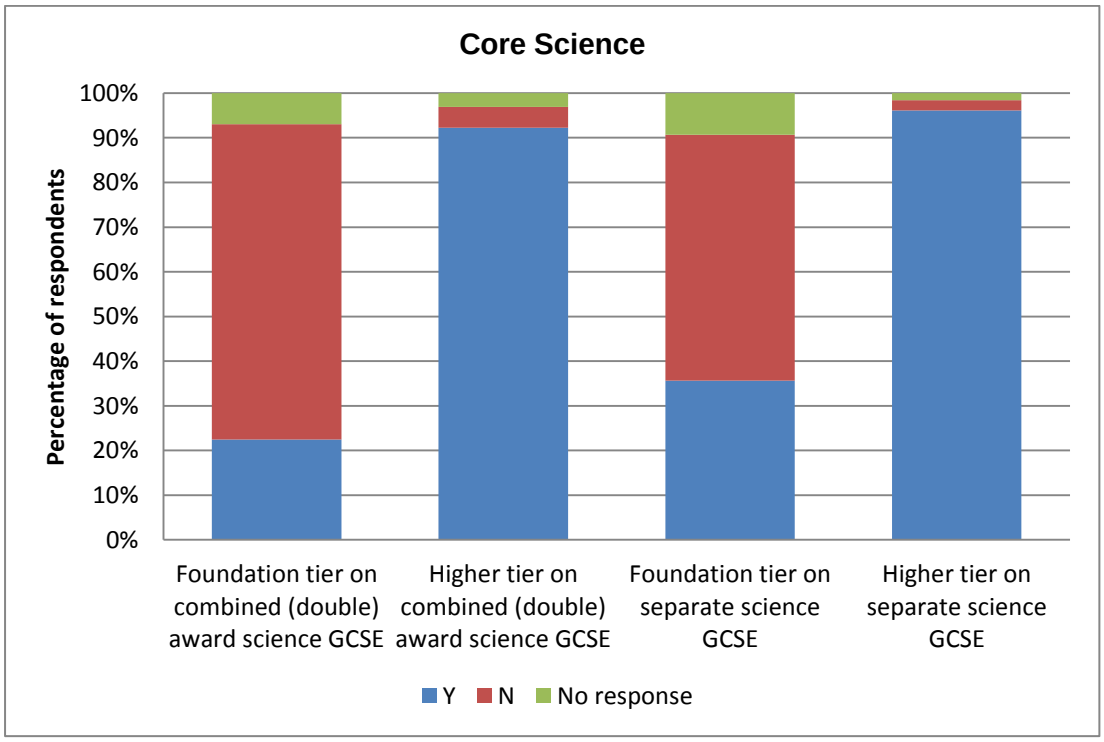


Figure S50: Suitability of different tiers and Science routes for progression to A level (Core Science).

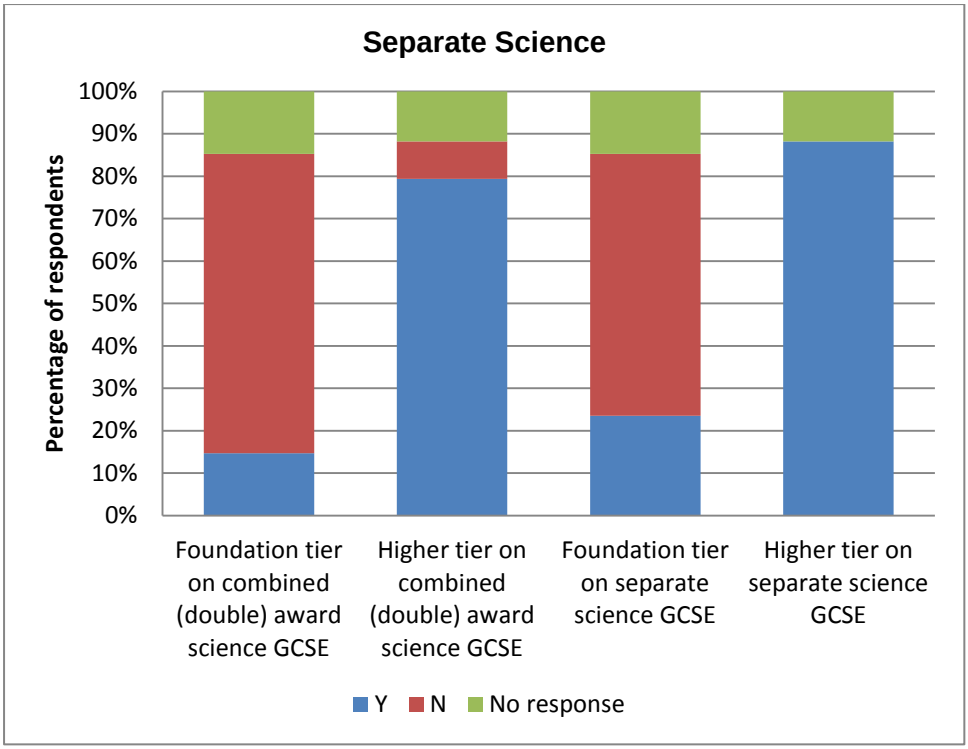


Figure S51: Suitability of different tiers and Science routes for progression to A level (Separate Science).

By school type

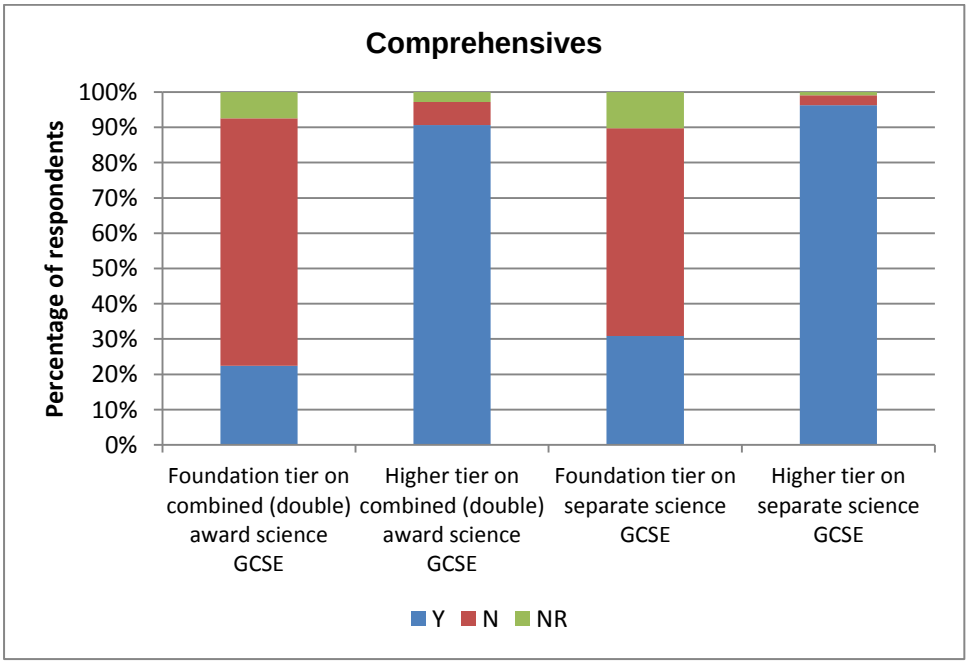


Figure S52: Suitability of different tiers and Science routes for progression to A level (comprehensives).

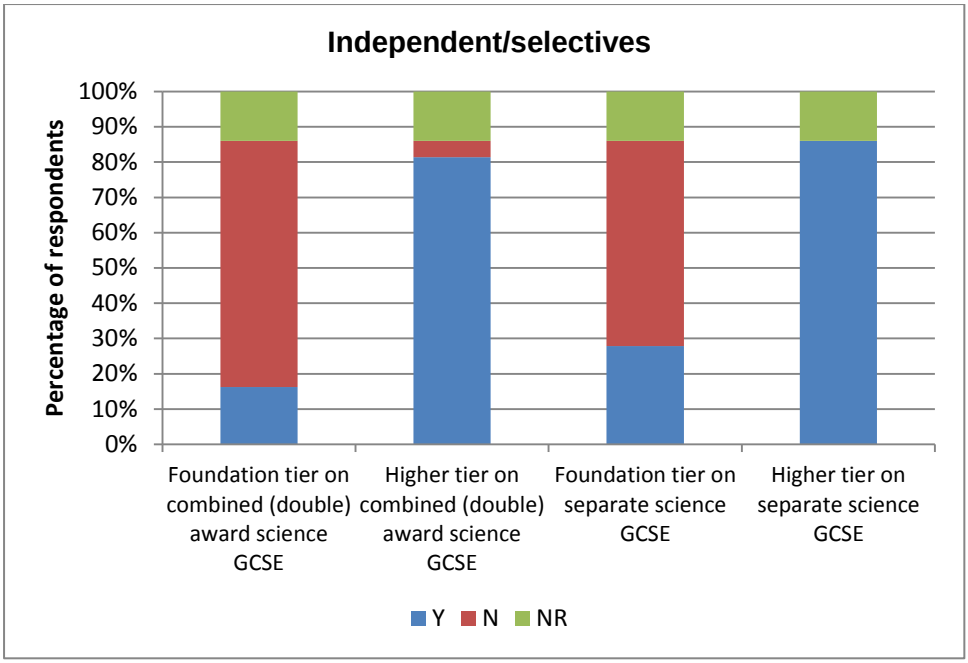


Figure S53: Suitability of different tiers and Science routes for progression to A level (independent/selective).

Table S18: Suitability of different tiers and Science routes for progression to A level.

All respondents	Yes	No
Foundation tier on combined (double) award Science GCSE	20.2%	69.1%
Higher tier on combined (double) award Science GCSE	87.6%	5.1%
Foundation tier on separate Science GCSE	32.0%	55.6%
Higher tier on separate Science GCSE	92.1%	1.7%

4.5.4 If the maximum grade available on the foundation tier decreased so that the highest grade available was D, how often would you be likely to enter students for each tier who fit the following description?

It might be hypothesised that by decreasing the maximum available grade on foundation tier, the percentage entering for higher tier would increase, partly because students expected to achieve a grade C would be more likely to be entered for the higher tier, and because students expected to achieve a grade D might be entered for the tier that allows them to achieve a grade C. Overall, respondents indicated that they would enter more students for the higher tier, though the increase was not as great as might be expected (Fig S54, Table S19). For example, in Core Science the percentage of schools saying they would always or mostly enter students for the higher tier if they were expected to get a grade C (currently the highest available grade on foundation) was 58.1% (Fig S55). This compares with just 34.1% of schools who would always or mostly enter students for the higher tier who were expected to get a grade D if grade D became the highest available grade on foundation. This pattern held for Core Science and separate Science schools (Fig S55 and S56) and for different school types (Fig. S57).

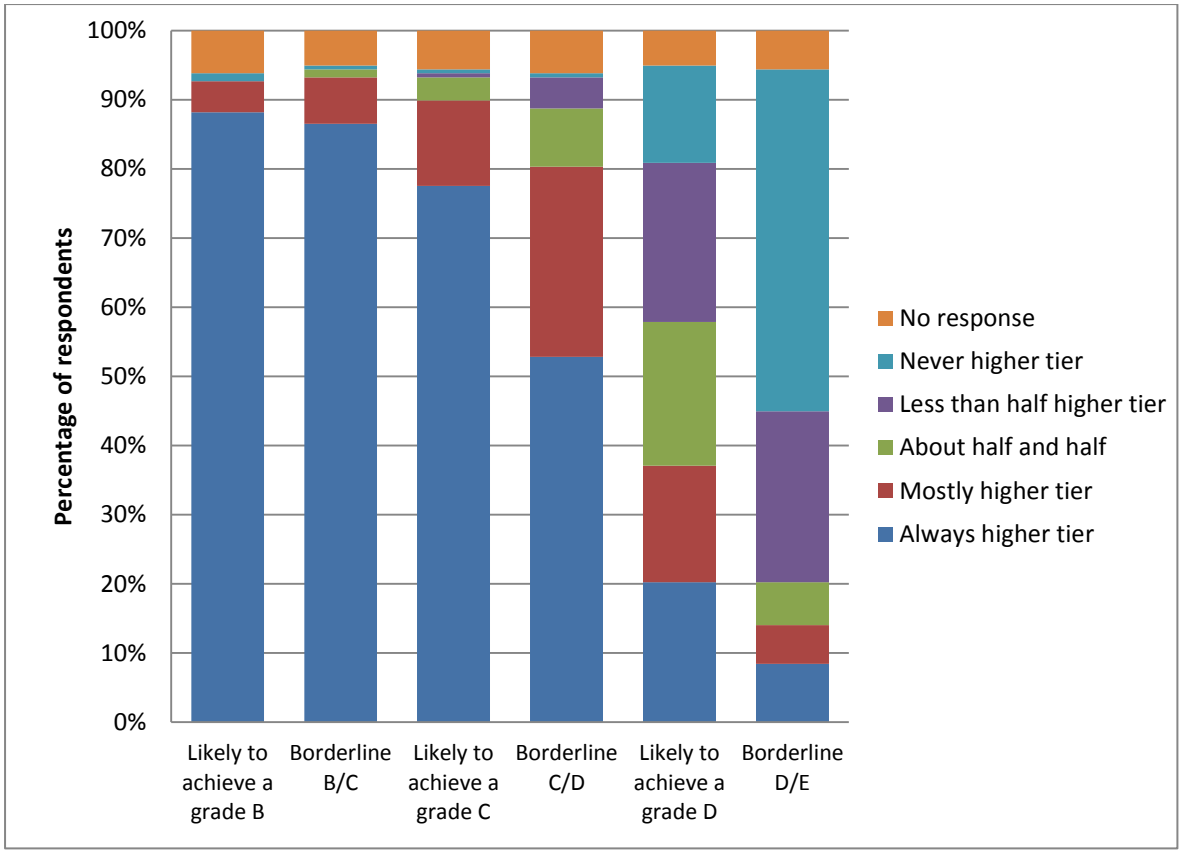


Figure S54: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade D.

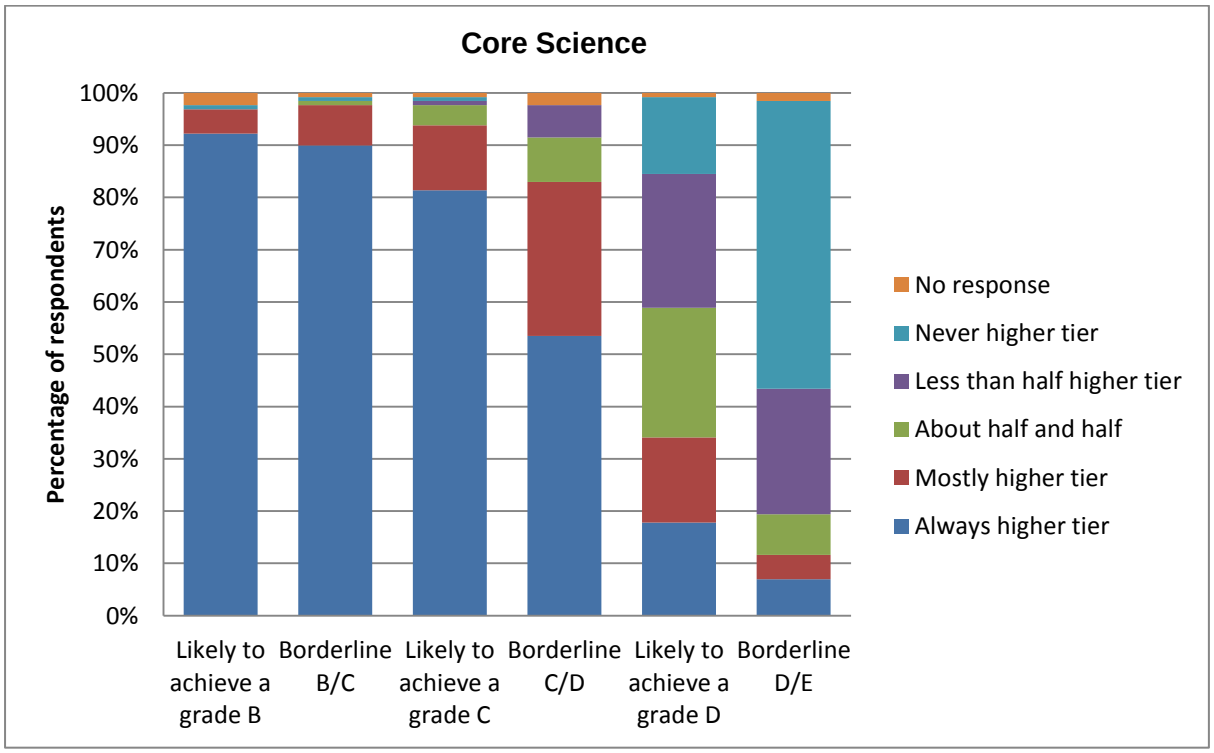


Figure S55: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade D (Core Science).

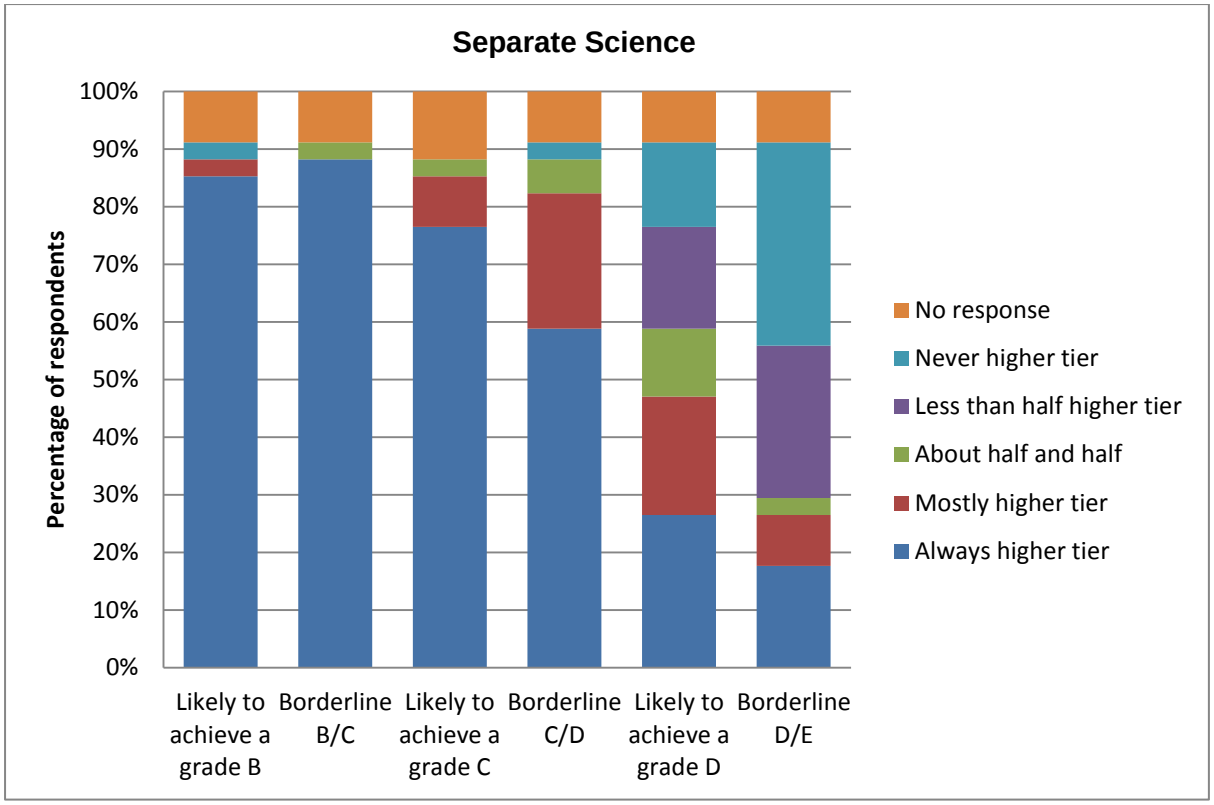


Figure S56: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade D (Separate Science).

By school type

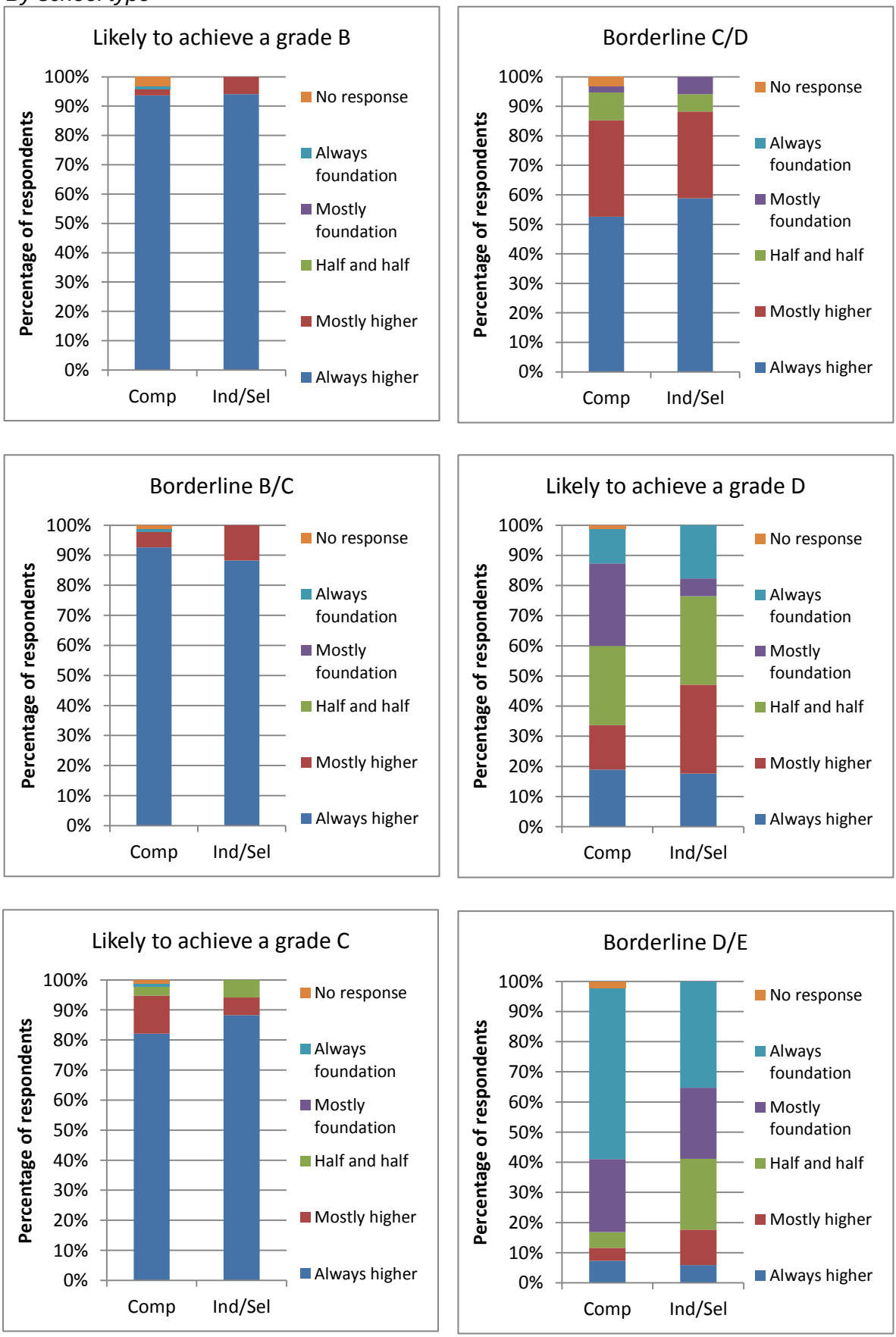


Figure S57: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade D, by school type.

Table S19: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade D.

	Likely to achieve a grade B	Borderline B/C	Likely to achieve a grade C	Borderline C/D	Likely to achieve a grade D	Borderline D/E
Always higher tier	88.2%	86.5%	77.5%	52.8%	20.2%	8.4%
	157	154	138	94	36	15
Mostly higher tier	4.5%	6.7%	12.4%	27.5%	16.9%	5.6%
	8	12	22	49	30	10
About half and half	0.0%	1.1%	3.4%	8.4%	20.8%	6.2%
	0	2	6	15	37	11
Less than half higher tier	0.0%	0.0%	0.6%	4.5%	23.0%	24.7%
	0	0	1	8	41	44
Never higher tier	1.1%	0.6%	0.6%	0.6%	14.0%	49.4%
	2	1	1	1	25	88
No response	6.2%	5.1%	5.6%	6.2%	5.1%	5.6%
	11	9	10	11	9	10

4.5.5 Do you have any further comments?

Forty respondents had further comments about tiering. Each comment is labelled with an identification number for the respondent, and the type of institution where the respondent was teaching.

Several respondents thought that tiering should be removed entirely. Some respondents felt that tiering encouraged "game playing", and that the low grade boundaries for grade C encouraged this.

> *Do away with Tiers. Teachers play games to improve schools results. Education should be about the individual needs of the pupil not hoop jumping for league table jockeying. (42, teacher, independent school)*

> *Life would be much easier without it. It is almost a gamble with student's grades. It would be far better to have one tier from G to A* and then the student would get the grade which reflected their ability rather than being skewed by the tier they were entered for. (91, teacher, comprehensive school)*

> *Should be abolished, would be cheaper, students would get the same grades. Too much gambling with potential outcomes in terms of exam board grade boundary setting, there is no description of a grade B student, so how are exams to be trusted in terms of assessing ability. Already a huge shame that only 25% students follow separate sciences and that the unit 3 exams are used to distribute the grades amongst these most able, so the unit 3 paper always scores much lower grades than the other two. Hence teachers have to anticipate the balance of grade boundary adjustment for students and allocate some unit 1 and 2 exams as HT and u3 as FT to try to maximise the outcomes for the students. At least make triple one tier only! (2, teacher, comprehensive school)*

> *I feel tiering is actually unfair on the students. The untiered exam we do is much easier to teach to as you do not have to decide a tier, the student can just do their best in the day of the exam. Tiering also means that students who get a C on a foundation paper really do not have the equivalent understanding of a student who gets a C on a higher paper, but the grade boundaries do not always reflect this. Also the movement of grade boundaries each year makes it really difficult to judge where a C/D borderline student should be placed. (22, teacher, comprehensive school)*

Furthermore, one teacher commented that their strategy varies according to awarding body.

> *Different exam boards have different patterns. We were [exam board x] with this board it is always better to enter for foundation but [exam board y] patterns suggest entering only higher tier (33, teacher, comprehensive school)*

The type of questions used in Science assessments was perceived to reduce the effectiveness of tiering, and make it difficult to judge which is the most appropriate tier for some students.

> *The main issue we have found with students who struggle with the exam papers is not due to the content of the questions. We have found that it is more to do with the wording and the high reading level required. Therefore it does not necessarily make it easier for students to attain a "better" grade on the foundation tier as the level of reading and comprehension is still very high. This in essence makes the tiering irrelevant. Especially for lower ability students." (136, teacher, comprehensive school)*

Language demands on Foundation tier are the biggest limiting factor not scientific knowledge and understanding (55, teacher, comprehensive school)

In an ideal world the tier system would be removed, entirely, from the examination process. This has been achieved well with some examination boards used in the same school. Because of the vagueness of many questions in the [exam board x] scheme it is very hard to judge whether it is "easier" to get a C on a foundation tier paper. (16, teacher, comprehensive school)

However, these views may at least partially reflect a more general dissatisfaction with the types of questions used in Science GCSEs.

The perception that teachers limit children's aspirations through foundation tier is unfair and cheap politics. That said the issue of tiering or not is a side issue to developing a robust and fair set of exams. Recent science exams (especially 6 mark questions) do not appear to have been thoughtfully trialled, nor does this seem to be improving . (108, teacher, comprehensive school)

Several respondents expressed positive views about tiering, and felt that the choice that it offers has educational benefits.

I personally am in favour of tiering but the IGCSE we follow does not have tiered papers (72, teacher, independent school)

I think it is important to be able to 'mix and match' tiers of entry for getting the best possible result for a student. e.g. they may do 2 x F tier and 1 x H tier to still allow access to the B grade. (84, teacher, independent school)

What I particularly like about tiering is that it encourages some choice, which I feel is important for all students - they should be allowed to play to their strengths, and may be at foundation level in some subjects and higher in others. I feel a little restricted by the fact that all of my students will be doing Higher tier, and all will be doing separate sciences. In an ideal world, I feel that we should be offering a wider range of courses to suit all tastes. However, school policy, perceived parental expectation and the dictates of option blocks have thus far prevented us from offering a more diverse choice. (97, teacher, independent school)

I would be sorry to see it go. For the C/D and below cohort, it spares them from being faced with pages of questions which are just beyond them. There needs to be a reasonable degree of overlap in possible grades between the tiers (as there is at present), otherwise those of us making the entry decisions will be forced to play it safe and not to give the might just scrape up a grade" student the chance to fly." (134, teacher in a unit for children with emotional difficulties)

I think it can be useful but it can mean that a student on a foundation course is not suitable for A-level courses. Means we have to make the right entry decisions. (117, teacher, comprehensive school)

Some respondents explained that they felt that there are benefits to the current tiering model, although a small number thought that introducing an intermediate tier would be beneficial.

I would prefer the current status quo so that students have the chance to achieve a grade C on a foundation paper. (79, teacher, secondary SEN)

In the [exam board y] Core and Additional science courses it has been possible to get a B grade with B grade coursework and a very good performance in the written exams (maximum UMS). I would prefer this continued rather than cap the foundation students to a D grade, which I would consider to be a disastrous decision. (118, teacher, comprehensive school)

I am happy that pupils who should get a C or above are entered for Higher but can still still get a D if they under perform....most of others will be entered for foundation and it should go from C to E where E is still a pass and may be all pupils need for future studies" (121, teacher, secondary modern school)

I think that if C is the grade which is seen as facilitating progression, not to A level - but onto other courses or work related courses/employment then it is important that the foundation tier should give access to grade C. (148, teacher, independent special school).

I think there should be an intermediate tier as there was in the past. (129, teacher, comprehensive school)

4.6 Summary of Science results

Participants taught a wide range of science courses.

- Between 70 and 80% of respondents stated that they taught GCSEs in Core Science, Additional Science, and the separate Sciences, GCE A levels in Biology, Chemistry and Physics.
- Slightly more than half of respondents taught in comprehensive schools.
- The percentage of students entered for the higher tier varied by GCSE course. Students studying GCSEs in separate Sciences were more likely to be entered for the higher tier. Independent/selective schools were more likely to enter students for the higher tier in Core, Additional and separate Sciences.

There is a relationship between ability setting and entry for tiers, but there is some flexibility.

- Schools/colleges typically started teaching Core Science and separate Science courses in Y9, or to a lesser extent, Y10. Additional Science courses were more likely to be started in Y10 or Y11. Independent/selective schools were slightly more likely to start teaching Core and separate Science courses earlier.
- Approximately 30% of respondents reported that their institution first put students into sets/groups in Y7. Independent/selective schools were less likely to set by ability, and to put students into ability sets later.
- Ability sets which entered students for a mixture of foundation and higher tiers were relatively common.
- Over half of respondents thought that it was possible to decide to enter a student for the higher tier more than half way through the course. Independent/selective schools were more likely to think that this decision could be delayed until the end of the course than comprehensive schools.
- Relatively few students in each school/college move between foundation and higher tier, though there seems to be little difference in the proportion of students who move in each direction. Independent/selective schools were more likely to report that no students moved between tiers.

Teachers used a range of different types of information when deciding which tier to enter students for; however, this information may lead to different outcomes depending on the type of institution and the Science course.

- Students following separate Science GCSE courses were more likely to be entered for the higher tier than those following Core Science courses, even when their expected achievement was predicted to be the same. This was particularly the case at the lower grades. Similarly, students at independent/selective schools were more likely to be entered for the higher tier than students at comprehensive schools, even when they were expected to achieve the same grades.
- Decisions about tiering were typically taken as a result of individual teacher judgement and department policy. However, input from students and their parents/guardians was also considered to be important or very important by more than 50% of respondents. Teachers from comprehensive schools were more likely to report that department policy was important, and less likely to say that parents or students had input into the decision than those from independent/selective schools.
- Predicted, prior or current attainment and the ability to cope with written examinations were the most important factors influencing entry for tiers. However, the recent performance of previous borderline candidates, the perceived difficulty of the grade C on different tiers and pressure to achieve a grade C were all considered to be important by approximately 70% of respondents. The student's opinion and aspirations were also considered to be important by over 60% of respondents. Writing and literacy skills were reported to be important by approximately 70% of respondents. Over 20% of respondents stated that student behaviour in class was

important when deciding tier entry. The pattern of responses was similar for teachers who taught Core and separate Science courses. Across school types, the recent performance of previous borderline students, writing skills and prior or current attainment were more important for comprehensives. The student's opinion was more important for independent/selective schools.

- Teachers reported using a combination of factors to decide on tier entry. The style of assessments, particularly the literacy demands of questions at each tier also played a role in deciding tier entry. It was felt by some respondents that the literacy demands were too high for many candidates on the foundation tier.
- Nearly 90% of respondents reported using past GCSE examination papers to measure prior attainment, while approximately 70% of respondents used judgement of classwork or tests developed by themselves and their colleagues. Independent/selective schools were more likely to use tests developed by publishers.

The planned reforms to GCSEs and school accountability measures will have a relatively small impact on tier entry, but are likely to have a small effect on the percentage of students entered for each tier.

- The move to 100% terminal assessment has made no difference to the likelihood that teachers will enter students for the higher tier for slightly more than 50% of teachers. However, of those who did report a difference, it was more likely to lead them to enter students for the foundation tier. Teachers who taught separate Science courses were more likely to report that the move to 100% terminal assessment would have no impact on their tier entry decisions. Teachers from comprehensive schools were more likely to say that the move to linear assessment would increase the number of students entered for the foundation tier, while independent/selective schools were more likely to report that it would make no difference.
- Approximately 30% of respondents said that the importance of the grade C for accountability measures, and progression meant that they were more likely to enter students for the foundation tier. However, nearly 25% of respondents said that it made them more likely to enter students for the higher tier. It was less likely to make a difference for teachers who taught separate Science courses compared to those who taught Core Science courses. Teachers from independent/selective schools were more likely to state that the importance of the grade C made them more likely to enter students for the foundation tier than those comprehensive schools.
- Over 60% of teachers reported that the new accountability measures would have no impact on their tier entry decisions. The relatively few respondents who reported that it would make a difference were more likely to say that it would increase the number of students that they entered for the higher tier. Teachers from independent/selective schools were more likely to say that the new accountability measures would make no difference to their tier entry decisions.
- As might be expected, teachers indicated that increasing the foundation tier to a grade B would reduce the likelihood that they would enter candidates for the higher tier. Similarly, if the foundation tier were reduced so that the maximum grade available were a grade D, teachers indicated that they would enter more candidates for the higher tier. However, on a reduced foundation tier, candidates expected to achieve a grade D, the highest grade available, would still be less likely to be entered for the higher tier than students expected to achieve a grade C under the current tiering arrangements.
- If the foundation tier increased to a grade B, only approximately 20% of respondents thought that the foundation tier of combined (double) award Science would be suitable for progression to A level Sciences, compared to slightly more than 30% for foundation tier on separate Science GCSE. The overwhelming majority of respondents thought that the higher tier for both double award and separate Sciences would be suitable for progression to A level Sciences.

There were mixed views on the value of tiering.

- Some respondents expressed the view that tiering should be removed from Science GCSEs, because it encouraged teachers to “game the system”. However, other teachers valued the choice that tiering offered, allowing them to select assessments which were better tailored to different learners.

5 Mathematics Results

5.1 Participants

Respondents taught in a range of different types of institutions. 48% taught in comprehensive schools, while 21% taught in independent schools. Nearly 10% of respondents taught in post-16 institutions (colleges) (Fig. M1). For the purpose of the analysis, these institution types were split into three categories: comprehensive, independent/selective and College (post-16) (Table M1). Key Stage 3 Mathematics, GCSE and A level were the courses most commonly taught by respondents (Fig. M2, Table M2). However, other courses, such as Entry Level, FSMQ and Functional Skills were also taught. Participants were asked what proportion of their students they typically entered for the higher tier in GCSE Mathematics. Across respondents, responses ranged from 0-100% (Fig. M3, Table M3). However, when separated into school type (Fig. M4), colleges tended to enter very few students for the higher tier, while independent/selective institutions entered all, or the majority of students for the higher tier. Comprehensive schools fell between these two extremes, with a modal value of 60-69% of students.

5.1.1 What type of school/college do you teach in?

Slightly less than half of respondents taught in comprehensive schools, while the second largest group taught in independent schools (Fig. M1).

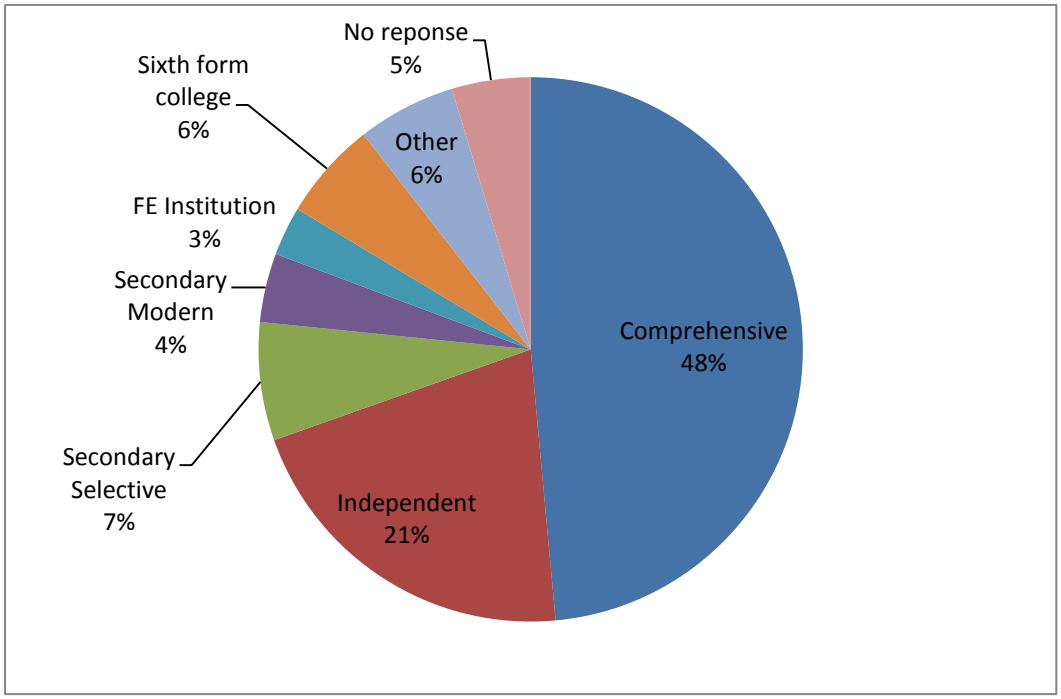


Figure M1: Type of institution.

It was hypothesised that different types of institution, operating in different educational contexts might behave differently with respect to entry for tiers. Therefore, institutional types were grouped into three categories (Table M1).

Table M1: Type of institution

Type of school/college	Percentage	n
Comprehensive	48.5%	83
Secondary Modern	4.1%	7
Independent	21.1%	36
Secondary Selective	7.0%	12
FE Institution	2.9%	5
Sixth form college	5.9%	10
Other	5.9%	10
No response	4.7%	8

5.1.2 Which Mathematics courses are taught in your school/college?

Nearly all respondents taught GCSE Mathematics. The majority also taught Key Stage 3 mathematics and A level Mathematics (Fig. M2, Table M2).

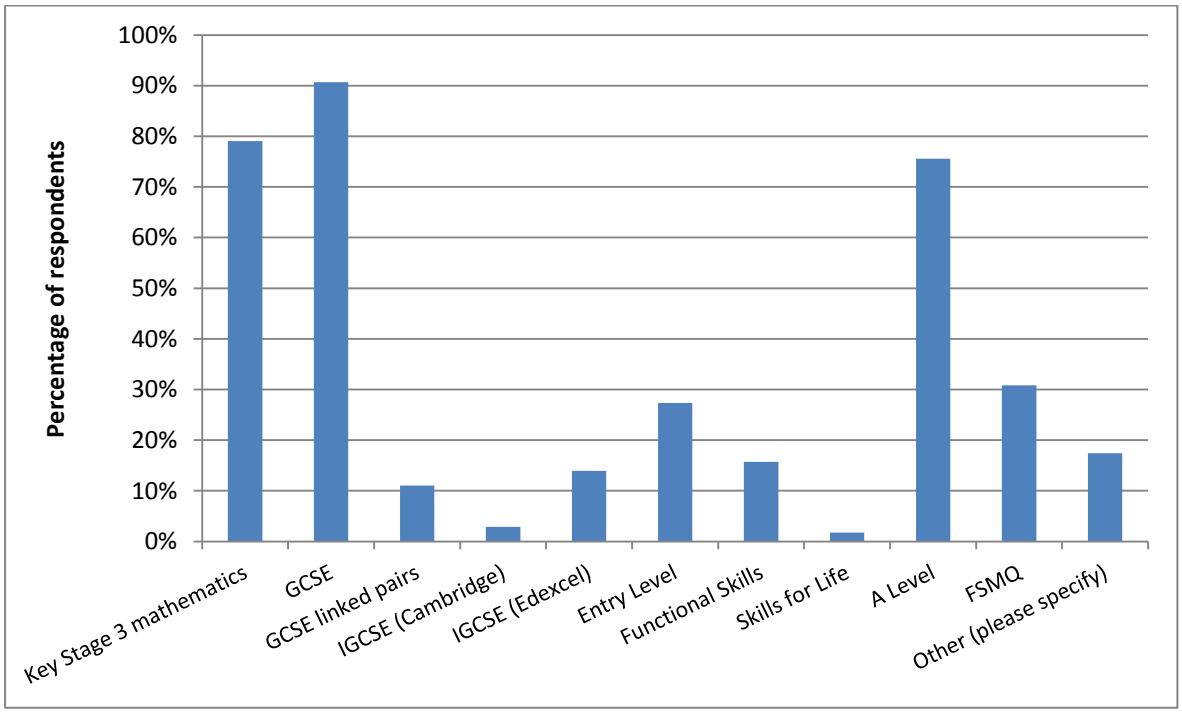


Figure M2: Mathematics courses taught in respondents' school/colleges.

Table M2: Mathematics courses taught in respondents' school/colleges.

Course	Percentage	n
Key Stage 3 Mathematics	79.1%	135
GCSE	90.7%	156
GCSE linked pairs	11.1%	19
IGCSE (Cambridge)	2.9%	5
IGCSE (Edexcel)	14.0%	24
Entry Level	27.3%	47
Functional Skills	15.7%	27
Skills for Life	1.7%	3
A Level	75.6%	130
FSMQ	30.8%	53
Other (please specify)	17.4%	30

5.1.3 Approximately what percentage of GCSE Mathematics students in your school/college currently enter for the higher tier?

A wide range of responses were received, with some centres entering all students for the higher tier, and others entering less than 10% (Fig. M3, Table M3). However, this varied by school type, with colleges more likely to enter very few students for the higher tier, and independent/selective school were more likely to enter all, or nearly all students for the higher tier (Fig. M4).

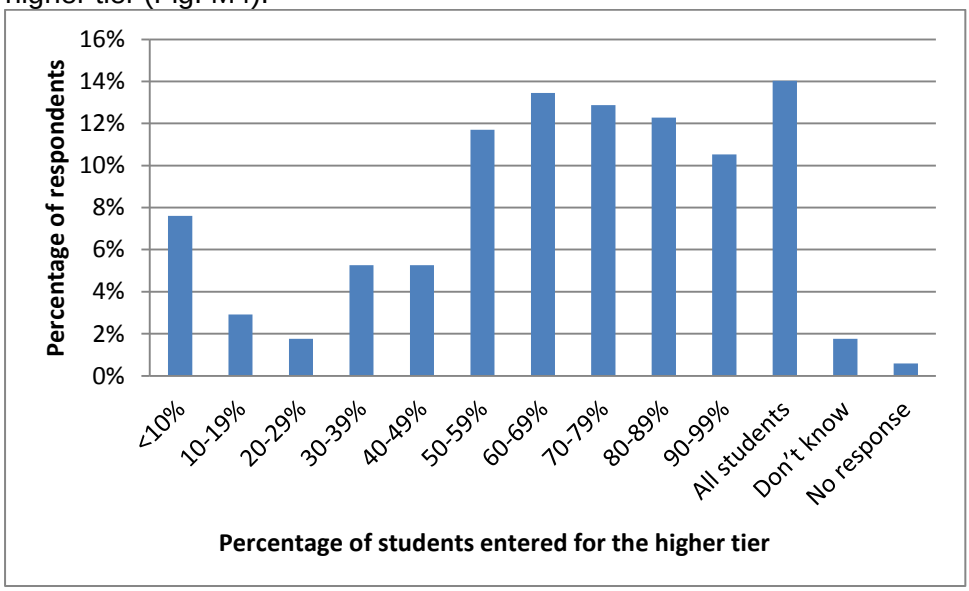


Figure M3: Percentage of students entered for the higher tier.

By school type

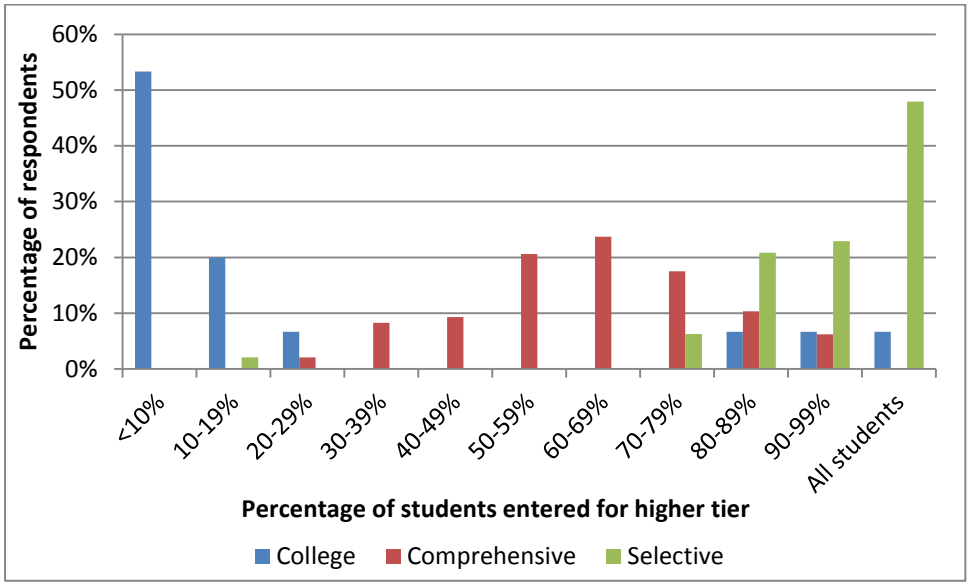


Figure M4: Percentage of students entered for the higher tier by institution type.

Table M3: Percentage of students entered for the higher tier.

Percentage of students	Percentage of respondents	n
<10%	7.6%	13
10-19%	2.9%	5
20-29%	1.8%	3
30-39%	5.3%	9
40-49%	5.3%	9
50-59%	11.7%	20
60-69%	13.5%	23
70-79%	12.9%	22
80-89%	12.3%	21
90-99%	10.5%	18
All students	14.0%	24
Don't know	1.8%	3
No response	0.6%	1

5.2 The relationship between tiering and ability sets.

The results from the following five questions are summarised together, because the results are most easily interpreted as a whole. Most respondents reported that they start teaching GCSE Mathematics specifications in either year 9 or year 10 (Fig. M5, Table M4). However, over 60% of institutions first put students into sets by ability in year 7 (Fig. M6, Table M5); this is the case for 80% of comprehensives, whose intake typically includes a wide range of ability levels (Fig M7). Independent/selective schools are more likely to first put students into ability sets later, while colleges typically don't set by ability. Furthermore, there is a strong link between ability sets and tier entry, with a very small proportion of ability sets, if any, entering students for a mixture of foundation and higher tiers (Fig. M8, Table M6). Despite the fact that additional content must be taught at higher tier, about 40% of respondents thought that it was possible for a student to move up to the higher tier more than half way through a GCSE course, or later (Fig. M9, Table M7). Post-16 institutions were more likely to indicate that the latest stage at which it was possible to move to the higher tier was less than half way through the course (Fig. M10), which is perhaps a reflection of the fact that

colleges are more likely to offer GCSE Mathematics as a one year resit course. However, approximately 20% of respondents indicated that no students moved between tiers, either from foundation to higher or vice-versa (Fig M11, Table M9), and overall it seems that students are unlikely to change entry tier once the decision has been made. Comprehensive schools were less likely than other institutions to indicate that no students moved between tiers (Figs. M12 and M13). Perhaps surprisingly, and in contrast to Gillborn and Youdell (2000), there seemed to be no clear difference between the number of students who moved from the foundation tier to the higher tier or the higher tier to the foundation tier. There was a relatively high proportion of "Other" responses; these were split between FE colleges, and those who see the teaching of Mathematics as a continuum, and responded that they started teaching from year 7.

5.2.1 When does your school/college currently start teaching the GCSE Mathematics specifications?

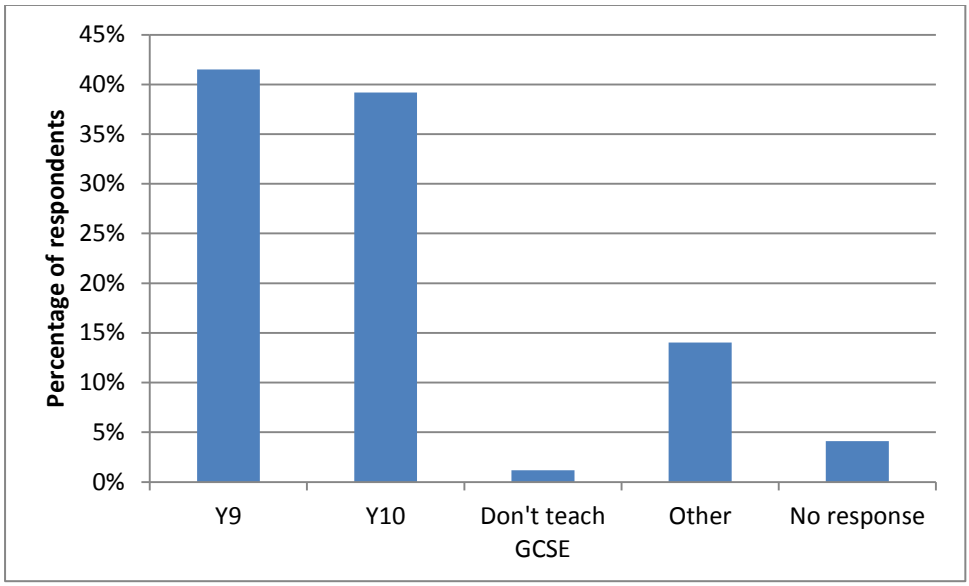


Figure M5: When does your school/college currently start teaching the GCSE Mathematics specifications?

Table M4: When does your school/college currently start teaching the GCSE Mathematics specifications?

Year	Percent	n
Y9	41.5%	71
Y10	39.2%	67
Don't teach GCSE	1.2%	2
Other	14.0%	24
No response	4.1%	7

5.2.2 In which school year does your school/college first put Mathematics students into sets/groups by ability?

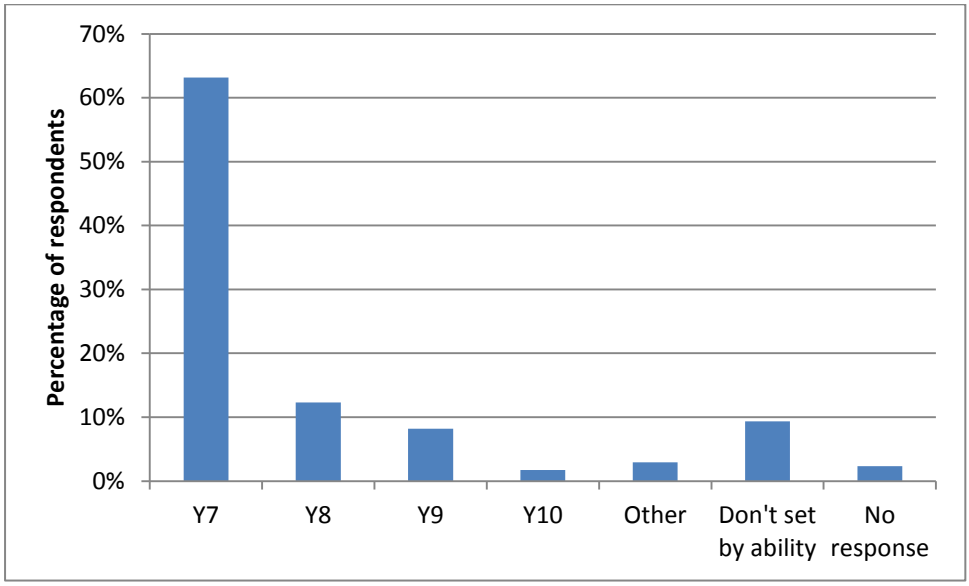


Figure M6: School year in which schools/colleges first put Mathematics students into sets/groups by ability.

By school type

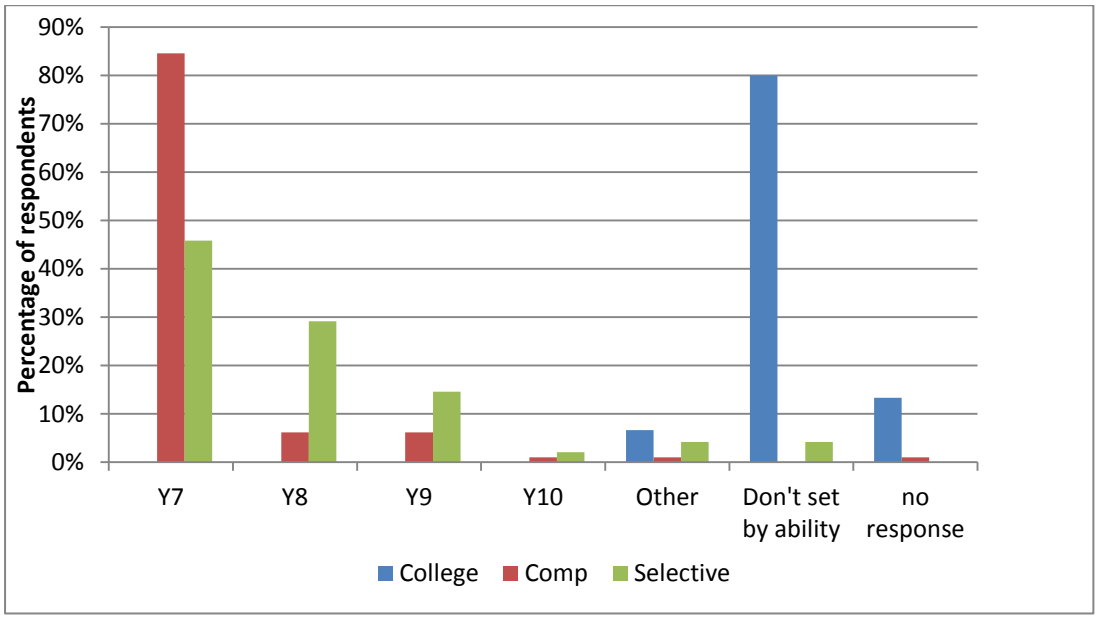


Figure M7: School year does in which schools/colleges first put Mathematics students into sets/groups by ability, by institution type.

Table M5: School year in which schools/colleges first put Mathematics students into sets/groups by ability.

Year	Percentage	n
7	63.2%	108
8	12.3%	21
9	8.2%	14
10	1.8%	3
Other	2.9%	5
Don't set by ability	9.4%	16
No response	2.3%	4

5.2.3 In your school, how many GCSE sets/ability groups contain some students entering for foundation tier and some for higher tier? Please enter the number.

Over a third of respondents stated that they had no ability sets which entered students for a mixture of tiers. In general, respondents reported that very few ability sets entered students for a mixture of tiers.

N.B. Respondents who did not respond, or who responded that they had no ability sets, were excluded from the analysis, leaving 151 respondents. 7.6% (13 respondents) reported not setting students by ability at all.

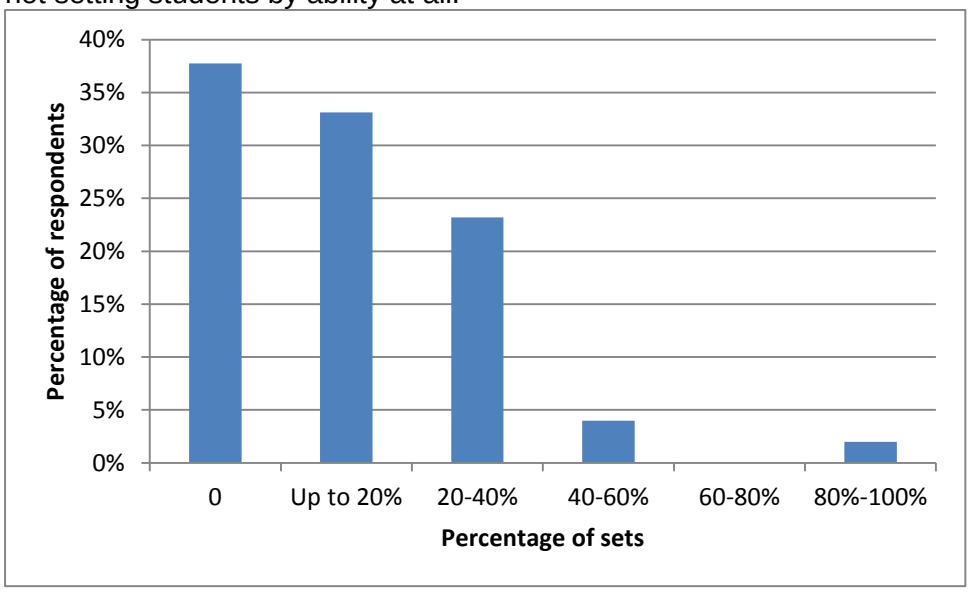


Figure M8: Proportion of sets which have students entered for both tiers.

Table M6: Proportion of sets which have students entered for both tiers.

Proportion of sets/ability groups	Frequency	Percentage
0	57	37.8%
Up to 20%	50	33.1%
20-40%	35	23.2%
40-60%	6	4.0%
60-80%	0	0.0%
80%-100%	3	2.0%
Total	151	100%

5.2.4 What is the latest point during a GCSE course that you think it is possible to decide to enter a student for the higher tier, and ensure that they have covered sufficient higher tier content? Please choose one.

N.B. An additional analysis removing all respondents who reported entering all candidates for either the higher or lower tier (n=132) was conducted, because these respondents may not have experience of teaching both tiers. However, the same, or a very similar pattern of results was obtained.

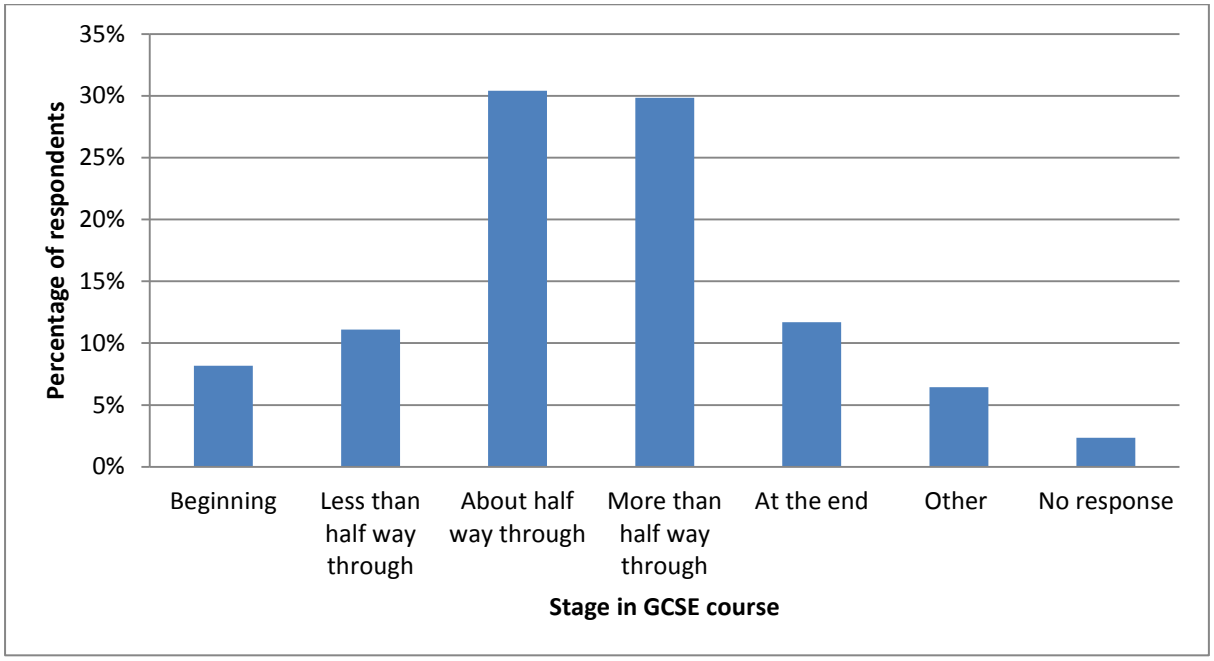


Figure M9: The latest point during a GCSE course that it is possible to decide to enter a student for the higher tier.

By school type

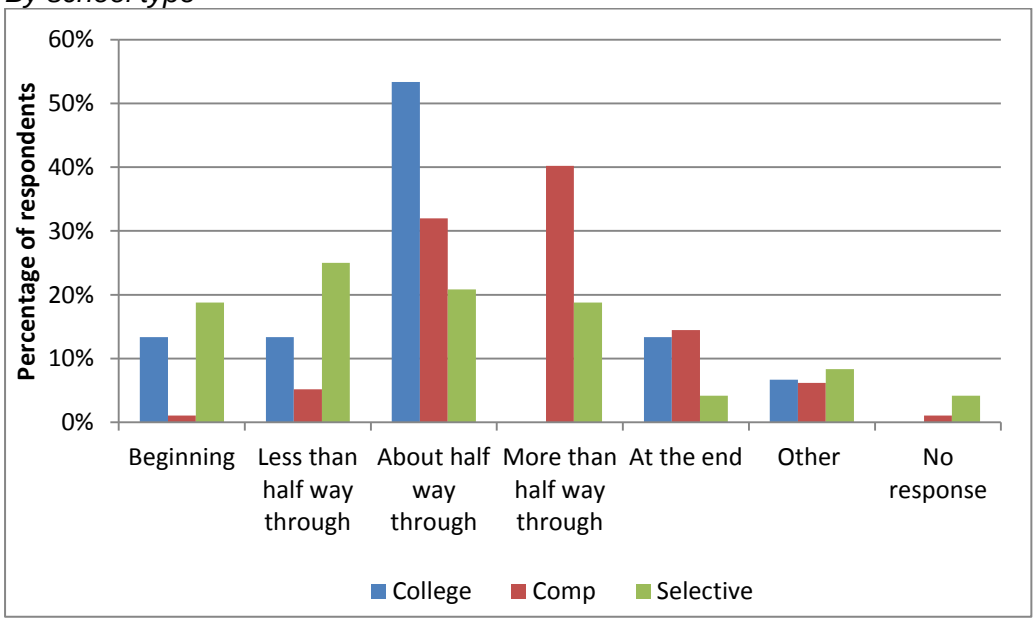


Figure M10: The latest point during a GCSE course that it is possible to decide to enter a student for the higher tier by institution type.

Table M7: The latest point during a GCSE course that it is possible to decide to enter a student for the higher tier.

Stage in GCSE course	Percentage	n
Beginning	8.2%	14
Less than half way through	11.1%	19
About half way through	30.4%	52
More than half way through	29.8%	51
At the end	11.7%	20
Other	6.4%	11
No response	2.3%	4

5.2.5 Approximately what proportion of your students move between the foundation tier curriculum and the higher tier curriculum during the GCSE course (and in which direction)?

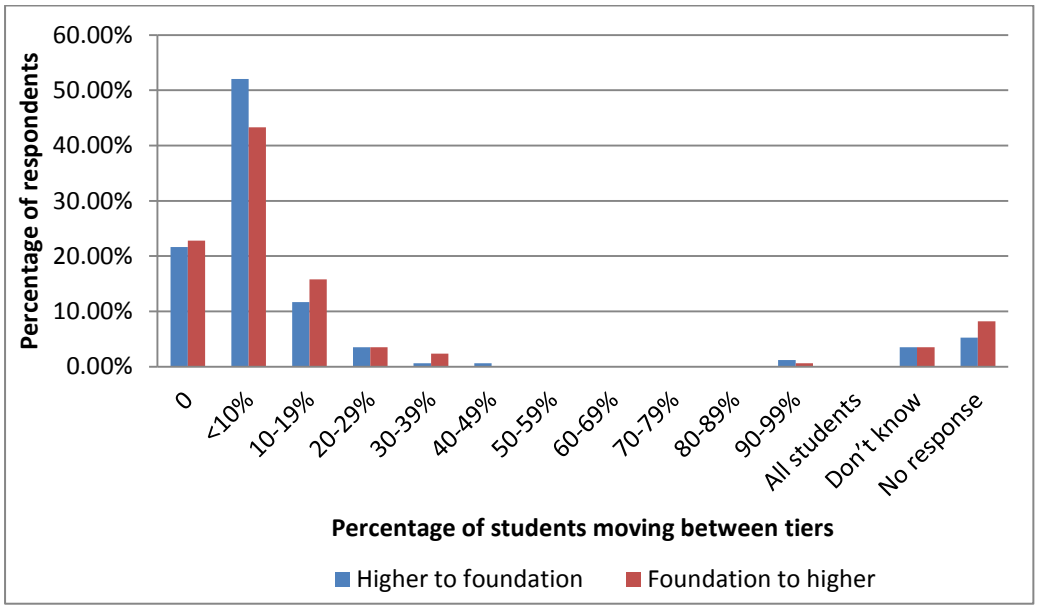


Figure M11: Percentage of students moving between tiers.

By school type

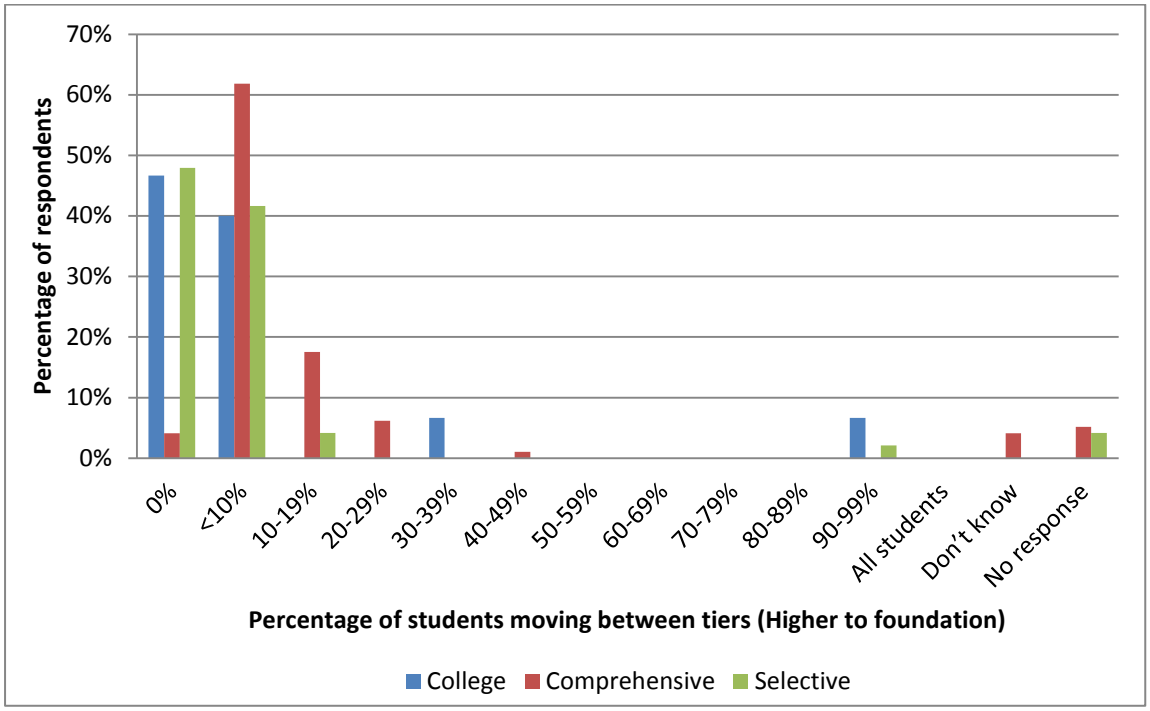


Figure M12: Percentage of students moving from higher to foundation tier by institution type.

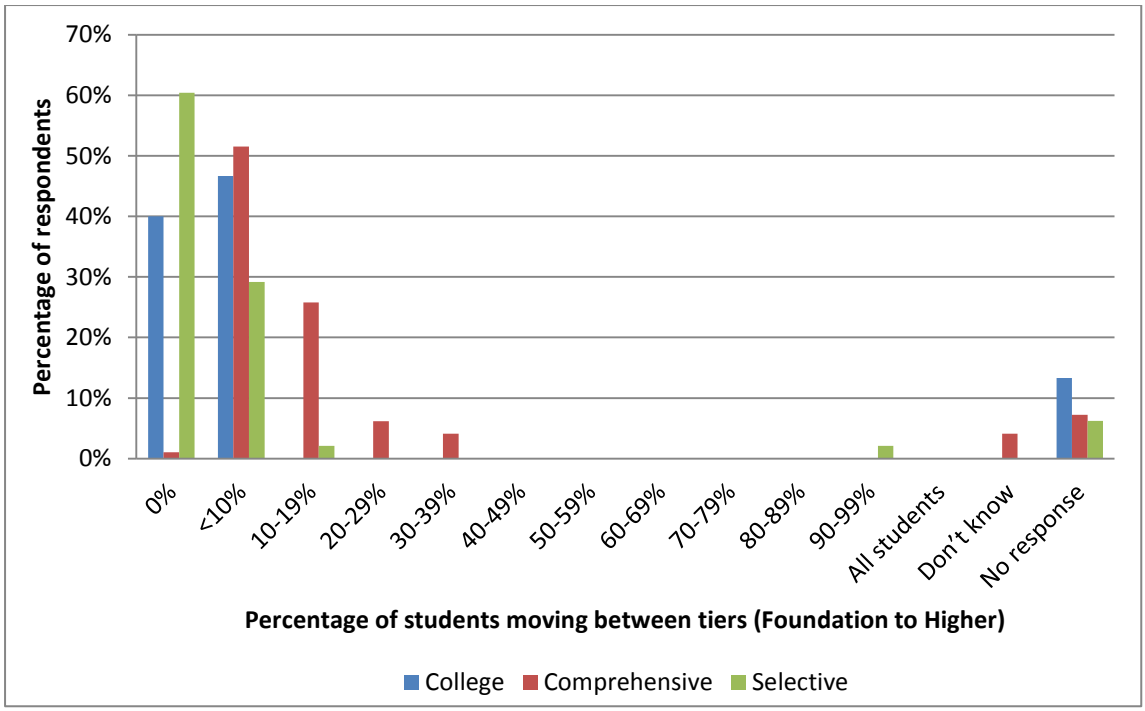


Figure M13: Percentage of students moving from foundation to higher tier by institution type.

Table M9: Percentage of students changing tier.

Percentage of students	Higher to foundation		Foundation to higher	
	Percentage	n	Percentage	n
0	21.6%	37	22.8%	39
<10%	52.1%	89	43.3%	74
10-19%	11.7%	20	15.8%	27
20-29%	3.5%	6	3.5%	6
30-39%	0.6%	1	2.3%	4
40-49%	0.6%	1	0.0%	0
50-59%	0.0%	0	0.0%	0
60-69%	0.0%	0	0.0%	0
70-79%	0.0%	0	0.0%	0
80-89%	0.0%	0	0.0%	0
90-99%	1.2%	2	0.6%	1
All students	0.0%	0	0.0%	0
Don't know	3.5%	6	3.5%	6
No response	5.3%	9	8.2%	14

5.3 Factors affecting entry for tiers.

5.3.1 How often would you be likely to enter students for each tier who fit the following description?

As might be expected, students' predicted attainment strongly influences which tier they are entered for. Almost all respondents stated that candidates who are likely to achieve a grade B would be entered for the higher tier. About 50% of respondents indicated that they always or mostly enter students who are likely to achieve a grade C for the higher tier; this is in line with published guidelines for tier entry (OCR, 2013) (Fig M14, Table M10). This is in contrast to previous work which suggests that teachers tend to be more likely to enter candidates for the foundation tier than the guidance suggests (Gillborn & Youdell, 2000). There were differences between different types of institution (Fig M15). Overall, independent/selective schools were more likely than other institutions to enter candidates for the higher tier. For example, 10% of respondents from independent/selective schools stated that they always enter candidates on the D/E boundary for the higher tier.

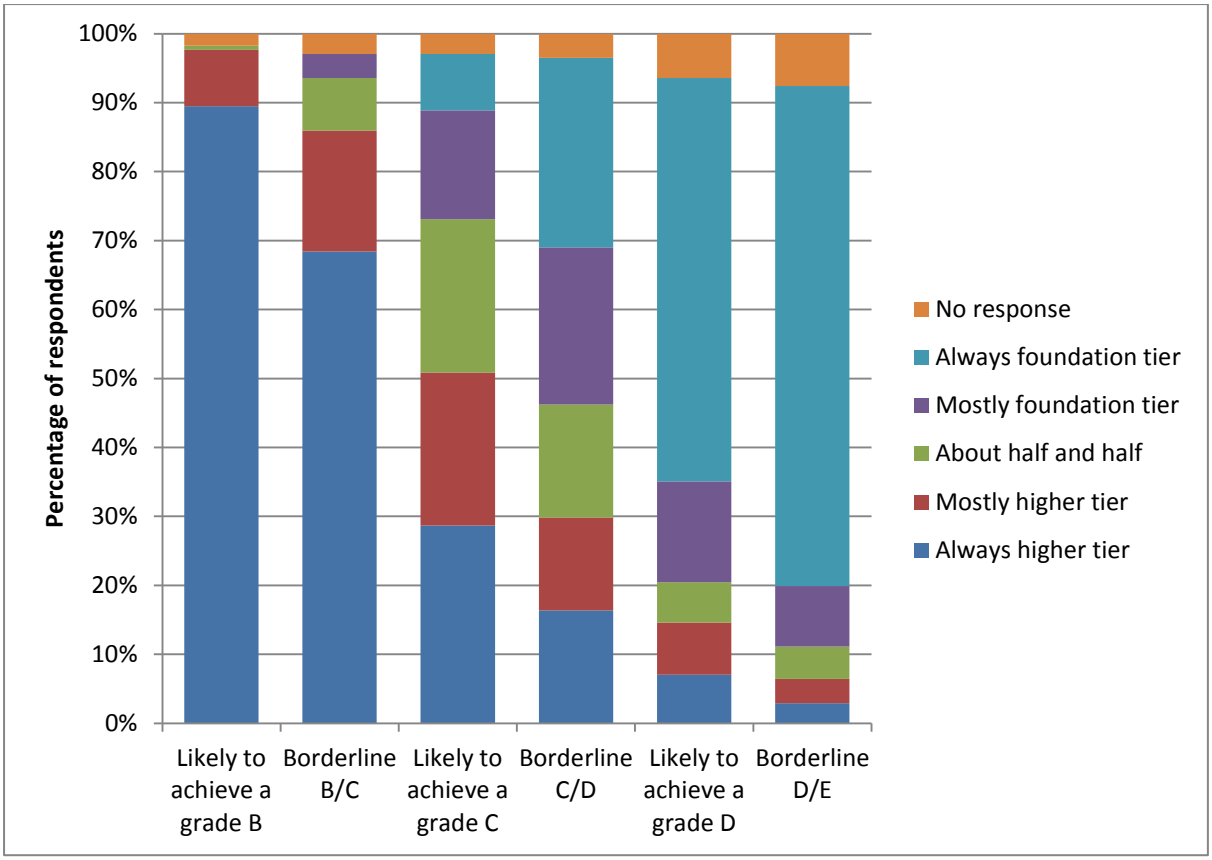


Figure M14: Likelihood of entry for each tier by predicted attainment.

Table M10: Likelihood of entry for each tier by predicted attainment.

	Likely achievement					
Proportion of students	Likely to achieve a grade B	Borderline B/C	Likely to achieve a grade C	Borderline C/D	Likely to achieve a grade D	Borderline D/E
Always higher tier	89.5% 153	68.4% 117	28.7% 49	16.4% 28	7.0% 12	2.9% 5
Mostly higher tier	8.2% 14	17.5% 30	22.2% 38	13.5% 23	7.6% 13	3.5% 6
About half and half	0.6% 1	7.6% 13	22.2% 38	16.4% 28	5.9% 10	4.7% 8
Mostly foundation tier	0.0% 4	3.5% 0	15.8% 6	22.8% 27	14.6% 39	8.8% 25
Always foundation tier	0.0% 0	0.0% 6	8.2% 27	27.5% 39	58.5% 25	72.5% 15
No response	1.8% 3	2.9% 5	2.9% 5	3.5% 6	6.4% 11	7.6% 13

By school type

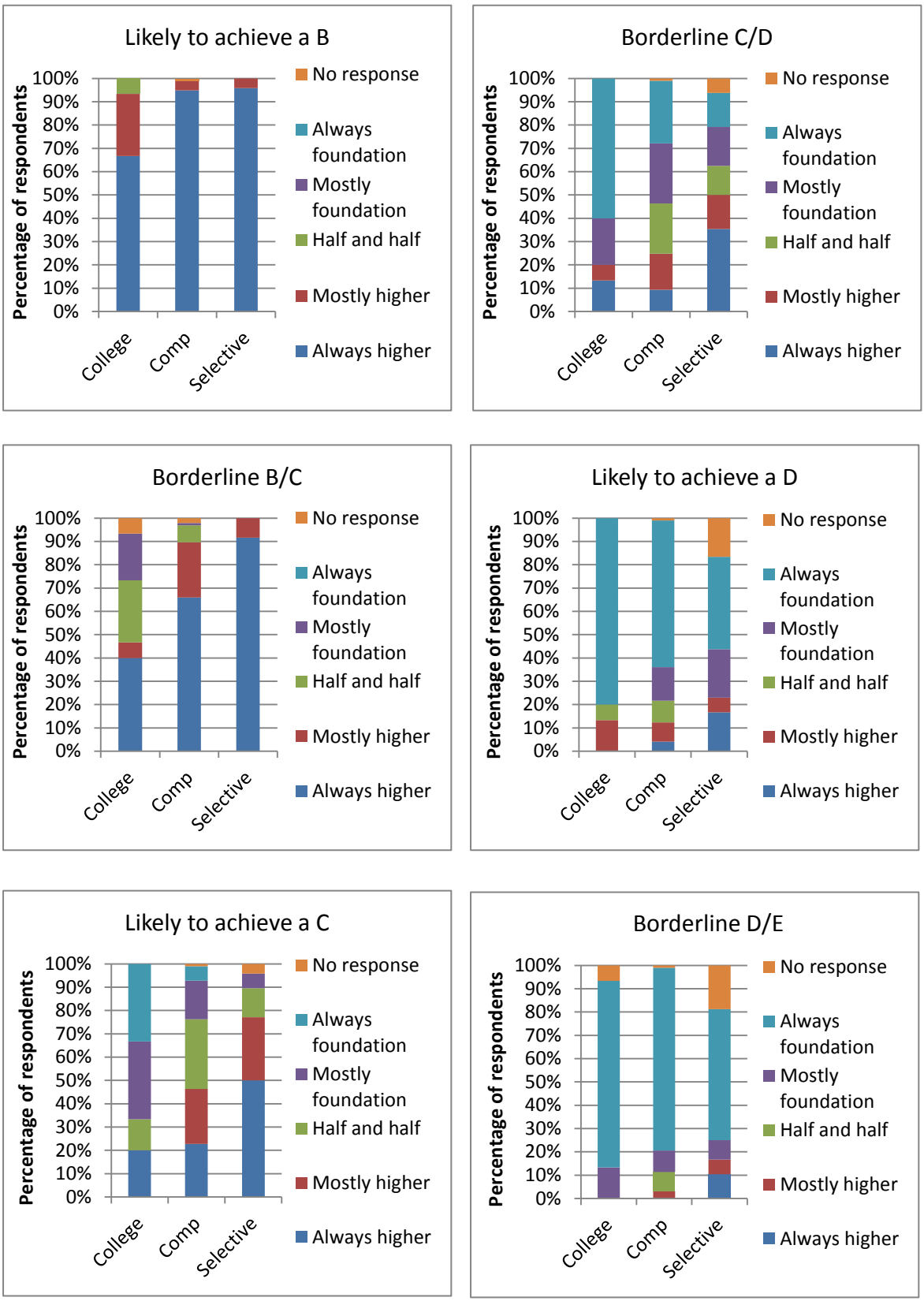


Figure M15: Likelihood of entry for each tier by predicted attainment and institution.

5.3.2 Who is involved in the decision about which tier a student should be entered for, and how important is this input?

Overall, the decision on tier entry is most likely to be taken at the level of the department or individual teacher (Fig. M16, Table M11). However, 70% of respondents indicated that student input was important or very important, while about 50% said that parental input was important. There were, however, differences across institutions. Parental input was more important for independent/selective schools than for colleges (Fig. M17).

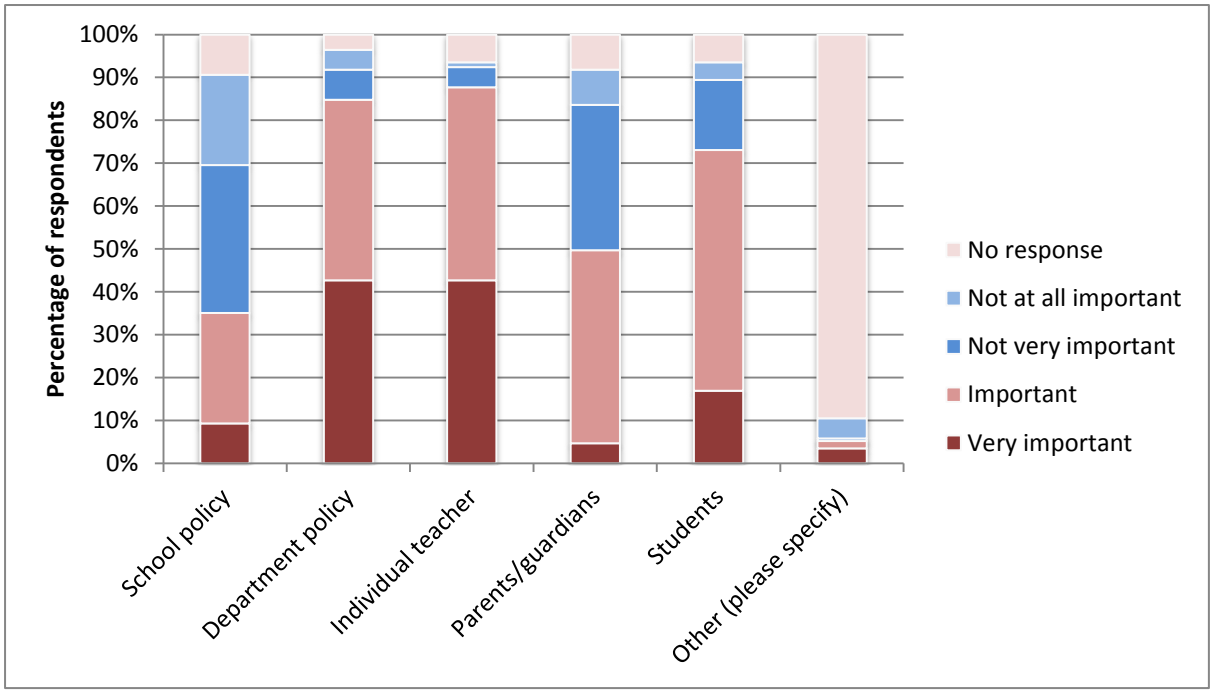


Figure M16: Importance of input from difference sources about tier entry.

Table M11: Importance of input from difference sources about tier entry.

	School policy	Department policy	Individual teacher	Parents/guardians	Students	Other (please specify)
Very important	9.4% 16	42.7% 73	42.7% 73	4.7% 8	17.0% 29	3.5% 6
Important	25.7% 44	42.1% 72	45.0% 77	45.0% 77	56.1% 96	1.8% 3
Not very important	34.5% 59	7.0% 12	4.7% 8	33.9% 58	16.4% 28	0.6% 1
Not at all important	21.1% 36	4.7% 8	1.2% 2	8.2% 14	4.1% 7	4.7% 8
No response	9.4% 16	3.5% 6	6.4% 11	8.2% 14	6.4% 11	89.5% 153

By school type

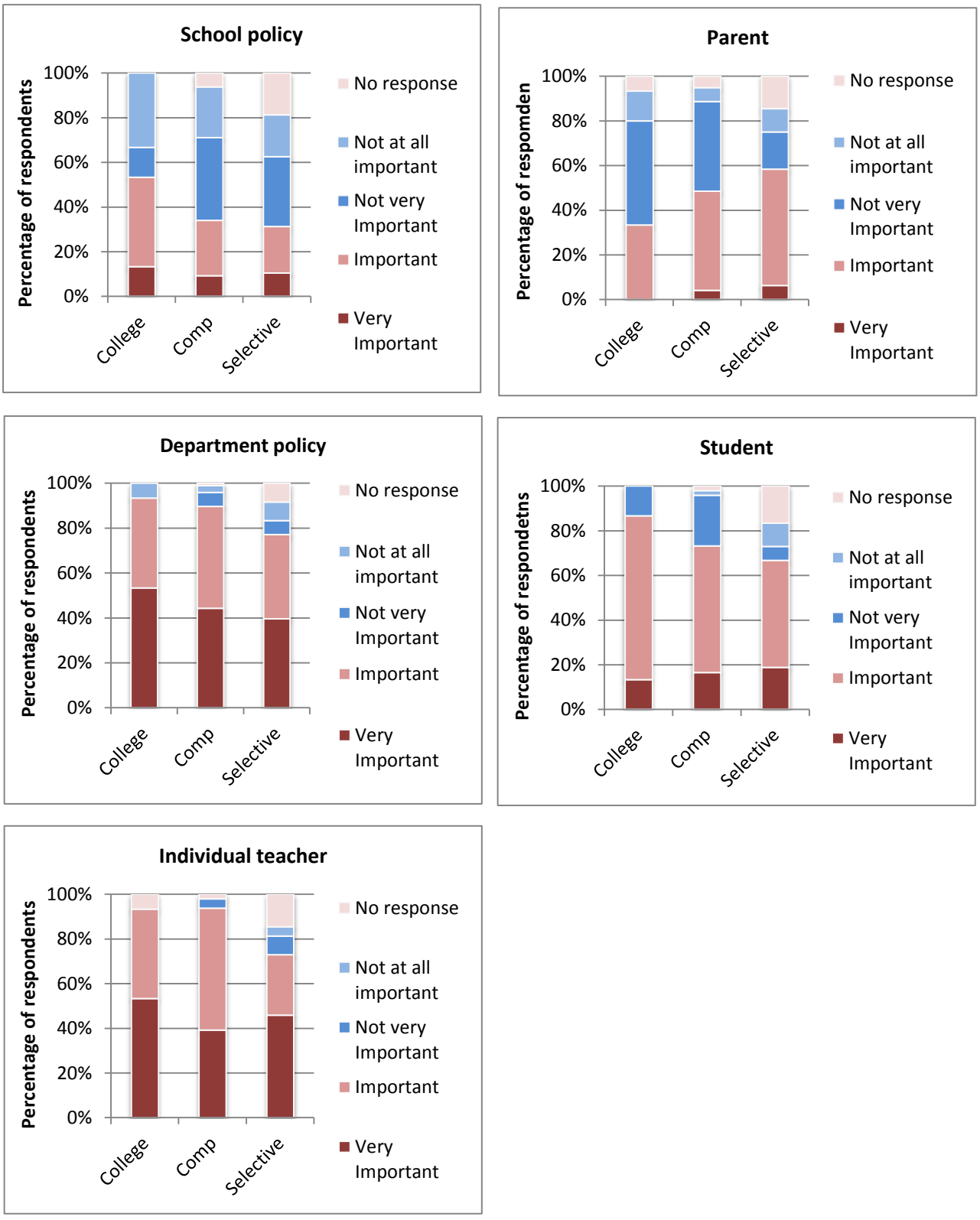


Figure M17: Importance of input from difference sources about tier entry by institution type.

5.3.3 For students who are 'borderline' for the foundation or higher tier, how important are the following factors for determining tier entry?

Respondents were asked to rate the importance of various factors for determining tier entry for candidates who were borderline for the foundation and higher tier (Fig. M18, Table M12). Both prior and predicted attainment were considered to be important or very important when deciding on the appropriate tier of entry for students, as was the ability to cope with written examinations. Student opinion and aspirations were also considered to be important by nearly 70% of respondents.

The recent performance of previous borderline candidates on each tier, and the perceived relative difficulty of the grade C on each tier were considered to be important or very important for about 70% of respondents, indicating that schools may be strategic when choosing a tier for their students. This is supported by the fact that nearly 70% of respondents stated that the pressure to "ensure" a grade C was important or very important.

The link between ability set and tiering was further underlined by the nearly 50% of teachers who said that the ability group that a student was in was important or very important. Approximately a quarter of respondents thought that a student's behaviour was important, indicating that motivation may play a role.

Across institution types, the overall picture was fairly similar (Figs M19-M21). However, respondents from comprehensives were more likely to indicate that the recent performance of borderline candidates was important. Respondents from independent/selective schools were less likely to say that predicted attainment was important. This might reflect the narrower range of ability typically found in these schools, or a general policy of entering all students for the higher tier.

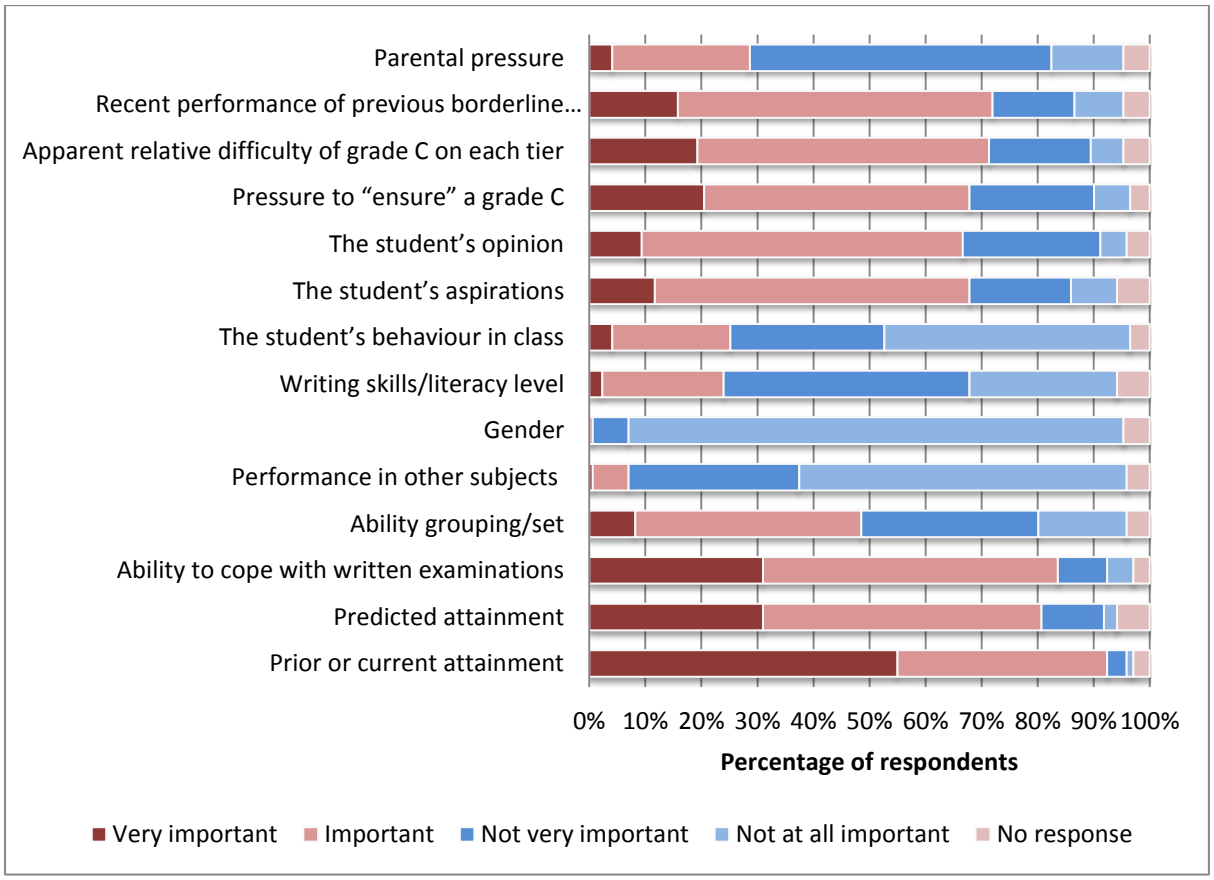


Figure M18: Importance of factors for deciding tier entry for borderline students.

By school type

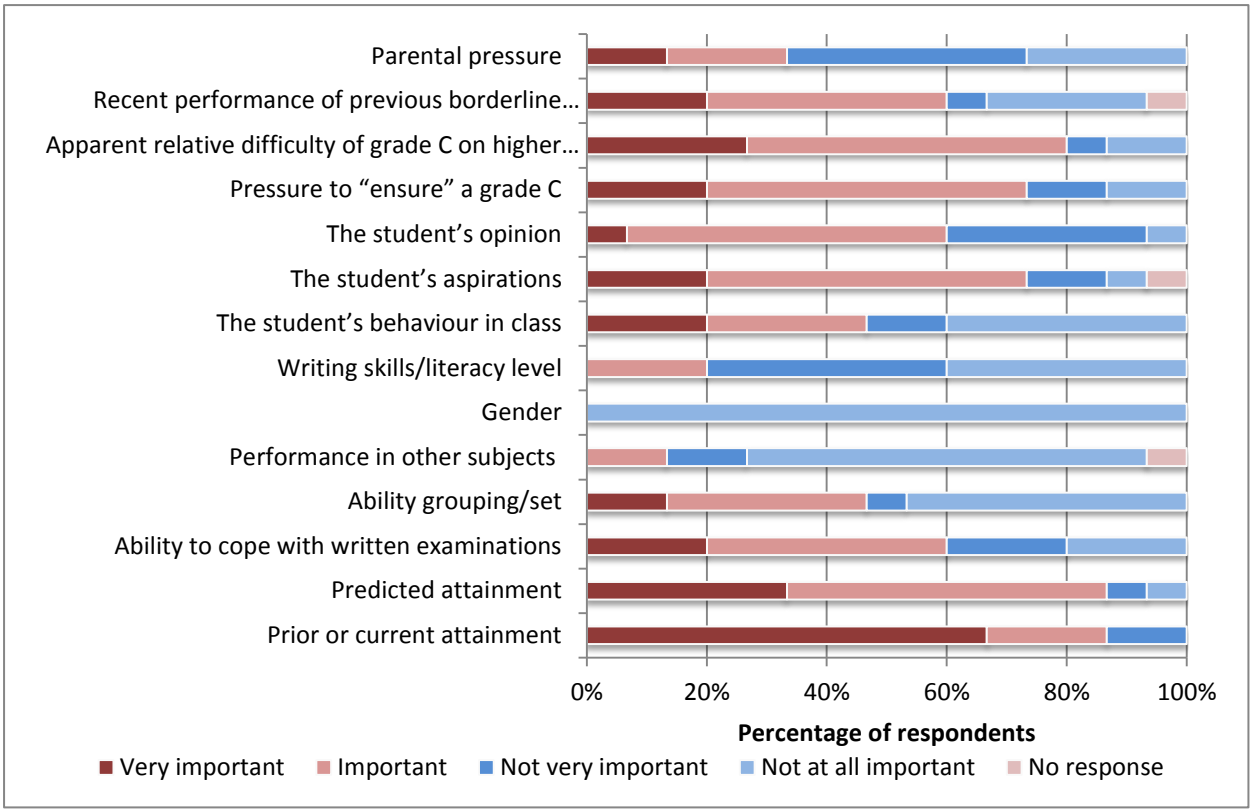


Figure M19: Importance of factors for deciding tier entry for borderline students in colleges.

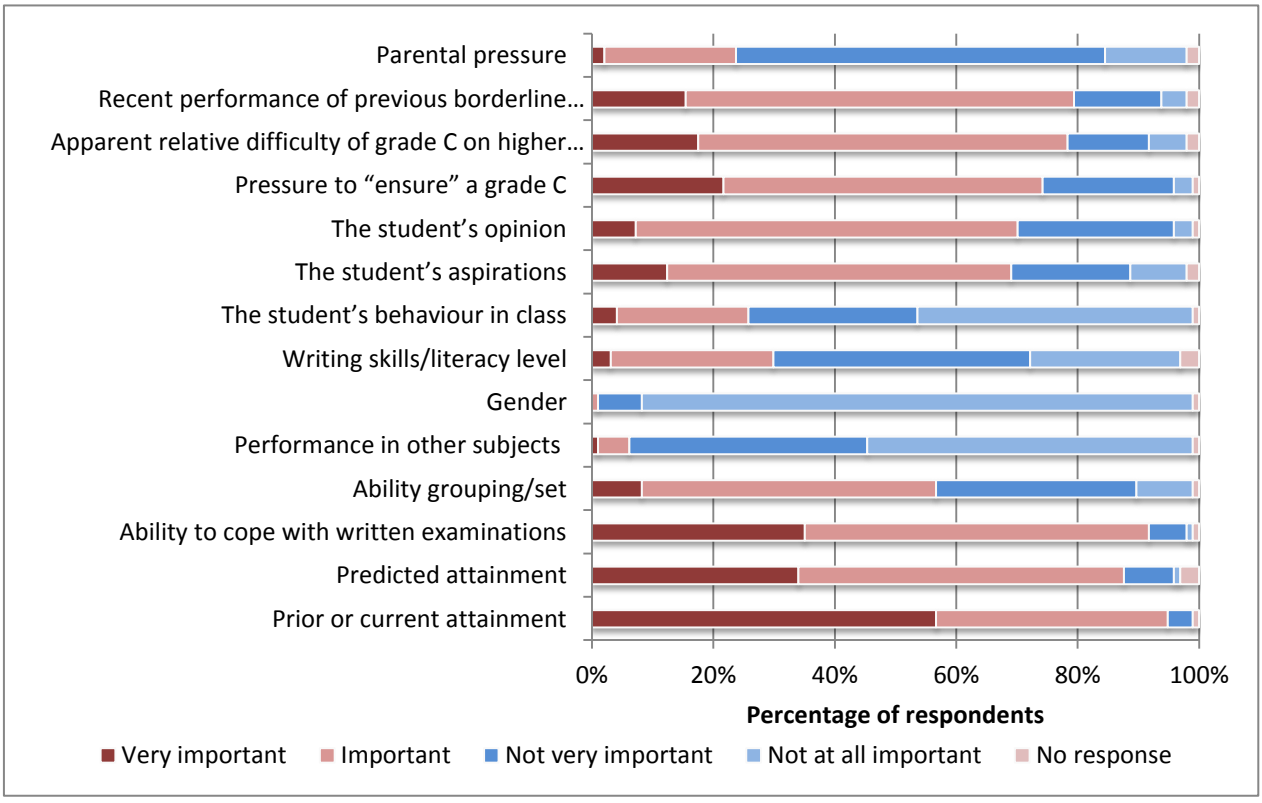


Figure M20: Importance of factors for deciding tier entry for borderline students in comprehensive schools.

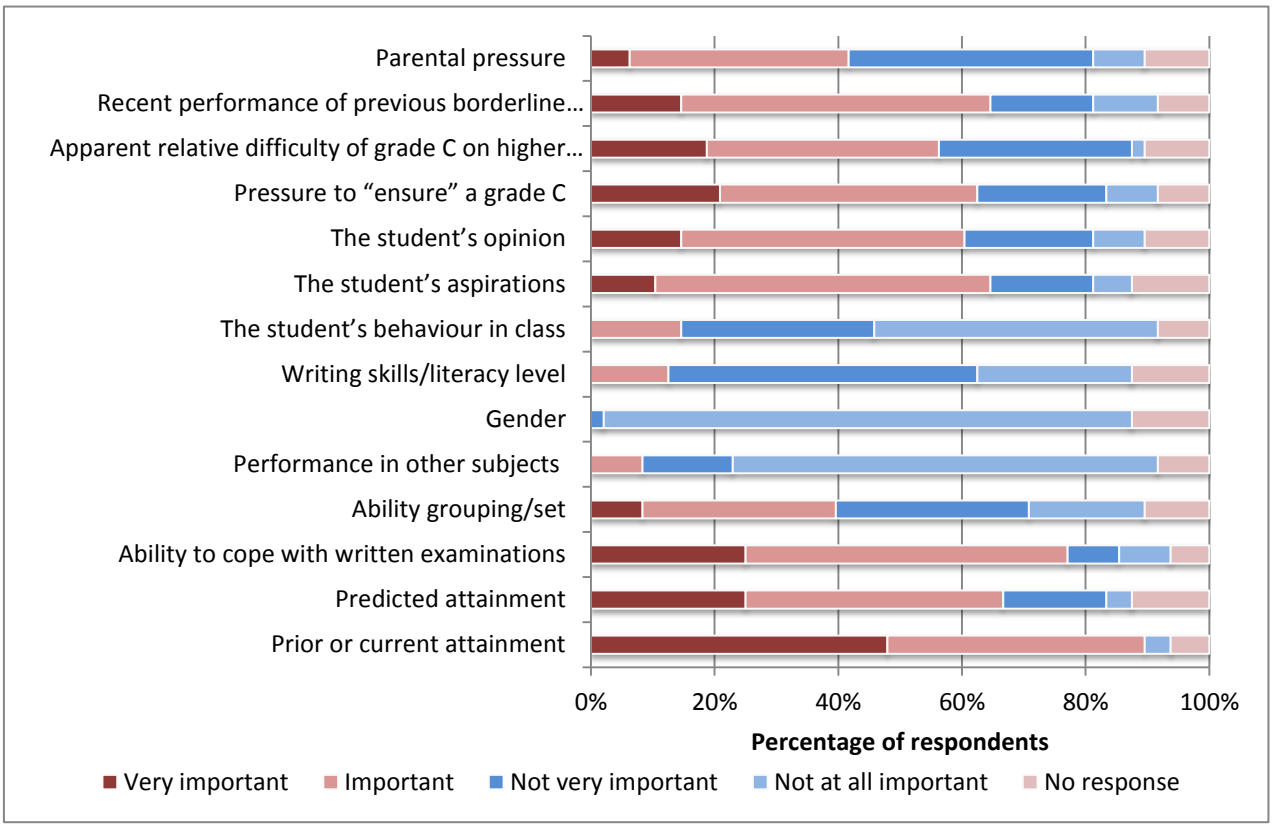


Figure M21: Importance of factors for deciding tier entry for borderline students in independent/selective schools.

Table M12: Importance of factors for deciding tier entry for borderline students.

	Very important	Important	Not very important	Not at all important	No response
Prior or current attainment	55.0% 94	37.4% 64	3.5% 6	1.2% 2	2.9% 5
Predicted attainment	31.0% 53	49.7% 85	11.1% 19	2.3% 4	5.9% 10
Ability to cope with written examinations	31.0% 53	52.6% 90	8.8% 15	4.7% 8	2.9% 5
Ability grouping/set	8.2% 14	40.4% 69	31.6% 54	15.8% 27	4.1% 7
Performance in other subjects	0.6% 1	6.4% 11	30.4% 52	58.5% 100	4.1% 7
Gender	0.0% 0	0.6% 1	6.4% 11	88.3% 151	4.7% 8
Writing skills/literacy level	2.3% 4	21.6% 37	43.9% 75	26.3% 45	5.9% 10
The student's behaviour in class	4.1% 7	21.1% 36	27.5% 47	43.9% 75	3.5% 6
The student's aspirations	11.7% 20	56.1% 96	18.1% 31	8.2% 14	5.9% 10
The student's opinion	9.4% 16	57.3% 98	24.6% 42	4.7% 8	4.1% 7
Pressure to "ensure" a grade C	20.5% 35	47.4% 81	22.2% 38	6.4% 11	3.5% 6
Perceived relative difficulty of grade C on higher vs foundation tier	19.3% 33	52.1% 89	18.1% 31	5.9% 10	4.7% 8
Recent performance of previous borderline students on each tier.	15.8% 27	56.1% 96	14.6% 25	8.8% 15	4.7% 8
Parental pressure	4.1% 7	24.6% 42	53.8% 92	12.9% 22	4.7% 8
Other (please specify)	1.8% 3	0.0% 0	1.8% 3	4.1% 7	92.4% 158

5.3.4 Do you have any other comments about how you decide which tier a student should be entered for?

There were 42 further comments from respondents about how they decide which tier a student should be entered for. Each comment is labelled with an identification number for the respondent, and the type of institution where the respondent teaches.

Several respondents commented that the relative difficulty of obtaining a grade C on the higher tier compared to the foundation tier was an important factor when deciding tier entry. In general, respondents thought that it was easier to get a grade C on the higher tier, because students need to obtain relatively few marks to reach a grade C.

> *We have found it much easier to get D grade students who are resitting in sixth form a C by entering them for higher tier as they can get a C without knowing all of the higher tier content and still make plenty of mistakes and still reach the C grade pass mark. Whereas they need to get most of a foundation tier correct (and these students tend not to be able to avoid silly mistakes even though they understand the maths). [114, teacher, sixth form college]*

We have more success recently with higher than foundation for borderline students. Foundation seems to have greater worded problems which students find more taxing than abstract maths. [105, teacher, secondary modern]

If unsure we usually put them in for higher as even students who are likely to get a C are able to answer B grade topics and even A grade handling data questions. [10, teacher, comprehensive school]

However, one commenter felt that this was bad practice educationally.

…Our impression with our students is that they have a better chance of a C in Higher as things stand although they will find much of the work very difficult. This is bad educationally. We used to use intermediate level when it was available. [15, teacher, independent school]

In contrast, one respondent thought that the higher tier was more difficult to access for some students.

We want to make sure our students' achieve to their full potential but we do find that some students find the higher tier paper more difficult to access and could end up with a Grade D instead of a Grade C - which is not an option in the current educational climate. We really feel the loss of the Intermediate Tier for our students who want to do Higher but struggle with the A and A content. [149, teacher, comprehensive school]*

Some respondents thought that a student's confidence affected how well they would perform on each tier.

Confidence - if they are nervous and hesitant then going in for Foundation Tier is often better for them, they are entering a paper where they should expect to get 80%. If they are confident, have low concentration (and often careless) then entering a paper where they expect not to be able to do about 75% of the paper can be better for them. [29 teacher, independent school]

The complexity of the decision was underlined by one respondent.

We start the GCSE in Year 10 and set according to ability, giving the benefit of the doubt to any student by putting them in the highest possible group. If we have a C/D borderline student who works hard, we would put them in our Set 2 and give them the chance of taking the exam at Higher tier. We test regularly and gradually throughout the course students shift between groups until we are almost fixed at the end of Year 10. We then do major examinations using past papers and readjust the sets ready for Year 11. The mocks are the final point that we move students and by this time both the students and their parents know the situation and how we are concerned about their progress and chance of succeeding at the Higher Tier. We try to stay in constant communication with the parents so that there isn't a problem when we move a student from Higher Tier to Foundation. [163, teacher, comprehensive school]

One respondent indicated that reforms to GCSE will change how schools make decisions on tier entry.

We continually assess pupils to see how they are performing. We see how they cope under exam situations and also listen to what grades they need to get onto the courses they want to take when they leave our school. We are an 11 - 16 school.

Only the top set take the Higher tier, however [sic] the pupils did take the exam at the end of year 10. Only a few were entered for the Higher tier at this sitting, but all that achieved a grade C in the Foundation tier were entered for the Higher tier in Year 11. This has all changed due to Mr Gove. We will be very sure of their pupils being able to cope with the Higher tier when we now enter them in year 11. Any that we have doubts about will only be entered for the Foundation tier. [32 teacher, secondary modern]

Some respondents from FE colleges indicated that their policy was to enter students for the foundation tier unless they needed a grade higher than C.

Officially, the college only teaches foundation GCSE as a resit offering students the opportunity to get a C. However, a handful of students who genuinely need a B to further their studies (university requirement or other) will get additional ad hoc [sic] support. They need to be motivated as they need to attend additional lessons outside of the normal timetable and work independently in addition. [68, College]

5.3.5 If you use prior attainment to decide on the tier of entry, how do you measure prior attainment?

The majority of teachers reported using past GCSE examination papers, as well as their judgement of students' classwork, and tests developed by themselves and their colleagues to judge prior attainment (Fig. 22, Table M12). Approximately 40% of respondents reported using past KS3 National Curriculum papers. When broken down by school type, colleges were less likely to report using KS3 tests, presumably because they do not teach KS3, and so do not have access to these papers (Fig. M23). One respondent reported that the "Foundation Initial, Bronze, Silver and Gold tests and [sic] invaluable" which were developed for the OCR GCSE specification J567.

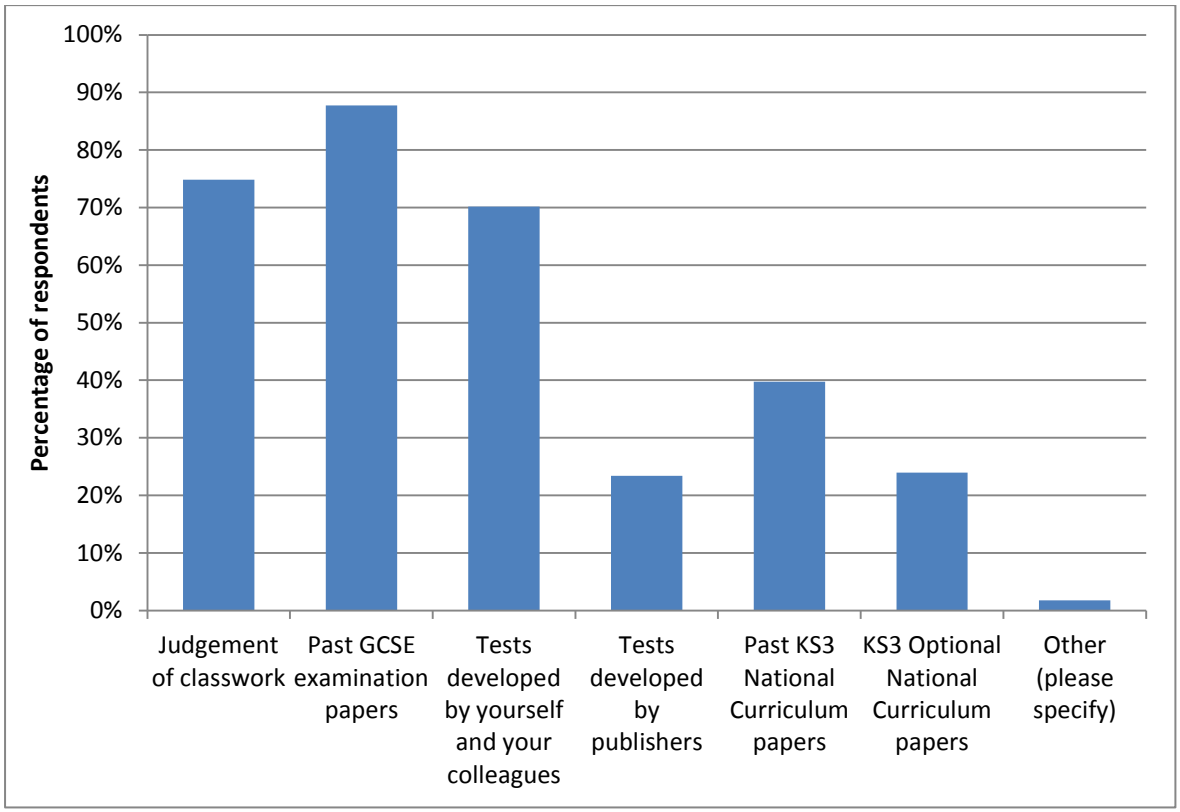


Figure M22: Measures of prior attainment used.

By school type

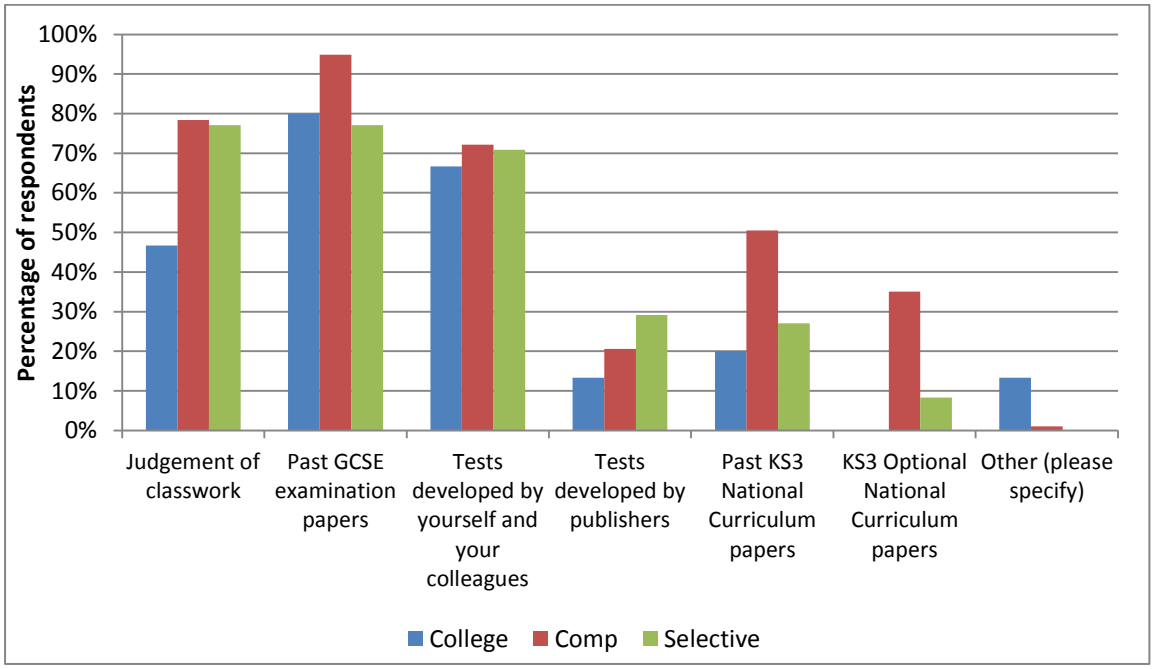


Figure M23: Measures of prior attainment used (by school type).

Table M12: Measures of prior attainment used.

	Judgement of classwork	Past GCSE examination papers	Tests developed by yourself and your colleagues	Tests developed by publishers	Past KS3 National Curriculum papers	KS3 Optional National Curriculum papers	Other (please specify)
No	17.5%	3.5%	21.1%	66.1%	49.1%	62.6%	21.6%
	30	6	36	113	84	107	37
Yes	74.9%	87.7%	70.2%	23.4%	39.8%	24.0%	1.8%
	128	150	120	40	68	41	3
No Reponses	7.6%	8.8%	8.8%	10.5%	11.1%	13.5%	76.6%
	13	15	15	18	19	23	131

5.4 Terminal assessment and accountability measures

5.4.1 All GCSE assessments must now be taken at the end of the course. Has the move to 100% terminal assessment at GCSE made you more or less likely to enter students for the higher tier?

Over 60% of respondents indicated that the move to 100% terminal assessment has not made it more or less likely for them to enter students for the higher tier (Fig 24, Table M13). Of those who did report that their decision on tier entry was affected by the move to terminal assessment, more respondents indicated that it made them more likely to enter students for

the foundation tier (16.4%) compared to those who would be more likely to enter students for the higher tier (7.0%) (Table M13). Selective schools were more likely to report that the move to 100% terminal assessment made no difference.

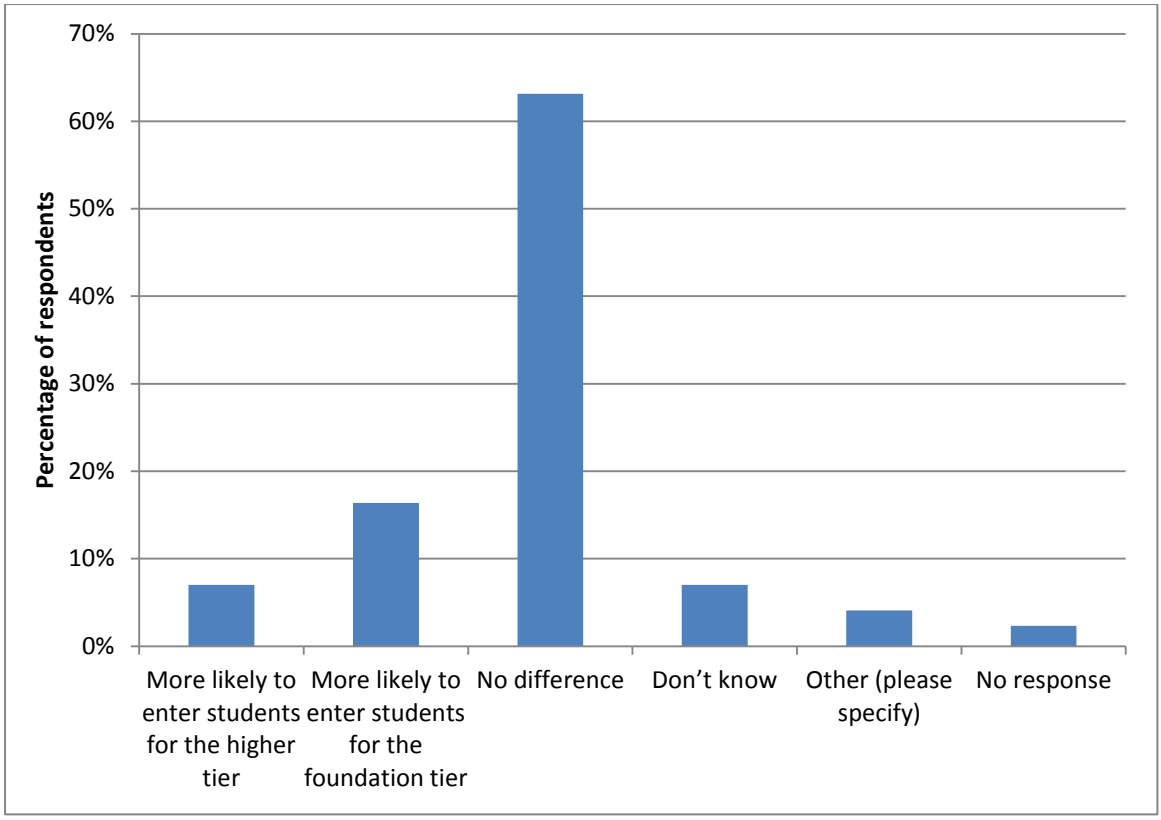


Figure M24: Impact of the move to 100% terminal assessment on tier entry.

By school type

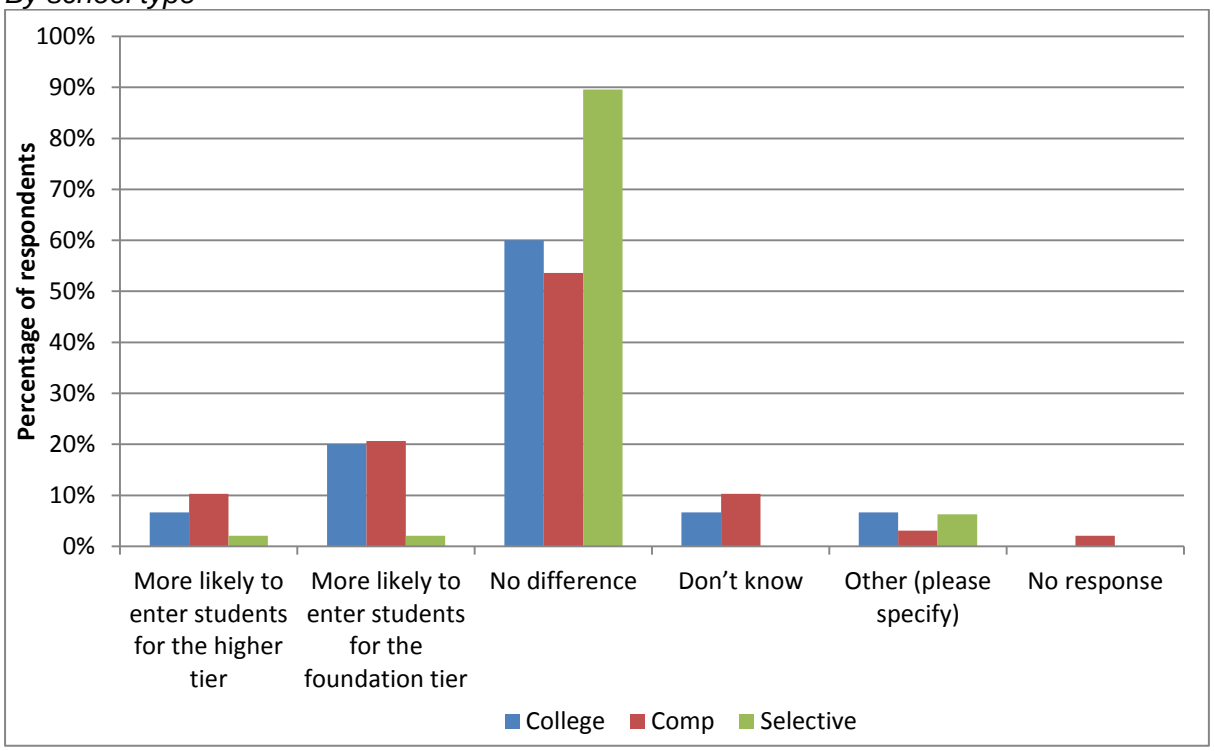


Figure M25: Impact of the move to 100% terminal assessment on tier entry by institution type.

Table M13: Impact of the move to 100% terminal entry on tier entry by institution type.

Effect	Percentage	n
More likely to enter students for the higher tier	7.0%	12
More likely to enter students for the foundation tier	16.4%	28
No difference	63.2%	108
Don't know	7.0%	12
Other (please specify)	4.1%	7
No response	2.3%	4

5.4.2 How often does your school/college enter students for more than one GCSE maths specification across different tiers? For example, entering a student for the foundation tier with one specification, and the higher tier with another?

Less than 40% of respondents reported that they never enter students for more than one GCSE Mathematics specification. However, double entering students for more than one tier does not seem to be very common (Fig. 26, Table M14), though it is more frequent in comprehensive schools compared to other types of institution (Fig. 27).

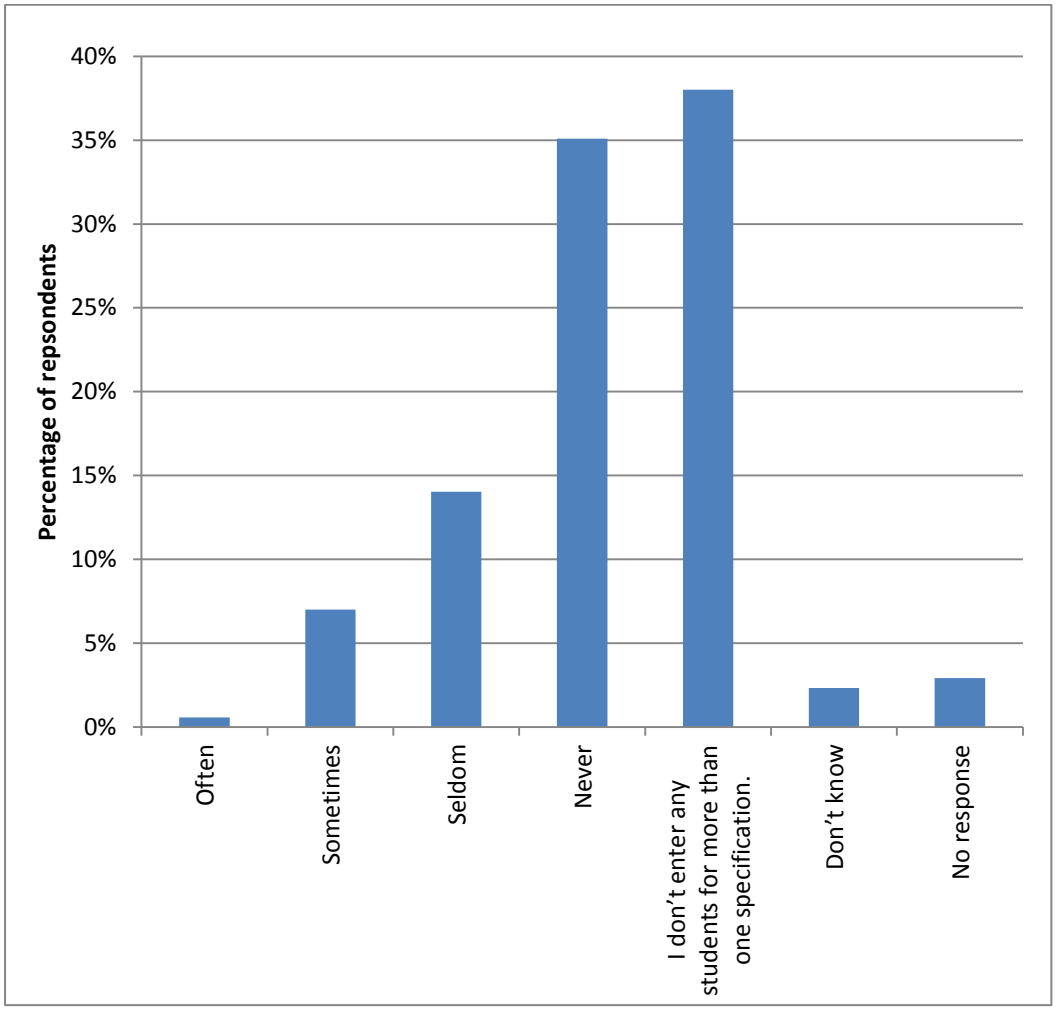


Figure M26: Frequency of double entry across tiers.

By school type

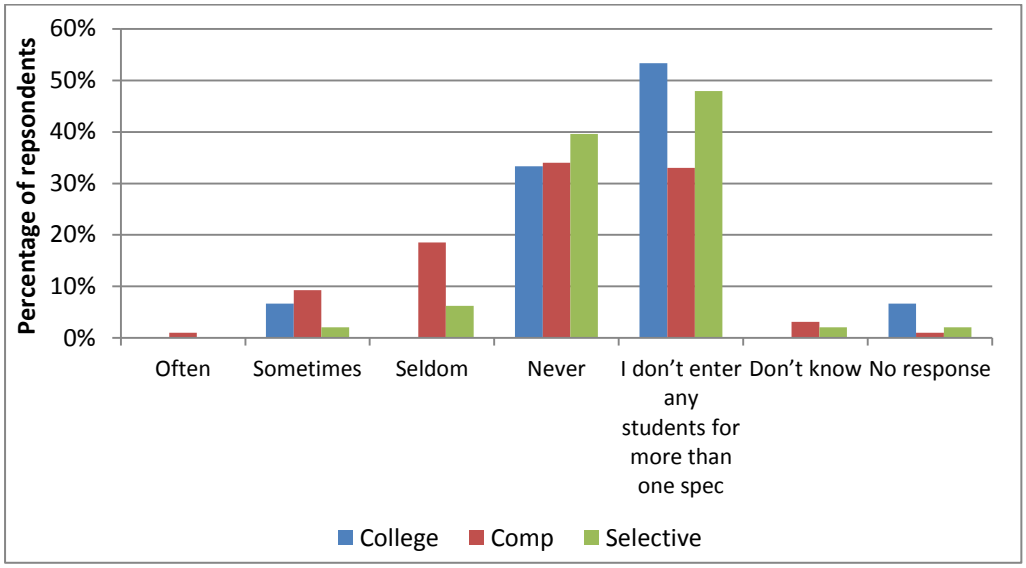


Figure M27: Frequency of double entry across tiers by institution type.

Table M14*:* Frequency of double entry across tiers.

Frequency of double entry at different tiers	Percentage of respondents	n
Often	0.6%	1
Sometimes	7.0%	12
Seldom	14.0%	24
Never	35.1%	60
I don't enter any students for more than one specification.	38.0%	65
Don't know	2.3%	4
No response	2.9%	5

5.4.3 Currently the grade C is an important grade for accountability measures, and is considered to be a "good pass". What impact does this emphasis on obtaining a grade C have on the likelihood that a student will be entered for each tier?

Approximately 40% of respondents indicated that the importance of the grade C and accountability measures do not affect how they make decisions on tier entry (Fig 28, Table M15). Furthermore, slightly more respondents indicated that accountability measures meant that they were more likely to enter students for the higher tier, than those who indicated they were more likely to enter students for the foundation tier. This perhaps reflects the fact that some teachers think that it is easier for many students to achieve a grade C on the higher tier. Independent/selective schools were more likely to indicate that accountability measures have no impact on their tier entry decisions, perhaps reflecting the fact that independent schools are not subject to accountability measures in the same way as state schools, and the fact that they are likely to have fewer students at the borderline between foundation and higher tiers (Fig. 29).

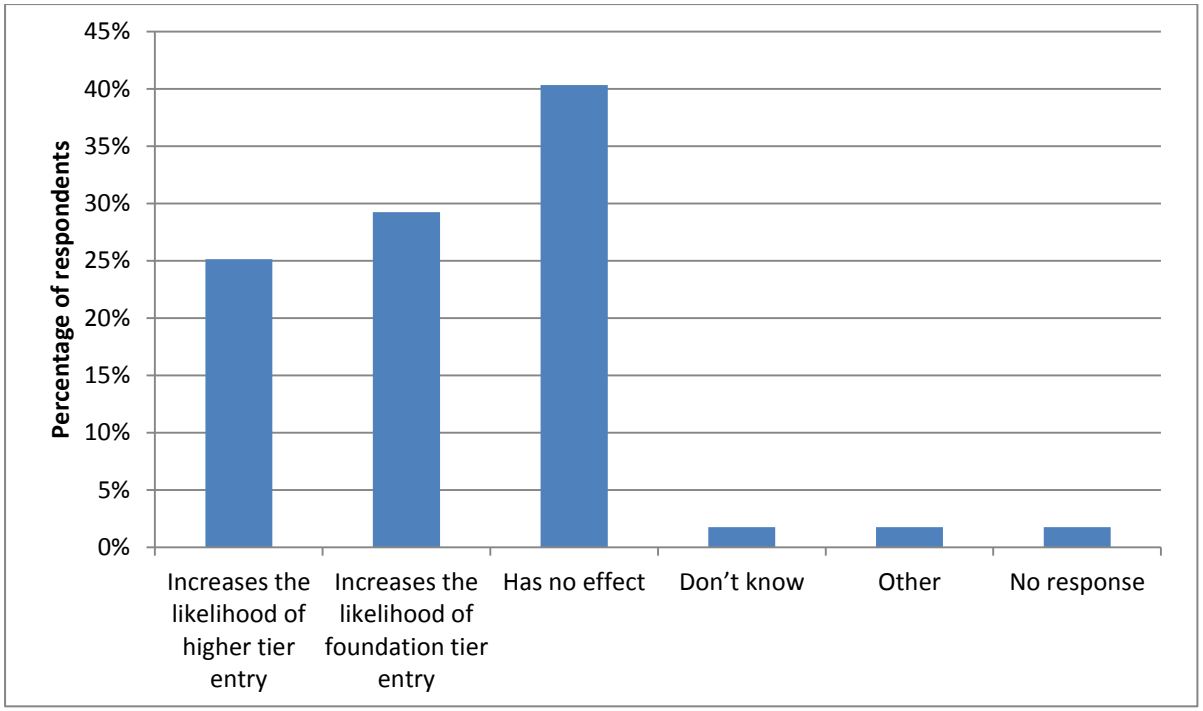


Figure M28: Impact of accountability measures on entry for tiers.

By school type

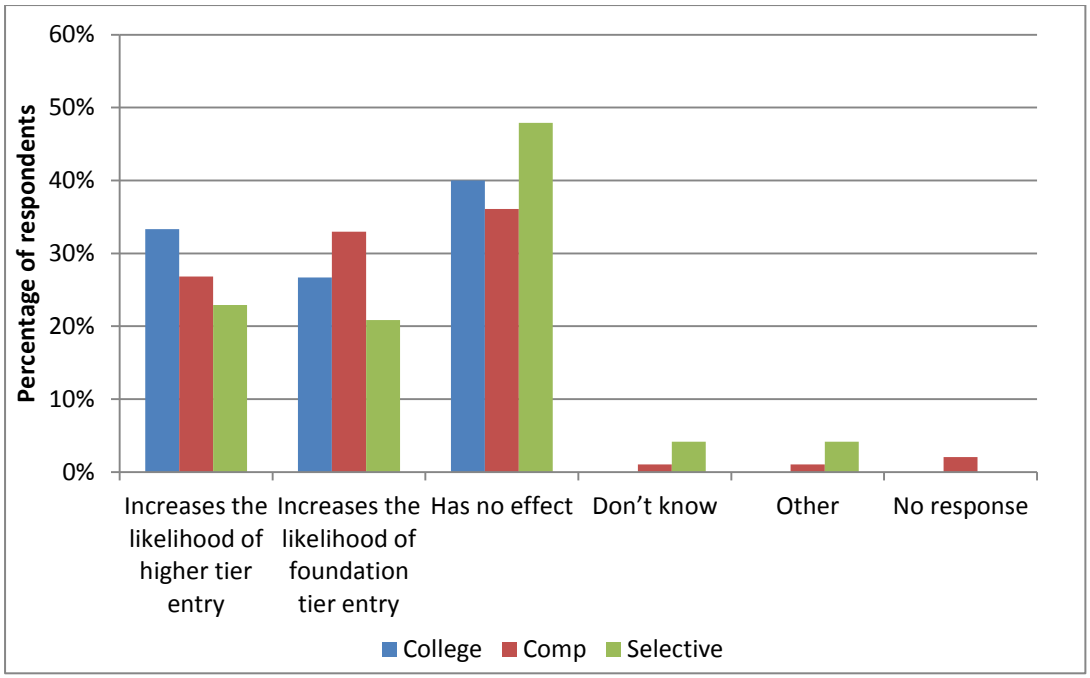


Figure M29: Impact of accountability measures on entry for tiers by institution type.

Table M15: Impact of accountability measures on entry for tiers by institution type.

Effect	Percentage	n
Increases the likelihood of higher tier entry	25.2%	43
Increases the likelihood of foundation tier entry	29.2%	50
Has no effect	40.4%	69
Don't know	1.8%	3
Other	1.8%	3
No response	1.8%	3

5.5 Proposed changes to tiering arrangements

5.5.1 The new performance measures for schools will focus on progress in a student's best 8 GCSE subjects, rather than on the grade C as a threshold measure. Mathematics will have a double weighting in this measure. Will these new performance indicators make a difference to the proportion of students whom you expect to enter for each tier?

Over 60% of respondents indicated that changes to accountability measures will make no difference to the proportion of students whom they expect to enter for each tier (Fig. 30, Table M16); this was particularly the case for independent/selective institutions (approximately 85%). However, about 12% of respondents indicated that they would expect to enter more students for the higher tier. Around 20% of colleges indicated that this would be the case, perhaps reflecting the fact that they currently enter very few students for the higher tier.

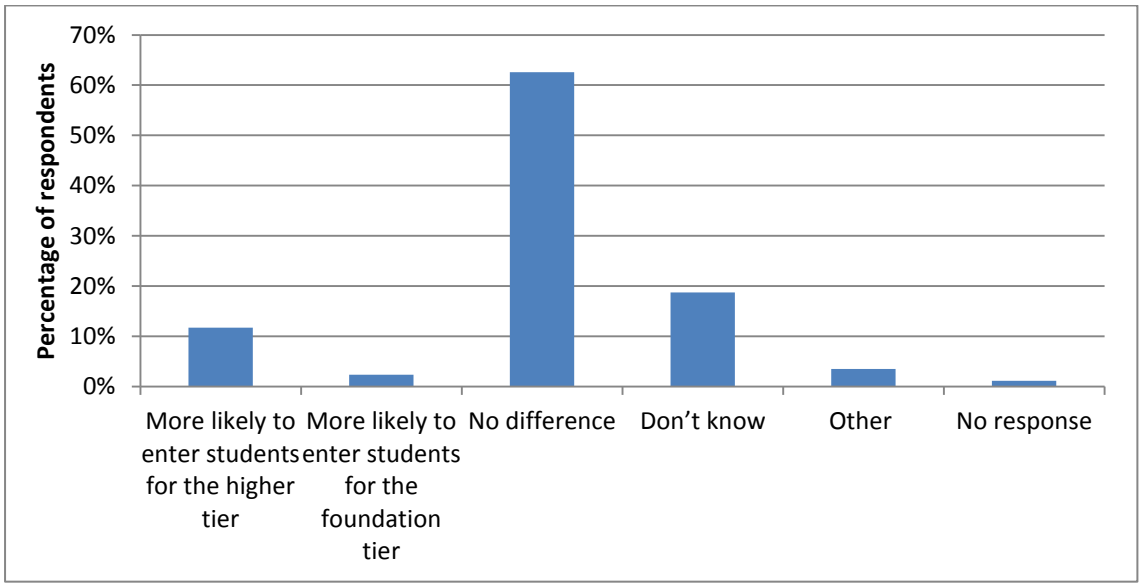


Figure M30: Expected impact of new accountability measures for tier entry.

By school type

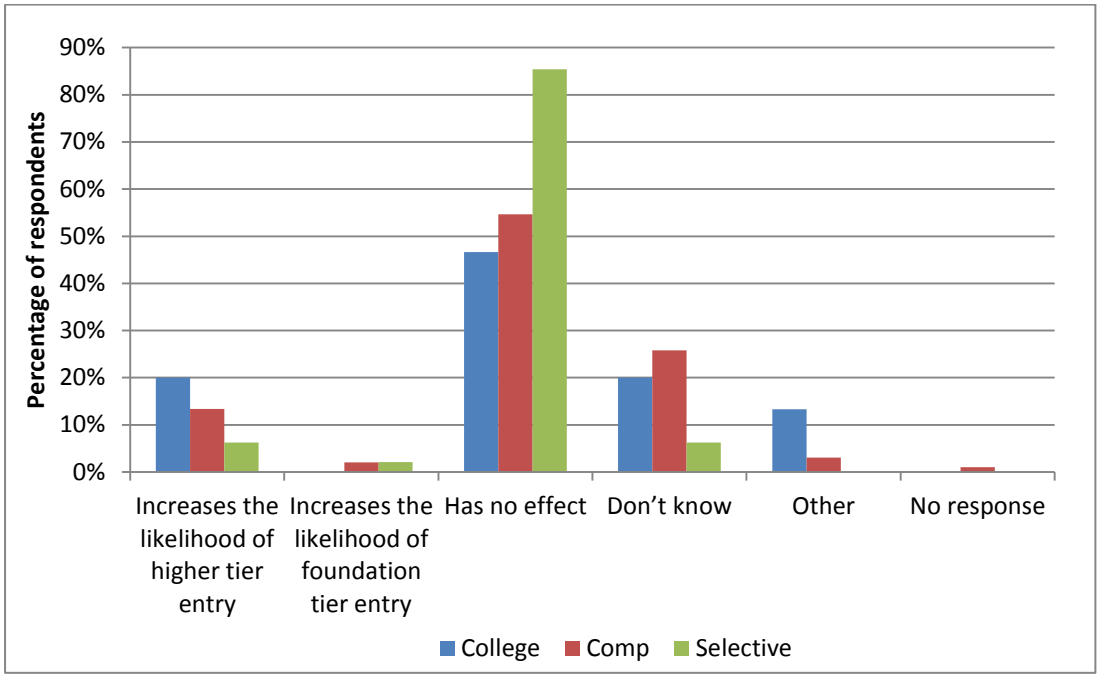


Figure M31: Expected impact of new accountability measures for tier entry by institution type.

Table M16: Expected impact of new accountability measures for tier entry by institution type.

	Percentage	n
More likely to enter students for the higher tier	11.7%	20
More likely to enter students for the foundation tier	2.3%	4
No difference	62.6%	107
Don't know	18.7%	32
Other	3.5%	6
No response	1.2%	2

5.5.2 *The tiering model used at GCSE has changed since its introduction. Reforms to the GCSE grading system by Ofqual in the future may change the maximum grade available on the foundation tier. If the maximum grade available on the foundation tier increased so that the highest grade available was B, and the minimum grade available on the higher tier also increased to a grade C (with an allowed grade D), how often would you be likely to enter students for each tier who fit the following description?*

As might be expected, respondents overall indicated that they would enter fewer candidates for the higher tier if the maximum grade on the foundation tier increased to a grade B (Fig. 32, Table M17). For example, under the current arrangements, where the maximum grade available on the foundation tier is a grade C, 89.5% of respondents indicated that they would always enter a student expected to achieve a grade B for the higher tier (see Table M10). If the foundation tier increased to a grade B, then this falls to 56.7%. However, if we compare how respondents would enter candidates expected to achieve the highest grade on the foundation tier, whether a C as present, or the hypothesised B, then a different picture emerges. Under the current tiering arrangements, the percentage of respondents who reported that they would always enter candidates who are expected to achieve a grade C, the highest grade on the foundation tier, for the higher tier, is only 28.7%, much lower than

56.7%. This suggests that although raising the foundation tier to a grade B would decrease the number of students entered for the higher tier overall, it might not do so as much as expected. This remains true across institution types, although independent/selective institutions remain much more likely to enter students for the higher tier (Fig. 33).

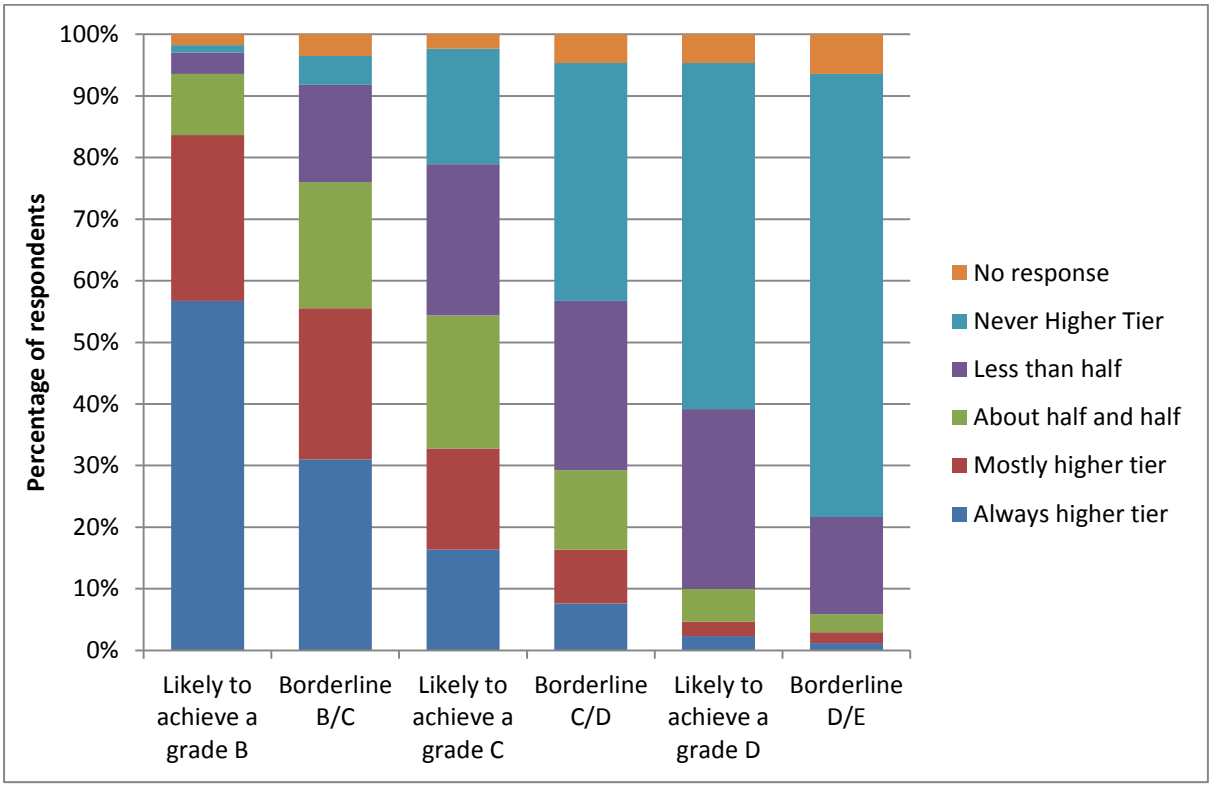


Figure M32: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade B.

Table M17: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade B.

	Likely to achieve a grade B	Borderline B/C	Likely to achieve a grade C	Borderline C/D	Likely to achieve a grade D	Borderline D/E
Always higher tier	56.7% 97	31.0% 53	16.4% 28	7.6% 13	2.3% 4	1.2% 2
Mostly higher tier	26.9% 46	24.6% 42	16.4% 28	8.8% 15	2.3% 4	1.8% 3
About half and half	9.9% 17	20.5% 35	21.6% 37	12.9% 22	5.3% 9	2.9% 5
Less than half	3.5% 6	15.8% 27	24.6% 42	27.5% 47	29.2% 50	15.8% 27
Never Higher Tier	1.2% 2	4.7% 8	18.7% 32	38.6% 66	56.1% 96	71.9% 123
No response	1.8% 3	3.5% 6	2.3% 4	4.7% 8	4.7% 8	6.4% 11

By school type

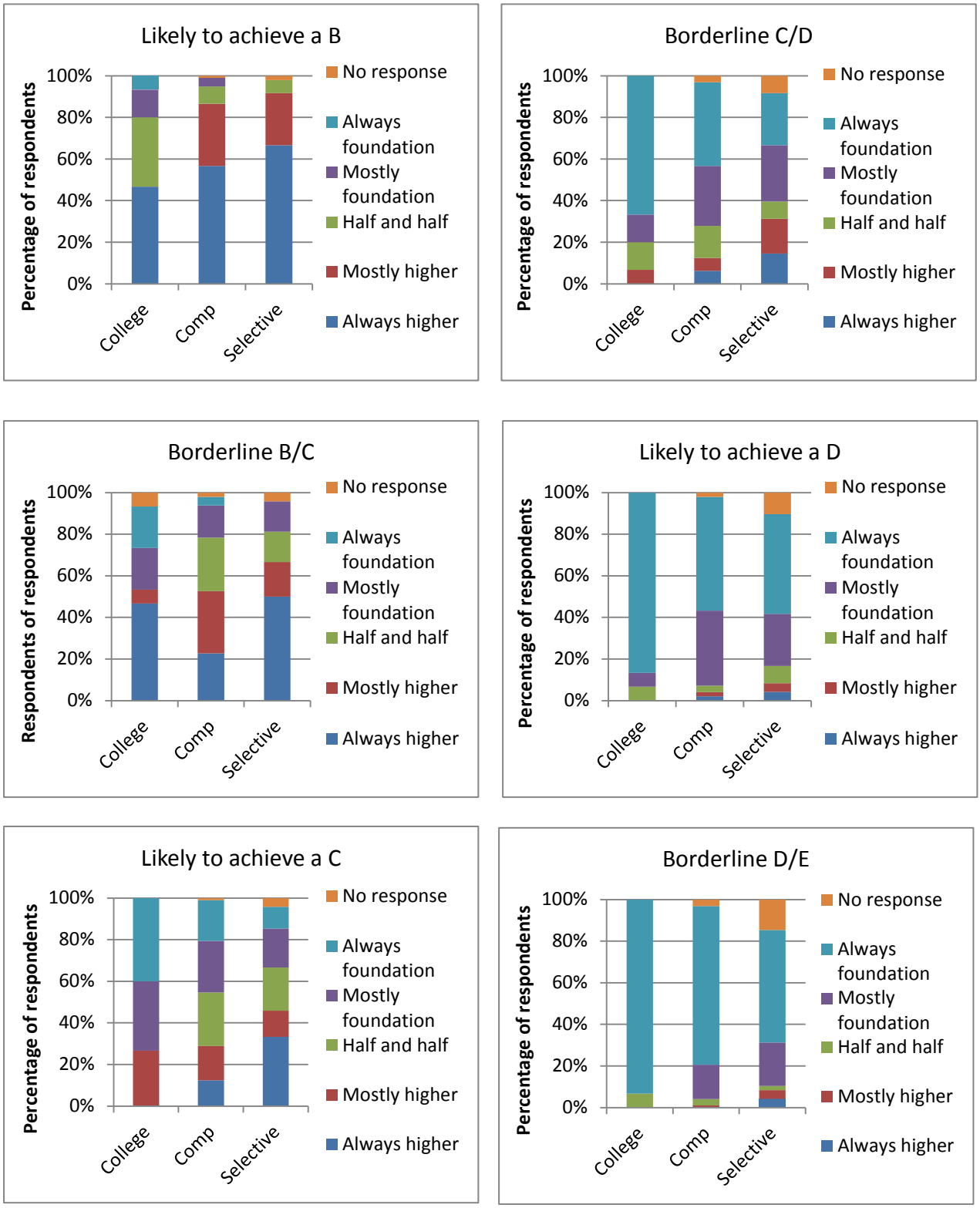


Figure M33: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade B by institution type.

5.5.3 If the maximum grade available on the foundation tier decreased so that the highest grade available was D, how often would you be likely to enter students for each tier who fit the following description?

If the maximum grade on the foundation tier decreased so that the highest grade available was a grade D, respondents indicated that they would be more likely to enter students at every level of attainment for the higher tier (Fig 34, Table M18). However, 22.8% of respondents indicated that they would always enter candidates expected to achieve a grade D for the higher tier; less than the 28.7% of respondents who would enter candidates expected to achieve the maximum grade C on the current foundation tier. Independent/selective schools were more likely to enter students of the same expected attainment for the higher tier (Fig. 35).

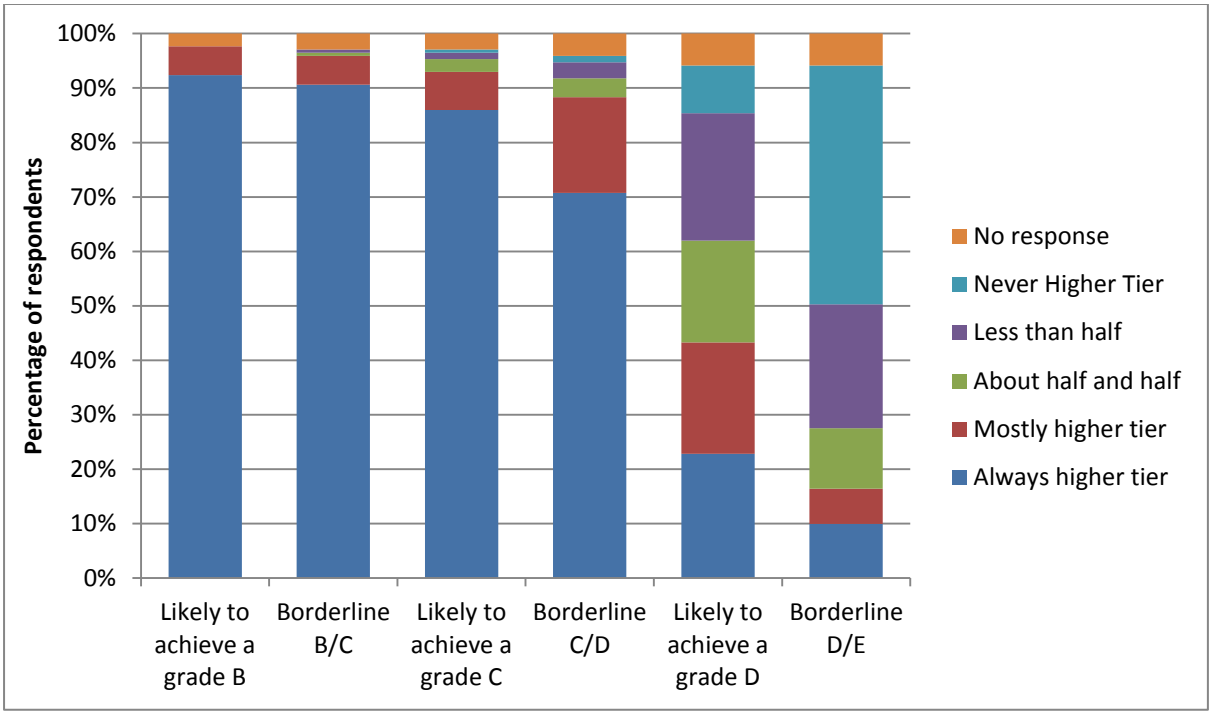


Figure M34: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade D.

Table M18: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade D.

	Likely to achieve a grade B	Borderline B/C	Likely to achieve a grade C	Borderline C/D	Likely to achieve a grade D	Borderline D/E
Always higher tier	92.4% 158	90.6% 155	86.0% 147	70.8% 121	22.8% 39	9.9% 17
Mostly higher tier	5.3% 9	5.3% 9	7.0% 12	17.5% 30	20.5% 35	6.4% 11
About half and half	0.0% 0	0.6% 1	2.3% 4	3.5% 6	18.7% 32	11.1% 19
Less than half	0.0% 0	0.6% 1	1.2% 2	2.9% 5	23.4% 40	22.8% 39
Never Higher Tier	0.0% 0	0.0% 0	0.6% 1	1.2% 2	8.8% 15	43.9% 75
No response	2.3% 4	2.9% 5	2.9% 5	4.1% 7	5.9% 10	5.9% 10

By school type

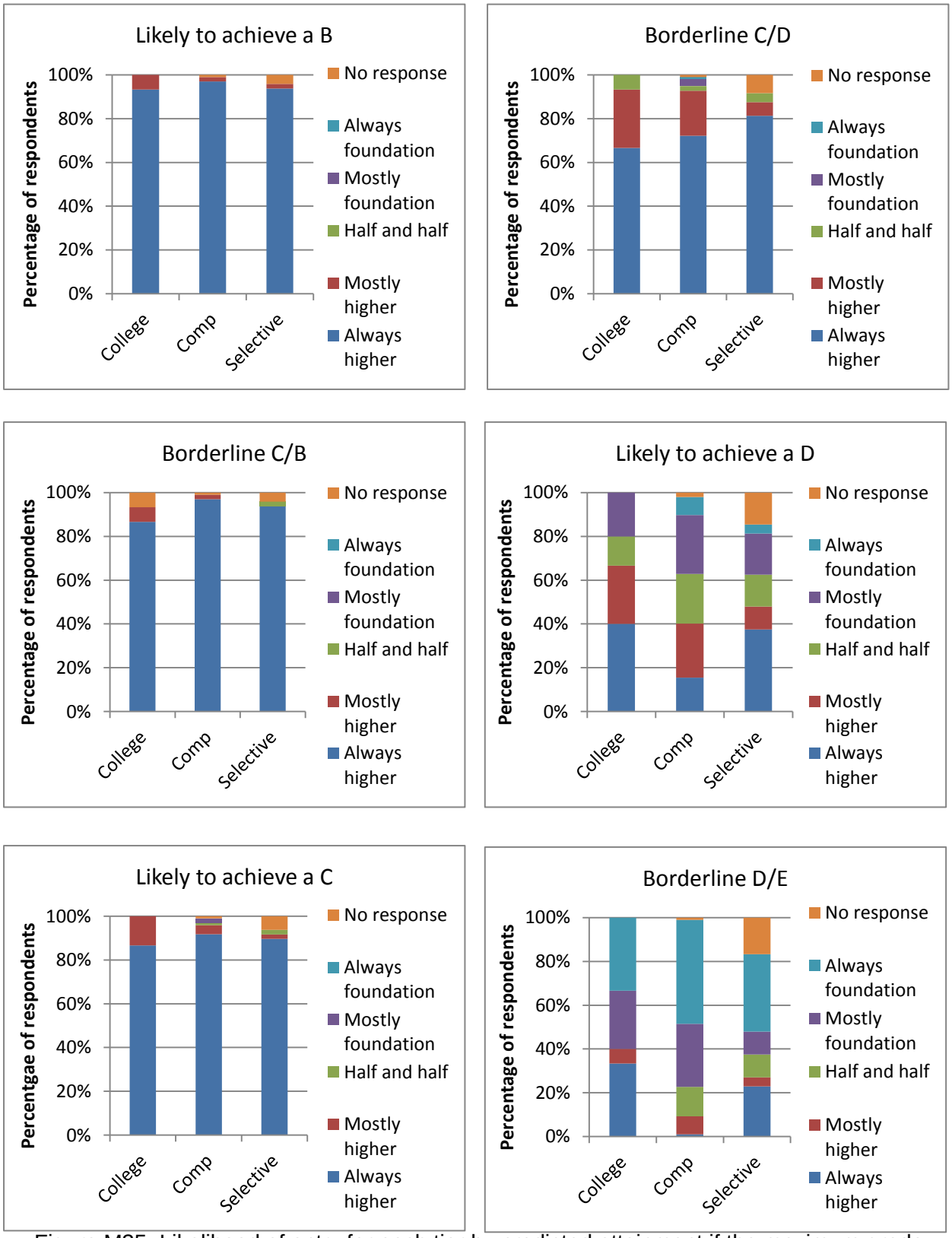


Figure M35: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade D.

5.5.4 In the new Mathematics GCSE, reasoning, communication and problem solving will have a larger weighting on the higher tier than they do on the foundation tier. What effect do you think this will have on the proportion of students whom you enter for the higher tier?

Approximately a third of respondents indicated that they would be more likely to enter students for the foundation tier as a result of changes to the weighting of reasoning, communication and problem solving on the higher tier (Fig. 36, Table M19). Independent/selective institutions were less likely to report that their entry practices for tiers would be changed by these changes (Fig. 37).

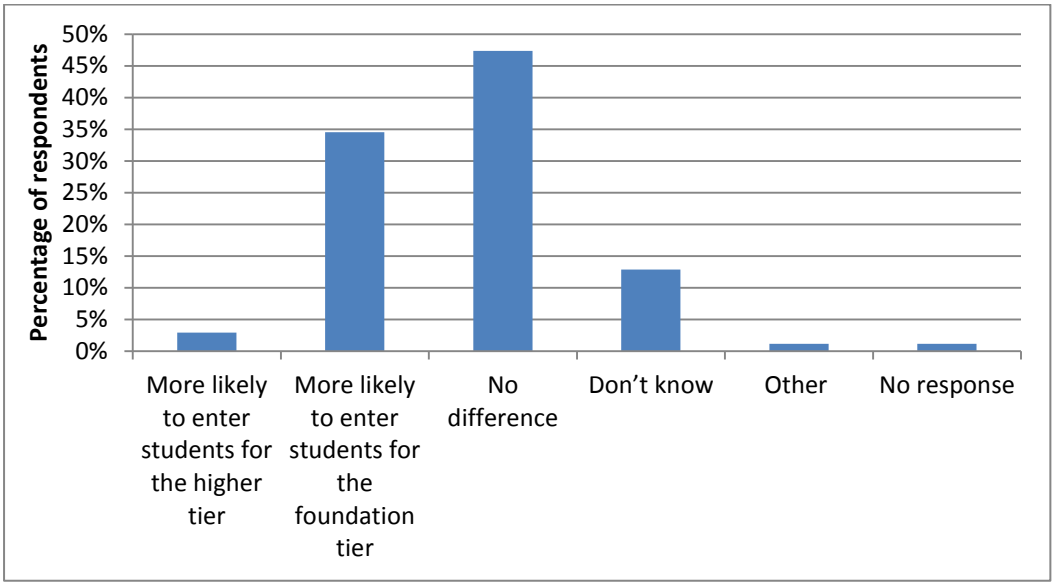


Figure M36: Expected impact on tier entry as a result of the increase in reasoning, communication and problem solving on the higher tier.

By school type

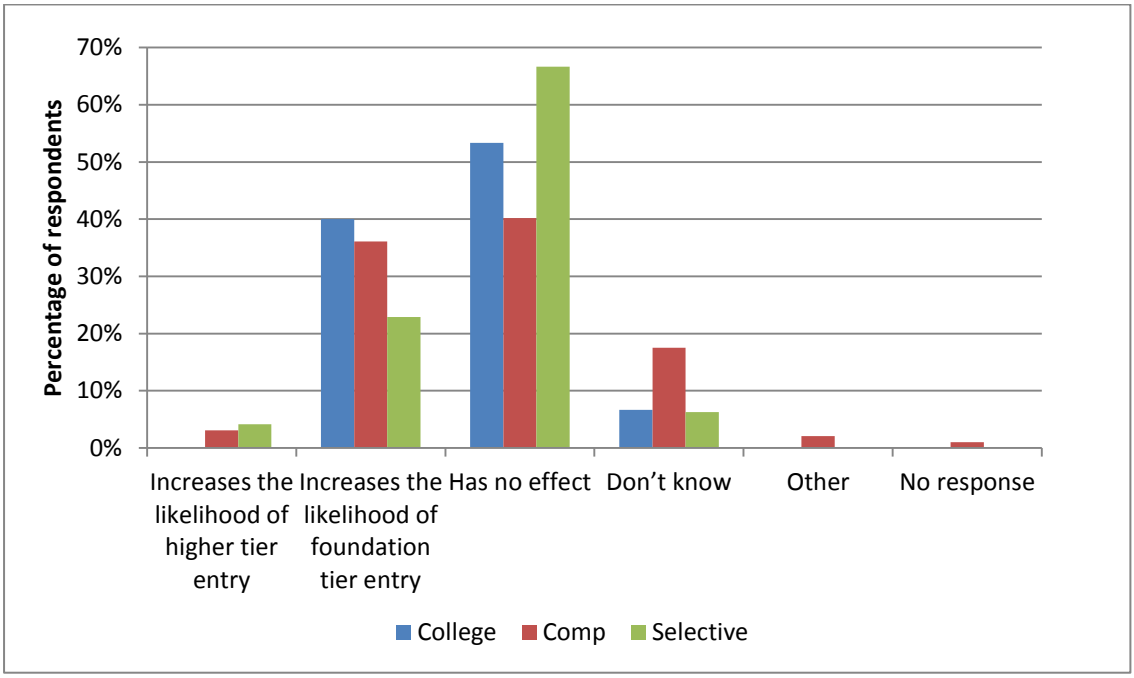


Figure M37: Expected impact on tier entry as a result of the increase in reasoning, communication and problem solving on the higher tier by institution type.

Table M19: Expected impact on tier entry as a result of the increase in reasoning, communication and problem solving on the higher tier.

Effect	Percentage	n
More likely to enter students for the higher tier	2.9%	5
More likely to enter students for the foundation tier	34.5%	59
No difference	47.4%	81
Don't know	12.9%	22
Other	1.2%	2
No response	1.2%	2

5.5.5 Do you have any further comments about tiering?

Respondents were asked to provide any further comments that they might have about tiering. Each comment is labelled with an identification number for the respondent, and the type of institution where the respondent was teaching. Several respondents commented on the advantages of the old intermediate tier[7], particularly for students expected to achieve a grade B or C. The current higher tier was considered to be not demanding enough for the most able students.

Really liked the old Intermediate paper. But now think the Higher paper does not test the top students enough, nor differentiate between them. There should be an A extension paper - 1 extra hour - only A* and A** questions. [58 teacher, independent school]*

I miss the old intermediate tier. The bulk of our learners are grade B to E students, and the intermediate tier was a good fit. [113, teacher, FE college]

I thought the old three tier system worked best for pupils where there was an intermediate tier where the highest grade was a B. My B/C grade students find the Higher tier paper hard. They were much better motivated on the intermediate papers when they were aiming for 70% as they felt that they were good at Maths and could do it. [153, teacher, comprehensive school]

As a school, we still feel that our B/C grade students in our bottom sets got a far better education in Maths when the Intermediate tier was available [162, teacher, independent school]

It is vital that on the new foundation paper a student is able to achieve at least one grade above the 'good pass' threshold as this has always been a point of friction with the current papers and the highest grade available being a C. My opinion is that when the model last changed the wrong paper was got rid of and the intermediate paper should have been extended down allowing students to achieve a grade B on the foundation.[123, teacher, comprehensive school]

However, some disadvantages of the three tier system were mentioned.

I run a department that is individualised [sic] for students, we enter students based on what tier will benefit them the most. I think it would be great if the foundation went up to B, but don't think the highest grade on the foundation should be a D grade. when we had this when the three tier system was available students who knew they were being entered for

[7] Before 2006 GCSE Mathematics used three tiers: higher, targeting grades A*-C, intermediate, targeting grades B-E, and foundation, targeting grades D-G.

foundation had low aspirations and did not see the point. [61, teacher, comprehensive school]

They really must have access to the 'magic' grade C at all tiers. Most of our students go on to HE and without the Maths grade C their options are limited. [29, teacher, independent school]

Furthermore, it was felt that clarity about which grades and tiers would be suitable for progression to A level Mathematics is necessary.

The tiering needs to be kept but increasing foundation to include a B could have negative impact on A level results. We currently accept students to do A level who have a B, however, the pass rate is poor, despite them having studied for the higher tier. If hey [sic] get B at foundation, they will not have the grounding for A level but may think they have because they have a B. [64, teacher, bilateral school[8]]

Relatively few respondents commented on specific content areas which are taught at each tier. However, one respondent felt that problem solving could be particularly challenging for students with weak English skills.

Grade C students and below struggle with the problem solving and using and applying part of Maths. Although encouraged to explain their reasoning, they find this hard and are doubly penalised if the English skills are not strong. We are working on this, however the changes to examination from modular to linear etc. have affected our progress. [5, teacher, comprehensive school]

[8] A bilateral school contains both grammar (selective) and non-selective streams, which are taught separately.

5.6 Summary of Mathematics Results

The decision about which tier to enter for is decided early for the majority of students.

- Over 60% of schools/colleges responded that they first put students into sets/groups by ability in year 7.
- About a third of respondents said that their school/college had no sets which entered students for a mixture of tiers. Of the remainder, a third had 20% or fewer sets entering students for a mixture of tiers.
- Approximately half of respondents indicated that the latest point at which it would be possible to change tiers was half way through the course or earlier.
- Almost all respondents indicated that fewer than 20% of students moved between tiers, with approximately 20% suggesting that no students in their institution moved between tiers.

Teachers combine several sources of information when deciding on tier entry.

- Department policy and individual teachers played the most important role when deciding which tier a student should enter. Otherwise, nearly 70% of respondents indicated that student opinion was either important or very important.
- The factors most likely to be considered important in deciding tier entry were student prior or current attainment, predicted attainment and ability to cope with written examinations.
- Other factors thought to be important include the student's aspirations, the perceived relative difficulty of grade C on each tier, and the recent performance of previous borderline candidates.
- Respondents did not appear to be particularly cautious when entering candidates, with nearly half of respondents stating that they would always or mostly enter a candidate who was likely to achieve a grade C for the higher tier.
- The emphasis on grade C for accountability measures had no effect on tier entry for 40% of schools. For those who said that it did make a difference, slightly more (29.2% vs 25.2%) said that it made them more likely to enter candidates for the foundation tier.
- Some teachers commented that the higher tier is easier to get a C on because students have to answer fewer questions correctly.

The impact of reforms to GCSEs on tier entry is likely to be relative small, but it is likely that the percentage of students entered for each tier will change somewhat.

- Over 60% indicated that the move to linear assessment would make no difference to their tier entry. Of the remainder, twice as many respondents said that it would make them more likely to enter students for the foundation tier as the higher tier.
- Raising the maximum grade available on the foundation tier would likely mean a larger percentage of students expected to achieve this grade entered for the higher tier.
- Approximately a third of respondents indicated that increasing the weighting of reasoning, communication and problem solving on the higher tier would increase the likelihood that students would be entered for the foundation tier.

Themes emerging from the final comments section:

- Several respondents felt that the intermediate tier, which allowed candidates to achieve up to a grade B was very useful, and mourned its demise.
- However, increasing the foundation tier to grade B might be problematic for progression to A level; foundation tier grade B was not considered sufficient for progression to A level.

- Several respondents thought that it was important for students to be able to access a grade C on the foundation tier, for motivational reasons, and because C is a key grade for progression.

There were differences between different types of institution.

- Comprehensives were much more likely to start setting in year 7 than other school types.
- Comprehensives were more likely to say it is possible to move students to the higher tier later in the course.
- Comprehensives were more likely to move students between tiers.
- Selective schools were more likely to enter students (of the same expected attainment) for the higher tier than either colleges or comprehensives.
- Parents were more influential at selective schools
- Selective schools were less likely to say the move to linear will change policy on tier entry.
- Selective schools were also less likely to say that an increase in the weighting given to reasoning, communication and problem solving etc. will change policy.

Many of these differences were as expected, reflecting the different ability levels of the students attending each type of school. Comprehensive schools are more likely to have students on the borderline of foundation and higher tiers than selective schools or colleges, so they are more likely to be flexible in changing tiers. In contrast, most college students will be entered for foundation tier and most selective school students for higher tier. Therefore changes impacting on decisions about tier entry will have less effect on these schools.

6 Comparison of Science and Mathematics Results

In this section we directly compare Science and Mathematics teachers' responses for those questions which were common across the two subjects. For some questions in the Science questionnaire, respondents were asked to choose whether to answer about Core or Separate Science courses. For these questions, responses for Core and Separate Sciences have been combined.

6.1 The relationship between tiering and ability sets.

6.1.1 When does your school/college currently start teaching the GCSE specifications?

Mathematics teachers were most likely to start teaching GCSE Mathematics specifications in either Y9 or Y10. Core Science, and separate Science courses were most likely to be first taught in Y9, though Additional Science was most likely to be first taught in Y10. Overall, therefore, it does not seem to be the case that GCSE Mathematics is taught earlier than Science GCSE specifications (Fig. C1).

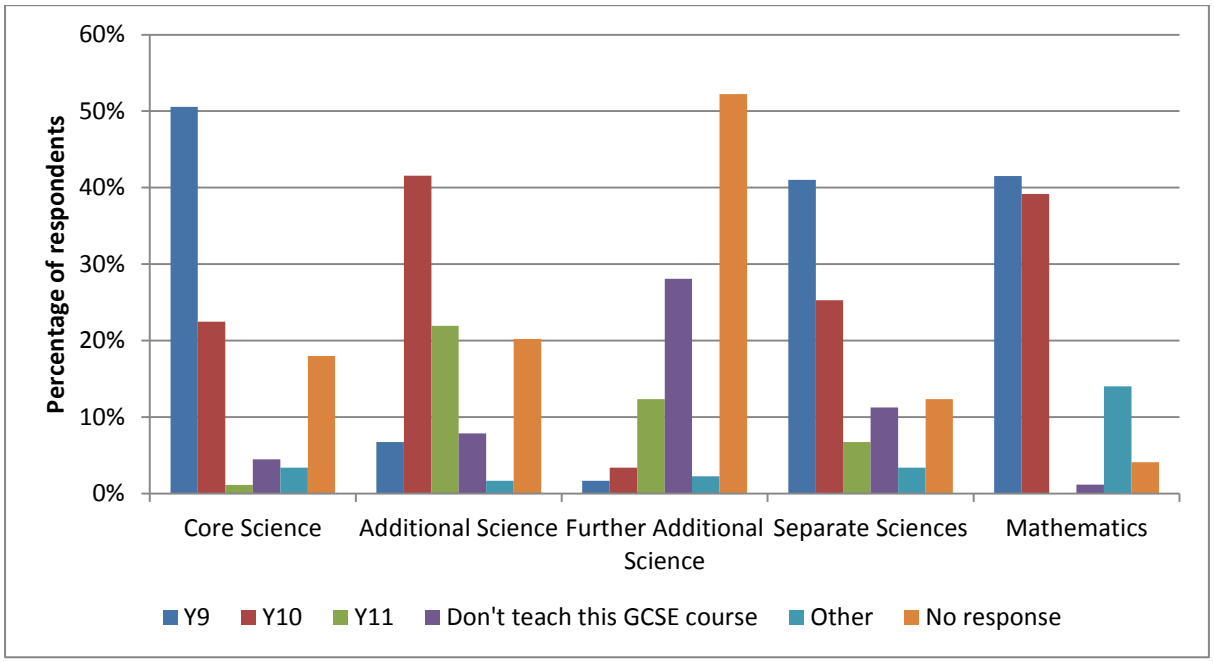


Figure C1: School year in which schools first start teaching the GCSE specifications in Science and Mathematics.

N.B. Mathematics teachers were not given the option of Y11.

6.1.2 In which school year does your institution first put students into sets/groups by ability?

The majority of Mathematics teachers reported that their institutions first put students into sets or groups by ability in Y7. For Science, however, although approximately 30% of institutions put students into ability sets in Y7, there was a much greater spread across years. Science teachers were more likely to indicate that their institution did not use ability setting in their subject than Mathematics teachers (Fig. C2).

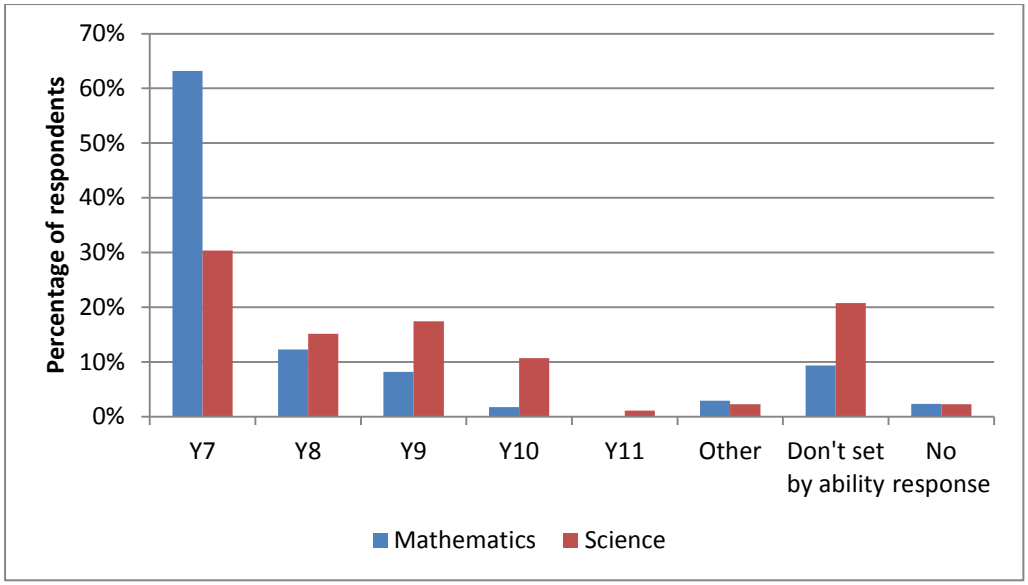


Figure C2: School year in which students are first put into ability sets in Science and Mathematics.

6.1.3 In your school, how many GCSE sets/ability groups contain some students entering for foundation tier and some for higher tier?

Science teachers were more likely to report that their school had at least one ability set which entered students for a mixture of tiers, and that a greater proportion of their ability sets entered students for a mixture of tiers, compared to Mathematics (Figs. C3 and C4). This suggests that there is a closer link between ability set and tiers in Mathematics compared to Science.

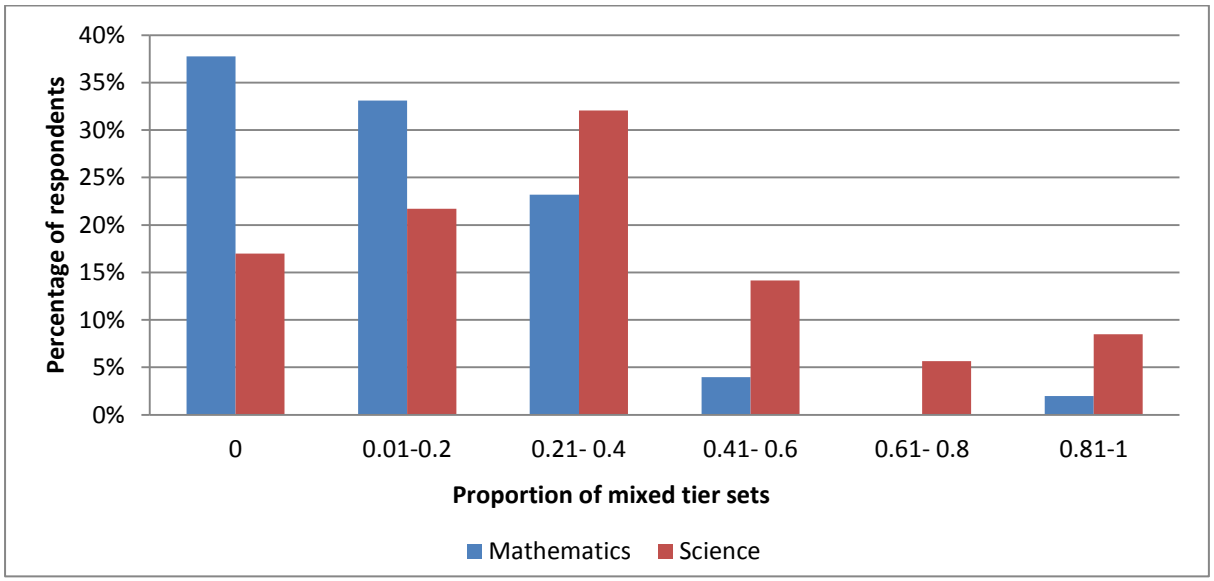


Figure C3: Proportion of ability sets with students entered for both tiers.

6.1.4 What is the latest point during a GCSE course that you think it is possible to decide to enter a student for the higher tier, and ensure that they have covered sufficient higher tier content?

Science teachers were more likely than Mathematics teachers to indicate that they thought that it was possible to decide to enter somebody for the higher tier towards the end of the course.

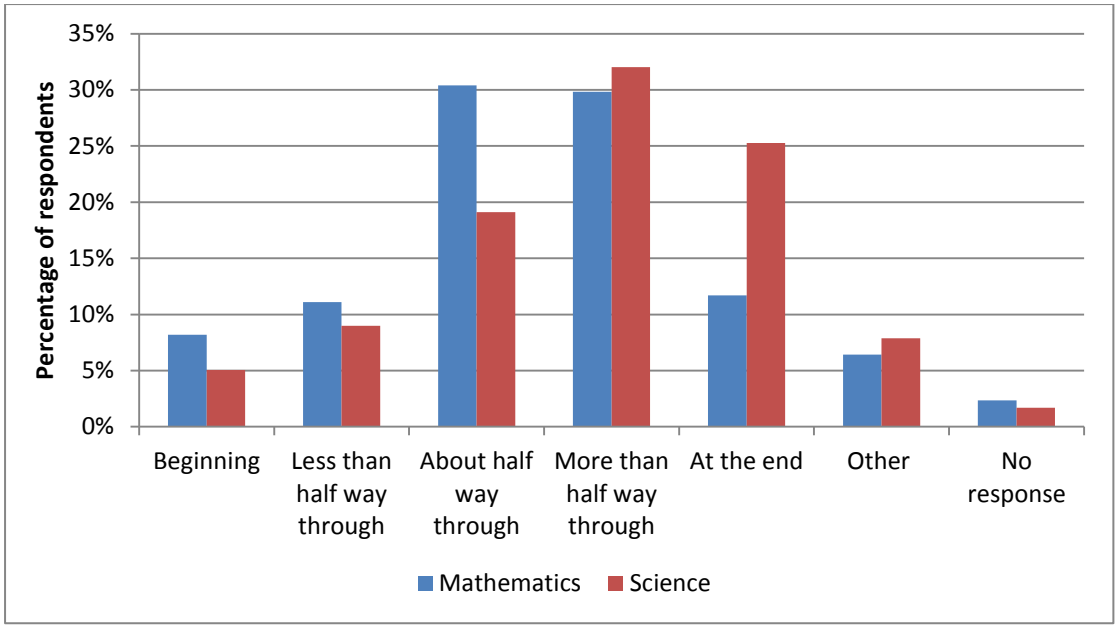


Figure C4: The latest point during a GCSE course that it is possible to decide to enter a student for the higher tier in Mathematics and Science.

6.1.5 Approximately what proportion of the students in your school/college move between the foundation tier and the higher tier curriculum during the GCSE course (and in which direction)?

For both Science and Mathematics approximately 20% of respondents stated that no students moved tiers during the GCSE course (except in Science where only around 13% said that students moved from higher to foundation tier). The percentage of students moving tiers tended to be slightly higher in Science than in Mathematics (Figs. C5 and C6).

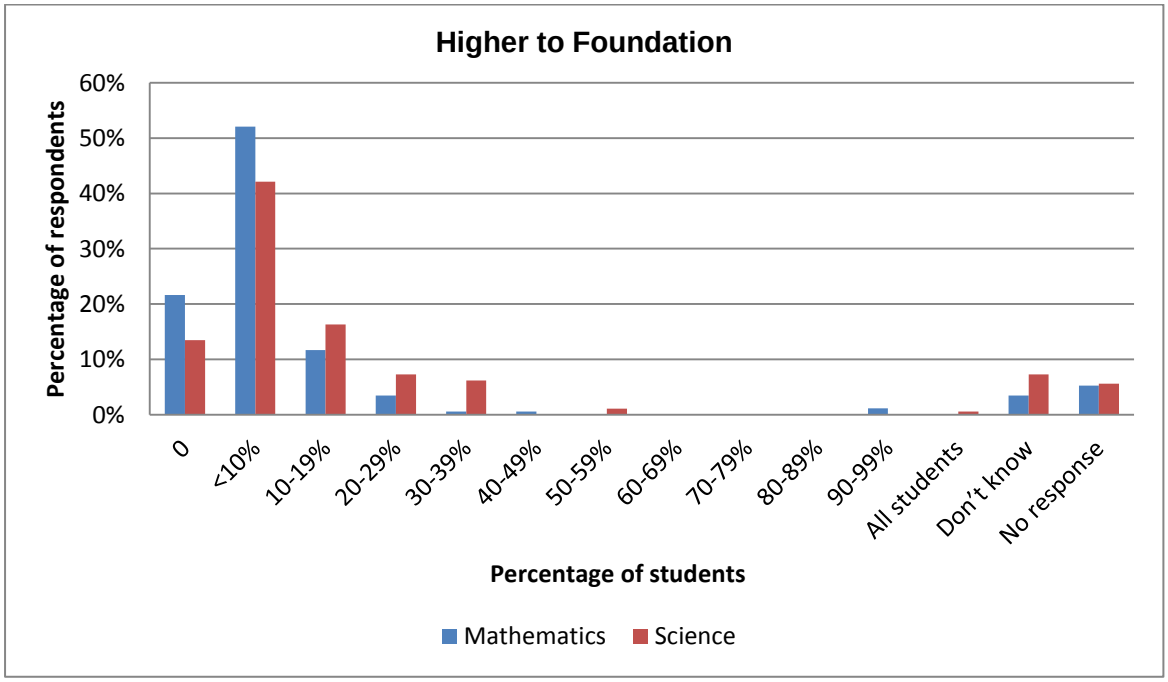


Figure C5: Percentage of students who moved from the higher tier to the foundation tier during the GCSE course.

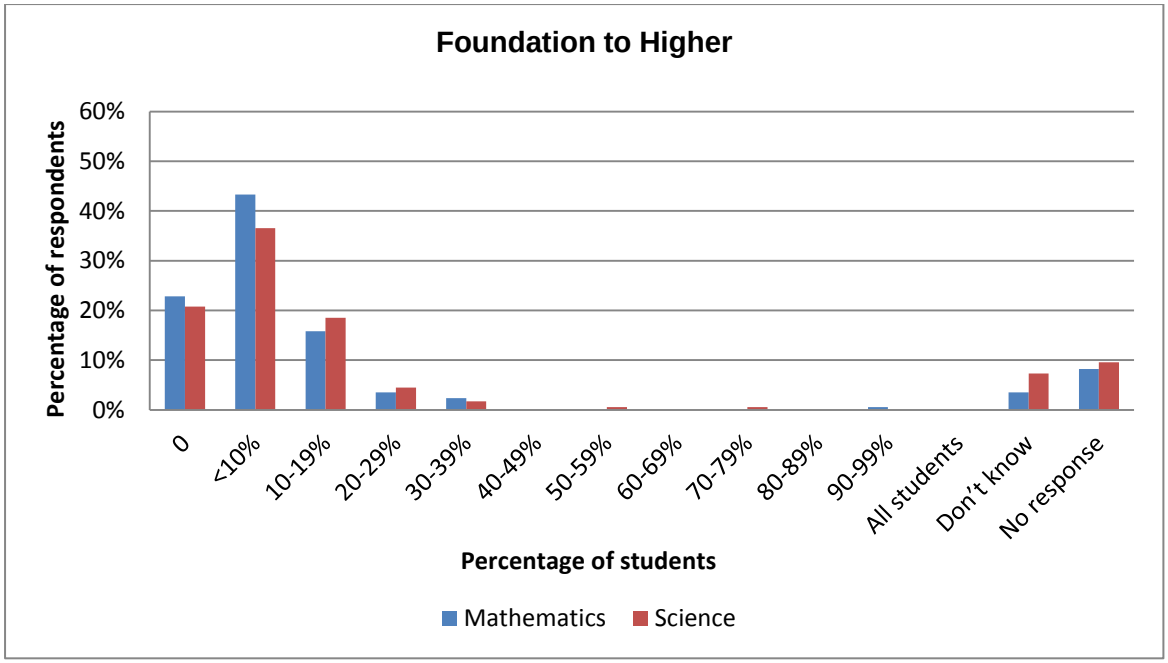


Figure C6: Percentage of students who moved from the foundation tier to the higher tier during the GCSE course.

6.2 Factors affecting entry for tiers.

6.2.1 How often would you be likely to enter students for each tier who fit the following description?

There was very little difference in tier entry for students of different expected attainment between Science and Mathematics (Fig. C7).

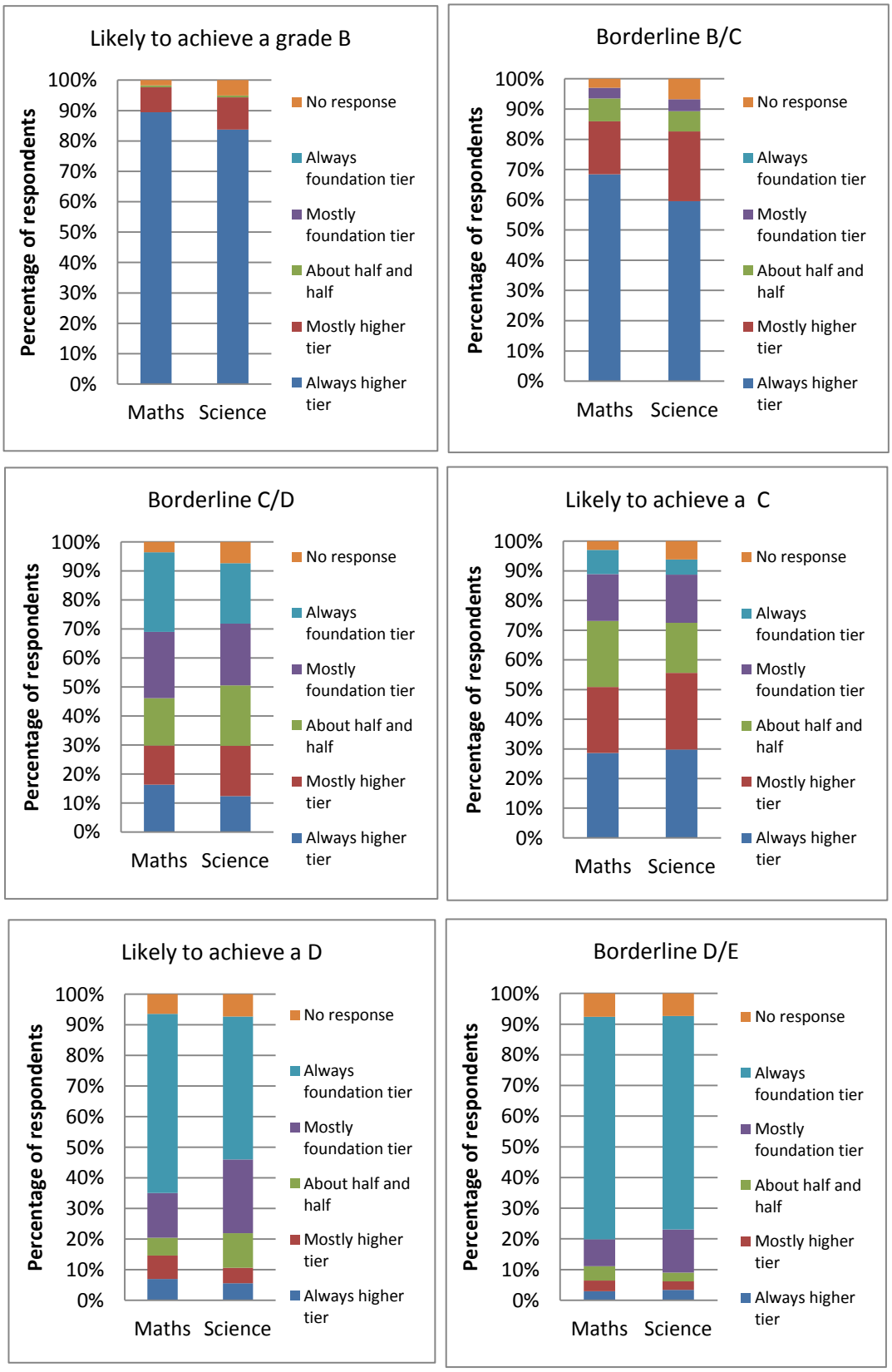


Figure C7: Likelihood of entry for each tier by predicted attainment in Science and Mathematics.

6.2.2 Who is involved in the decision about which tier a student should be entered for, and how important is this input?

The overall pattern of responses suggested that input into tiering decisions came from the same sources for each subject (Fig. C8). However, for Science, the individual teacher's input was relatively more important than department policy; this was not the case for Mathematics.

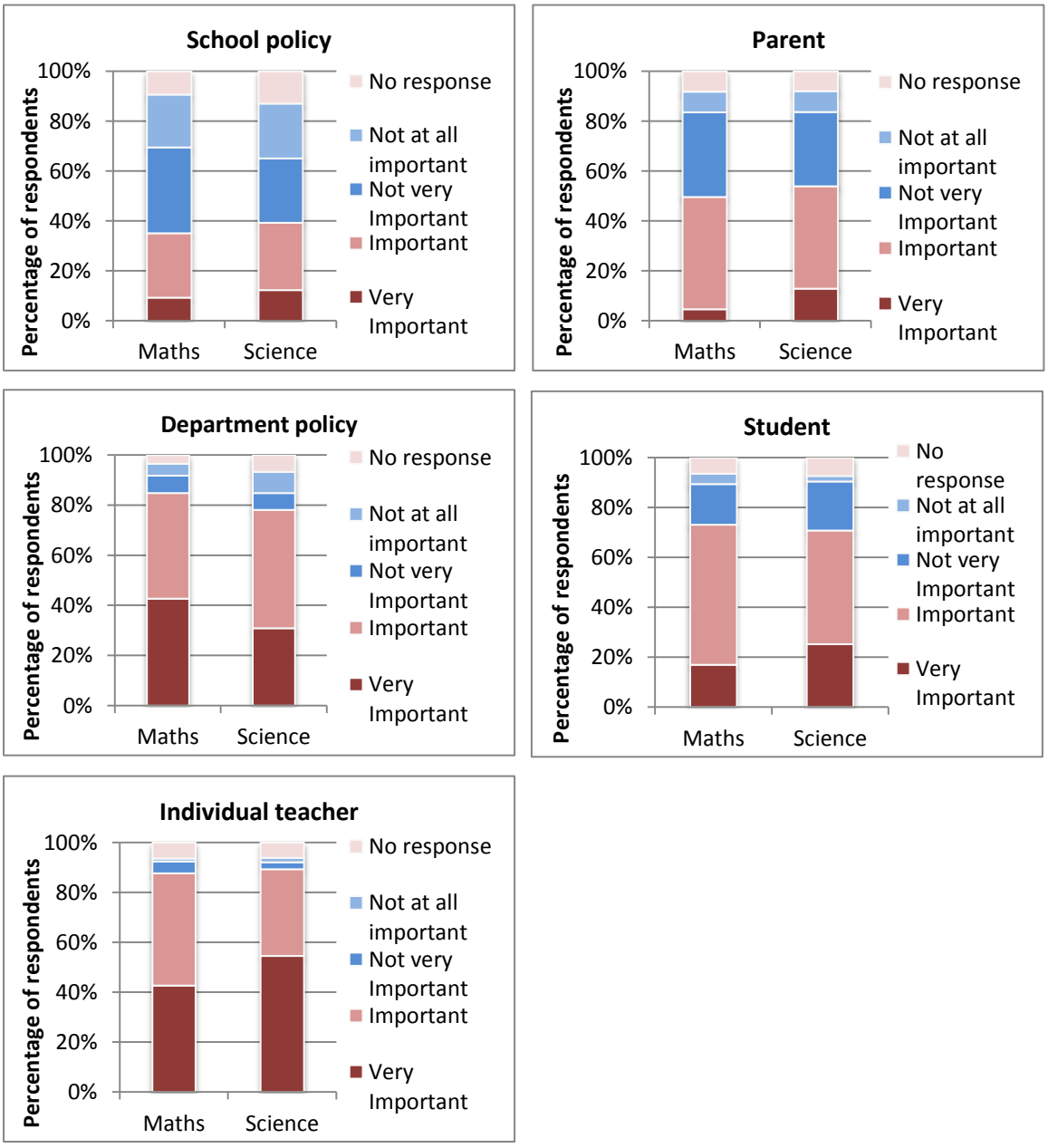


Figure C8: Importance of input from different sources about tier entry in Science and Mathematics.

6.2.3 For students who are 'borderline' for the foundation or higher tier, how important are the following factors for determining tier entry?

For most factors, the differences between Mathematics and Science were relatively small (Figs. C9 and C10). However, writing skills and literacy level were considered to be important or very important by approximately 70% of Science teachers, but only about 25% of Mathematics teachers. In contrast, ability grouping was more important for Mathematics teachers compared to Science teachers.

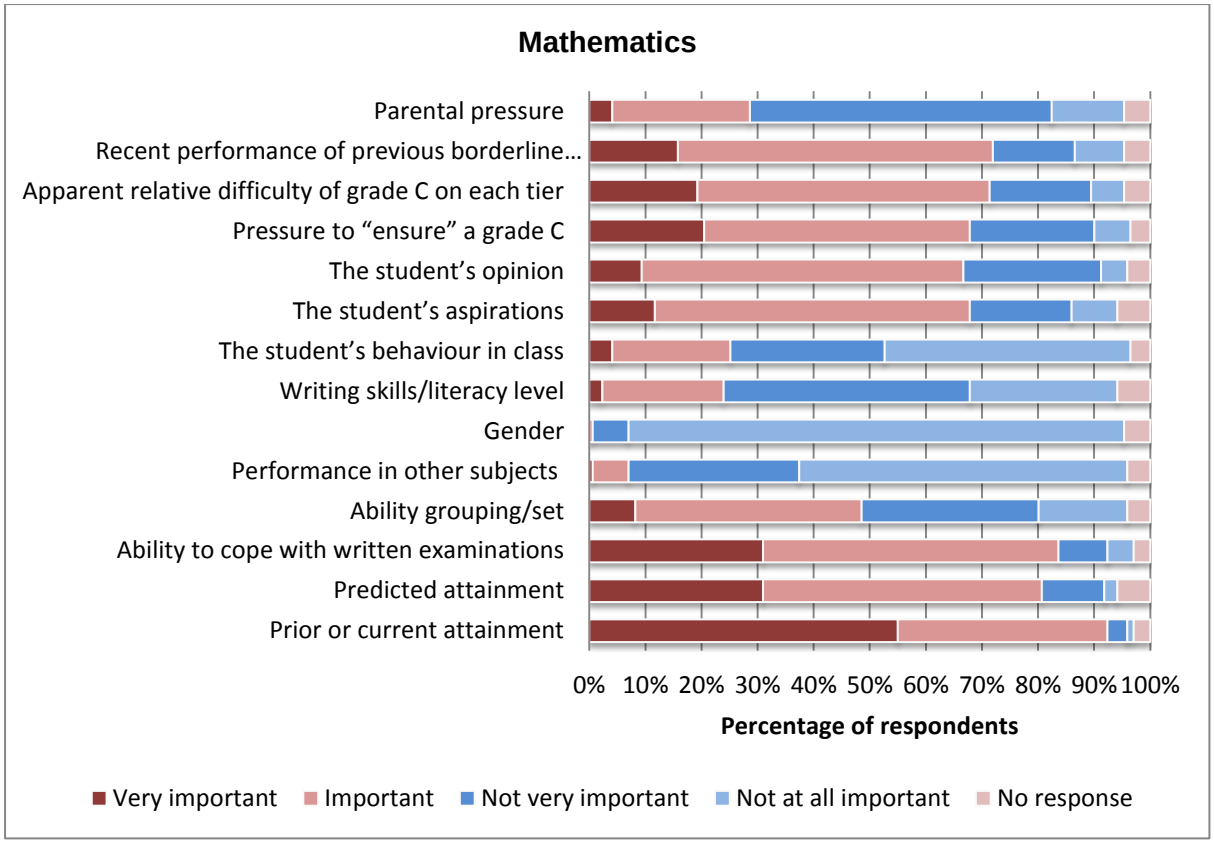


Figure C9: Importance of factors for deciding tier entry for borderline students in Mathematics.

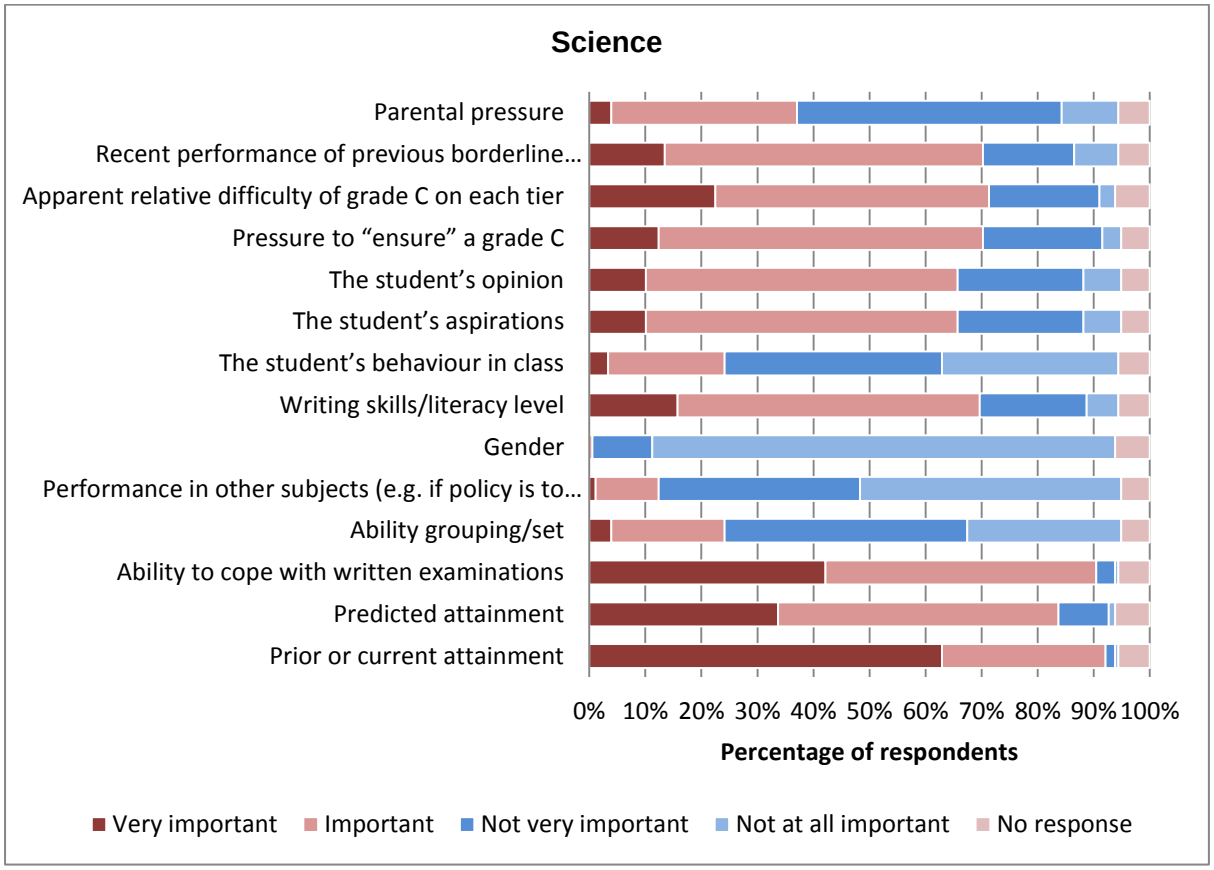


Figure C10: Importance of factors for deciding tier entry for borderline students in Science.

6.2.4 If you use prior attainment to decide on the tier of entry, how do you measure prior attainment?

Science and Mathematics teachers generally reported using the same measures of prior attainment (Fig. C11). However, Science teachers were more likely to use tests developed by publishers, while Mathematics teachers were more likely to use KS3 papers.

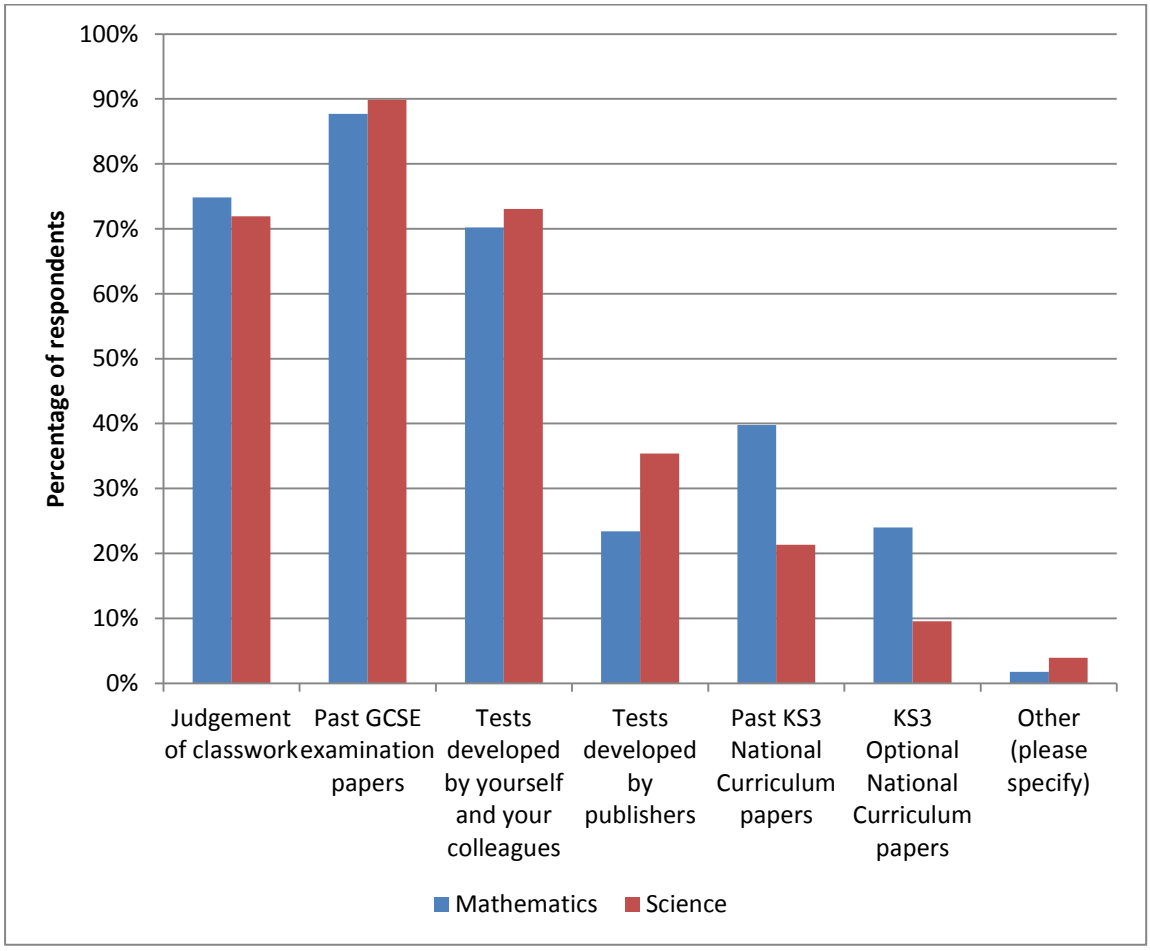


Figure C11: Measures of prior attainment used.

6.3 Terminal assessment and accountability measures.

6.3.1 All GCSE assessments must now be taken at the end of the course. Has the move to 100% terminal assessment at GCSE made you more or less likely to enter students for the higher tier?

Mathematics teachers were more likely to report that the move to 100% terminal assessment would make little difference to their tier entry decisions (Fig. C12); this is possibly because linear GCSE Mathematics specifications are already quite popular. Of those reporting that the change would make a difference, more teachers said it would increase the likelihood of foundation tier entry than those saying it would increase higher tier entry; this was the case to a slightly greater extent in Science compared to Mathematics.

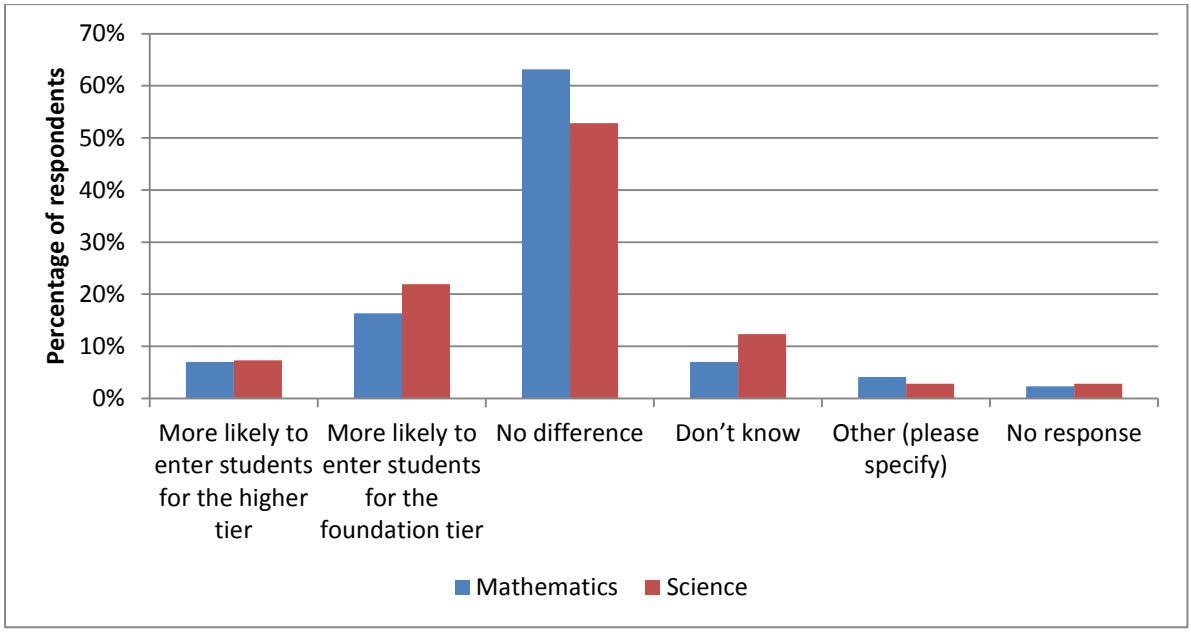


Figure C12: Impact of the move to 100% terminal assessment on tier entry.

6.3.2 Currently the grade C is an important grade for accountability measures, and is considered to be a "good pass". What impact does this emphasis on obtaining a grade C have on the likelihood that a student will be entered for each tier?

Mathematics teachers were more likely than Science teachers to report that the importance of the grade C has no effect on their tier entry decisions (40% compared to 30%) (Fig. C13). Across both subjects, of those saying that this did have an impact, teachers were more inclined to indicate that the importance of the grade C made them more likely to enter students for the foundation tier. This contrasts with individual comments from teachers in both subjects, who expressed the view that it is easier to obtain a grade C on the higher tier due to low grade boundaries.

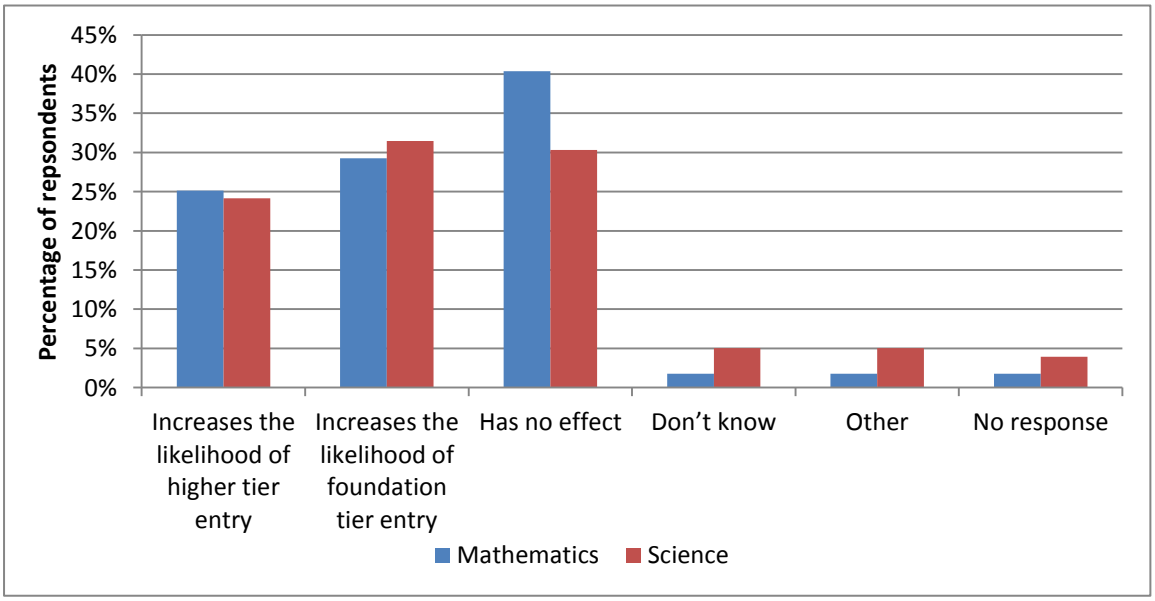


Figure C13: Impact of accountability measure on entry for tiers.

6.3.3 The new performance measures for schools will focus on progress in the best 8 GCSE subjects, rather than on the grade C as a threshold measure. Will these new performance indicators make a difference to the proportion of students whom you expect to enter for each tier?

Changes to accountability measures seemed to be relatively unimportant to both Science and Mathematics teachers with respect to tier entry (Fig. C14), although for both subjects it was likely to lead to a slight increase in students being entered for the higher tier.

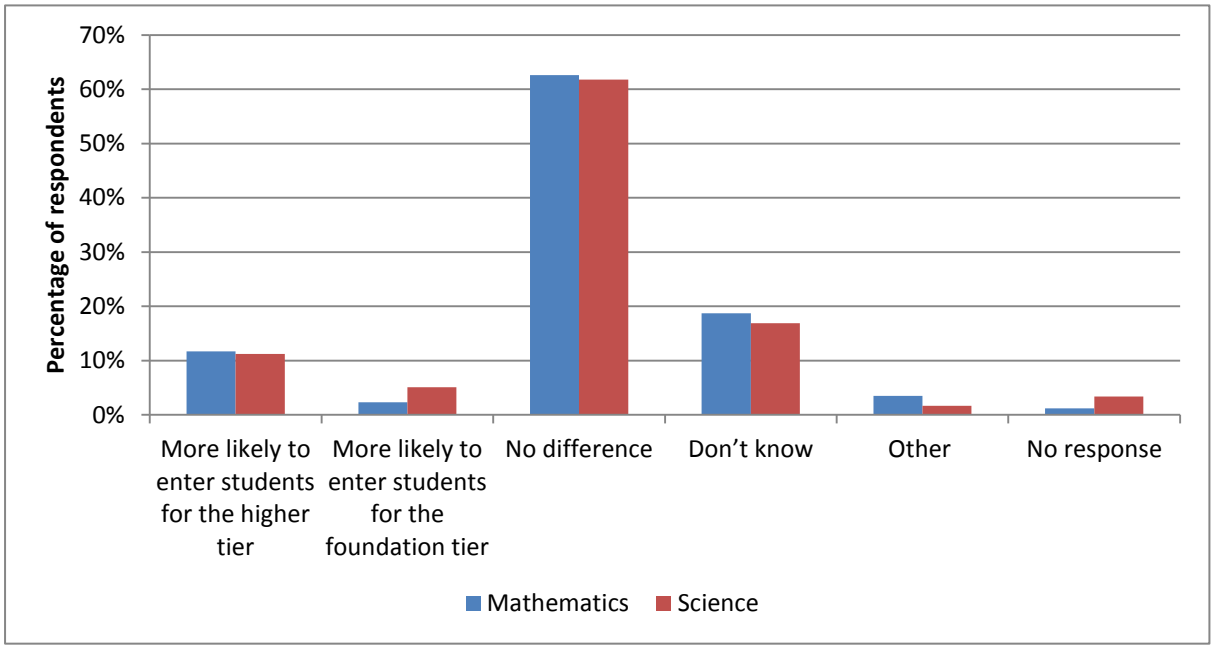


Figure C14: Expected impact of new accountability measures for tier entry.

6.4 Views about proposed changes to tiering arrangements.

6.4.1 If the maximum grade available on the foundation tier <u>increased</u> so that the highest grade available was B, and the minimum grade available on the higher tier also increased to a grade C (with an allowed grade D), how often would you be likely to enter students for each tier who fit the following description?

There were almost no differences between Mathematics and Science with respect to their anticipated behaviour if the maximum grade available on the foundation tier increased to a grade B (Fig. C15).

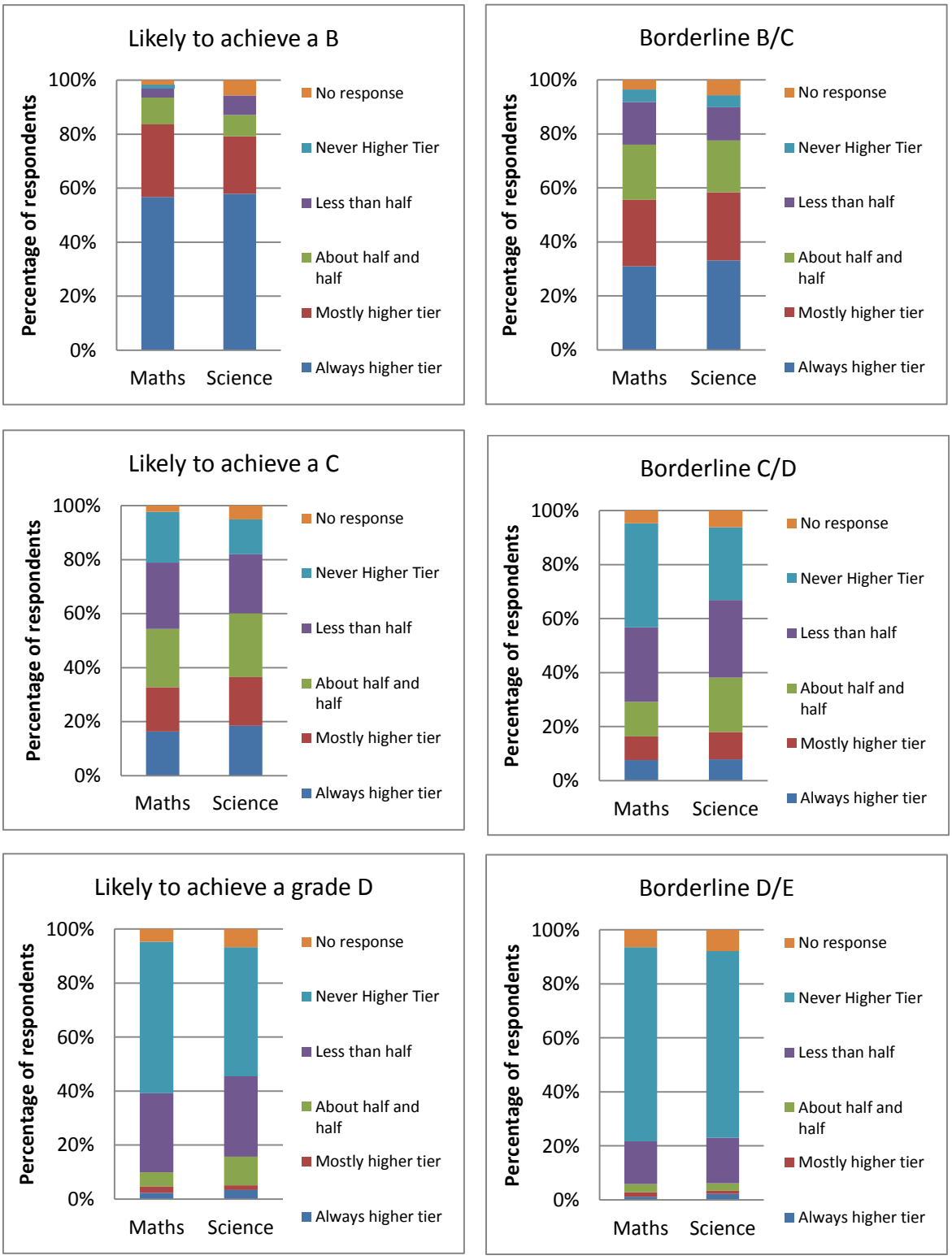


Figure C15: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade B.

6.4.2 If the maximum grade available on the foundation tier <u>decreased</u> so that the highest grade available was D, how often would you be likely to enter students for each tier who fit the following description?

Again, the differences between the subjects were mostly very small (Fig. C16). However, if the maximum grade available on the foundation tier reduced to a grade D, then Mathematics teachers would be slightly more likely than Science teachers to enter students who were expected to achieve a grade C, or were on the grade C/D borderline for the higher tier.

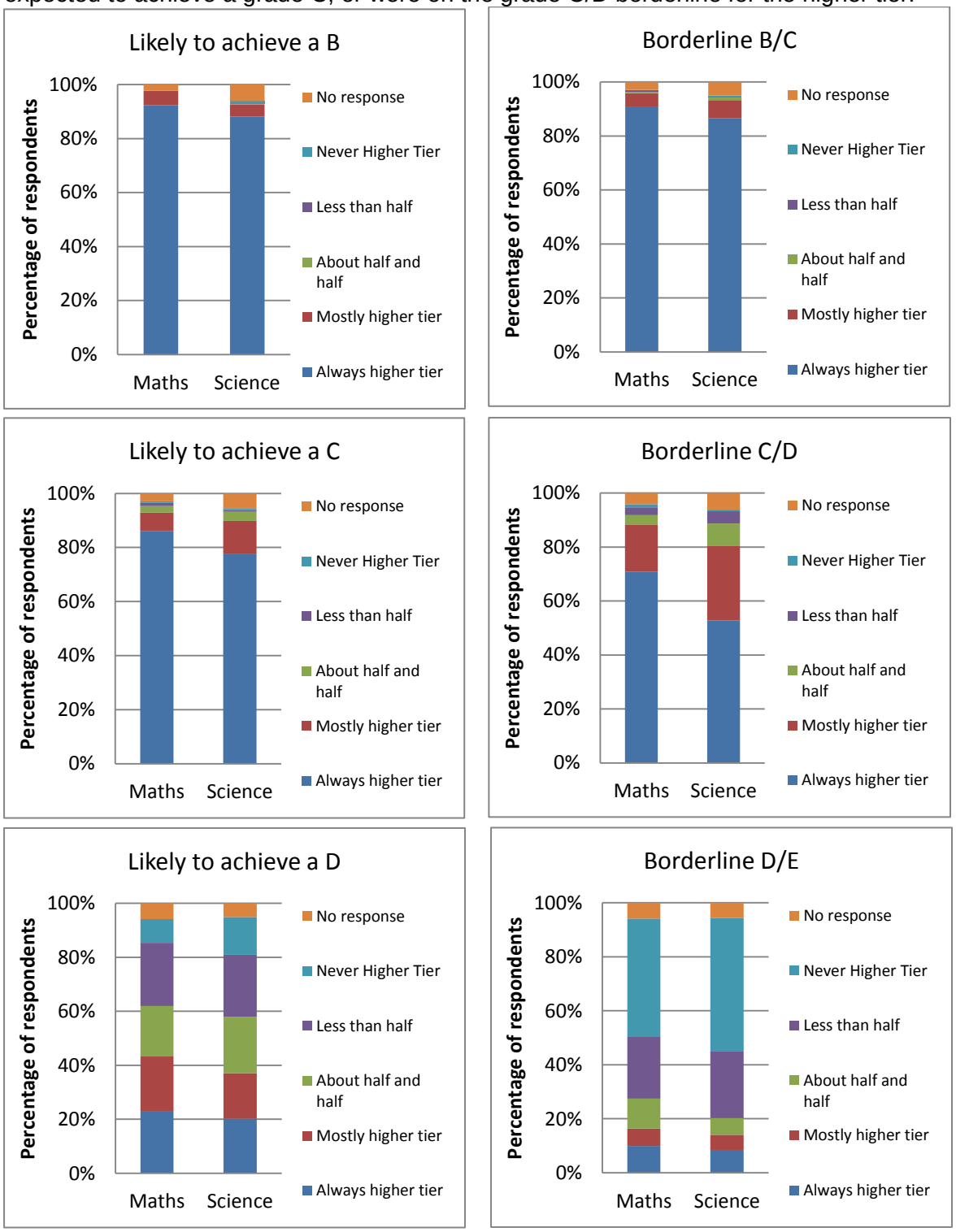


Figure C16: Likelihood of entry for each tier by predicted attainment if the maximum grade on the foundation tier were a grade D.

6.5 Comparison of Mathematics and Science results: Summary

- In Mathematics, students are typically placed into ability sets earlier than they are in Science. Furthermore, there is generally a stronger link between ability set and tier entry in Mathematics than there is in Science. Overall, Science teachers typically thought that decisions about tier entry could be made more than half way through a GCSE course, later than was the case for Mathematics teachers.
- In both subjects, a wide range of factors were used to decide which tier was most suitable for individual students. These were broadly the same across subjects. However, a student's writing skills and literacy level were considered more important by Science teachers than by Mathematics teachers.
- The move to 100% terminal assessment was less likely to affect tier entry decisions in Mathematics compared to Science.
- The importance of the grade C had a similar impact on tiering decisions across subjects, although Mathematics teachers were more likely to report that the use of the grade C for accountability measures made no difference to their decisions. Likewise, the proposed changes to accountability measures seem likely to have a similar impact across Science and Mathematics.
- Respondents were asked about how they would enter students of different levels of ability if the tiering model were adjusted to either increase or decrease the maximum grade available on the foundation tier. Such changes would have a similar impact across subjects.

7 Discussion

The use of tiering aims to allow students to take assessments which are better targeted at their ability level than a single paper which targets all grades. This is likely to lead to a more positive assessment experience, because students are not faced with questions which are too difficult, nor waste time answering questions which they find very easy. However, the tiering model relies on the ability to make the appropriate decision about which tier a student should be entered for. This study explored Science and Mathematics teachers' perspectives on how and when they, and their institutions, make decisions about tier entry at GCSE.

The study investigated three main areas. Firstly, we examined the way in which teaching is structured with respect to ability setting and tier entry, to examine when decisions about tier entry are likely to be made. Secondly, we investigated the factors affecting how decisions on tier entry are made. Finally, since the tiering model for GCSE is to be modified as part of a wider reform of GCSEs, we investigated the potential changes to tier entry which will result from such reforms. The data were analysed by school type (comprehensive, independent/selective and college), and for Science, by the GCSE Science course taught (Core Science or separate Sciences). N.B. Relatively small numbers of respondents reported that they taught in independent/selective schools or colleges, or responded to the Science questionnaire with respect to Separate Science. As such, the extent to which these findings are generalisable may be limited.

7.1 When are decisions made about tier entry?

It is common practice to group students by ability into classes, in both Mathematics and Science. Particularly in Mathematics, we found a strong link between ability set and tier entry. Respondents indicated that in most of the ability sets in their institution, all students were entered for the same tier, with very few sets entering students for a mixture of tiers; this was the case to a much greater extent in Mathematics compared to Science. Furthermore, teachers reported that their institutions typically placed students into ability sets before the start of the GCSE course; in Mathematics the majority of respondents stated that their institution did so in year 7, rising to over 80% in comprehensive schools; in Science, in contrast, ability setting typically occurred later, although the majority of respondents indicated that they placed students into ability sets by year 9. GCSE Mathematics courses were typically first taught in either year 9 or year 10. In Science, there was some variation across different GCSE courses; separate Science GCSE courses and GCSE Core Science were typically first taught in year 9, while Additional Science was typically first taught in year 10. This suggests that many students have already been placed into ability sets by the start of their GCSE course.

A strong link between tier entry and ability setting, however early this may occur, could be argued to be unproblematic if these ability sets truly reflect student ability. However, this is not necessarily the case. Even when prior attainment is controlled for, pupils with special educational needs, behavioural challenges, and those from lower socio-economic status backgrounds, are more likely to be placed in lower sets (Dunne et al., 2007; Muijs & Dunne, 2010). As a result, students who might otherwise have been entered for the higher tier could instead be entered for the foundation tier, or vice versa. Furthermore, not all students develop at the same rate intellectually, so an ability set which is suitable in year 7 may no longer be appropriate in subsequent years. However, if there is opportunity for students to move between ability sets or tiers, then the strong link between tiering and ability sets may not be problematic. In Science, approximately a quarter of respondents thought that it was possible to move between tiers even at the end of the GCSE course, however, for Mathematics, only about a tenth of respondents thought that this would be possible. In both subjects the majority of teachers thought that it was possible to move between tiers as late as half way, or more than half way through a GCSE course, though Science teachers were

more likely to indicate that a later switch was possible. Despite this apparent flexibility, respondents indicated that relatively few students actually did switch between tiers. Approximately 20% of respondents (in both subjects) indicated that no students switched between tiers. Somewhat surprisingly, and in contrast to previous related findings, there were no clear differences in the direction of any change in tier. Gillborn and Youdell (2000) and Baird et al. (2001) both found that students were more likely to move from a higher set to a lower set than vice versa, because students would not have covered sufficient material to move from a lower set to a higher set. It is possible that our finding was a result of the unitisation of GCSE assessments, because it is possible to take units from a mixture of foundation and higher tiers, and easier to move to the higher tier when moving from one unit to the next.

In general, the link between ability setting and tiering was weaker for Science than for Mathematics; students were typically put into ability sets later, and it was considered possible to make final decisions about tier entry later. What might account for this finding? Firstly, at GCSE, there are greater differences in content between foundation and higher tier in Mathematics compared to Science; so in Science it might be easier to teach more students the full higher tier curriculum in sets which entered students for a mixture of higher and foundation tier. One Science teacher noted that the differences in content were relatively small between foundation and higher tier, but the demand of the questions varied between tiers. Secondly, a wide range of routes are possible in Science (Vidal Rodeiro, 2012) compared to Mathematics. Currently in Science, in addition to vocational qualifications, students may take single award Science (Core) or dual award Science (Core and Additional Science), or triple Science (GCSEs in biology, chemistry and physics), as well as Applied Science GCSEs. It is possible that these different routes might to some extent replace ability setting, for example, with the most able students taking triple Science. However, it is not clear to what extent this is the case, because typically students are placed into ability sets before, or around the same time as, the start of their GCSE course.

7.2 How are tier entry decisions made, and by whom?

In this research, teachers reported that while they, and their departments, had the most important input into the decision, it was common for both parents/guardians and students to be involved in the decision. Both Science and Mathematics teachers felt that a student's aspirations were an important factor in deciding tier entry. One teacher commented that if a student needed a grade B for future study, and were sufficiently motivated, then they would enter that student for the higher tier, even though their prior attainment might indicate that foundation tier entry would be more appropriate. Both Science and Mathematics teachers stated that they used a combination of different factors to determine the most appropriate tier of entry for each student.

As might be expected, both Mathematics and Science teachers reported that prior attainment, often measured using past GCSE examination papers (presumably used when tiering decisions are taken after the start of the GCSE course), was an important factor in their decision. For example, one Science teacher stated that he or she gave students both a foundation and a higher tier question paper and compared the results. However, teachers also relied on their judgement of students' classwork, and other tests developed by themselves or colleagues when measuring students' prior attainment. A minority of respondents indicated that they used data from Key Stage 3 tests; this was more common in Mathematics than Science, perhaps reflecting the fact that decisions about tiering are typically made earlier in Mathematics.

A student's ability to cope with written examinations was considered to be important by both Mathematics and Science teachers. For Science, a student's writing skills and literacy level were felt to be important by many teachers, because it was felt that the literacy demands of

examinations, particularly at the higher tier, were high. As a result, teachers thought that some students with weaker literacy skills might benefit from foundation tier entry, regardless of their level of knowledge and understanding in Science. This highlights a potential comparability issue between tiers. If the grade C on the higher tier requires a greater literacy level compared to the foundation tier, then overlapping grades may not be comparable. Furthermore, it is questionable that literacy skills should influence student attainment in a Science examination. In contrast to literacy skills, students' level of mathematical skills did not seem to be important in determining tier entry in Science. The subject criteria for Science GCSEs specify the Mathematics requirements for GCSE Science, with additional requirements for higher tier (Ofqual, 2011a, 2011c). However, very few Science teachers (approximately 10%) stated that performance in other subjects was a factor in deciding tier entry. This is perhaps surprising, because Science teachers consider mathematical skills to be among the most important skills needed for progression to A level Sciences (Rushton & Wilson, 2013), indicating that mathematical knowledge is important for the study of Science. However, it is also possible that mathematical skills may indirectly determine tier entry, because they affect predicted grade.

In addition to students' academic skills, approximately a quarter of respondents indicated that student behaviour in class was important or very important in deciding the tier of entry for borderline students. While student behaviour may be linked to their motivation, which may have an impact on their ultimate attainment, this is consistent with Dunne et al's (2007) finding that student behaviour influences student placement in ability sets. For Mathematics, a few respondents commented that student confidence affected their tier entry decisions. Some candidates would benefit from the confidence boost obtained from answering easier questions on the foundation tier, while other students would not be daunted by the harder higher tier paper. A consistent finding from statistical studies of tier entry has suggested that gender influences tier entry (Elwood, 2005; Elwood & Murphy, 2002; Stobart et al., 1992; Wilson & Dhawan, 2013), with boys generally more likely to be entered for the foundation tier, even when prior attainment has been controlled for. However, teachers in the current study stated that they did not think gender was an important factor when deciding tier entry. Further work would be needed to determine whether unconscious gender bias plays a role in tier entry, or whether other attributes important for tier entry, such as behaviour are correlated with, or perceived to correlate with gender.

It seems then, that a combination of academic and behavioural factors are used to determine which tier would be the most appropriate for borderline students, and lead to a prediction about students' likely attainment on each tier. However, even if teachers are able to estimate which grade a student is likely to achieve, they may use this information in different ways. In the past, teachers have been given guidance relating to student expected attainment and tier entry (OCR, 2013; School Curriculum and Assessment Authority, 1996), indicating that students who are expected to achieve a grade C should normally be entered for the higher tier, with exceptions for those students who might find the harder paper daunting, and perform less well as a result. However, Gillborn and Youdell (2000) found that school policy meant that this guidance was not always followed. Instead, teachers entered students for the higher tier only when they were expected to achieve a grade B or above. Furthermore, Wilson (2013) investigated the relationship between forecast grades and entry for tiers, and found differences between Science and Mathematics. Half of students forecast a grade C in OCR GCSE Core Science (J630) were entered for the higher tier, while only a third of students forecast a grade C in OCR GCSE Mathematics (J562) were entered for the higher tier, dropping to a fifth for a linear OCR GCSE Mathematics specification (J567). In this research, respondents were asked which tier they would enter students who were expected to achieve grades B to a borderline D/E. Overall, the higher the expected attainment, the more likely teachers were to enter candidates for the higher tier. Nearly all respondents stated that they would always, or mostly, enter students whom they expected to achieve a grade B for the higher tier. This was slightly lower for Science

compared to Mathematics. Mathematics GCSE has no untiered components, so the only way for students to achieve a grade B is to enter at least one higher tier unit. In Science, there are untiered units, so it is possible, though unusual, to achieve a grade B if only foundation tier units are taken (Wilson & Dhawan, 2013). For candidates expected to achieve a grade C, around half of respondents indicated that they would always, or mostly enter such candidates for the higher tier. These findings are consistent with those of Wilson (2013), and suggest that teachers do not follow the guidelines for tier entry. However, these entry patterns are closer to the guidelines than the patterns reported in Gillborn and Youdell (2000), which were identified shortly after changes to the tiering model.

Differences in entry patterns were observed between different types of school, and those teachers responding with respect to Core Science and Separate Science. For both Mathematics and Science, teachers from independent or selective schools were more likely to enter students for the higher tier, regardless of their expected achievement, so that in a few institutions, all students who were expected to achieve around the D/E border were entered for the higher tier. It is likely that such candidates would not have a positive assessment experience.

A similar finding was obtained for Core and Separate Sciences, with teachers responding with respect to Separate Sciences also more likely to enter students for the higher tier, even at the lower grades. It seems likely that this pattern of tier entry decisions is related to the overall policies in these institutions. Independent/selective schools and those teaching primarily Separate Sciences were less likely to have ability setting, and to enter a greater proportion of their students for the higher tier. It is possible that such schools have a general policy to enter all, or most students for the higher tier, with only exceptional cases entered for the foundation tier. One teacher from an independent school suggested that parental pressure played a role in this, because some parents did not want their child entered for the foundation tier, even if that tier were a better match for their child's abilities.

Teachers, particularly those in comprehensive schools, indicated that their tiering decisions are often quite strategic: the perceived relative difficulty of the grade C on each tier, and the need for students to obtain a grade C was considered important or very important by the majority of teachers. Teachers used the performance of previous borderline students as a guide for entering their current borderline students for each tier. However, only a minority of teachers indicated that current accountability measures affected their tier entry decisions, suggesting that the importance of the grade C is at least as much related to the benefits of having a grade C or above for the student, rather than accountability measures. Respondents did not share the same opinion about the best way to 'ensure' a grade C. Of those respondents who said that accountability measures did make a difference to their tier entry decisions, the majority said that it made them more likely to enter students for the foundation tier. This is consistent with Baird et al. (2001), who found that teachers tended to be "cautious" and enter student for a lower tier if in doubt. However, several teachers from both Science and Mathematics commented that they thought that it was easier to achieve a grade C on the higher tier, because the grade boundaries on the higher tier are so low, so students only need to answer a very small number of questions correctly to achieve a grade C. One teacher commented that students at this level were very likely to make careless mistakes, so they felt that it was difficult for them to achieve the high levels of accuracy needed to achieve a grade C, even on the easier questions on the foundation tier. Furthermore, on a unitised specification, the issue of "dropping off the bottom" of the higher tier is perhaps less problematic, because students who do not achieve sufficient marks on a unit to achieve a grade are still awarded UMS marks in the F-G range, which may be aggregated towards a grade at the certificate level.

Recently there has been growing concern about the rise in multiple entry for GCSE Mathematics, in which students are entered for more than one specification (Vidal Rodeiro,

2014). This is in order to try and maximise the grade obtained, particularly in relation to increasing students' chances of achieving a grade C or better. For students who are on the borderline between the foundation and higher tier, it was hypothesised that multiple entry across different tiers in different Mathematics specifications might be used by some schools strategically. Nearly 40% of respondents who indicated that they used multiple entry, responded that they had entered students for different tiers across different specifications. However, the majority of teachers who indicated that they entered students for different tiers across specifications stated that they did this infrequently. This suggests that while multiple entry across tiers does occur, it is not the predominant strategy used in multiple entry.

7.3 Potential effects of reforms to GCSEs

GCSEs in Mathematics and the Sciences are currently being reformed as part of a wider reform of Key Stage 4 qualifications and the accountability measures used to assess school performance. Current accountability measures for schools focus on the percentage of students achieving grades A*-C, leading to what is often considered to be an undue focus on students at the C/D borderline (Acquah, 2013). Furthermore, Gillborn and Youdell (2000) have suggested that this focus on the grade C has affected schools' entry decisions for different tiers. From 2016, a new accountability measure, "Progress 8" will be introduced; this measures students' progress from their Key Stage 2 attainment in eight subjects, with English and Mathematics having double weighting, and three slots reserved for Ebacc subjects, which include the Sciences[9]. This new measure is intended to reduce the focus on the grade C for accountability purposes. The majority of Science and Mathematics teachers, however, indicated that changes to accountability measures would not make any difference to their decisions on tier entry. It is likely that this is because other performance measures, such as the Ebacc, and the percentage of students achieving grades A*-C will still be reported by schools, so the grade C (and its replacement) will remain an important threshold for performance measures, and for students' opportunities for progression. However, of those teachers who did indicate that the changes to accountability measures would have an impact, the majority stated that they would be more likely to enter students for the higher tier, indicating that though the effect will be small, it may lead to more students being entered for the higher tier.

Some reforms to GCSEs have already been implemented, leading to modifications of existing specifications. From 2014, all GCSEs will require 100% terminal assessment, such that all assessments must be taken in the same session in which the GCSE is awarded[10]. Wilson and Dhawan (2013) and Wilson (2013) found that students entered for linear GCSE specifications (in 2012 and earlier) were more likely to be entered for the foundation tier. It is possible that this is because entry for tiers in a modular structure is less risky, because there are more, and more accessible, opportunities for resitting if students do not perform as expected. Just over half of Science teachers, and over 60% of Mathematics teachers stated that the move to 100% terminal assessment at GCSE would make no difference to the proportion of students that they entered for the higher tier. However, of those who did think that their entry decisions would change, the majority thought that they would be more likely to enter students for the foundation tier. This may increase the risk that some students' achievement is capped as a result of tiering, because they might be more likely to be entered for the "safe" foundation tier, rather than attempting the higher tier. One teacher suggested that the demand of sitting all assessments in the same session might lead students to prefer to sit foundation tier papers.

[9] Ebacc subjects include English, Mathematics, the Sciences, Computer Science, Geography, History, Modern and Ancient Languages. Students who achieve five Ebacc subjects, including, English, Mathematics and two Sciences are considered to have achieved the Ebacc.

[10] Internal assessments may be carried forward for the lifetime of the specification for resits.

Since the introduction of the GCSE, various models of differentiated assessment have been used (Baird et al., 2001; Wilson & Dhawan, 2013). Over time, these models have been harmonised so that all GCSEs which use differentiated assessment now use the same tiering model. As part of the summer 2013 consultation on GCSE reform, Ofqual (2013b) stated its intention to improve the tiering model by considering the position and size of the overlapping grades, noting that if the highest grade achievable on the foundation tier were set too high, then too many pupils might be taught the restricted foundation tier content only, whereas if it were set too low, then students might be discouraged by their inability to achieve a grade which is considered suitable for progression. The results of this study would seem to support this: in general, regardless of the level of expected attainment, if the highest grade available on the foundation tier increased to a grade B, teachers reported that they would enter fewer students for the higher tier. Conversely, if it were reduced to a grade D, then more students would be entered for the higher tier. However, the magnitude, and location of the effect varied. It might be hypothesised that if the foundation tier were reduced to a maximal grade D, that teachers might be more likely to enter students expected to achieve a grade D for the higher tier, to allow them the opportunity of achieving the grade C. However, this was not wholly the case. Considering students expected to achieve the highest grade available on the foundation tier in each model (i.e. grade B if the maximum grade on the foundation tier were a grade B vs grade D if the maximum grade on the foundation tier were a grade D); if the maximum grade on the foundation tier increased to a grade B, a greater proportion of students expected to achieve a grade B would be entered for the higher tier, than would be the case for candidates expected to achieve a grade D if the maximum grade available were a grade D. It is likely that this is because for candidates expected to achieve a grade B, the most demanding questions on the higher tier would be relatively more accessible than they would be for a candidate expected to achieve a grade D.

7.4 Institution Type

Across both Science and Mathematics, the type of institution affected entry decisions for tiers. Teachers from independent/selective schools were more likely to put students into ability sets later than other institutions, think that final decisions about tier entry can be made later, and enter more students for the higher tier. This was the case even for students predicted to achieve a grade D or E, with some independent/selective schools entering all such candidates for the higher tier. Furthermore, in independent/selective schools, parents were more likely to have input into tier entry decisions than in comprehensives or colleges (for Mathematics[11]). Conversely, students were more likely to be involved in the decision in colleges than comprehensives and independent/selective schools.

Different types of institution appeared to value different factors when deciding on tier entry. In Mathematics, colleges reported that they often enter all students for the foundation tier by default; typically students in these institutions are re-sitting GCSE Mathematics to obtain a grade C, and so the full higher tier content is not taught unless a student specifically needs a grade B or higher. Across both Science and Mathematics, comprehensive schools reported using information relating to the likelihood of obtaining a grade C to a greater extent than independent/selective schools. This reflects the fact that independent schools are not subject to the same accountability measures as state schools, and have (in general) a greater proportion of students who are expected to achieve a grade B or better.

7.5 Science issues

Students may take a number of routes through Science GCSE, with the availability of Combined Science, Separate Science, and Applied Science options. Core and Separate Science GCSE courses are often first taught in year 9, while Additional Science courses are

[11] Data for colleges for Science were not analysed separately.

most likely to be started in year 10. In this study we focused on Core Science (combined) and Separate Science GCSEs. Schools which predominantly enter students for Separate Science GCSEs were more likely to set students by ability later, though less likely to indicate that it was possible to move tier at the end of the course. However, since more able students typically take Separate Science GCSEs, it is possible that teachers who mainly teach Separate Sciences have relatively little experience of students at the borderline between tiers. Furthermore, these teachers were more likely to enter all students for the higher tier, even those who were expected to obtain relatively low grades.

The introduction of combined Science GCSE courses aimed to allow students to study a balanced Science curriculum using only the curriculum time for two GCSEs (double or dual award), but still allowing progression to A level. However, there has been criticism that studying for the double or dual award in Science is not as good a preparation for A level Sciences as taking separate Science GCSEs (Jenkins, 2000), and the existence of more than one route through GCSE means that students may start A level courses with different levels of knowledge.

Although some teachers indicated that they thought that tiering had a negative effect on teaching and learning because of the potential for teachers to "game the system", some teachers felt that tiering was beneficial because of the choice it allowed, particularly because students could be entered for different tiers for different Science subjects (e.g. sit a Biology paper at foundation tier and a Chemistry paper at higher tier) as part of a combined Science course. However, Wilson and Dhawan (2013) found that very few students were entered for different tiers across different Science subjects, and that very few schools chose the route through the 21st Century GCSE Sciences suite which allowed this option[12].

7.6 Mathematics issues

The reformed Mathematics GCSE will include additional content, with a greater weighting for reasoning, communication and problem solving on the higher tier than they do on the foundation tier. Approximately a third of respondents indicated that this reform would make them more likely to enter students for the foundation tier. One teacher commented that they felt that this would penalise those students whose English skills were not strong.

7.7 Implications

The findings of this study have several implications, both internally, and for the reformed GCSEs in the Sciences and Mathematics more generally. Firstly, it is clear that there are differences in the way that Science and Mathematics teaching is organised. In general, there seemed to be a stronger link between ability set and tier entry in Mathematics, and students were put into sets by ability earlier. In Science, however, it was considered possible to delay final decisions on tier entry until the end of the course. This suggests that curriculum support resources for Science should allow provision for differentiation across tiers. For Mathematics, in contrast, given the differences in content across tiers, it seems likely that resources which allow teaching across tiers may not be needed, nor possible to the same extent.

Both Mathematics and Science teachers stated that they used a mixture of different sources of information to measure prior attainment, including past GCSE examination papers, judgement of student classwork and tests developed by themselves and their colleagues. However, relatively few teachers indicated that they used tests produced by publishers,

[12] In 21st Century Science, before the move to 100% terminal assessment, teachers could choose where students sat Science papers which contained all three Sciences, or separate papers for Biology, Chemistry and Physics to be certificated towards a GCSE in Core or Additional Science.

although this was more common in independent/selective schools. This suggests that awarding bodies may have a role to play in providing high quality tests linked to specifications which can be used to monitor student performance across their GCSE course, because initially there will be no past GCSE examination papers to use, only sample assessments. Furthermore, this may be particularly important given the move towards 100% terminal assessment, and the fact that the new GCSE examinations will be more demanding, with a change in the grades and level of performance required at each tier, to allow teachers to make an informed decision on tier entry.

The type of institution which a student attends may affect which tier they are entered for, with independent/selective schools more likely to enter students for the higher tier. This raises questions about the equality of opportunity across institutions. However, it is not necessarily the case that all students at independent/selective schools are at an advantage; students may be more likely to be automatically entered for the higher tier, even if their expected attainment indicates that the foundation tier would be more appropriate. This may lead some students to achieve lower grades than they might otherwise have done. Additionally, students taking GCSE Mathematics in colleges may be automatically entered for the foundation tier, even though they might be able to achieve a grade B or higher. However, many of the students in colleges are likely to be re-sitting GCSE Mathematics, and may only require a grade C.

For Science, several teachers noted that the literacy levels needed for the higher tier were quite high, and that this meant that some students were entered for the foundation tier when they might otherwise have been entered for the higher tier. Further investigation of the precise nature of the literacy demand in higher tier Science GCSE examinations might allow the development of assessments which have an appropriate literacy demand. Although literacy demands were not highlighted as a particular issue in Mathematics at present, the plans to increase the weighting of problem solving and communication in the higher tier might lead this to become an issue in Mathematics assessments in future. This issue is already being addressed by other awarding bodies, with AQA claiming that in 2013 their GCSE Mathematics assessments contained 22% fewer words than those of another awarding body[13]. However, a more nuanced approach focusing on, for example, the impact of the use of context (e.g. Greatorex, 2014) or the features of the language used in the assessment may ultimately prove to be more fruitful.

The design of assessments has an impact on the way in which students are entered for tiers. Although there was no clear consensus about whether it is easier to obtain a grade C on the foundation or higher tier (and indeed, it seems to vary by student), if the grade C boundary on the higher tier is set particularly low, then this may encourage some teachers to enter students for this tier because they feel that it is more likely that they will achieve a grade C compared to the foundation tier, which requires a higher level of accuracy, albeit on less demanding content. The reformed GCSE Mathematics assessments are likely to assess more, and more demanding content, which may lead to lower grade boundaries. If grade boundaries on the higher tier of the new GCSEs are indeed even lower than at present, then this is likely to encourage more teachers to enter students for the higher tier, when the foundation tier might allow a more positive assessment experience.

The reformed GCSEs will use a reformed grading system, ranging from grade 9 (highest) to 1 (lowest). For tiered assessments, the foundation tier will target grades 1-5, while the higher tier will target grades 4-9, thus having an overlap of two grades (4 and 5). Currently it is planned that the bottom of grade 4 will be an equivalent standard to the bottom of grade C, while grade 5 will be an equivalent standard to a high grade C or a low grade B, so the maximum grade achievable on the foundation tier will be set at a higher standard than the

[13] See http://www.aqa.org.uk/subjects/mathematics/Switch-now

current grade C. As such, it seems likely that overall the proportion of students entered for the higher tier will decrease, because students at the current B/C boundary will be more likely to be entered for the foundation tier, and thus potentially will not be taught the full higher tier curriculum.

It has previously been hypothesised that accountability measures which focus on the threshold grade C may distort tier entry, by encouraging teachers to enter students for the tier which they feel offers students the best chance of achieving a grade C, even if this results in students' achievement being capped (Gillborn & Youdell, 2000; Ofqual, 2013a, 2013b; Wilson & Dhawan, 2013). The introduction of the Progress 8 accountability was designed to reduce the importance of the grade C (and its replacement under the new grading system), by focusing on progress. However, it seems likely that the introduction of this measure will have a relatively small impact on entry for tiers, probably because the threshold grade C remains of importance for other measures, such as the Ebacc, and the fact that it is considered a "good pass" for students' own progression.

Until 2006, GCSE Mathematics had an intermediate tier, with a maximum grade B. This was criticised because it was not clear that a grade B on the intermediate tier was an adequate preparation for A level, due to the reduced algebra content, even though a grade B was commonly considered to be a progression grade. One possible objection to an increase in the maximum grade available on foundation tier would be that this grade would not be appropriate for progression, due to the more restricted curriculum, while the same grade on the higher tier would be. However, since the reforms to the grading system entail that the minimum progression grade (grade 6), will only be available on the higher tier, this problem has been resolved. An increase in the standard of the maximum grade available on the foundation tier may have further implications. Girls were more likely to be entered for the intermediate tier than boys (Gillborn & Youdell, 2000; Stobart et al., 1992), leading to reduced opportunities for progression in Mathematics for girls. It is possible that this pattern of entries may be repeated, however: currently girls are more likely than boys to be entered for the higher tier (Wilson & Dhawan, 2013), so it is possible that this reform may redress the balance. Future work should examine whether this is the case, and investigate which students are more or less likely to be entered for each tier. Among Mathematics teachers, several teachers commented that they felt that the old intermediate tier (with a maximum grade B) should be reintroduced, because they felt that it was more suitable for a wide range of candidates than either the current higher or foundation tier, so it seems likely that many Mathematics teachers will welcome the move towards an increased foundation tier.

8 Conclusions

Making decisions about which tier is appropriate for each student can be a complex decision, involving teachers, students and their parents. Teachers combine multiple sources of information, including prior attainment, student aspirations, the ability to cope with the specific demands (e.g. literacy demands) of each tier, with strategic knowledge about how to maximise student outcomes. The different priorities and constraints on different types of institutions lead them to prioritise these factors differently. The planned reforms to GCSE are likely to reduce the number of students entered for the higher tier, however, changes to accountability measures are unlikely to have a very large impact on tier entry decisions.

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