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Development of the Qualifications Assessment Framework

1 Background

The Qualifications Assessment Framework was developed following a process that initially set out to devise a range of plausible scenarios for GCSE resits policy and test each against an objective analytical framework, with a view to informing policymaking.

In April 2019, RS ACME held a meeting of its Community of Interest to discuss and refine the scenarios and the evaluation criteria. This was followed up by a day-long workshop in October 2019. Both workshops are described in more detail below.

The results of the latter workshop were used to develop the Qualifications Assessment Framework presented in Working Paper 1.

2 Introduction

An iterative process for specifying and analysing education policy scenarios was conceived (figure 1). The process started with a review of professional and research evidence, followed by identifying a set of criteria for evaluation education policy scenarios. The analysis took place in two phases. In phase 1, each scenario was analysed against six criteria. In phase 2, the scenarios were assessed using a risk matrix and possible mitigating actions were specified against each identified risk. Each analysis phase allowed for further refining and defining of the policy scenarios.

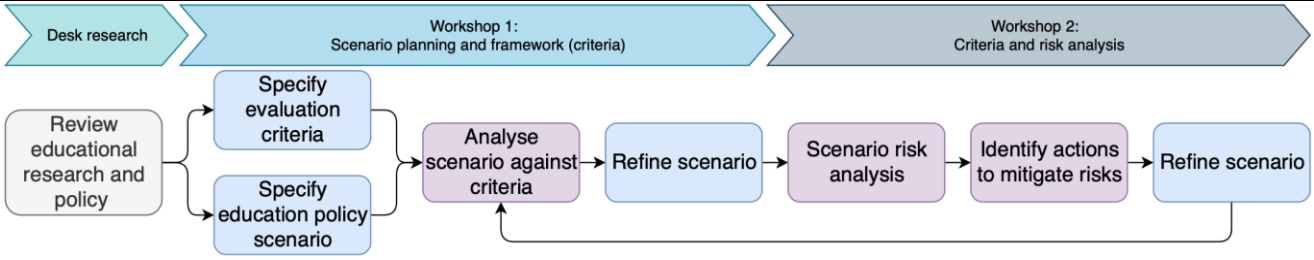

Figure 1. The process for specifying and analysing policy scenarios

3 Criteria

The Working Group used six criteria (table 1) to evaluate a series of policy scenarios. The process also identified success criteria and possible negative unintended consequences, resulting in proposals for the mitigation of these risks. The framework was conceptualised to capture opportunities and challenges against each of the criteria rather than provide a binary judgement.

Table 1. Criteria for the evaluation of education policy scenarios

	Criterion	Example
1	Fitness for purpose	Achieving high level aims
2	Impact on all learners	Impact expected on different types of learners
3	System workability	Regulatory barriers
4	Provider workability	Teacher supply and training needs
5	Cost and benefits	To colleges and to the public purse
6	Market validity	Use and exchange value

4 Policy scenarios

In a workshop held in March 2019[1] at the Royal Society, the Working Group scoped four alternative scenarios for future education policy at a strategic level, the suggestions being rooted in the practical realities of the education sector.

Scenario 1. Continue with the current GCSE resit policy (1a. with, or 1b. without, changes to optimise its effectiveness)

Although the existing policy is not proving to be satisfactory now, the workshop participants considered whether there are grounds for expecting that students' achievement in GCSE mathematics post-16 will improve and eventually come right in the future. They considered how long that may take, how well training providers were adapting, what steps they are taking and whether there was evidence that the policy was able to improve young people's attainment in mathematics post-16. In summary, the participants considered whether the policy was having the desired outcomes for learners, training providers and other stakeholders.

Scenario 2. Make GCSE resits desirable rather than mandatory and improve alternative pathways

In this scenario, the study of mathematics is required but no particular qualifications are mandated, and the present suite of qualification pathways is deemed sufficient. This scenario might mean improving some qualifications (e.g. Functional Skills mathematics) and would include the setting out of a clear framework of mathematics pathways for all learners. In this scenario, the participants considered related policy areas, such as some vocational qualifications allowing learners to delay taking their assessment until they are ready. In summary, the participants considered how the current policy could be adapted to address some of the current challenges with student success rates.

Scenario 3. Develop a new mandated level 2 mathematics qualification

An alternative to the standard GCSE mathematics for post-16 learners who do not achieve the coveted grade 4 or above in GCSE mathematics at age 16 has been suggested by various groups in recent years. The participants considered challenges associated with developing and implementing a vocationally relevant curriculum while ensuring a degree of commonality (i.e. high 'use value'), overcoming regulatory obstacles (e.g. limiting to post-16 learners), and ensuring market recognition ('exchange value') without threatening the current position of GCSE mathematics.

Scenario 4. Abandon GCSE (Mathematics) altogether

GCSEs were designed as school-leaving examinations and may no longer be fit for purpose in a system where all study to 18. Moreover, the 'mathematics-for-all-to-18' agenda might be best served with a completely new mathematics qualifications framework. Dismantling the whole GCSE system in the short term is unlikely, although the problems intrinsic to having a high-stakes exam at age 16 are likely to persist. The participants separated intrinsic problems from those that are contingent and therefore amenable to change. Experience from other countries with baccalaureate or diploma systems were used to illustrate this. In this scenario, GCSE Mathematics would become desirable for students to study post-16 if they did not achieve grade 4 or above at the first attempt, but it would not be compulsory for those who achieved GCSE mathematics grade 3 to retake or take an alternative mathematics qualification.

[1] See Appendix 1 for details of the Working Group's membership.

5 Analysis of scenarios against criteria

In a workshop held at the Royal Society in October 2019[2], the six criteria in Table 1 were used to evaluate the benefits, challenges and issues with each of the four scenarios.

5.1 Scenario 1a. Continue with the current policy (without any changes)

Fitness for purpose. The participants questioned whether the current success rates of fewer than 20% of students achieving a grade 4 or above post-16 indicated that the current policy could continue without any planned changes. The available attainment data suggest that the requirement for a grade 4 or above may be aspirational rather than achievable for some of these students (see Appendix 2). GCSEs may not be suitable for all students, especially for the cohort of largely vocational students required to resit them.

Impact on learners. Evidence indicates that the current GCSE resits policy is impacting students' motivation, anxiety, mental health and wellbeing (see Appendix 3). The mismatch between students' needs and the purpose of the GCSE (Mathematics) discussed under *Fitness for purpose* means that students may not succeed at the level expected by policymakers.

System workability. The purpose of GCSEs for students, policymakers, colleges, or curriculum writers may be different and be misaligned. The barrier to system workability is the fact that GCSEs are mandatory for students with a grade 3 in their GCSE mathematics. The GCSE curriculum may not be relevant to all students post-16, especially since there is no defined post-16 curriculum.

Provider workability. The participants found that it was difficult to consider provider workability against Scenario 1 because of the nature of the student cohort, of the qualifications' pathways post-16, and constrained resources. For example, recruiting qualified teachers could vary by region and may not necessarily be related to GCSE resits policy.

Cost and benefits. Further education funding has been flat for a number of years and the GCSE resits qualification is an additional burden on training providers especially since the funding does not take into account prior attainment.

Market validity. The participants agreed that GCSEs have market validity with Higher Education providers, some Further Education institutions, and employers. The perception was that GCSEs are more valued by users than other, alternative vocational qualifications.

5.2 Scenario 1b. Continue with the current policy (while optimising effectiveness)

The participants considered that this scenario of continuing with the current policy while optimising effectiveness may involve a review of the purpose of GCSEs, assessment strategy, improved funding, management, teacher supply and engagement from providers.

Fitness for purpose. The participants suggested that the current policy should consider the purpose the qualifications should have rather than the GCSE's current defined purpose.

Impact on learners. The participants suggested reporting differently on performance, e.g. improvement in performance (% score) could be used as progress and taking students' very diverse context into account.

[2] See Appendix 1 for a list of participants.

System workability. The participants suggested an alternative approach to the assessment of mathematics post-16 that may involve two core papers aimed at grade 5 and one extension paper as well as scope in changing the assessment methods, e.g. continuous assessment, e-assessment, or pre-release material. A different assessment methodology may be more appropriate for the 16–19 age group.

Provider workability. The participants agreed that the system needs a period of qualification stability and an opportunity for current initiatives to realise their impact. However, they also suggested that the assessment regime could be optimised. In addition, initial teacher training may require some changes to ensure that new teachers are well prepared to deliver alternative mathematics qualifications post-16. Also, qualified teachers need subject-specific continuing professional development.

Cost and benefits. Entering students for more than one qualification is costly for providers.

Market validity. Functional Skills qualifications are recognised as being rigorous. It may be possible that GCSE and Functional Skills are not rigidly age-related, and students should be able to take them at any point from ages 14 to 18. The participants also suggested that a change to current accountability measures may have a positive impact on how GCSE resits are delivered.

5.3 Scenario 2. Make GCSE resits desirable rather than mandatory

The participants suggested that to make GCSE resits desirable rather than mandatory may mean that GCSE Mathematics is not compulsory and that the present suite of pathways can be deemed sufficient. The participants further questioned whether it would be more desirable if GCSE Mathematics was not taken at age 16 and whether the GCSE Mathematics certificate should include a breakdown of strengths and weaknesses.

Fitness for purpose. There may be potentially large differences between students achieving grades 2 and 3. Those students who must resit GCSE Mathematics are a very different cohort and teachers require a different skill set to teach GCSE Mathematics resit students. At present, GCSE Mathematics resits is taught by teachers who are one step ahead (in the textbook) from the students while at the same time the GCSE assessment is too controlled and not fit for purpose. Teachers focus on teaching to pass a test, rather than helping students develop the mathematics skills they need for progression. The grade 4 cut-off appears to be arbitrary, while at the same time grades 5/9 may not represent success. The question then is whether all students or a much higher proportion of students should resit GCSE Mathematics. Making GCSE resits desirable would raise questions about the value of learning and progression in mathematics. In this case, GCSE Mathematics would benefit from being more contextualised. Desirable (not mandatory) qualifications take focus away from box-ticking exercises.

Impact on learners. The current focus on content over skills may change if GCSE Mathematics is not mandatory although the success of the qualification is dependent on the quality of teaching. However, the absence of additional mathematics qualifications may leave a large gap between GCSE and Higher Education courses or further learning.

System workability. The participants considered that the current uniform policy of GCSE Mathematics resits fits better into the system than a plethora of options. However, the participants suggested that there could be different regulatory requirements for retake cohort, although the wide range of needs of retake students taking may create difficulties for schools and colleges.

Provider workability. The GCSE resits teaching workforce requires specialist teacher training and continuing professional development. Teaching GCSE resits requires good to outstanding mathematics teams with a mix of members who can focus on students, rather than necessarily a group of talented mathematicians. At the same time, providers do not know how many students will need to retake their GCSE mathematics. Therefore, this policy raises teacher supply issues and makes teacher recruitment difficult.

Cost and benefits. A non-mandatory qualification may mean that mathematics becomes desirable for more students and may help with timetabling issues since mathematics would not be offered instead of or in addition to other subjects. However, it may also lead to a decrease in improving the mathematics skills for young people.

Market validity. GCSEs have strong recognition with employers. However, the current grading system is neither indicative of what a student can or cannot do, nor of the differences between students. Scrapping the focus on 4/5 grade boundaries may remove an arbitrary focus.

5.4 Scenario 3. Develop a new mandated level 2 mathematics qualification

The participants considered that this scenario would be a recognised level 2 qualification similar to Core Maths (which is level 3) yet separate to GCSE and Functional Skills. Functional Skills could be replaced by this alternative qualification with the aim being for students to become confident users of mathematics. However, a new mathematics qualification would need buy-in from vocational providers and employers from the start.

Fitness for purpose. Designing a vocationally relevant mathematics qualification may be problematic since occupational vs transferable competences are difficult to define. A stepped, mandated qualification would need to be relevant, engage learners and be suitable for lower-level learners. The other challenge is how similar the content should be to the widely accepted GCSE Mathematics.

Impact on learners. The root of the problem lies in the initial GCSE, so an alternative GCSE would need to increase motivation and engagement of lower-level learners, e.g. by using a lower-stakes assessment approach or by having a choice of equivalent qualifications.

System workability. Although the participants considered that the current GCSE has low workability, it would be difficult to establish the workability of a new non-GCSE option. The participants noted that an alternative qualification cannot be called a GCSE if it does not cover the full content of a GCSE. Ofqual is therefore a key stakeholder in determining parameters for alternative qualifications. A non-'GCSE' qualification would certify a minimal level of competence and would replace the Functional Skills criteria-based, pass/fail approach with the expectation of high pass rates. Any new qualification would need to be suited for all progression routes, such as A levels, T Levels and apprenticeships.

Provider workability. As most students would do this alternative (to GCSE) qualification, teachers would have to teach conceptually different qualifications (GCSE and a new alternative other qualification), which could be challenging. Teachers in schools might struggle with this new alternative, but college teachers would adapt more easily. Teachers would still have training needs, but a closer fit with existing qualifications may have positive beneficial gains for teacher supply.

Cost and benefits. Accreditation and development of new qualifications is costly.

Market validity. Based on previous experiences with Core Maths and T Levels, any new qualification requires acceptance from HE and employers which raises credibility issues. This would require high level backing and a joined-up approach. A new alternative qualification would need to meet the basis literacy demands of T Levels, ensure progression to apprenticeships and should have same currency as a GCSE for employers. These challenges would need an effective marketing campaign.

5.5 Scenario 4. Abandon GCSE (Mathematics) altogether

The participants discussed the option to potentially replace the GCSE mathematics with a new holistic and integrated set of pathways that are coherent between and within levels.

Fitness for purpose. The option to take a qualification when ready and provide a range of pathways differentiated for different cohorts raises issues for determining the right pathways and for assessing at different transition points.

Impact on learners. A modularised approach may encourage flexibility and creativity and the opportunity for more depth and relevance. This may improve motivation and engagement (benefits to mental health). However, a modularised approach may mean a loss of student focus. Sometimes the idea of 'getting through the exam' is the sole thing keeping students focused on a subject. If this scenario were to remove the focus on the exam, teachers would need to be supported to clearly convey to the students why mathematics is important to them in a context, which is not straight forward.

System workability. Mathematics needs to be part of a larger system rather than being delivered on its own to ensure a workable system. The participants were not able to ascertain whether this scenario would help or hinder teaching. On the one hand, it could impose a greater strain on the system and a need for better teachers, while on the other hand it could improve teacher professionalism. The current system removes some of the professionalism of teachers due to the high stakes accountability, structure and the rigid focus of the curriculum and ongoing assessments. This scenario might improve teacher professionalism with potential for more time to focus on professional development and on improving how students learn rather than how they assessed. The participants also recognised challenges with summative and formative assessment. If there was just a summative assessment at age 18 regardless of pathway, there would need to be strong mechanisms for formative assessment to pick up those students moving pathways, transition and progress.

Provider workability. A very different education policy would require high-level political culture change over a long period of time to establish transitions between organisations and systems.

Cost and benefits. The removal of assessment costs at age 16 may create additional resource within the system. However, there may be high costs associated with reform, new resources being created and lead times.

Market validity. The participants could not establish the currency of a new system and validity of new standards and acknowledged the need for cultural changes for new qualifications to gain market validity. Even so, comparison of pathways chosen would still be a problem for users of these qualifications.

6 Risk analysis

Using the risk analysis framework (see § 3), the workshop participants further analysed the risk of implementing any of the five alternative policy scenarios to anticipate the implications of their enactment in practice. The risk analysis matrix aimed to identify actions or strategies for controlling risks associated with different scenarios. The matrix included the following categories:

- Policy area.
- Risk.
- Root cause (as a result of).
- Consequence (leading to).
- Risk likelihood (1=extremely unlikely, 2=unlikely, 3=possible, 4=probable, 5=highly probable).
- Risk impact (1=insignificant, 2=minor, 3=moderate, 4=major, 5=catastrophic).
- Overall risk (Likelihood x Impact + Impact).
- Impact category.
- Possible actions.
- Interpreting risk (2–7=low overall risk, 8–17=medium overall risk, 18–30= high overall risk).

Four groups then considered each scenario using this risk matrix and identified a range of policy areas and agreed the risk ratings against each (see Appendix 4). This section provides an overview of the high-risk policy areas (Box 1) and summarises possible actions that could be taken to mitigate them.

Box 1. Summary of policy areas against risk

High risk
Coherence (between/across stages)
Suitability of qualification pathways (credibility and take up)
Students' experiences with mathematics
Teachers and teaching

Medium risk
Coherence (Government policy, mathematics curriculum, teaching)
Coherence (accountability and regulations)
Suitability of qualification pathways (too little choice)

Low risk
Suitability of qualification pathways (too much choice)
Teachers and teaching (pressure on training providers)

6.1 Coherence (between/across stages)

The lack of coherence between and within ages and stages was judged as high risk (overall risk rating of 30) for scenario 1 while coherence of curriculum, teaching, government policy, accountability and regulatory frameworks were judged as medium risk for scenarios 1, 3 and 4.

An education system broken down into stages while lacking support for students to select appropriate pathways may lead to inconsistent student experiences. Instead of thinking of the education system as split into stages, it might be more beneficial to consider the process of student progression through several appropriate pathways.

The participants suggested that the current policy for GCSE resits in scenario 1 does not incentivise schools to take control of student achievement in mathematics. The move towards academisation and the lack of local authority control were identified as causes of incoherence within the education system. Frequent reorganisation and structural changes for training providers can destabilise the teaching cohort and diminish the value of schools and colleges.

Further, traditional curricula and qualifications designed around school subjects may not be suitable in the 21st century. In scenario 4, incoherent curricula could result from poor incentives for providers and a curriculum unfit for the GCSE resits student cohort. Incoherent curricula may affect teaching of the GCSE and finally students' experiences with mathematics.

Possible actions

- Set a sector wide strategy (all 16+) that aligns curriculum, teaching and assessment.
- Investigate models of best practice.
- Develop materials/resources to support the mathematics curriculum.
- Modernise the curriculum and downplay the importance of mathematics.
- Provide up to date and frequent continuing professional development for teachers.
- Involve experts in all of the above.

6.2 Suitability of post-16 qualifications pathways and curricula

The risk that was identified across all scenarios was about whether the post-16 pathways proposed in a particular scenario were suitable for students, credible with stakeholders and would be offered by training providers. In scenario 1 (current policy), frequent reorganisation and changes due to academisation might impact on the suitability of GCSE resits. However, changes to the current policy which allows for choice of pathways in the other alternative scenarios (especially scenarios 2 and 3) might impact uptake of a new qualification, thereby leaving a vacuum that moves the focus away from the students who are most in need of support with mathematics. Alternative qualifications which may be deemed as too academic, valuing knowledge more than skills would not bring the desired effects. The persistent lack of post-16 teachers coupled with large cohorts of students may negatively impact the quality of students' experience in all scenarios.

Possible actions

- Clarify funding entitlement.
- Set a sector wide strategy (all 16+).
- Offer clear messaging: defined pathways need to include an entitlement for students to do mathematics.
- Ensure appropriate curriculum for vocational students yet equivalent to the GCSE mathematics in the eyes of parents, students, providers and employers.
- Promote and link to existing initiatives (including T Levels).
- Offer realistic timescales.
- Pilot with stakeholder engagement at every stage.
- Ensure appropriate curriculum content, and that the qualification has equivalence to a grade 4 GCSE pass.
- Involve Further Education and vocational education experts in qualification development.
- Well-structured continuing professional development programmes.

6.3 Students' experiences with mathematics

Students' experiences with mathematics was identified as a key risk across all scenarios and in particular for scenario 1 (highest rated risk). The current policy, which promotes a circle of failure with

the qualifications system requiring a specific grade in order to progress into other courses/next level, may lead to an underqualified workforce, high crime and lack of citizenship. In the 21st century, education needs to move away from traditional curricula and qualifications designed around school subjects towards different ways of learning and assessment which are promoting positive motivation and student wellbeing.

Possible actions

- Coherent education system.
- Pathways within/across stages.
- Curricula and assessment.
- Address students' achievement in mathematics earlier on.

6.4 Teachers and teaching

This area was considered a high risk across all scenarios, due to insufficient mathematics graduates wanting to take up teaching and also relatively low teacher pay. Too few teachers are available to teach post-16 students for all scenarios, which can lead to poor quality teaching, large class sizes of disaffected students and poor student attendance rates. Teachers' awareness of policy changes coupled with inadequate supply of post-16 teachers may lead to poor quality of teaching and student experience and low motivation.

Possible actions

- Improve post-16 teachers' pay.
- Treat teachers as professionals.
- Design ITT as an apprenticeship.
- Improve funding and resources.
- Continuing professional development for teachers.
- Involve school leaders.

6.5 Emerging issues from the risk analysis of scenarios

The risk analysis allowed participants to rate the risk likelihood and impact on a five-point scale, which made it possible to order risks according to a high, medium and low overall ratings. The likelihood and impact of risks varied across the scenarios. For example, coherence of between and across educational stages in scenario 1 (current policy) was judged as high overall risk. In scenarios 1 and 2, coherence of curriculum and teaching were rated as lower risk.

7 Discussion and conclusions

The process of identifying evaluation criteria and policy scenarios established key policy features with associated benefits, gaps and challenges. National educational policies may use this multifaceted framework involving a set of six pre-determined criteria and a risk matrix to address the challenges of quality and curricular relevance of mathematics education to post-16 students with low prior attainment.

The framework offers a mechanism for policymakers to compare, review and formulate national mathematics education policies. For example, figure 1 shows the scenario analysis process as an iterative process involving a series of stages that aim to enable the policy scenarios to be continuously refined, and to identify risks and actions to mitigate them.

The framework may therefore be suitable for monitoring progress of the implementation of post-16 mathematics education policy through this iterative process. Different teams in a Government department and different stakeholders may assess different facets of a policy scenario.

In conclusion, this process of specifying and analysing policy scenarios focused attention on several critical facets of the GCSE resits policy, which could be prioritised in the evaluation of national education policy: (1) coherence of the education system; (2) pathways and curricula; (3) student experience with the teaching of mathematics; (4) assessment; and (5) market validity. In the case of the GCSE Mathematics resits policy, coherence of education policy between and within stages and the quality of the teaching of mathematics are considered essential to ensuring post-16 students have positive experiences with mathematics and achieve desired outcomes by the time they leave compulsory education.

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Appendix 1. List of workshop participants

Royal Society Committee on Mathematics Education (RS ACME) GCSE Resits Working Group

Professor Andy Noyes (Chair)	University of Nottingham
Steve Brace	Royal Geographical Society
Professor Jeremy Hodgen	UCL Institute of Education
Jane Imrie	Deputy Director, NCETM
Eddie Playfair	Association of Colleges
Nicole Schnappauf	New Victoria College
Karen Spencer	Harlow College
Sir David Spiegelhalter FRS	University of Cambridge
Andrew Stanley	Institution of Civil Engineers
David Swinscoe	Education Consultant
Anthony Tomei CBE	City and Islington College
Professor Geoff Wake	University of Nottingham
Dr Helen Harth	Senior Policy Adviser, Royal Society
David Montagu	Policy Adviser, Royal Society
Emma Blunt	Project Coordinator, Royal Society

GCSE resits workshop held at the Royal Society on 17 October 2019

Diane Dalby	University of Nottingham
Paul Glaister	University of Reading
Jennie Golding	UCL Institute of Education
Jane Imrie	National Centre for Excellence in the Teaching of Mathematics (NCETM)
Jo Lees	Hampshire Maths Advisory Centre
Roger Porkess	Independent consultant
Peter Saunders	King's College London
Karen Spencer	Harlow College
David Swinscoe	City and Islington College
Stephen Munday	The Cam Academy Trust
Emma Gregory	Ofsted HMI and mathematics teacher
Eddie Playfair	AoC
Stella Dudzic	MEI
Peter Whitehead	Head of Mathematics at West London College
Cheryl Lloyd	Nuffield Foundation
Jim Addison	Department for Education
Norma Honey	Post-16 lead Central Maths Hub
Stylli Charalampous	Senior Programme Manager, Further and Higher Education, Royal Academy of Engineering
Jenni Ingram	University of Oxford
Andrew Noyes (Chair)	University of Nottingham
Anthony Tomei	City and Islington College
Jeremy Hodgen	UCL
Steve Brace	RGS
Nicole Schnappauf	New Victoria College

Diane Dalby	University of Nottingham
Karen Spencer	Harlow College
Eddie Playfair	AoC
Jane Imrie	NCETM
Jo Lees	Hampshire Mathematics Advisory Centre
Andrew Taylor	AQA
Natalie Arnett	NAHT
Graham Cumming	Edexcel
Janet Holloway	Ofqual
Sarah Old	Ofqual
Jim Addison	Department for Education
Sue Southward	Cambridge Mathematics Hub
Caroline Chessum	OCR
Carmen Vidal Rodeiro	Cambridge Assessment
James Handscombe	Harris Westminster Sixth Form
Amanda Kelly	City and Guilds
Geoffrey Wake	University of Nottingham
Alix Robertson	Centre for Education & Youth
Sam Antill	Education and Training Foundation
Jill Stokoe	NEU
Helen Harth	Royal Society
David Montagu	Royal Society
Emma Blunt	Royal Society
Edward Clarke	Royal Society

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Appendix 2. Attainment in GCSE mathematics

Not everyone obtains a strong pass (grade 4 or above) in their GCSE examinations first time around. However, the rates among those retaking GCSE English and mathematics being unsuccessful in achieving the caveated grade 4 in GCSE mathematics have been worryingly high and have worsened further in recent years. Indeed, examination entry data for summer 2019 show that of the 180,672 entries to GCSE mathematics recorded among UK candidates aged 17 or over, just 22.3% achieved a 'standard' grade 4 pass or better (compared to 23.7% in 2018). In total, across all ages, in 2019 more than 314,000 students failed to achieve a grade 4 in mathematics and 290,000 in English and overall results in both English and mathematics among students of all ages improved slightly. The grade 4 pass rate for mathematics in 2019 stood at 59.6% (up from 59.4% in 2018) and 62% in English (up from 61.8%).

The Department for Education published data in 2019 showing that the progression rate in Level 2 English and mathematics (which measures those young people who had not achieved Level 2 in English and mathematics at 16 but had done so at age 19) by GCSE qualifications alone was 20.9% in 2018, up from 17.6% in 2017. Given the mechanism of 'comparable outcomes', the percentages of pupils attaining Level 2 mathematics post-16 (figure A1) have not changed substantially in recent years.

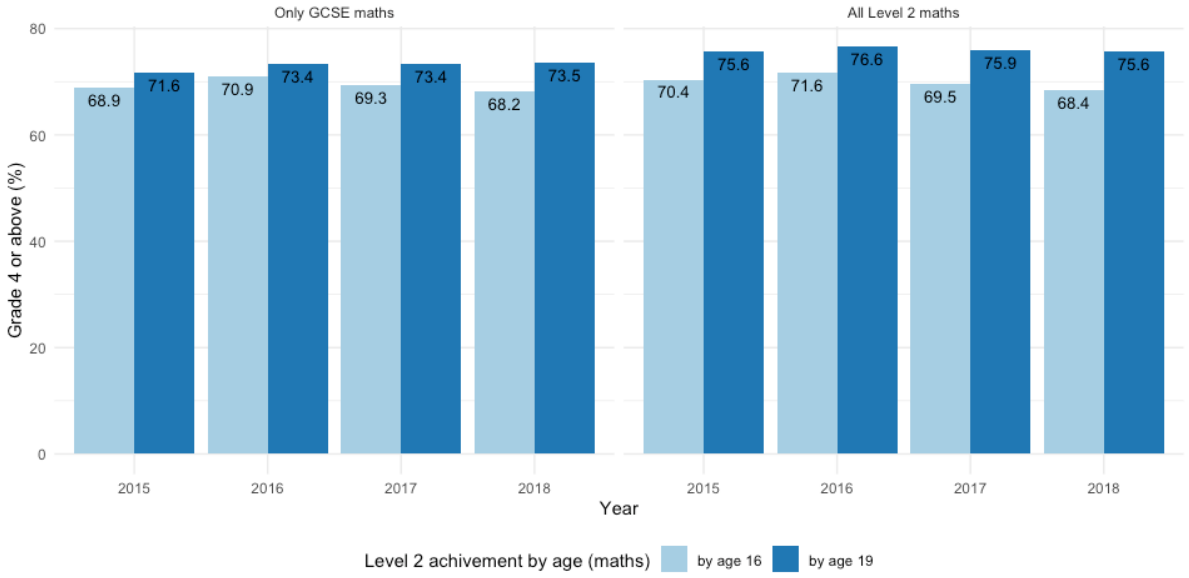

Figure A1. Students attaining level 2 mathematics by GCSE only and by GCSE and equivalent (2015–18)[3].

Approximately a quarter of students did not obtain a level 2 mathematics qualification by age 19, which is cause of serious concern[4,5]. In the November 2019 sitting, the overall percentage of students who achieved a grade 4 in their GCSE resits has once again dropped, compared with last year. At one exam

[3] See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/791405/L23_attainment_2018_main_text.pdf

[4] See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/761606/29523_Ofsted_Annual_Report_2017-18_041218.pdf, pp. 10–11.

[5] https://www.ascl.org.uk/Our-view/Campaigns/The-Forgotten-Third

board, less than a quarter of students resitting mathematics reached the holy grail of a ‘standard’ pass[6,7].

[6] https://www.tes.com/news/another-gcse-results-day-another-disappointment
[7] https://www.tes.com/news/gcse-resits-english-and-maths-pass-rate-drops

Appendix 3. Impact of GCSE Mathematics resits on students

Resitting or retaking an exam,[8] particularly for students who do so repeatedly (some of whom may never attain the required pass), is likely to be a deeply demoralising experience. Impetus-PEF found that some students are resitting GCSE English or mathematics multiple times, with some resitting the exams up to 9 times.[9] In 2018, Her Majesty's Chief Inspector set out the following aims of retaking GCSEs in English and mathematics: 'rather than creating the perception that English and mathematics study in FE is a punishment for not getting a grade 4 at an earlier stage of education, it should instead be pitched as a core part of vocational training. Learners should be able to appreciate that improving their literacy and numeracy is about genuinely improving their knowledge and their prospects for further training and employability, rather than simply something to cram for in a test.'[10] Data published in 2018 however showed that some students had sat their GCSEs as many as nine times but were significantly less likely to improve their grades while students in sixth form colleges were more likely to improve their grades[11]. Further. 60% of young people from disadvantaged backgrounds don't have a Level 2 qualification (GSCE or equivalent) in mathematics and English by age 19, compared to only 30% of their better-off peers[12].

A recent study for the Nuffield Foundation found that such students have low confidence levels and a tendency to rely on mis-remembered rules applied without understanding. They are often disengaged from mathematics and many do not see it as relevant beyond a pass grade requirement for entry to further training or jobs. Students' past experiences mean they lack both motivation and confidence when required to retake their mathematics GCSE, which might explain the low the resit success rate[13]. In a recent study, the Association of Colleges (AoC) found that resit students understood why mathematics was important for progression and many vocational students were able to explain how mathematical skills related to their vocational area[14]. However, although the students in this study had a positive view about their chances of improvement and appreciated the support they were getting from training providers, they also felt that they 'failed' mathematics rather than seeing additional mathematics study as progress towards a higher grade, thus establishing grade 4 as the minimum required for a 'pass'.

[8] Resitting need not involve any additional study beyond the initial attempt(s).
[9] See https://impetus.org.uk/blog/2018/thousands-of-young-people-are-facing-an-endless-cycle-of-gcse-resits.
[10] *Op. cit.*, note 3.
[11] https://www.cambridgeassessment.org.uk/Images/476535-which-students-benefit-from-retaking-mathematics-and-english-gcses-post-16-.pdf
[12] https://impetus.org.uk/policy/educational-attainment
[13] See https://www.nuffieldfoundation.org/sites/default/files/files/Hough%20-%20Main%20Public%20Output%20(Nov17).pdf, accessed 17 December 2019.
[14] https://www.et-foundation.co.uk/uncategorized/cfem-blog-how-do-students-feel-about-retaking-gcse-mathematics/

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Appendix 4. Risk analysis of education policy scenarios

		Risk		
Scenario	**Policy Area**	**Likelihood**	**Impact**	**Overall***
1	Teacher supply and quality of teaching	5	4	24
1	Training providers	3	3	12
1	Coherence (transitions)	5	5	30
1	Suitability, credibility and take up	5	5	30
1	Mathematics	3	4	16
1	Policy	3	4	16
2	Political survivability	4	3	15
2	Political 'startability' (too complex)	3	5 or 2	20 or 17
2	Take up	4	4	20
2	Reform exhaustion	1	3	6
2	Coherence within stage (direction)	5	4.5	24
2	Suitability (not for all students)	4	4	20
2	Opportunity cost	2	3	9
2	Credibility (too much choice)	1	3	6
2	Take up	5	4	29
2	Teacher supply and quality of teaching	3	4	16
3	Take up	3	4	16
3	Suitability (content and assessment)	2	4	12
3	Credibility (with HE, employers)	5	4	24
3	Training providers	1	4	8
3	Suitability (too academic)	4	5	25
3	Teacher supply and quality of teaching	5	4	24
4	Policy	4	3	15
4	Coherence (transitions)	–	–	–
4	Accountability measures	4	3	15
4	Teacher supply and quality of teaching	3	3	12

***Calculated as (Likelihood x Impact) + Impact.