

## ANALYSIS OF CONSULTATION RESPONSES

Analysis of responses to our  
consultation on future assessment  
arrangements for GCSE (9 to 1)  
computer science

**ofqual**

# Contents

<b>Executive summary .....</b>	<b>3</b>
<b>Introduction .....</b>	<b>4</b>
<b>Who responded? .....</b>	<b>5</b>
<b>Approach to analysis .....</b>	<b>6</b>
<b>Views expressed – consultation response outcomes .....</b>	<b>6</b>
<b>Appendix A: List of organisational consultation respondents .....</b>	<b>40</b>

## Executive summary

We have consulted on our proposed long-term assessment arrangements for GCSE computer science. This follows interim changes we made to the qualification's assessment arrangements in January 2018. The consultation ran between 5 November and 3 December 2018. The consultation questions were available to complete online or to download. A copy of the consultation is available at:

<https://www.gov.uk/government/consultations/future-assessment-arrangements-for-gcse-computer-science>

We sought views on our proposal that from 2022 the assessment of programming skills in GCSE computer science should be conducted under exam conditions. We proposed students should be required, within our definition of an examination, to design, write, test and refine a program to a set task or to solve a problem, either as separate activities or in combination. We did not propose to set any further assessment requirements beyond those already contained in the subject-level conditions. This would allow exam boards to determine the approach to assessing programming skills in an exam which they deemed to be most suitable.

We also proposed to maintain the current interim assessment arrangements for GCSE computer science for an additional year, to allow teachers and exam boards time to implement and prepare for the new assessments, and for the original assessment objective weightings in this subject to be reintroduced.

In our consultation we also sought the views of stakeholders on whether heads of centre should be required to provide a statement confirming that students had been given the opportunity to design, write, test and refine programs, using one or more high-level programming language with a textual programming definition as part of their preparation for the examinations.

We received 394 responses to the consultation. We are grateful to everyone who participated.

We summarise the responses in this report.

# Introduction

## **The consultation on future assessment arrangements for GCSE computer science**

This report is a summary of the views expressed by those who responded to our consultation which took place between 5 November and 3 December 2018. We sought views on the potential ways in which students' programming skills could be assessed in this qualification in the future, following our January 2018 decision, in the light of malpractice, to remove the programming project (a form of non-exam assessment (NEA)) from the GCSE 9 to 1 grade.

## Who responded?

We received 394 responses to our consultation. 73 of these were from organisations and 321 were personal responses. We thank everyone who responded.

### **Individual responses:**

Students: 12

Parents/carers: 2

Teachers: 288

Other: 19

### **Organisational responses:**

Schools/colleges: 54

Awarding organisations: 4

Unions: 2

Universities/higher education providers: 1

Local authority: 2

Academy chain: 5

School, college, or teacher representative group: 2

Subject association: 1

Private Training Provider: 1

Employer: 1

## Approach to analysis

The consultation was published on our website. Respondents could choose to respond using an online form, by email or by posting answers to the consultation questions to us. The consultation included 11 questions related to our proposals for the assessment of programming skills within GCSE computer science.

This was a public consultation on the views of those who wished to participate. We recognise that the responses are not necessarily representative of the general public or any specific group.

We present the responses to the consultation questions in the order in which they were asked. Respondents could choose to answer all or just some of the questions. This means that the total number responding to each question varies.

Some respondents chose to express their views without specifically answering the questions asked. These responses were considered but were not included in the total number of responses to each question.

We read all responses in full and summarise in this report the range of views that were expressed. While we structure the report by question asked, some of the comments inevitably straddled two or more of the questions. As a result, we recognise that not all views expressed or the extracts we have included fit neatly under individual questions.

Where we have included comments, we have edited some for clarity, brevity and to preserve anonymity but have been careful not to change their meaning.

## Views expressed – consultation response outcomes

In this section we report the views, in broad terms, of those who responded to the consultation document.

Responses to the individual consultation questions were as follows:

**Question 1: To what extent do you agree or disagree that assessment by examination is the best approach for assessing all of the content in GCSE computer science?**



\*Rounded to the nearest integer

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

The majority of respondents agreed with our proposal that assessment by examination is the best approach to assessing programming skills within GCSE computer science.

### Teachers' views

Support for this proposal was particularly pronounced among teachers, with 64% either agreeing or strongly agreeing that assessing students' programming skills by examination was the most appropriate option for GCSE computer science in the longer term.

Most of those agreeing cited concerns about the potential for malpractice if programming skills were assessed outside of an exam. Some teachers were particularly concerned about the possibility of malpractice in non-exam assessment that while they and their students might follow the rules, others might not.

*Example 1* "This ensures that no students are given an advantage or are able to cheat, and means that the playing field is levelled for all."

2 "There is far too much risk of malpractice when NEA/controlled assessments are used. Teachers are under pressure and centres up and down the country will be using varied conditions and support which is impossible to make fair against the centres who (like us) follow all the rules accurately."

Some teachers indicated that they did not necessarily agree that assessment by examination was the *best* approach for assessing programming skills, but felt that prior experience with the NEA in the qualification illustrated that it was the only realistic approach to delivering reliable results. Some highlighted the specific unique opportunities in the subject for students to commit malpractice (such as the availability of solutions to tasks through online code repositories). Others attributed it to the status of computer science as an EBacc subject, and the pressure this placed on teachers to secure the best outcomes possible for accountability purposes.

*Example 1* "Programming should, *ideally*, be assessed by practical project work but with the evidence of widespread malpractice, this does not seem viable or fair."

2 "CS [computer science] is difficult. The temptation to collude during coursework (and the ease of which material (i.e. code) can be shared) is typically greater than many other subjects... This is not the case at A-level where individuals choose their own projects. However, students at GCSE lack the high level skills and knowledge needed to choose, design and complete such a project."

Some teachers referred in positive terms to assessments at other levels or in different qualification types which already assessed programming skills by examination.

*Example 1* "Allows for more equity and consistency - we use the IGCSE model (pre-release for coding, with questions on the pre-release in the examination) which works well."

2 "I teach both A level and GCSE. We already do this at A level and it is very effective. Also, it frees the teacher to decide how to structure the pattern of [their] lessons."

Some suggested that assessment by examination would improve the perception of the subject in schools (particularly compared to other sciences), and others that assessment of practical programming skills by project was more suited to a vocational qualification.

*Example 1* "Keeps it in line with other EBacc subjects."

- 2 *“It is an academic, scientific subject and therefore should be assessed in that manner.”*

Many teachers also felt that exam assessment would allow teachers greater freedom to deliver the course as they wished and remove the challenge of managing a project-based assessment.

*Example 1 “Coursework is a nightmare to police, setup, monitor and control student progress. It is a minefield for teacher[s] to spot cheating.”*

- 2 *“Non-examined assessment is difficult to complete and be sure that it is the candidate's own work without placing very restrictive [rules] on teachers and students. Examination makes it easier to be sure that students' work is their own and that all work is being completed fairly.”*

Some teachers also argued students would become more engaged with the subject if they did not have to work on a single task for a significant period of time with little teacher input.

*Example 1 “Examinations would minimise the risk of malpractice and provide focus for pupils, who have no interest in programming silently for 20 hours.”*

- 2 *“Old NEA was good to let them experience a long term code project, but it ran for too long - most got 'bored' if delivered in regular lesson time as most schools would.”*

Another advantage some teachers identified in assessment by exam was that it restricted the assessment element to a defined period at the end of the course, rather than intruding into teaching time, reducing stress and anxiety for students. They also argued that this was better preparation for further study, as it increased students' familiarity with terminal assessment in computer science – better preparing them for exams they would experience later on.

*Example 1 “Controlled Assessment in general is detrimental to students by dominating their full 2-year GCSE experience with constant reference to "assessment". This is at a time of increasingly pronounced mental health issues, pressures and burnout being witnessed.”*

- 2 *“Terminal exams are how most qualifications are decided for computing at most levels of education.”*

Not all teachers agreed with the proposal. Some argued in favour of students experiencing an extended programming project and that programming skills could not be assessed by examination, either because of the constraints of time or because exams would allow students to demonstrate only some of the skills required to be an effective programmer. Others were concerned that examiners might not be able properly to reward students who could demonstrate the skills in a range of ways.

*Example 1 “Examination only of skills such as programming, often makes assumptions about a correct solution and at times I've felt that students can be marked down for applying different techniques in equally valid ways.”*

- 2 *“Computer Science has a large algorithm and programming content - trying to assess this [in] an exam paper is not good enough and rewards students who can talk about it and not necessarily do it.”*

Other teachers argued against assessment of programming by examination because it would not replicate the ways in which programming is carried out in industry. In some



instances, responses presumed the form which the assessment would take, which was not something specified in our proposal.

- Example 1* “Real world programming is not performed under test conditions, programmers have access to online resources, support forums, reference manuals, libraries of well-designed code and a host of other tools. To examine students under test conditions would be to discount their ability to make use of these resources, and hence would not reflect their ability as a programmer.”
- 2 “To program (a vital part of Computer Science) you need to be able to plan, create and test (amend) your code. 100% written examination does not allow for this to happen. In industry no programmer is expected to create a program that would be correct the first time round. But we are grading candidates on exactly that.”

Other respondents were opposed to testing what they felt to be primarily a practical or creative subject through a mode of assessment which they did not feel could adequately measure students’ competency or ingenuity. Some argued that examinations were instead mainly a test of students’ recall of knowledge rather than an opportunity to demonstrate skills. Some argued assessment by examination would reduce student uptake.

- Example 1* “The programming aspect of the course is a practical aspect. You wouldn’t expect Design to be assessed solely by examination, with no opportunity for students to show their skills/abilities.”
- 2 “Many students are attracted to Computer Science (CS) because they enjoy coding. They stick out the theory, which many find dull, because they enjoy coding. Removing actual coding will likely reduce numbers taking the course and have a knock on effect to A level.”

Others disagreed with our proposals because they felt it would be more difficult for students, or for certain groups of students.

- Example 1* “It would penalise certain groups of students (like lower ability) who may not be able to problem solve as effectively under exam conditions. Also the more able may not be provided with sufficient time to fully demonstrate their ability. Exam assessment is too narrow if the student only sees the problem at the start of the exam. At GCSE they may spend far too long thinking about the problem rather than solving it.”
- 2 “Removing project / NEA / CA material will have a detrimental effect on girls taking up GCSE Computer Science and will affect their self-efficacy and self-confidence.”

### Students’ views

Of the 12 students who responded, most disagreed that programming skills should be assessed by examination. They argued that exams would not reflect the ‘real-life’ context of computer programming. One student felt that undertaking practical programming tasks had been a positive experience, and that they were not sure they would have been able to demonstrate the same skills if they had been assessed in an examination.

- Example 1* “Computer science is by definition done on a computer, and not paper. They are very different experiences for the student.”

2 *“Examinations do not prepare students in a way which is beneficial to go on to jobs. They are not realistic to the scenarios found in the workplace.”*

However, some students felt examinations would offer a better approach to assessing programming skills.

*“It is not possible for NEA to be conducted in an appropriate way - this has been seen. I think there is a need for programming to be assessed, but NEA brings the risk of malpractice.”*

### Representative groups' views

ASCL, Computing At School (CAS) and the NASUWT all agreed that, given recent experiences in the subject, assessing programming skills by examination was the best approach at this time.

CAS strongly agreed with the proposal but did not feel that programming skills content could simply be absorbed into the existing exam assessment materials used by the exam boards:

*“However, the current examination content and presentation is perceived as not providing appropriate opportunities for candidates to demonstrate their skills, knowledge and understanding of computer programming. Conventional and innovative ideas need to be adopted to ensure candidates' abilities in designing writing, testing and refining can be recognised.”*

The NEU and Birmingham City University (BCU) School of Education disagreed with our proposal. The NEU questioned the validity of an assessment of programming skills which did not reflect the real-life contexts in which programming is conducted in industry.

Similarly, BCU School of Education argued that assessment by examination would not be appropriate because it would not be able to effectively test all aspects of programming skills.

### Exam boards' views

Of the four exam boards that offer GCSE computer science (AQA, OCR, Pearson and WJEC), two agreed that assessment by examination presented the best approach for assessing programming skills within this qualification. OCR and Pearson both indicated that they had sought the views of the teaching community, and that this had informed their support for the proposal.

Pearson argued that assessment by examination would improve the current arrangements by removing the need for the 20-hour programming task, and would lead to a better experience for teachers and students:

*“Pearson Edexcel has surveyed 140 computer science teachers in order to build our views on this proposal... Currently, the 20-hour programming project is time consuming for teachers and for students. Responses to our consultation have indicated that it inhibits teaching and learning of programming. Students are enthused by programming and this proposal will allow them to explore their interest more.”*

OCR recognised that there was a range of views among teachers, but that in their opinion assessing programming skills by an exam was the best option *in this instance*. They stressed that this was not always the case, but acknowledged that their own experience led them to agree that other approaches would not be viable for this qualification.

*“OCR conducted its own survey of teachers and their input has helped us greatly in shaping our response to this consultation... Our survey showed teachers hold varied*

*views, but our own experience, which is in line with Ofqual's findings, supports the conclusion that an examination is the best option for this qualification and for the skills specified to be assessed."*

WJEC, who already offer an on-screen assessment of programming skills within their specification, neither agreed nor disagreed with our proposal. They felt that assessment by examination, or through an extended NEA programming task, both provided acceptable approaches to the assessment of programming skills:

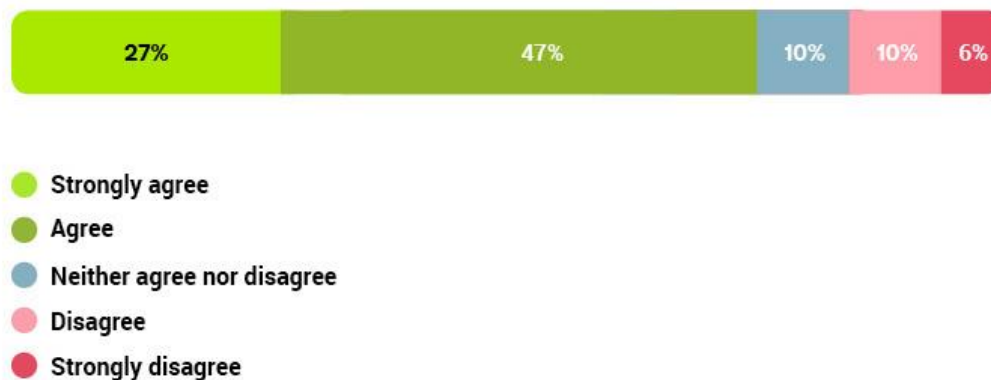
*"Assessment by examination is a suitable way of assessing programming skills, but we believe that an extended programming task is also a suitable way of assessing programming skills."*

AQA argued that not only does examination not present the *best* approach to assessing programming skills, but expressed concerns about the viability of assessing the full range of practical programming skills specified in the subject content in any other way than an extended programming project:

*"Our position reflects significant concerns regarding the practicalities and authenticity, validity and reliability of assessing the full range of practical programming skills, as set out in the DfE subject content, in an examination."*

Specifically, AQA argued that assessing programming skills by examination might (among other concerns) increase the assessment burden on students and teachers, limit the use of programming languages which can be used by students, reduce the focus on programming skills within the qualification and potentially result in students obtaining top grades in the subject without possessing adequate functional programming skills. AQA also argued that our proposals risked polarising exam boards between on-screen/online and paper-based assessment approaches.

**Question 2: To what extent do you agree or disagree that there are a range of ways by which programming could be assessed within our definition of an exam?**



The overwhelming majority of respondents felt that our proposals allowed for a range of ways in which programming skills could be assessed which would still conform to our definition of an examination.

#### Teachers' views

Over 75% of teachers agreed that there was a range of different approaches under which it would be feasible to assess practical programming skills by exam.

**Example 1** *"Even though I disagree that the subject should be assessed solely by examination, I do agree that there are a range of ways that programming can*

*be assessed in the exam format - especially if taken through a computer based examination.”*

- 2 *“I think that the proposal will allow exam boards to use already used and new approaches to assessment to allow computer-based and exam-based assessment of programming and problem solving.”*

Some teachers expressed a clear preference as to how programming should be assessed.

*Example 1 “The discussed options around online or computer based solutions would seem the most appropriate. If an exam board is allowed to offer a small number of alternatives this may better allow all centres to assess in line with their own needs/resources.”*

- 2 *“I like the idea of using a pre-release task that would enable students to prepare for an examination.”*

Other teachers identified challenges with some aspects of assessment by examination, but felt that these could be managed.

*Example 1 “As different centres deliver a range of programming languages it would be difficult to tailor the exams. If you had practical examinations in IT suites, allowing students to write code to solve problems this could solve all of these problems.”*

- 2 *“I expect that online programming assessment is more interactive, but agree that offline might work better. My school would be fine with this method, however there would be some schools who have a problem with resources.”*

Some referred to examples of where such assessment is already being used.

*Example 1 “It has worked for AQA A-level Computer Science for many years in their Exam 1, previously COMP1.”*

- 2 *“Many organisations use only assessment to recruit new developers. It is therefore reasonable to assume that similar methods of assessment can be used by the exam board.”*

Some suggested that assessment by examination could potentially be more valid or reliable than other approaches.

*Example 1 “The options as laid out in the consultation document leave considerable scope for exam boards, including the option of issuing pre-release materials which would enable students to research the context of a scenario before knowing the specifics of a question, thus enabling a more creative approach to programming solutions.”*

- 2 *“Practical exams are not unknown - students could write a program to solve a problem, rather than write the program on paper. In many ways this would be a more reliable test as the computer could check the output, rather than relying on the judgment of the marker.”*

Others suggested that not all of them would be as reliable as others.

Example 1 *“Your proposal does give a variety of potential ways, however... all fall short of being fully effective. I have serious reservations of assessing pupils’ ability to write programming syntax by hand, as syntactic mistakes are not spottable by pupils until they try to run their code, something that can’t be done on paper.”*

2 *“There are a range of ways but some are more secure or manageable than others depending on the size of the cohort.”*

Some teachers were concerned that a variety of approaches would be allowed.

Example 1 *“Having a range of assessment approaches for programming creates confusion, unfairness and more workload.”*

2 *“Every school and every exam board to be required to examine in the exact same way. This would avoid unfairness creeping in with one exam board being easier than the other. The exact same task/test should be set for all exam boards.”*

Some teachers suggested that certain styles of assessment should not be allowed. They did not disagree that a range of approaches could be used, but suggested some would be more suitable than others.

Example 1 *“Please avoid the on-screen programming test - this is unlikely to work well and reduce the number of students taking the test. I also think that this would limit the languages offered and I’m not convinced that this is a good thing.”*

2 *“A paper based coding exam is not realistic. When students write code they can test as they write. Also, using the internet and collaborating is usual for programmers.”*

Other teachers disagreed with our proposal because they believed one specific approach was superior to others (which they argued would not be viable). In some cases this was a form of assessment by examination. Some felt that any future approach to assessment should retain existing features of the interim arrangements, which they regarded as working well.

Example 1 *“Whilst there are a few ways such as pseudo-code questions and programming tasks under exam/timed conditions, I do believe that a large task completed over a longer period of time (like the current NEA) is more realistic for those who wish to pursue computer science further.”*

2 *“You have not suggested that the programming unit should be absorbed in unit 2. The questions should relate to one set programming task that the students should have undertaken prior to the exam.”*

### Students’ views

Most students disagreed that there was a range of possible approaches under which programming skills could be assessed in an examination and questioned the suitability of the approach.

Example 1 *“A timed exam would not reflect a pupil’s ability to code regularly and consistently. Programming should not be done during timed exam conditions.”*

- 2           “...a program should only really be constructed outside of examinations so that candidates have the relaxed mentality to complete the set tasks to the highest of their abilities.”

### Representative groups' views

All of the representative groups agreed that there is a range of ways by which programming skills could be assessed within Ofqual's definition of an examination. However, some had concerns about the suitability of certain possible approaches. This ranged from comments about the varying potential for malpractice under each approach from BCU Education School, to concerns from the NEU about the viability of on-screen assessment.

CAS agreed exam boards should be allowed some freedom to design their assessments.

### Exam boards' views

All four exam boards agreed or strongly agreed that there was a range of ways by which programming could be assessed which would meet our definition of an examination. They also felt that certain approaches were likely to be more effective than others. They also recognised that differences in approach could lead to significant variation in student experience and that the most suitable approach might vary between schools depending on their circumstances. OCR indicated that it was already engaging with the subject community to establish what their preferred approach would be.

*“The proposals give exam boards scope to assess programming using a range of approaches... we are already consulting with colleagues, the assessor community and teachers to explore which approaches might work best for pupils, teachers and schools.”*

While all of the boards agreed that it was *possible* to assess programming in a range of ways through examination, AQA argued that this approach was likely to be less effective than other forms of assessment. In particular, AQA (who currently offer an A level exam with a pre-release task which students are then required to modify in an examination) expressed concerns that approaches used elsewhere would not be appropriate at GCSE.

*“There are a range of ways to assess programming by examination, as defined by Ofqual. However, these approaches are not without issue... the pre-release alone does not assess, to the same extent, all of the same skills as an extended programming period would.”*

*“Adopting this approach, but using a simpler/shorter pre-release program that GCSE would require, would likely have the effect of driving in more predictability to the assessment... Indeed the prior availability and necessary simplification of the pre-release task could once again create a market for question-spotting, which AOs would find very difficult to mitigate.”<sup>1</sup>*

### **Question 3: If you do not support our proposed approach, how would you prefer programming skills to be assessed in GCSE computer science?**

There were 162 responses to this question. This is greater than the number of respondents who indicated that they disagreed or strongly disagreed with our proposal for assessment by examination. Some who disagreed did not suggest an alternative approach, while others who agreed or strongly agreed with Question 1 used this as an opportunity to indicate what their preferred approach would be.

---

<sup>1</sup> These concerns were specific to the existing A level pre-release model used by AQA, and there would be no requirement under our proposed rules that exam boards would have to adopt the same approach at GCSE.

In some cases, respondents who did not agree with our proposed approach indicated that they would favour a form of assessment of programming skills that would, in fact, be allowed under our proposal.

### Teachers' views

Many teachers who favoured an alternative approach suggested that programming skills should be assessed through some form of project – either as a return to teacher marked and exam board moderated non-exam assessment, or as a form of coursework that would require students to compile a portfolio which would then be either teacher marked and exam board moderated or marked by the exam board directly. Others suggested programming skills might be better assessed on a competency basis, with teachers verifying that students had demonstrated the ability to complete certain processes, rather than assessed in an exam.

*Example 1* “Coursework and schools being allowed to come up with their own problem to tackle or students coming up with an idea. These 'Problems' can be shown to exam boards who can assess whether they are challenging enough.”

2 “Multiple small assessments to be completed within 1 hour of exam conditions within a classroom with an invigilator. These will make up a portfolio showing the skills that students have acquired.”

Some suggestions were variations of a programming project, for instance with students working collaboratively or completing multiple short tasks during their GCSE course.

*Example 1* “NEA where the students get a free choice of project (so long as it can meet the criteria). The student has to explain (in a combination of written and video-recorded forms) how their code works and how they developed it.”

2 “I feel that short tasks should be released on a set day that students can complete within a few hours and then they may complete a number of these over the year to gain accreditation for the course. The tasks will vary in each assessment window so that students cannot cheat and model answers cannot be released online.”

Some teachers suggested a return to the programming project.

*Example 1* “High control, controlled assessment with NO internet access. Alternatively controlled assessment where the work done by students is stored on a central portal that includes a programming language emulator(s).”

2 “A controlled assessment under the correct conditions. The issue was that teaching staff published confidential material. This is the issue that needs to be addressed.”

Some suggested approaches used in other qualifications such as A level computer science and International GCSEs which use pre-release material.

*Example 1* “Similar to A-Level. Students given a skeleton code each year which they are required to learn about. The exam would be on-screen and require students to make enhancements and adjustments to the skeleton code. Answer theory

questions on the skeleton code. And also do a blind programming task. (Section C in AQA A-Level exams).”

2 “Use the pre-release model that IGCSE has.”

Others argued that the current interim arrangements should be maintained, formalised and carried forward on a permanent basis. Some suggested how these could be improved, but generally these respondents thought that maintaining the status quo was preferable to significant change.

Example 1 “I like the current situation: two exams and the project that has to be completed to a minimum standard in 20 hours.”

2 “Keep it as it is. At 0% NEA and 2x 50% exams. I now have a class of children enjoying the NEA, not struggling, but focused and enjoying problem solving.”

Some teachers suggested that programming skills should not be assessed at all within a computer science qualification or that the limited assessment of Assessment Objective 3, which currently takes place in the written exams, is sufficient. Some respondents suggested the removal of practical programming skills from the final qualification grade was beneficial because it allowed students to focus on refining their programming skills without being concerned about the implications for their final grade.

Example 1 “The programming aspect is sufficiently tested in component 2 and the current format is enabling students to enjoy improving their programming with freedom. They are actually enjoying and developing a thirst for it like I’ve not seen before.”

2 “Just how it is now theory in paper 2 is enough.”

### Students’ views

Students who commented on this question generally favoured a return to some form of project, but there was no consensus about the form that this would take. Where students referred to models of project work with which they were familiar, such as the NEA, they often advocated looser controls on these tasks (for instance, full access to the internet or the ability to work collaboratively) on the basis that this would be more ‘realistic’.

Example 1 “I strongly believe that a similar 20 hour project is best. This develops students’ programming ability and problem solving skills. I also think that students should have full access to internet resources as this is realistic to the way real developers work.”

2 “Personally, I think the skills should be assessed under industry conditions, i.e. from the release of the task to the deadline, students can work however they want and use whatever resources they want.”

One student argued for a practical endorsement model similar to GCSE English spoken language.

### Representative groups’ views

Of the representative groups who did not agree with our proposals when answering Question 1, both indicated that they would prefer a project-based approach more akin to the NEA. BCU Education School advocated an approach similar to current models of NEA used



at A level, and argued that this would be likely to improve student motivation and Key Stage 5 uptake:

*“Via an open choice project as in the A level course. This activity would cover the entire software development process and allow candidates to develop wider skills in research, resilience and problem solving. Candidates could record their work on a structured forum including planned weekly tasks, progress made, issues encountered and an action plan for solving these allowing for incremental development and ongoing testing”*

The NEU argued that NEA, or other approaches that made use of internal assessment, would better capture evidence of students’ programming skills and would be a more valid measure of their abilities because they took place under more authentic conditions:

*“Various forms of Non-Exam Assessment or Teacher Assessment would allow for a more authentic programming experience. The assessment of programming skills is about more than just the outcome – the program created – but is about the process too (designing, writing, testing, and refining). A teacher could assess these skills by observing the candidate actually carrying them out, and this would likely be a better reflection of the candidate’s ability than an examiner could determine by reading a candidate’s response to a question... The teacher could award a grade based on one specific task set by Awarding Organisations, by a series of tasks throughout the duration of the course or against more general assessment guidelines regarding what a candidate is expected to demonstrate. This form of assessment would empower teachers to use their professional judgment to come to a valid, reliable decision about the programming skills a candidate has displayed.”*

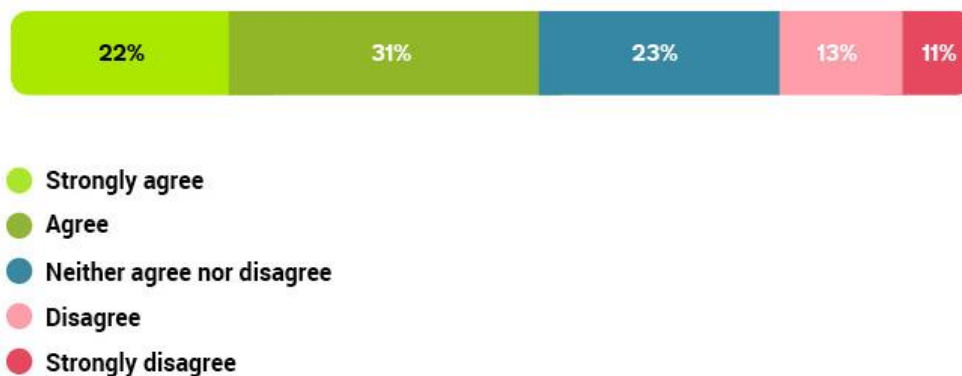
### Exam boards’ views

OCR, Pearson and WJEC did not answer this question, as all felt that assessment by examination constituted an acceptable approach to testing programming skills. AQA felt that assessing these skills by examination would be an inauthentic experience for students and risked compromising the validity of the qualification.

*“Practical work should be primarily for learning, undertaken in as realistic a context as possible, and should foster curiosity and exploration... A key consideration for Ofqual should be ensuring the workload for learners is proportionate to the reward, and is also a sufficiently valuable experience of programming to justify its inclusion. We believe that an extended programming opportunity measures aspects of students’ understanding/skills that are valuable and important to the subject and is the best way of assessing the computational thinking, problem solving and programming skills that are fundamental to the subject.”*

AQA suggested an endorsement model similar to A level science or the assessment of spoken language within GCSE English.

**Question 4: To what extent do you agree or disagree that the original assessment objective weightings should be reinstated?**



The majority of respondents agreed that the original assessment objectives (30% AO1, 40% AO2, 30% AO3) specified when the reformed qualification was designed should be reinstated, to replace the revised weightings adopted under the interim arrangements when the NEA was removed from the qualification grade.

Question 4 attracted fewer comments than other questions, perhaps reflecting the technical nature of the Assessment Objective weightings.

Teachers' views

A significant majority of teachers agreed or strongly agreed that the original assessment weightings should be reinstated. The most frequently cited reason was that this would increase the emphasis on practical programming skills, which respondents felt was a key element of a computer science qualification.

*Example 1* "Good to get the practical AO back up to 30%."

*2* "The weightings will rebalance the qualification, towards computational thinking."

Some suggested the original weighting would better reflect students' expectations of a computer science qualification and would be more motivating for them.

*Example 1* "A computing qualification should have a good proportion set aside for coding. Pupils choose the qualification largely to code, not learn at times dull theory."

*2* "For most students, especially those who don't want to enter the software industry, the programming (and therefore problem-solving and decomposition) skills are the key thing that they take away from studying Computer Science."

Some felt that this would be more likely to lead to students continuing to study computer science at Key Stage 5, as it makes the qualifications more appealing to students with an interest in, and aptitude for, the practical aspects of coding.

*Example 1* "Some students have excellent practical skills and less good theoretical skills - there used to be a balance where those students at either end of the scale could still achieve well. At the moment some students are affected and cannot demonstrate those skills in the same way which is detrimental to their final grade."

- 2 *“There are many students who are excellent at the subject practically but struggle with exam questions. This weighting gives them the chance to show where their strengths are for consideration of taking the A Level course.”*

Teachers who disagreed did so for different reasons. Many felt the AO3 should in fact be increased beyond its original value – and assessed by a project. Others felt that the AO3 weighting should be greater regardless of the form of assessment which is adopted.

*Example 1 “There should be more of a weighting towards the practical sides of the qualification because of the nature of subject.”*

- 2 *“If set at 20% this would be difficult to persuade students the importance of undertaking the exam, however 60% is also too much. Placing more emphasis on theory and say 40% on programming would in my opinion be a fairer assessment criteria.”*

### Students’ views

The majority of students favoured returning the Assessment Objectives to their original weightings, although a significant number disagreed. Those who argued in favour of reinstating the weightings did so on the basis that programming was an important part of the course that would contribute to their future employability.

*Example 1 “It put the focus on the programming and developing the skills that will help in the future workforce.”*

- 2 *“I would agree, but I would argue more weighting should be given to programming, given that is the main requirement for a career in computer science.”*

### Representative groups’ views

None of the representative groups who responded to the consultation disagreed with our proposal that the original assessment objectives should be reinstated. They felt this would restore the rightful emphasis on programming skills within the qualification, as originally intended. This is exemplified by the following comment from BCU Education School:

*“The ability to write code is the physical manifestation of an algorithm derived using computational thinking schools. I agree that the original weighting should be restored to indicate the significance of this in the assessment of computer science.”*

ASCL also agreed, but expressed concerns that doing so may result in programming only being taught in preparation for the exam. This linked to their argument in response to Question 5, of the benefits of maintaining the requirement for a statement from heads of centre that students had been provided with the opportunity to learn programming skills.

The NASUWT neither agreed nor disagreed with our proposal, arguing that the assessment objective weightings should be determined by the requirements of the approaches to assessment by examination most likely to prove successful.

### Exam boards’ views

OCR, Pearson and WJEC all agreed that the original assessment objectives should be reinstated, on the basis that revising them was a stop-gap measure when the NEA was removed from the final grade.

WJEC said reinstating the original weightings would make the qualification more reflective of the subject community’s expectations of a GCSE in computer science, particularly since they had been consulted when those weightings were devised:

*“The original assessment objective weightings were subject to public consultation, and reflect a broad consensus of what GCSE (9-1) computer science should involve.”*

AQA, on the other hand, strongly disagreed – arguing that the assessment objectives and weightings were decided when NEA was the intended method of assessing programming skills, and that if an alternative approach were adopted then the weightings would need to be revisited. In particular, AQA expressed concerns that if the original weightings were reinstated it may result in unmanageable assessments which place unreasonable burden on teachers and students:

*“There are some risks to both specification coverage and the overall validity of the qualifications if 30% of the total marks are allocated to AO3 in its original form. AQA believes there is a very real risk that the assessments will not cover the range of content and skills in a suitable time frame without increasing the assessment burden by either more, or greater duration, of assessments.”*

**Question 5: In our proposals we discuss the continued use of a statement signed by the head of centre confirming that students have been given the opportunity to design, write, test and refine programs, using one or more high-level programming language with a textual programming definition as part of their preparation for the examinations. If programming skills are assessed in the exams, should such a statement be required?**



The majority of respondents did not feel heads of centre should be required to verify that students had been given the opportunity to design, write, test and refine programs using a high-level programming language in the course of their studies. The subject association CAS, ASCL and all students who responded to the consultation supported the requirement for a statement.

#### Teachers' views

Almost 75% of teachers did not feel that we should require such a statement from centres under our proposed approach.

Most argued that if practical programming skills were to be assessed by examination there should no longer be a requirement for a statement, as whether or not a centre's students had been given such an opportunity would be borne out by the results. A few acknowledged there might be other advantages to such a statement – for instance, stressing the importance of practical programming skills and adequate resourcing to support their teaching within centres.

**Example 1** *“The current signed statement is to show that a programming project has been undertaken. If the programming skills are being tested in an exam, not through a project, then it just seems like a superfluous piece of paperwork.”*

**2** *“To prepare students for an exam without this would be madness. However, I do accept that there are possibly some schools out there where such a*

*requirement would be helpful to departments in arguing for more time and resources for Computer Science.”*

Some felt that the requirement would be an unnecessary burden upon teachers and that it needlessly duplicated statements they were already required to complete under JCQ rules.

*Example 1 “This is an unnecessary burden should the programming skills be assessed in an examination.”*

*2 “Teachers are under enough scrutiny without adding this as well.”*

Others questioned the value of such a statement, and whether heads of centre were best placed to provide assurances about the time provided for the programming task. Some felt that such a statement would be open to abuse or misinterpretation and would still not necessarily ensure that students were receiving an equitable experience.

*Example 1 “It is valueless. Centres mostly act with integrity, those that don't would not be revealed by this process. If centres practise deceit it will only be uncovered after it is too late to rectify it.”*

*2 “Unless the head teacher plays an active role in overseeing Computer Science GCSE classes, or they are line managing the head of computing, they will not know how many hours of programming have taken place.”*

Some of those who disagreed with the requirement for such a statement also pointed out that this is not a requirement for other aspects of the course, which they felt to be equally important, and did not reflect the focus that might be given to these skills at other Key Stages. Others argued such a statement would serve to constrain teachers, who should be allowed to deliver the course as they see fit.

*Example 1 “There's no requirement to sign to say we've taught the rest of the exam content so why should this topic be any different?”*

*2 “If a centre decides that on balance they would rather focus on other priorities then that is their call. Personally the way the assessments are done with exam questions means I teach practically anyway. But I don't think it should matter to the outcome whether I have decided to do this or not.”*

Those in favour of such a statement suggested it would ensure that all students were given the same opportunities to develop practical programming skills. There were teachers who felt that this would be particularly important if exam boards differed in their approach to assessing programming skills by examination. Some argued that the burden involved in signing a statement would actually be very minor, and that if it helped to ensure that programming was receiving suitable attention then this would be an acceptable trade-off.

*Example 1 “This is still something which should be happening in each centre, and I do not see signing this statement as a burden.”*

*2 “If the outcome is that all programming will be assessed in an exam then there will be a temptation for some centres to simply focus on “teaching to the test” and avoid spending curriculum time on extending programming problems. This is a huge disservice to candidates, it removes one of the biggest joys of learning Computer Science and furthermore it would not*

*adequately prepare them for the real world of further study at Level 3 or onwards.”*

Some favoured a statement because it would provide an additional element of accountability in light of previous malpractice in this qualification and would help to rebuild trust following the removal of the NEA. Others felt that it was necessary to address specific loop-holes which centres might try to exploit, and would support teachers in some centres in resisting pressure to compromise teaching to maximise outcomes.

*Example 1 “It adds another layer of accountability to ensure that inappropriate actions from the schools are more visible and allows individual schools to be penalised, as opposed to a whole cohort in the country.”*

*2 “If there is no such statement then centres may be tempted to remove the provision to students and thus deliver a 'watered-down' course. While this is easier where there is no specialist subject teacher (and thus attractive to centres) this devalues the subject and leaves students who do not receive this provision disadvantaged in the longer term. It also indirectly encourages centres to employ non-specialists and avoid the provision that their students deserve.”*

Others argued that this would raise the status of computer science teaching within schools by bringing it more into line with other science subjects. They also felt that it would highlight to heads of centre the importance of adequate resourcing for the subject.

*Example 1 “At this point yes to convey importance to centres. There are many centres who have a shortage of staff with the capable programming skills.”*

*2 “This puts Computer Science in line with other sciences, where this approach has proven to be successful.”*

### Students' views

In contrast to the overall views of stakeholders, all students who responded to the consultation felt that heads of centre should be required to provide a statement attesting that those taking the examination had been provided the opportunity to design, write, test and refine programs, using one or more high-level programming language with a textual programming definition as part of their preparation.

Students' comments indicated that they felt programming skills were a key part of the course that would be vital if they were to go on to further study or employment in fields related to computer science.

*Example 1 “Centre heads should be able to confirm and prove that students are able to program in a real environment and apply those skills appropriately. Not merely answer questions correctly on an exam paper.”*

*2 “Because it is critical that students get an opportunity to practise and develop their programming skills before the exam.”*

### Representative groups' views

BCU Education School, the NASUWT and the NEU did not feel that heads of centre should be required to sign such a statement. They suggested it would be an unnecessary burden if programming skills were assessed in an exam.

On the other hand, ASCL and CAS both argued in favour of such a statement. In CAS's view, opportunities to undertake practical programming tasks is a central part of the curriculum which every student of computer science should be offered, and that it would not be overly burdensome for heads of centre to confirm that this was the case. ASCL argued in favour of retaining the requirement for a statement to encourage centres to adopt a wider approach to teaching computer science rather than narrow teaching to the test.

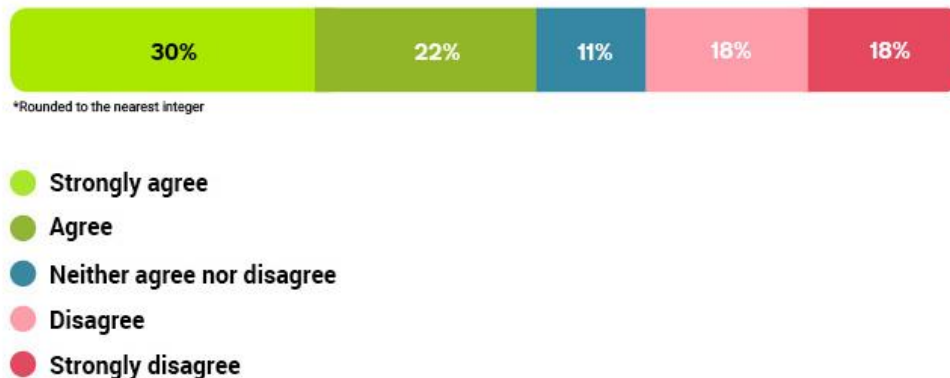
### Exam boards' views

Exam boards were split over the proposal. OCR, Pearson and WJEC felt that such a statement would be unnecessary, as teachers would be required to teach the content to adequately prepare them for the examination. Programming content and skills would therefore be sampled in a similar manner to the rest of the defined subject content. OCR argued that the statement would also represent an unjustifiable administrative burden, and that the emphasis on programming skills within the qualification could be reinforced in other ways.

While WJEC did not feel that a statement would be necessary as students who had not been taught programming would be disadvantaged in their exams, they noted that some schools might value such a statement as a means to reinforce the importance of adequately resourcing the subject.

AQA argued that the statement should be retained on similar grounds, recognising that while the examination should be a sufficient incentive to teachers and centres to ensure that students have been taught these skills, a statement would help to reinforce that programming skills are "a critical element of the teaching and learning".

### **Question 6: To what extent do you agree or disagree that the interim arrangements should remain in place for students who will take their exams in summer 2021, with the new assessments being used for the first time in summer 2022?**



52% of respondents agreed with our proposal to maintain the interim assessment arrangements for GCSE computer science for an additional year (ending in 2021).

### Teachers' views

The majority of teachers agreed with the proposal to introduce the revised assessment arrangements from 2022. However, the margin was narrower than in response to other questions and there was a sizable minority of teachers who argued for earlier implementation.

Many of those who agreed with the proposed date for implementation said this would allow time to change schemes of work, curriculum plans and resources in response to new specifications, and to decide whether to change the exam board they used for the subject. .

*Example 1* “It would be better to keep the interim arrangements in place to enable timely communication of new arrangements and planning by centres, [than] to rush through changes for students starting GCSE courses in 2019.”

2 “Allows the exam board to make their decision and then give to the schools so if schools feel it will be best to change boards they have the information a significant amount of time before the cohort start their GCSE years.”

Some teachers saw a need for additional staff training – and particularly for former IT teachers who might not be able to fall back on a strong computer science subject background to assist them in adjusting to any changes.

*Example 1* “This gives a fair amount of time to develop a clear marking criteria and develop a course for teaching staff so they better understand the requirements and skill sets required.”

2 “Sufficient time for teaching staff to be upskilled is required. Lack of knowledge was the issue last time, if the timescale is reduced the same issue will exist.”

Often, teachers’ responses indicated that they are satisfied with the current arrangements. Some argued that the interim arrangements are working well so they could be left in place longer if this meant that there would not be further changes in the near future.

*Example 1* “This needs to be done properly and not rushed. Current arrangements are working.”

2 “I am enjoying this method of delivering the course and the pupils are too and I feel gaining a lot from it.”

Some were critical of the recent pace of change in this qualification and felt that this had been detrimental to both their teaching and their wellbeing. This was particularly felt to be the case in smaller departments.

*Example 1* “There’s been too much change across Computing at the moment and smaller schools (I am a department of one), are currently swamped with new requirements and specification changes.”

2 “Adapting the scheme of work for the 2018 year 11 cohort was challenging for the students and teachers. For the 2021 cohort who have already started their learning, a mid-course adaption would put additional pressure on them and their teachers.”

Others felt that allowing exam boards more time to implement changes was more likely to result in innovative approaches. This was particularly the case with on-screen or online approaches to assessment by examination which would need to be tested.

*Example 1* “This will provide exam boards the chance to develop a new method of assessing the programming element.”

2 “This will then give you enough time to share the idea with teachers and then allow them to feed back with comments on if it would actually work. It is all



*well and good a person in charge coming up with the ideas and plans but if they don't see it on the floor and actually being run then they don't know how well it would work, if at all."*

Some teachers were concerned about the potential impact of changes on students who had already started their two year course.

*Example 1 "Already teaching cohorts for 2021 so unfair to change part way through."*

2 *"I have a group of Year 9 students already signed up - we are in the process of deciding [whether] to keep or change the course depending on what happens. Please take time, the changes are not good for students or staff."*

Some felt that the degree of change in computer science qualifications in recent years had damaged the perception of the course, reducing student uptake and the willingness of schools to deliver it.

*Example 1 "I feel it is important for there to be no additional false starts since these negatively affect the credibility of the subject and reduce its attractiveness to students."*

2 *"There has been so much change over the past 5 years to ICT & Computer Science courses... At the moment Computer Science is regarded by SLT as unreliable because of the problems."*

Most who disagreed argued the changes should be introduced more quickly. Some did not feel that the proposed changes would necessitate delay. Others argued that changes to the current arrangements could be accomplished quicker if our proposed approach more closely replicated one already in use at other levels or for other qualifications.

*Example 1 "2022? How much time do you need? Get it done for students starting GCSE in September 2019 [i.e. those who would be taking examinations in 2021]."*

2 *"Time is being spent to create these new assessments that could be invested in [implementing the changes within schools]. We also know that the solutions will resemble other exam boards or solutions used at A-level (on-screen test, pre-release material, coding a solution that is then assessed on a paper based exam)."*

Others felt that the interim arrangements were failing students, as teachers were no longer providing adequate teaching of practical programming skills, or that the setting aside 20 hours for a project which does not count towards the student's grade is a waste of time.

*Example 1 "The current arrangements disadvantage students where the examination has no practical component... Assessment and learning are different processes, so the nature of the current NEA limits the learning potential of this time."*

2 *"I see no point in forcing pupils to do a 20 hour project which counts for nothing. The time could be better used preparing them for the 2 exams - which count 100% for their grade."*

Others felt a 2020 introduction would be too soon.

*Example 1* “Wait until the first round of specification re-writes are required, let CS [computer science] staff manage the change in a more timely manner... hold the assessment update to the point when a "revamp" updating of the specification content is also required.”

2 “Not long enough as most schools now have three year KS4.”

### Students' views

Students were split over timing. Those who supported 2022 introduction felt that it would provide their teachers with some respite from changes in this subject and recognised the need to give exam boards time to test their assessments.

*Example 1* “Staff shouldn't be rushed to keep changing how they teach continuously.”

2 “This gives the exam boards sufficient time to implement and test the new solution.”

Those who disagreed felt either that the new arrangements should be put in place sooner or argued that the subject should return to the former model of assessment by NEA.

Those students who neither agreed nor disagreed either did not comment or felt that the current arrangements were not a cause for concern. They did, however, comment that their peers did not all recognise the value of the current programming task.

*“It seems the current arrangements are fine, although it is important to consider the fact that some candidates are not taking the programming project seriously.”*

### Representative groups' views

ASCL, the NASUWT and the NEU agreed that the interim assessment arrangements should be retained until 2021, with the revised approach to assessment coming into effect for first examination in 2022. ASCL and the NASUWT suggested this would provide sufficient time for schools and teachers to prepare for the new assessments, with ASCL stressing the importance of effective communication and detailed guidance to schools.

The NEU argued that the current arrangements were not working, but that attempting to put in revised assessment arrangements from the new academic year would be too disruptive.

BCU School of Education disagreed, arguing that revised assessment arrangements could be introduced next year depending on the approach adopted.

CAS did not say when the revised assessment arrangements should be introduced, commenting only that this should come at the point the exam boards judged to be most feasible to implement and which allowed time for teachers to be adequately supported in developing teaching materials.

### Exam boards' views

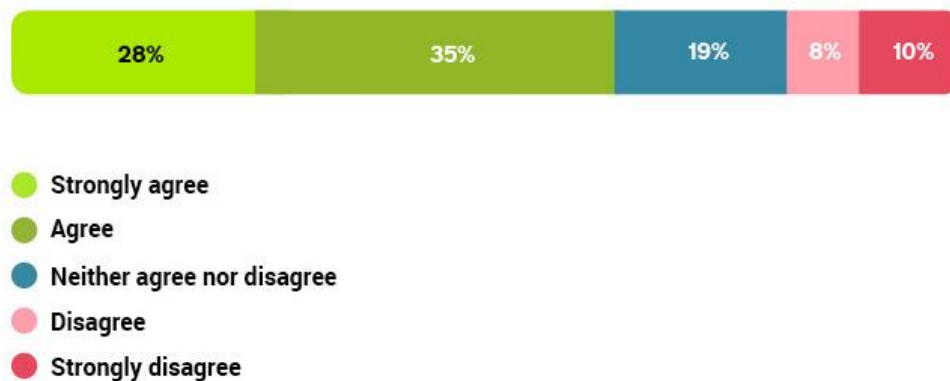
All four boards agreed that the interim arrangements should remain in place for an additional year, with any revised assessment arrangements coming into effect for first examination in 2022. OCR, Pearson and WJEC stressed the importance of ensuring that teachers are given sufficient time to adjust to any changes to specifications. It would also allow the boards to ensure that adequate support materials and training were in place. OCR also pointed out that the additional time would allow further opportunities to engage with teachers to determine the most suitable approach to assessment by examination:

*“Assessment in 2022 allows time for us to work with teachers to consider and develop the best possible approach and to put in place materials and guidance to support teachers through the change. Teachers must also be given time to familiarise themselves with the new model and prepare accordingly in order to ensure fairness for all learners.”*

AQA argued that 2022 might in fact be too soon to introduce the new arrangements, and could constrain the amount of development work boards could undertake on their new specifications, therefore restricting the approaches they might take:

*“AQA would argue... that introducing new assessment arrangements for summer 2022 will constrain AOs and will likely result in orthodox development work in order to ensure that specifications are available in a suitable time frame for teachers.”*

**Question 7: We believe that our proposals will reduce the burden upon teachers, who will be able to decide how they develop their students’ programming skills and how to timetable this in the course. To what extent do you agree or disagree?**



The majority of respondents felt that our proposals would be likely to reduce the burden currently placed upon teachers under the interim arrangements.

#### Teachers’ views

For many teachers, the primary benefit would be the removal of the requirement to set aside 20 hours for students to complete a programming task. In particular, teachers felt that even where the exam boards had relaxed their rules around the conduct of these tasks they continued to place unreasonable expectations upon teachers.

**Example 1** *“Under current arrangements the confines of the 20 hours of NEA interferes with mock examinations or preparations for final examinations.”*

**2** *“The 20 hour window for NEA was, and still is a nightmare. Students are all too aware that this does not “count” towards final marks, even though it should help them in the exams, and as such switch off. Having programming as part of the course will mean that teachers are not fighting against this.”*

Internal assessment of programming tasks was identified as being a major draw on teachers’ time, and teachers pointed out that in addition to this marking, there was also the administrative burden of carrying out internal moderation and submitting NEA marks and moderation samples.

**Example 1** *“I agree that teacher work load will be reduced by not having to formally mark controlled assessments.”*

- 2                    *“Completely agree. Taking the marking of the NEA away from teachers will allow more focus on teaching and learning.”*

Other teachers argued that our proposals would reduce their burden by allowing greater flexibility to determine how to deliver the course, and in particular to tailor their teaching to the needs of individual students.

*Example 1        “The current timetabling of the "NEA" means that time that could be better spent preparing the students for the exams and practical assessment.”*

- 2                    *“At the moment 2 out of 3 lessons have to be given across to the programming project 20 hours. This approach would allow me to have much more flexibility with time across the course and especially in Year 11.”*

Some respondents felt that our proposal would be likely to add to the burden upon teachers. Comments indicated that *any* changes to the current arrangements would be likely to add to their workload as they would need to adapt schemes of work and curriculum planning to take into account new exam board specifications. Some argued in favour of postponing any changes until these qualifications were next reformed.

*Example 1        “This will do the opposite. We would have no choice but to change schemes of work, change lessons and change teaching styles. There will be no resources for staff to get in thus increasing the load on staff further.”*

- 2                    *“If you impose more change, then our workload rises. It's that simple. If you leave it alone until the next major curriculum reform, then our workload is more manageable.”*

Other teachers disagreed on the grounds that they did not feel that the interim arrangements created undue burden on teachers, or that any reduction in burden due to changes would be mitigated by the additional preparation teachers would be required to undertake as a result.

*Example 1        “Don't believe it to be overly burdensome at present.”*

- 2                    *“It simply means that teachers have a greater burden having to plan lessons, rather than being able to build programming skills which may be used in an NEA over a long period rather than one exam that could be make or break.”*

Other responses indicated that teachers felt that examinations were inherently more stressful for teachers and students than other forms of assessment and that any additions to the existing examined content would add to their burden and increase anxiety. Some respondents cited particular concerns about the impact of a change given the number of former ICT teachers now being required to deliver computer science in schools.

*Example 1        “This adds more exam stress and pressure to both staff and students.”*

- 2                    *“Results are expected, which means stress and pressure to teach and complete practice exams until students meet targets.”*

Some suggested that assessing programming skills in an exam would create additional burden lower down the school for teachers at KS3, where respondents felt that computer science provision is often delivered by less qualified teachers.

*Example 1        “I have tried to create a suitable balance with regards to programming and feel through KS3 and KS4 I have a balanced approach so they can access the current format.”*

- 2            *“For schools who do not have a strong KS3 CS [computer science] program they will struggle to get students up to speed/sufficiently adequate level. There might be schools where there is only one CS specialist teacher and the other teacher isn’t able to deliver programming at KS3.”*

Finally, some argued that considerations of teacher burden due to the assessment model were less significant than the potential impact of other factors.

- Example 1    *“At this moment many schools still are unable to recruit computer science specialist teachers therefore we have inexperienced teachers teaching it. Therefore, you will continue to have centres that can't deliver a quality experience including programming whereas others will.”*

- 2            *“SLT often dictate much of what staff can and can’t do. Heads don’t want 20 hours wasted on tasks that don’t count! We have been under pressure to ignore tasks altogether or offer much less time!”*

### Students’ views

The majority of students disagreed that our proposed approach would reduce the burden on teachers. Others suggested that, while it might do so, this would be at the expense of their own learning. Others interpreted this question as referring to the burden that different assessment approaches placed on students and responded accordingly.

- Example 1    *“I understand that it may be difficult for teachers to prepare students for the NEA however I think that the new proposal will not give all students equal programming ability as the teacher will have more freedom.”*

- 2            *“It may reduce the burden on some teachers but for others it will mean that hardly any programming is taught... my teacher didn’t teach me anything on how to code. Everything was self-taught for my coursework with my teacher also not knowing my programming language they didn’t help either. By relaxing it, it will just mean certain teachers will no longer teach to the standard required, so students will fail as they have to try and teach themselves.”*

Among students who did not express an opinion either way, one felt that any reduction in burden would be negligible if teachers continued to focus on properly teaching programming.

*“Realistically speaking there should already be extra programming skill progress made throughout the course regardless of the programming project, to prepare candidates for the programming tasks.”*

### Representative groups’ views

Of the two teacher unions that responded to the consultation, the NASUWT did not offer a view on the impact that our proposals would have on the burden upon teachers. The NEU argued that the net result would be to shift, rather than reduce, total teacher burden:

*“Whilst the burdens associated with the interim arrangements would cease to exist, other burdens will appear... preparing for what will be yet another exam at the end of the course will increase the burden of revision, exam preparations and mock exams.”*

ASCL supported proposals that would enable teachers to decide how to develop their students' programming skills and how to timetable this into their course. CAS stated that they supported all measures that would result in a reduction in the net burden on schools and suggested ways that assessment by examination might accomplish this.

BCU School of Education agreed that our proposals would be likely to reduce the burden on teachers due to the removal of the 20 hour requirement and the need for teachers to internally assess the NEA.

#### Exam boards' views

Two of the exam boards (OCR and Pearson) agreed that our proposals would lead to an overall reduction in the burden placed upon teachers. OCR felt that a move to assessment by examination would result in greater flexibility for teachers in determining how best to teach practical programming skills to their students:

*"We agree that this approach allows flexibility for teachers to deliver programming skills in a way that works best for their learners. We believe there are further opportunities presented by the examined model to reduce administrative burdens... and to maximise teacher and delivery time to help students develop fluency in the important skill of programming."*

Pearson argued that there would be advantages for teachers in moving away from a 20 hour programming project in terms of the classroom time this would free up:

*"We have received feedback from our centres who have said the current programming project is time consuming to organise and administer. It also occupies considerable teaching time for the students to complete the project according to the regulations. Moving over to an examination means that the 20 hours could be used for teaching and learning of programming skills, allowing students to become more proficient and confident."*

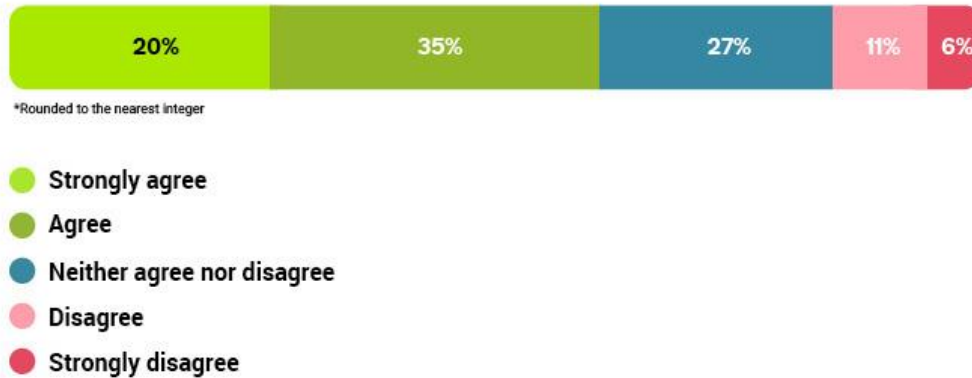
The other two boards (AQA and WJEC) neither agreed nor disagreed with our view of the likely impact upon teachers. AQA felt that moving away from a defined 20 hour programming task would reduce the administrative burden upon teachers, but could also have a detrimental impact on their teaching of programming skills.

*"With all assessment being conducted by examination, there is little doubt that this will reduce the burden on teachers both in terms of the previous requirement to set aside time in the timetable to conduct the NEA and the associated administrative responsibilities.... Many teachers like the current programming project arrangements, they are confident that they are teaching the required content and the removal of the programming task format to examination based scenarios may undermine this confidence."*

WJEC suggested any reduction in the burden upon teachers at GCSE could be offset if students choosing to continue to A level needed additional teaching to gain skills which would previously have been attained through the programming task.

*"There may be an increased burden on teachers delivering GCE AS or GCE A level Computer Science, because learners may not have completed an extended piece of programming work as part of their GCSE course."*

**Question 8: We do not believe that there would be a negative impact from our proposals on any students because of their protected characteristics, beyond those already identified for whom reasonable adjustments can be made. To what extent do you agree or disagree?**



The majority of respondents felt that our proposals would not have a negative impact upon students with particular protected characteristics, which could not be mitigated through existing reasonable adjustments. Where respondents did not agree, they were more likely to indicate that they took no view than they were to disagree.

#### Teachers' views

A significant majority of teachers agreed that our proposals would not have any negative impact on students with particular protected characteristics and noted that disabled students are able to receive reasonable adjustments. Others felt that any potential detrimental impact on individual students under an exam approach would be mitigated by the removal of the potential for malpractice through the NEA. Teachers were confident that any disabled students who might be disadvantaged by the change in the form of assessment could be suitably accommodated by reasonable adjustments (such as extra time). In this, teachers did not feel that computer science differed from any other GCSE subject in the range and availability of reasonable adjustments which might be made for students – and pointed out that 100% assessment by exam is now the norm at Key Stage 4.

*Example 1* “There will always be a subset of students who are individually impacted by any assessment. It is all about balance. There are measures in place to support students who are in need of adjustments.”

*2* “Most other GCSEs are examination only and this is not seen as being an issue with those subjects.”

While most respondents referred to disabled students or students with special educational needs, one teacher queried whether there might also be a potential impact on gender – something which was covered in detail in our 2017 consultation on removing the NEA from the GCSE computer science grade<sup>2</sup>.

*“Although girls traditionally do better with NEA/ coursework and there is a recruitment problem, is there any research or evidence that shows what exam style is more attractive for girls? I don't want to make the balance go in the wrong direction when it is already pretty shocking.”*

<sup>2</sup> [Consultation: Assessment arrangements for computer science](#), November 2017

Another teacher felt that while reasonable adjustments *could* address any impact on disabled students arising from the change in assessment format, they would prefer Ofqual to specify the reasonable adjustments which should be put in place.

*“Ofqual have specified protected characteristics but this is down to the exam boards to facilitate this... I would prefer Ofqual not to pass the risk on this to exam boards, and take ownership.”*

Comments by those who disagreed or strongly disagreed tended to focus on the perceived difficulty of different approaches to assessing programming skills by examination. Some focused on the perceived impact on students with generally low attainment, while others argued that students with a particular learning style or those with particular traits were more likely to be disadvantaged by our proposals.

*Example 1 “The weaker students will continue to struggle because the GCSE is pitched at too high a level for them.”*

*2 “Some pupils are very good when writing programming but struggle to articulate their understanding within a formal written exam.”*

A few teachers commented on a potential impact on SEND students. One teacher argued that there were implications for school resourcing arising from SEND provision under an exam-only approach to assessing practical skills, which would also need to be taken into account.

*Example 1 “SEN students will struggle with this approach.”*

*2 “For those students where extra support or time is needed, this will impact the student further. More resources needed to the cost of the school.”*

Some teachers felt that there was likely to be a particularly negative impact on students prone to exam stress or anxiety.

*Example 1 “Some students in exam settings feel overwhelmed with the pressure and this will negatively affect them.”*

*2 “Coding in exam conditions is very stressful. We used to do AQA A Level where they have to do this and the students stressed and worried about it from the start of the course. No amount of practice helped... We have bright students but none were able to show their full potential in the A Level exam paper where they had to code in exam conditions.”*

One teacher was concerned about a possible impact on students with long term medical conditions.

*“... for students with long-term medical conditions it was possible to schedule controlled assessment times when they were able to work. Due consideration should be made for such candidates in any changes, especially considering that career paths in computing/programming are often available to people with such medical conditions or disabilities.”*



### Students' views

Students were divided over whether they felt that our proposals would be likely to have an impact on students with particular protected characteristics which could not be mitigated through reasonable adjustments.

*"It is impossible for any kind of programming test to discriminate on 'protected' characteristics unless it's not actually testing programming."*

*"I myself am dyslexic, this means for me when I'm reading through code words look normal when there are mistakes. In coursework I could leave the question as I [had] other time to go back to it. While in my A level exam even with extra time I couldn't find my mistakes or by the time I had the lightbulb moment it was too late to finish the question when I was more than able to code the question required."*

### Representative groups' views

Of the representative groups which responded to this question, only ASCL agreed that our proposals would not have a negative impact on students with particular protected characteristics which could not be mitigated through reasonable adjustments. Both BCU School of Education and CAS neither agreed nor disagreed – the former on the grounds that there would be some students who would be advantaged by a change from NEA to exam assessment and others who would be disadvantaged, and the latter because they felt that additional research would be required to determine this. The BCU School of Education did note, however, that the impact of the change in assessment format would be the same as with all other EBacc subjects, thereby negating any subject specific effect.

The NEU disagreed with our statement, arguing that a shift to assessing programming skills by examination would disadvantage SEND students:

*"Assessing the entire qualification via examination further entrenches disadvantage for those students who are less able to demonstrate their true ability in exam conditions. Often this impacts even more heavily on SEND students. Having some of the assessment carried out in an alternative way would mean that the unfairness for these students would be at least partially compensated for."*

They also argued that the proposals would likely have a significant impact on students whose learning style meant that they preferred, or benefited from, the ability to work on computers as opposed to completing assessments on paper:

*"Members tell us that many students are attracted to Computer Science due to the fact that much of the work is completed using computers, rather than on paper. It is certainly possible that moving to 100% exam assessment could lead to an increase in paper-based working in lessons and as such, the disengagement of those students who enjoy working with computers."*

### Exam boards' views

None of the exam boards felt that our proposals would be likely to have a negative impact on students with protected characteristics which could not be mitigated through reasonable adjustments. OCR noted the existing range of access arrangements available to disabled students and that if exam boards were to implement on-screen assessments then additional special arrangements might become possible.

WJEC felt that there might be an impact on other students who temperamentally might be disposed to perform better in NEA than in assessment by examination, but acknowledged that this was not a protected characteristic under the Equality Act.

**Question 9: If you are responding on behalf of an exam board, please provide us with an indication of any additional costs you estimate you will incur if we implement our proposals as set out in this consultation. In your response please distinguish between one-off and recurring costs.**

All four exam boards responded to this question. 10 responses were also received from teachers and students from organisations (maintained schools and a private training provider) who either used this question to give their own estimate of the likely costs to exam boards or to provide details of the additional costs to schools and colleges if we were to proceed with our proposal that programming skills be assessed by examination. These have been taken into account in the Regulatory Impact Assessment.

#### Exam boards' views

Exam boards noted that any additional costs arising from our proposals would depend on the method of assessment by examination which they adopted and the time frame in which they had to implement the changes.

The boards provided estimates of one-off costs for the development of new specifications which ranged from £5,000 to £22,000. One board estimated additional recurring costs of approximately £13,000. The other boards did not provide an estimate of recurring costs, but one suggested that they would increase significantly if a third exam paper was required. Further consideration of the likely financial impact of our proposals on the exam boards is provided in the Regulatory Impact Assessment.

AQA argued that the development costs entailed in developing an online assessment could be prohibitive for AOs, and that this might have consequences for the future of the qualification.

**Question 10: We have a duty under the Apprenticeships, Skills, Children and Learning Act to have regard to the desirability of facilitating innovation in connection with the provision of regulated qualifications. We have committed in our Corporate Plan to survey awarding organisations' views of the impact of our regulatory requirements on innovation and consider any revisions required in response. We consider that our proposals are sufficiently flexible to allow exam boards to take innovative approaches to assessment in GCSE computer science, and do not believe that these proposals would unduly prevent innovation. To what extent do you agree or disagree with this statement?**



\*Rounded to the nearest integer

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree
- Skipped

The majority of respondents felt that our proposals would allow exam boards to take innovative approaches to assessment and would not unduly prevent innovation. Where

respondents did not agree or strongly agree with the statement, they were more likely to take no view than they were to disagree.

### Teachers' views

The overwhelming majority of teachers agreed that our proposals would allow exam boards to take innovative approaches to assessing GCSE computer science. They felt that this might bring the potential for a number of improvements to the accessibility of the assessments from which students might benefit.

*Example 1* "The mixture of proposed approaches e.g. screen-based, pre-released programming on which questions will be set, exam questions etc. allows the boards to produce interesting and appropriate assessments."

2 "Having on-screen exams will allow differentiated questions as well as "easy marking" when trying to determine a grade as it can all be automated. Exams can be differentiated to higher and lower grades. Questions can be practical to solve a particular problem for higher students whereas lower ability students can pick from a range of answers, or use blocks of code to arrange in order rather than having to type the syntax themselves."

Some teachers argued that this would likely provide benefits for centres in terms of greater choice about the form of assessment that their students would take – ensuring that this is best suited to their students and their own preferred teaching style.

*Example 1* "The exam board can specify the method of assessment and the school can choose the board most suitable to their students."

2 "Hopefully each board will take a slightly different approach and schools can decide which one suits their unique circumstances. I would be disappointed if all boards did exactly the same thing, thus no choice is available even though you are advocating it."

A few teachers agreed in principle with the statement but questioned whether this flexibility in approach might create the potential for new issues which would need to be closely monitored.

*Example 1* "You need to be tight on this to prevent one board creating an easier to achieve qualification than the others."

2 "... while innovation is good, this is not the priority. Exams in any subject should reliably do what they are intended to do - accurately assess the students in that subject. If innovation helps this - Yes, if it does not - No!!"

Where teachers neither agreed nor disagreed that our proposals would promote innovation, this was often because they felt that while our proposed approach may allow innovation, it did not require it and that exam boards were likely to adopt more conservative approaches to minimise risk. Others felt that innovative approaches to assessment might not fulfil other regulatory requirements and that in going through Ofqual's quality assurance checks exam boards might be forced to conform closely to existing models.

*Example 1* "It's not whether the exam board can, but whether they will. Not the same at all."

- 2            *“This proposal does not cover the decisions that will be made when accrediting proposed GCSE specifications. Those decisions have the potential to stifle innovation more than this set of proposals do.”*

Teachers who disagreed that our proposals offered opportunities for innovation generally felt that if we required exam boards to adopt an approach which met our definition of an examination (“assessments that are taken by all students at the same time, under formal supervision, and are set and marked by the exam boards<sup>3</sup>”), we would prevent alternatives which might be more appropriate for the assessment of practical programming skills such as coursework or an extended project. Some argued that the range of potential approaches to assessing programming skills by examination included in the consultation were not innovative, either because they reflected models already utilised elsewhere, or because exams presented an inherently conservative approach. Furthermore, it was felt that the form of assessment adopted might in turn influence the way in which the subject was taught. Concerns were also expressed that the degree of leeway offered to the boards under these proposals might allow them to ignore a potentially beneficial innovative approach or one requiring significant development work in favour of one which was easier to implement, for reasons other than the likely effectiveness of the assessment.

*Example 1    “If you specify an exam, then this takes away the option of doing a programming project over a series of weeks or months. Therefore, you are reducing the number of possible approaches.”*

- 2            *“Insisting on an examiner element for project development/lifecycle introduces yet another “taught to the exam” scenario and therefore by definition removes innovation.”*

Others agreed that our proposals *would* allow exam boards to innovate in their approaches but questioned whether this was a good thing. Some felt there was a risk that divergence in approach between the boards could lead to confusion among teachers and create rather than reduce opportunities for malpractice.

*Example 1    “An innovative approach may mean more problems in the future - there should be a consistent playing field for exam boards.”*

- 2            *“I am sceptical because CS [computer science] prior to last summer has always felt a bit like a hornet’s nest and has stifled / terrified teachers as they have been scared to over step or cross [the] seemingly endless grey fuzzy boundaries and risk malpractice and maladministration.”*

### Students’ views

In contrast to the views of stakeholders, the majority of students disagreed that our proposals would be sufficiently flexible to allow innovation by the exam boards, but comments suggested this was based in some cases on their opposition to assessing programming by examination.

*Example 1    “The level of skill students will be able to be tested on will be lowered so the variety of projects an exam board can do will decrease.”*

- 2            *“This increases the reliance on the final exam which is not an accurate measure.”*

---

<sup>3</sup> [As defined in our publication \*Developing New GCSEs, A levels and AS Qualifications for First Teaching in 2016\*](#)

Those who agreed suggested that exam boards would be more likely to be innovative if they were no longer required to expend resources dealing with malpractice arising from the NEA.

*“The completion of the NEA under controlled conditions... would cost the exam boards more time and money and would be much more confusing.”*

Students who neither agreed nor disagreed did not comment, other than one who felt that whichever approach the boards adopted, their rules around the completion of assessments should become more strict.

#### Representative groups' views

Of the representative groups that responded to this question, BCU School of Education agreed that our proposals were sufficiently flexible to encourage innovation but noted that the limiting factor would be the practicalities of their implementation in schools.

CAS neither agreed nor disagreed with our statement on innovation, noting that while our proposals would allow innovative forms of assessment, they did not require it. They indicated that their membership is divided over whether online or on-screen assessments would be preferable to other ways of assessing programming skills by examination, and noted that innovative approaches did not necessarily entail the use of technology.

The NEU disagreed that our proposals were sufficiently flexible to allow exam boards to innovate in their approach to assessing programming skills, arguing that our rules would stifle innovation by allowing only one approach to assessment. The NEU argued that more innovative approaches to assessment in GCSE computer science would be those that allowed greater use of Teacher Assessment and cited examples of other educational contexts where this is used:

*“A truly innovative approach would be to allow exam boards to trial or use other forms of assessment, for example Teacher Assessment. Teacher Assessment is used successfully in many countries such as Finland, where for the Basic Education certificate (awarded at 16) grades are determined by teachers. These grades are based on assessment guidelines for the subject in question... [Royal Society research] shows that it can be “more reliable and more valid than external assessment”. Ofqual’s proposals for the assessment of all content in GCSE Computer Science would unduly prevent the innovation of a potentially more reliable and more valid method of assessment.”*

#### Exam boards' views

Three of the exam boards (AQA, Pearson and WJEC) agreed that our proposals allowed flexibility in their approach to assessing programming skills by examination. Pearson felt that they would not be able to say definitively that the proposals would allow innovative approaches to work until they had fully explored the options available, but were satisfied that they were not prescriptive. AQA and WJEC noted that limitations on innovation were not likely to arise from our rules, but from other factors. WJEC identified school resources as a particular potential limiting factor:

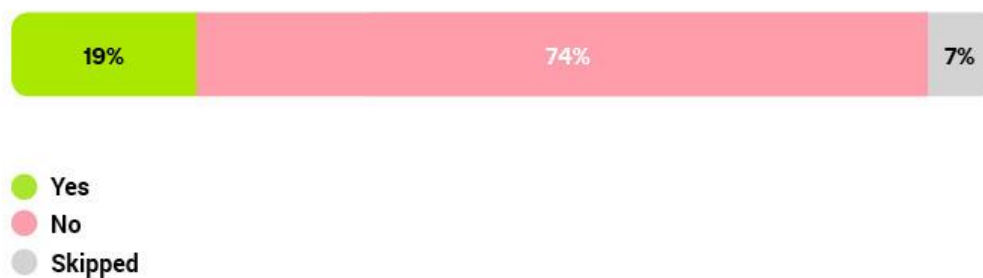
*“We believe that the most significant barrier to innovation is the variation in the range and quality of resources within centres, and the need to ensure that the requirements of the specification, including assessment arrangements, can be met in full by centres interested in delivering the course.”*

AQA were similarly concerned that schools' circumstances might restrict the range of approaches which they could feasibly adopt. They also argued that if exam boards adopted different approaches to cater for variations in school resourcing then this may lead to other issues:

*“Lack of specialist teachers, plus limitations with in-school IT infrastructure are also major considerations for AOs to ensure that developments and solutions are manageable and scalable nationally.... However, if individual AOs produce different assessment models this is likely to make comparability of demand an issue.”*

OCR neither agreed nor disagreed that our proposals would allow innovation. Similar to WJEC and AQA, they argued that this was because variations in schools’ resources and technological infrastructure were likely to restrict the range of approaches available to exam boards regardless of the flexibility in our rules.

**Question 11: Do you have any comments on the proposed changes to our rules for GCSE computer science presented in Annex A?**



Only a small proportion of respondents commented on the detail of the proposed changes to our rules for GCSE computer science.

Teachers’ views

The overwhelming majority of teachers did not comment. A very small number of those who did not have specific comments on the rules used this opportunity to comment on our proposals more generally. As these views have already been reflected in the responses to earlier questions, they have not been repeated here.

Teachers who did comment raised issues about the proposals more generally. Again, as the majority of these views have already been reflected in the responses to earlier questions, they have not been repeated here.

While not responding specifically about the language of our conditions, however, some teachers did make general comments about our proposals which are not captured elsewhere (potentially because they do not fit under a specific question) and so have been provided below.

*Example 1 “Having had experience with online assessments from 2 exam boards, the learning machine and WJEC/EDUQAS I’m concerned about the nature of submission of pupils’ exams. TLM’s online exams manage this very well with an online exam. EDUQAS had issues last year with pupils thinking that work had uploaded correctly but that not being the case or not being able to upload work and school staff having to submit it the following day, and then again in September only to discover that despite our best efforts some work had still not been submitted/assessed.”*

*2 “Good plan in general but please try to discourage the use of Python, it’s not the best and only has such high usage stats due to it being employed as a back end analysis tool in industry. C# is much better!”*

Others made novel suggestions about the potential approaches to assessment by examination which had not been raised previously, or about the manner in which the exam boards might provide support for teachers under an exam-only assessment model.

*Example 1* “What would be the chance of having two grades, like [combined] science where the student can have a 4-4 etc. One grade to reference their exam theory and the second for practical programming skill?”<sup>4</sup>

2 “I believe specifying which language is to be used in the assessment would help AOs produce exams which are fit-for-purpose. The 'Haggis' language used in Scotland is one potential language. It is fully specified and already has a basic online interpreter which could be built on.”

### Students' views

The one student who commented raised the importance of different skills to a computer science qualification.

### Representative groups' views

Only BCU School of Education and the NEU responded to this question. NEU noted that, while our existing rules allow for exam boards to restrict the range of programming languages which students can use in their assessments and require them to provide justifications when they do (a requirement of which they approve), in their opinion assessments should not restrict students to specific programming languages:

*“However, our opinion is that assessments should not restrict candidates to a particular language or set of languages. Any assessment should be designed with the freedom to achieve full marks if the appropriate programming skills are demonstrated, regardless of the language used.”*

The BCU School of Education argued in favour of an open programming project, and expressed concern that our proposals for assessment by examination could lead schools to reduce the amount of programming they teach to the detriment of progression:

*“One major concern that I hold is that there is potential for some teachers to complete less practical programming during the course. It needs to be made absolutely clear that practical programming is a valuable and integral part of the qualification. To facilitate progression onto the A level course or a relevant applied general qualification, it is absolutely vital that pupils can code.”*

### Exam boards' views

Only AQA commented on our proposed rule changes. AQA reiterated their views about the potential implications of reinstating the assessment objective weightings in response to Question 4 and expressed concerns about the requirement in the subject content for students to learn a high-level programming language (and therefore to be assessed on this in the examination under our proposed approach). In particular, AQA questioned whether syntax compilers should be available to students to test their programs when undertaking on-screen or online assessments under exam conditions, and if the language requirements could potentially have implications for awarding:

*“It would be unreasonable for AOs to ask students to remember anything but basic constructs in a high-level programming language so it risks making the questions less realistic/relevant, with less scope for stretching the grade 7, 8 and 9 students.”*

---

<sup>4</sup> This comment refers to GCSE combined science, which is a dual award worth two GCSEs. Grades are awarded for the subject as a whole on a 17-point scale from 9-9 to 1-1. It is not, therefore, graded in the way suggested here (separate grades for separate parts of the qualification).

## Appendix A: List of organisational consultation respondents

When completing the questionnaire, we asked respondents to indicate whether they were responding as an individual or on behalf of an organisation.

Below we list those organisations that submitted a response to the consultation. We have not included a list of those responding as an individual.

All Saints Church of England School

AQA

Arthur Mellows Village College

ASCL

Bedford Free School

Bethany School

Birmingham City University School of Education

Bramhall High School

Canford School

Claremont High School Academy

Clitheroe Royal Grammar School

Computing At School

Co-op Academy Leeds

Creative Computing Club CIC

Dronfield Henry Fanshawe School

Easthampstead Park School

Finborough School

Francis Holland School

George Mitchell School

Goldolphin and Latymer School



Hackney Learning Trust

Hayes School

Heartlands High School

Highcliffe School

Hill House School

Holbrook Academy

Horbury Academy

The Jewish Community Secondary School

Kettering Buccleuch Academy

King Edward VI Handsworth School for Girls

Kings Norton Girls School

Langtree School

Leeds Jewish Free School

Longridge Towers School

Lord Williams's School

Lymm High School

Marling School

Montsaye Academy

NASUWT

NEU

OCR

Outwood Grange Academies Trust

Oxford High School

Patcham High School

Pearson

Putney High School

Queen Mary's Grammar School

Queens' School

Rodborough School

Saint Aidan's CE High School

Sandbach School

Sandringham School

Buckingham School

Skinnners' School

St Albans School

St Bartholomew's School

St Birinus School

St Luke's Science and Sports College

St Mary's Catholic High School, Crewe

St Thomas More Catholic High School

The Champion School, Hornchurch

The Castle School

The Norton Knatchbull School

The Perse School

The Priory Academy, LSST

The Roundhill Academy

The Student Room

Twelve Oaks Softare Ltd

West Buckland School

Weydon School, Farnham

WJEC



© Crown Copyright 2019

This publication is licensed under the terms of the Open Government Licence v3.0 except where otherwise stated.

To view this license, visit

[www.nationalarchives.gov.uk/doc/open-government-licence/](http://www.nationalarchives.gov.uk/doc/open-government-licence/)

or write to

Information Policy Team, The National Archives, Kew, London TW9 4DU

Published by:

**ofqual**

Earlsdon Park  
53-55 Butts Road  
Coventry  
CV1 3BH

0300 303 3344  
[public.enquiries@ofqual.gov.uk](mailto:public.enquiries@ofqual.gov.uk)  
[www.gov.uk/ofqual](http://www.gov.uk/ofqual)