

Response from the Royal Society of Biology to Qualification Wales consultation.

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The Royal Society of Biology responded to Qualification Wales consultation on the future range of subjects that should be available as GCSEs and which other made-for-Wales qualifications should be available alongside them. RSB have engaged with Wales previously on the development of their new curriculum and took part in discussions with Qualification Wales on the new qualifications. To inform this response, RSB called for views from our Biology Education Research Group, Curriculum Committee, Education Policy Advisory Group and Education and Science Policy committee. We have also drawn on existing policy positions and our draft framework for a coherent 5-19 biology curriculum.

Introduction

The Qualified for the future – Phase 2 proposals include questions on the six different Areas of Learning and Experience (Areas) as well as Integral Skills. Please select the Areas you wish to comment on.

Science and Technology

Proposal 1 - GCSEs in Computer Science, Built Environment, Design and Technology, and Digital Technology.

RSB is not responding to this proposal

Proposal 2 – GCSE in Engineering and Manufacturing.

RSB is not responding to this proposal

Proposal 3 – GCSE Science qualification

We propose to create a new GCSE Science qualification to replace the existing set of science GCSEs. This qualification is likely to be roughly the size of two GCSEs.

There are currently several different science GCSEs available to schools with variations in content and assessment. Not all schools offer all options, so learners do not have an equal choice.

A single GCSE qualification would replace the current set of science GCSEs including Biology, Chemistry and Physics. This new qualification would be accessible to a wide range of learners and would support further study of, and careers in, STEM subjects. It would reinforce the connections across the whole Area.

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For learners who would like to focus more on science at 14-16, the next proposal outlines additional science qualifications that could be taken to supplement the new GCSE science qualification.

How far do you agree or disagree with our proposal to create a new GCSE Science qualification to replace the existing set of science GCSEs? This qualification is likely to be roughly the size of two GCSEs.

Strongly Agree / Tend to Agree / **Neither agree or disagree** / Tend to Disagree / Strongly disagree / Don't know

The Royal Society of Biology welcomes the proposal for a single-route for the Sciences at GCSE that is equitable in size to two GCSEs. The Society holds the view that all students should have equitable access to high quality study of the Sciences and that the best way to achieve this is by the creation of a single-route at Key Stage 4; removing the need for students to make decisions at the age of 14 that could limit their future choices.

This position is supported by the findings of research conducted by Shift Learning in 2018 on the variety of timetabling models used by schools in England at Key Stage 4, commissioned by the Association for Science Education, Institute of Physics, Royal Society, Royal Society of Biology and Royal Society of Chemistry.

Findings showed that only 13% of responding schools allowed students a completely free choice of either Combined Science or separate sciences; the majority of the remaining schools used at least one measure of attainment in allocating students. Additionally, research by the Sutton Trust found that 20% of higher attaining students eligible for free school meals attended schools that do not offer triple science compared with only 12% for higher attaining students from more affluent homes, further highlighting the current inequality of options open to students.

ASPIRES 2 research states that young people's choices, aspirations and progression are constrained by a range of educational gatekeeping practices. SCORE's 2014 report: 'The Sciences at KS4: time for a rethink' further highlights this problem; finding that the level 2 route with the highest progression rate was triple science with 46% progressing onto science related education at post 16. This was 26% for double science award and less than 5% of those taking an applied route. Therefore, suggesting that decisions at age 14 affect post 16 trajectories and a level playing field for all is therefore essential. ASPIRES triple science policy briefing recommends a common route for all at KS4 which would be more equitable and productive for schools and society.

We are pleased that Qualification Wales is considering a single route through the sciences for GCSEs. However as in the points that follow, it is important that each of the science disciplines have their own identity. RSB would recommend a single GCSE route that retains the identities of Biology, Chemistry and Physics. This could:

- Support better deployment of specialist teachers
- Ensure a clearer identity of the three individual subjects
- Provide separate grades for students, worth 2/3 of a GCSE grade, for each of the sciences
- Better support students' awareness and confidence in the individual subjects with a view to improving progression.

Research by Shift Learning showed that in many establishments the sciences are taught as a 'blend', with 46% stating that they do not timetable GCSE Combined Science separately for each discipline (i.e. biology, chemistry and physics). This can result in the characteristics and boundaries of the individual disciplines becoming lost to students.

RSB would support a single route for GCSE sciences in Wales, that retains either individual qualifications for each of the sciences or ensures that grades are sub-reported i.e. students receive individual grades for biology, chemistry and physics rather than a combined grade for all three, allowing students to make informed decisions about progression beyond GCSE. However, it does not need to be three individual GCSEs worth of time, we would recommend that qualifications in biology, chemistry and physics are each equivalent to 2/3 of a GCSE.

Currently, students either take a combined science, with a combined grade for three subjects, worth two GCSEs, or take three separate GCSEs and receive a grade for each of the three sciences. While triple science offers more scientific content, it is no more difficult than combined science. However, research by Shift learning showed that the conditions in which triple science is taught does in fact make it harder. Intensive time pressures can result in some students being expected to learn more content without having greater time to do so and in some cases even seeing sessions for triple science GCSE being offered at lunch or after school to make up the shortfall in space in the timetable. An approach that takes the best features of triple science and applies them to a more reasonably sized curriculum e.g. two GCSEs, would be a positive step towards a more equitable approach for students.

Such an approach will also better facilitate schools in appropriately deploying teachers with disciplinary expertise, with the sciences timetabled as biology, chemistry and physics and a teacher with specialism allocated to each. SCORE's 2014 report: The Sciences at KS4: time for a rethink provides evidence to support RSB's position of a single route for science at KS4 which retains separate identities for Biology, Chemistry and Physics.

RSB continues to have concerns about that lack of prescription in the published new Curriculum for Wales. RSB is currently developing a curriculum framework to set out our view of a cohesive and coherent 5-19 bioscience education and would be happy to engage with Qualification Wales to develop further detail for specifications using our curriculum framework to inform this process. There needs to be consistency of approach across the nation. It is critically important that pupils in Wales are qualified for a future not only within Wales but beyond and that students in Wales, who take the new science GCSE, are not disadvantaged in comparison to students in England, Scotland or Northern Ireland.

While we recognise that this consultation, and the associated new curriculum for Wales, focus on 3-16 education, 16-19 qualifications must be considered as the new 14-16 qualifications are developed to ensure students are able to successfully progress into A level, or equivalent, courses. RSB has taken a holistic view in developing our 5-19 biology curriculum framework and see the benefits for progression of this approach. Qualification Wales must consider the impact of significant change at ages 3-16 without yet reforming A Levels.

References:

<https://d25f0oghafsja7.cloudfront.net/sites/default/files/2019-06/shift-learning-science-timetable-models-research.pdf>

<https://www.bl.uk/britishlibrary/-/media/bl/global/social-welfare/pdfs/non-secure/m/i/s/missing-talent.pdf>

https://discovery.ucl.ac.uk/id/eprint/10092041/6/Moote_9538%20UCL%20Aspires%202%20report%20online%20version.pdf

https://www.rsb.org.uk/images/score_sciences_at_ks4_final.pdf

https://discovery.ucl.ac.uk/id/eprint/10080169/1/aspires_2_triple_science_policy_briefing.pdf

<https://hwb.gov.wales/storage/b44ad45b-ff78-430a-9423-36feb86aaf7e/curriculum-for-wales-guidance.pdf>

Proposal 4 – Additional, small science qualifications

We propose to create a set of small science qualifications that can be taken in addition to the proposed new GCSE Science qualification. These qualifications would enable learners with a strong interest in science to focus more on this Area at 14-16. These units are likely to be equivalent in size to either one-third or two-thirds of a GCSE.

This builds on the previous proposal to create a new GCSE Science qualification which replaces the existing set of science GCSEs. These supplementary qualifications would give schools the flexibility to tailor their curriculum and offer learners the choice to explore science further and in different ways.

The content would be designed to build on the new science GCSE and not duplicate it. It might be possible to combine units together to create a single additional GCSE in science on top of the GCSE science qualification set out in the previous proposal.

How far do you agree with our proposal to create a set of small science qualifications that can be taken in addition to the proposed new GCSE Science qualification? These units are likely to be equivalent in size to either one-third or two-thirds of a GCSE.

Strongly Agree / Tend to Agree / Neither agree or disagree / Tend to Disagree / **Strongly disagree** / Don't know

The Society is concerned that inclusion of additional, albeit optional, science qualifications may lead to a triple science route by default, therefore undermining the single route approach and its benefits. There is a risk that the creation of small science qualification risks overburdening students and putting increased pressure upon timetabling and resourcing for schools. It is likely that a student taking two or more of such smaller qualifications, equating to a full GCSE, will have a greater burden of work and content to learn than would be expected in a single course equivalent to one GCSE.

RSB would oppose the creation of additional qualification that could result in biology content such as ecology, natural science, climate change and investigative skills being removed from the core subject content and thus not being made available to all students. Furthermore, experiences provided through the learning of such curriculum areas directly link with many of the 'What Matters' statements for science and technology. For example, 'Being curious and searching for answers is essential to understanding and predicting phenomena' and 'The world around us is full of living things which depend on each other for survival.' Therefore, it would seem that in removing areas such as ecology and climate change from the core content of the Biology curriculum to create smaller science qualifications is at odds with the aims of the new curriculum for Wales and indeed, of the wider Welsh policy ambitions such as 'a globally responsible Wales' and a 'healthier Wales.'

The Royal Society of Biology is currently developing a curriculum framework to set out our view of a cohesive and coherent 5-19 bioscience education, informed by the expertise of our curriculum committee, drawing on research and best evidence, and developing learning progressions throughout. The framework will be published later in 2021, however we are happy to be engaged with Welsh government and Qualifications Wales while it is still in draft. The aim of the document is to inform policy makers, curriculum designers and specification designers.

Our curriculum framework includes 7 big questions, spanning three dimensions:

- **Biology as a science:** how biology works as a science, including the thinking and reasoning processes intrinsic to the sciences
- **Core concepts of biology:** the underpinning concepts of biology that help us to understand the living world around us
- **Biology in the world:** how biology can be used in real-world application and its impact on society

Within the 3 dimensions, the 7 big questions include themes that increase in depth and complexity from 5-19 to provide a narrative for teaching biology and a clear progression route to allow students to answer these questions.

The 7 big questions of Biology:

1. Big Question: How do we study the biological world?
2. Big Question: What are organisms and what are they made of?
3. Big Question: How do organisms grow and reproduce?
4. Big Question: How do organisms live together?
5. Big Question: How do organisms stay healthy?
6. Big Question: Why are organisms so different?
7. Big Question: How do people use biological knowledge?

Our curriculum framework includes scientific practices and thinking, and application and impacts as a key part of bioscience education. We would not support a new science GCSE in which key investigative or practical skills are separated out into additional qualifications.

RSB is concerned that students will not receive equitable access to science education because schools are extremely unlikely to be able to timetable and deploy teachers such that every school is able to offer every student every option to study small science modules. If Qualifications Wales decides to go ahead with creating a set of small science qualifications, the RSB would like to seek reassurance that all students would receive equitable access to such qualifications and that progression onto the further study of science would not be hindered by a requirement to hold one of these qualifications.

References:

<https://hwb.gov.wales/curriculum-for-wales/science-and-technology/statements-of-what-matters>

Next Steps:

RSB continues to have concerns about that lack of prescription in the published new Curriculum for Wales and would be happy to engage with Qualification Wales to develop further detail for specifications using our curriculum framework to inform this process. There needs to be consistency of approach across the nation, so clear expectations need to be set for a science GCSE and how it will ensure progression to A level and other routes.

In addition to this, RSB views the development of new made-for-Wales qualifications as an opportunity to explore alternative assessment models. RSB would be happy engage with Qualification Wales to discuss this further. Following publication of RSB's curriculum framework later in 2021, our curriculum committee will consider recommendations for assessment methods. Some of the possible assessment to consider might include:

- **Student portfolios** which contain a collection of student work and therefore often provide a more accurate picture of a student's achievement than a single test or project could.
- **Open book exams or flash cards** which encourage students to learn to apply knowledge rather than memorise course material. Additionally, the process of deciding what to include in the notes and putting concepts in your own words is advantageous for students.
- **Collaborative testing which asks** students take tests in pairs or small groups, allowing students to discuss the materials.
- **Performance Tests which asks** students to apply the knowledge or skill they have learnt while the assessor observes and evaluates the process.
- **Multiple choice testing with option to explain answers** which allows students to explain an answer to a multiple choice question to avoid ambiguity.
- **Home exams** give students problems that will take longer period of time to answer compared with a traditional examination and will encourage students to use a variety of reference points.
- **Options to retake** benefits most students by decreasing anxiety around high stakes examinations.
- **Replacing tests with summaries** which include the main points, a critical reaction to the ideas, and a discussion of what's most important.