Our vision is of a world that understands the true value of biology and how it can contribute to improving life for all.
Framing the Biology Curriculum

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RSB Curriculum Committee

- Convened in 2014
- Aim to ensure the biology curriculum, at all educational stages and through all qualification routes, is as relevant as possible
- And to prepare students for their next steps in life – whether they go on to study biology at university, use biology in a related career or use their biology knowledge as non-scientist citizens of the 21st century.
Why develop a framework?

• The framework will be used to inform policy makers in government, curriculum developers, awarding organisations and specification writers across the UK.

• We are consulting with the bioscience and education communities to inform our position and make recommendations for a coherent biology curriculum across 5 – 19, in preparation for future curriculum reviews across the UK.
A framework for the biology curriculum - three pronged approach

- Practices / Thinking and reasoning
- Core concepts
- Applications and impacts of biology

- How do we study the biological world?
- Big questions of biology
- How do we use biological knowledge?
How do we study the biological world (Practices / Thinking and reasoning)

1. Asking questions to help us understand the biological world
2. Developing and using tools to make observations
3. Planning and carrying out practical experiments and investigative work to collect data in the laboratory and in the field
4. Analysing, interpreting and evaluating data, qualitatively and by using mathematical and computational thinking
5. Developing explanations and models
6. Communicating information and engaging in evidence-based arguments
Big questions of Biology (core concepts)

7. What are organisms and what are they made of?
8. How do organisms grow and reproduce?
9. Why are organisms so different?
10. How do organisms stay healthy?
11. How do organisms live together?
How do we use biological knowledge?  
(Applications and impact)

12. Asking questions about the impacts of applications
13. Promoting human wellbeing and sustaining nature
14. Influencing policy and practices
15. Changing our views of the biological world
### Approach – developing big questions of biology

from Wynne Harlen’s *Big ideas of science*

<table>
<thead>
<tr>
<th>Harlen’s big ideas of science</th>
<th>Big questions of biology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisms are organised on a cellular basis and have a finite life span.</td>
<td>1. What are organisms and what are they made of?</td>
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<td>2. How do organisms grow and reproduce?</td>
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<td>3. How do organisms stay healthy?</td>
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<tr>
<td>Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms.</td>
<td>1. What are organisms and what are they made of?</td>
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<td></td>
<td>4. How do organisms live together?</td>
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<tr>
<td>Genetic information is passed down from one generation of organisms to another.</td>
<td>2. How do organisms grow and reproduce?</td>
</tr>
<tr>
<td>The diversity of organisms, living and extinct, is the result of evolution.</td>
<td>5. Why are organisms so different?</td>
</tr>
</tbody>
</table>
Approach - Mapping the curriculum

• We mapped the existing English curriculum statements, and reviewed content under headings of five big questions with a focus on:
  – Differences and similarities between the UK nations
  – Improving progression between age ranges
  – Improving coherence between themes
<table>
<thead>
<tr>
<th>Big questions</th>
<th>ages 5 - 7</th>
<th>ages 7 - 9</th>
<th>ages 9 - 11</th>
<th>ages 11 - 14</th>
<th>ages 14 - 16</th>
<th>ages 16 - 19</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are organisms and what are they made of?</td>
<td>Requirements for life</td>
<td>Tissues, organs and systems</td>
<td>Tissues, organs and systems : Exchange and transport</td>
<td>Tissues, organs and systems : Coordination and control</td>
<td>Biochemistry</td>
<td>Cell structure and function</td>
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<tr>
<td>Cells to systems</td>
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<tr>
<td>How do organisms grow and reproduce?</td>
<td>Growth and development</td>
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<td></td>
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<td></td>
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<tr>
<td>How do organisms live together?</td>
<td>Interdependence of organisms</td>
<td>Interdependence of organisms</td>
<td>Interdependence of organisms</td>
<td>Environmental interactions and processes</td>
<td>Biodiversity and human impact</td>
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<tr>
<td>Organisms and their environments</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>How do organisms stay healthy?</td>
<td></td>
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<td></td>
<td>Healthy lifestyles</td>
<td></td>
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<tr>
<td>Health and disease</td>
<td></td>
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<tr>
<td>Why are organisms so different?</td>
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<td></td>
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<tr>
<td>Variation, classification and evolution</td>
<td>Adaptations</td>
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</tbody>
</table>
Approach – “evolution not revolution”

• While revising and refining content, we followed the mantra “evolution not revolution” and considered questions on the following slide.

• In developing the 5-19 exemplification statements we have consulted with:

  - assessment and curriculum development specialists
  - bioscience higher education representatives
  - education researchers
  - initial teacher training representatives
  - primary and secondary teachers and specialists
  - representatives from industry;
  - undergraduate students.
Do the themes and learning progressions develop sensibly through compulsory education and post-16?

Where there are gaps in a learning progression, should ideas be added or content rearranged?

Is there consistency of language, operational and technical, across the age ranges and between themes?

Are there instances of unnecessary repetition of ideas between age ranges?

Do any of the statements need to be moved to a higher or lower age range to improve cohesion?

Are any of the statements outdated or scientifically incorrect?

Do any of the statements need to be rewritten to improve clarity or remove unnecessary detail?

Could any of the statements be removed, to lighten the content load and give students and teachers more time to develop core concepts?

Which statements in the current curricula for chemistry and physics are relevant to biology, and how should they be considered in our recommendations for the biology curriculum?

Is there appropriate coverage of topics often covered in personal, social and health education, or relationships and sex education, in a biological context?
<table>
<thead>
<tr>
<th>What are organisms and what are they made of?</th>
<th>What is life?</th>
<th>Tissues, organs and systems</th>
<th></th>
<th>Biochemistry</th>
<th>Cell structure and function</th>
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<td>Growth and development</td>
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<td>Inheritance and the genome</td>
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<td>How do organisms stay healthy?</td>
<td>Health and non-communicable disease</td>
<td>Communicable disease</td>
<td>Treating disease</td>
<td>Animal and plant defence against disease</td>
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<td>Health and disease</td>
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<td>Why are organisms so different?</td>
<td>Classification</td>
<td>Adaptation</td>
<td>Adaptation and evolution</td>
<td>Variation, adaptation and evolution</td>
<td></td>
</tr>
</tbody>
</table>
How do organisms grow and reproduce?

<table>
<thead>
<tr>
<th>Key stage 1</th>
<th>Lower KS2</th>
<th>Upper KS2</th>
<th>Key Stage 3</th>
<th>Key Stage 4</th>
<th>A Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth &amp; development</td>
<td>G &amp; D</td>
<td></td>
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</tbody>
</table>

Reproduction

Inheritance and the genome

![Diagram showing growth and development, reproduction, and inheritance through different stages and ages](image)

- **Growth and development**
  - Ages 5-7
  - Ages 7-11
  - Ages 11-14
  - Ages 14-16
  - Ages 16-19
- **Reproduction**
- **Inheritance and the genome**
Why are organisms so different?

<table>
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<th>Key stage 1</th>
<th>Lower KS2</th>
<th>Upper KS2</th>
<th>Key Stage 3</th>
<th>Key Stage 4</th>
<th>Key Stage 5</th>
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<tr>
<td>Classification</td>
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</table>

- **ages 5-7**: Classification
- **ages 7-11**: Adaptation
- **ages 11-14**: Adaptation and evolution
- **ages 14-16**: Variation, adaptation and evolution
- **ages 16-19**: Classification
Discussion:
Reflecting on the big questions

How do organisms grow and reproduce?
How do organisms live together?

- Is the learning progression appropriate and does the exemplification appropriately prepare students for the next phase? Are command words used appropriately?

- We have tried to reduce 14 – 16 content while maintaining, or ensuring, a coherent learning progression. Is the balance right? Should we be doing more to reduce?
Discussion: Making the curriculum relevant and useful for all students

• What do all students need to help them in their lives going forward?

• How can we future-proof biology/science in schools, and should we even try?

• Historic and contemporary figures – how can we include realistic role models, and engage with biology content through historic, local and global contexts, without a checklist of names in each specification?
Next steps

- Continuing to develop 11 - 16, 16 - 19 and 5 – 11 framework documents.
- Collaborative work with other societies
- Working towards publication of a Framework for the Biology Curriculum in May 2020
Publications


Links to publications and future events available at www.rsb.org.uk/curriculum
Where to find us at ASE 2019

– Tweet and follow our hashtag #RSBatASE
– Visit our stand in the exhibition marquee (A25)
– Details of other sessions in our RSB at ASE leaflet

How can the Royal Society of Biology support your teaching?

Please take our short survey at bit.ly/RSBatASE
Contact details

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For updates on our curriculum work please visit
www.rsb.org.uk/curriculum