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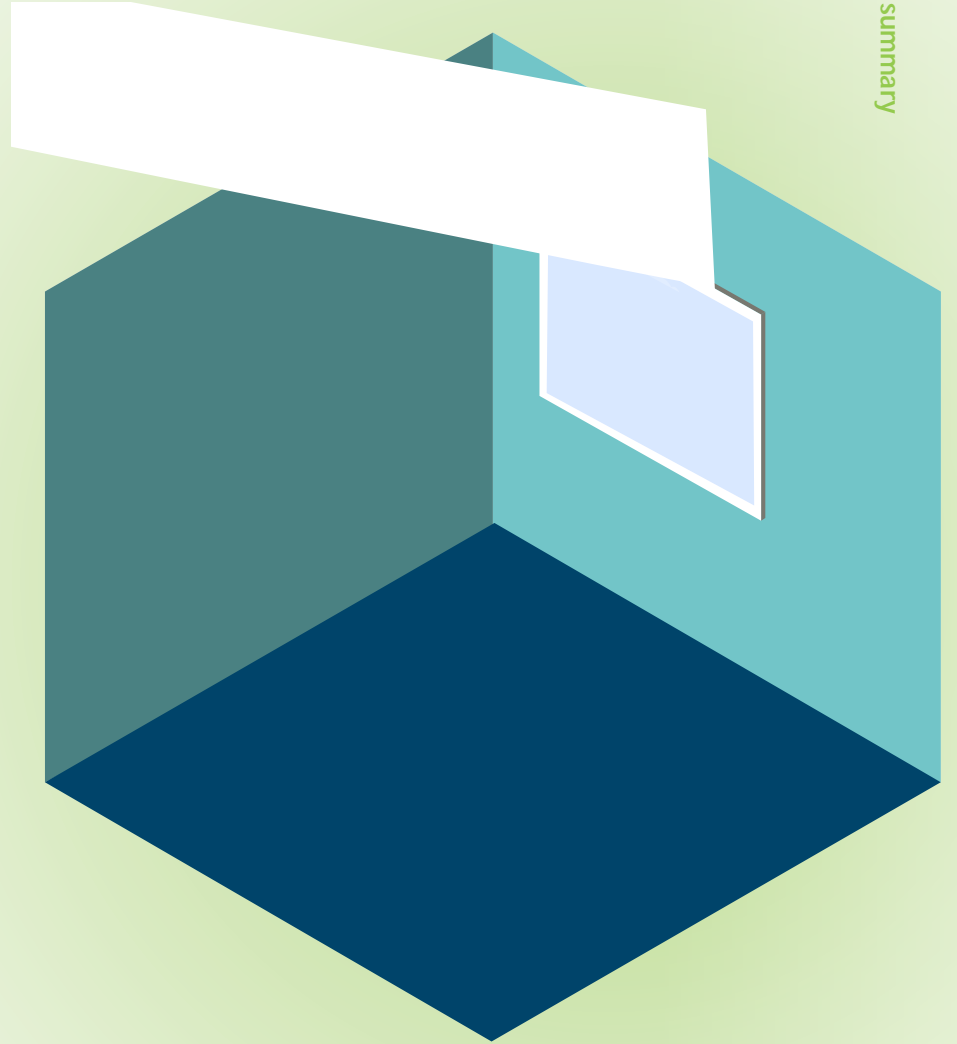
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# Introduction

## **Our previous Green Shoots research found that young people and chemistry educators around the UK and Ireland think climate change and sustainability should be a key priority for the chemistry curriculum at all ages.**

Young people are acutely aware of the climate change and sustainability challenges they face. Eight in ten of the students we surveyed, who were aged 11 to 19 years, told us that they think climate change is an urgent challenge to solve and a priority for the chemistry curriculum.

Chemistry educators agree, with **84%** of educators teaching ages 11–19 years and **94%** of those teaching ages 5–11 years saying it is important that chemistry and science lessons cover climate change and sustainability. However, many feel that current chemistry curricula are falling short. Two thirds of those teaching ages 11–19 years think the chemistry curriculum should have more content on climate change and sustainability, rising to nine in ten of those teaching primary school age.

Understanding the science of sustainability is not only important to enable young people to take their place as scientifically literate citizens – it is also essential to equip them for jobs in the green economy. The UK Government aims to support two million green jobs by 2030<sup>i</sup>, as part of the transition to net zero carbon emissions by 2050.<sup>ii</sup>

We wanted to better understand how well chemistry teaching in schools prepares young people for further study and work related to the chemistry of climate change and sustainability. We asked chemical scientists currently working in academia and industry what they think of the way the current chemistry curriculum covers these topics. 1,198 practising chemists responded to our survey.

**Their message was clear: the chemistry curriculum must be updated to close the current gap in skills and knowledge needed for green jobs now and in the future.**

<sup>i</sup>UK Government press release, 12 November 2020. Available at: <https://www.gov.uk/government/news/uk-government-launches-taskforce-to-support-drive-for-2-million-green-jobs-by-2030>

<sup>ii</sup>UK Government press release, published 20 April 2021. Available at: <https://www.gov.uk/government/news/uk-enshrines-new-target-in-law-to-slash-emissions-by-78-by-2035>

# Chemistry Education for Sustainability

We asked practising chemists what young people studying chemistry at school most need to learn about in relation to climate change and sustainability, selecting from a range of options.

**Practising chemists said the priority sustainability topics for *students going on to pursue further study or a career in the chemical sciences* are:**

1. Lifecycle and impact of materials and products; role of chemistry in developing new materials.
2. Carbon literacy: the science and relative impact of how sectors and individual actions contribute to climate change.
3. The finite nature of resources, element conservation, critical raw materials.
4. Pollution (air, soil and water).

**They said the priority sustainability topics for *all young people* to cover by the time they finish compulsory chemistry education are:**

1. Carbon literacy: the science and relative impact of how sectors and individual actions contribute to climate change.
2. The finite nature of resources, element conservation and critical raw materials.
3. The scientific consensus in relation to climate change and how it is established.
4. Pollution (air, soil and water).

**Respondents also suggested some *additional priorities for the curriculum* in free text comments. The additional topics that participants suggested were:**

1. Energy and related sustainability issues, such as cost, production, storage and recycling.
2. The role of chemistry in understanding and addressing climate change and sustainability issues.
3. Personal and societal responsibilities related to climate change and sustainability.
4. The role of politics in decision making and the way information on these topics is presented and sometimes misrepresented.

# C. Additional priorities for chemistry education

While chemists working in industry and academia identified similar priorities for the chemistry curriculum as chemistry educators, there was a notable difference. They also stressed the **importance of all students learning about the scientific consensus** in relation to climate change by the time they finish compulsory chemistry education.

In addition, several respondents suggested that chemistry teaching should help students understand the science of climate change and sustainability within the **wider social and political context**, as reflected in the additional priorities outlined on the previous page.

This is significant given that, in our earlier research, **40%** of those teaching chemistry to ages 16 to 19 years said they worried about teaching about sustainability and climate change because others might see them as controversial topics. The feedback from chemists in academia and industry reinforces the argument for ensuring the curriculum **empowers teachers to state the scientific consensus** directly.

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Most practising chemists think that current chemistry education in schools equips students only somewhat well to engage with climate change and sustainability, whether as knowledgeable citizens or through further study or work – and around one in three say it doesn't prepare them well.

In addition, **32%** of respondents in free text comments said that sustainability and climate change topics are lacking in the chemistry curriculum.

Many respondents also suggested that the **current curriculum content is out of date**. This is similar to feedback from chemistry educators, many of whom suggested that the curriculum could be improved by reducing some content, eg on fossil fuels, and adding more on specific sustainability topics.



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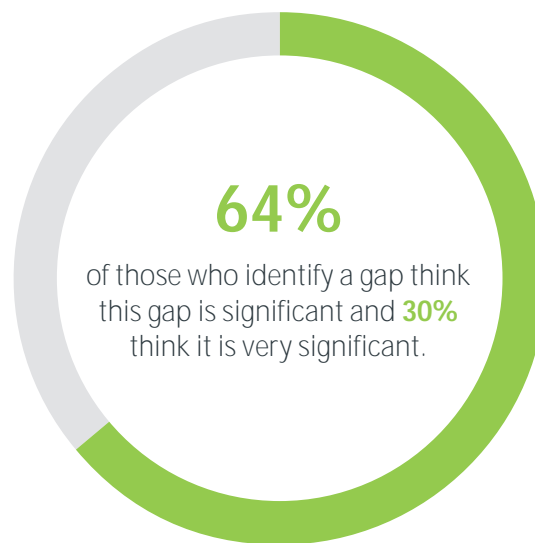
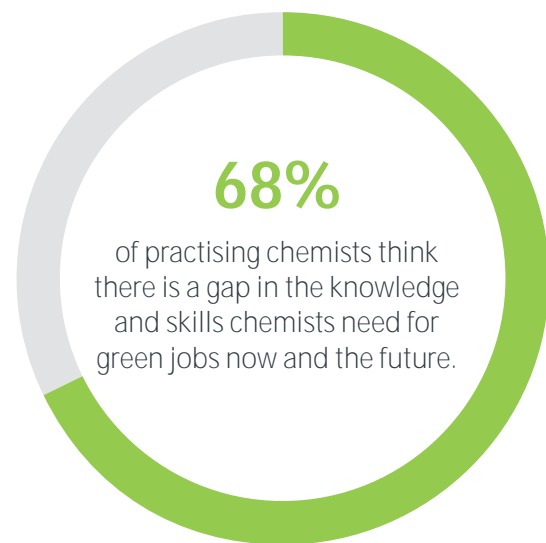
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# Trends

We asked chemists practising in industry and academia whether there is a gap between the skills and knowledge that chemical scientists currently have and those needed for green jobs now and in the future.

Nearly seven in ten said that there is a gap and less than one in ten said there isn't a gap, with the remainder of respondents being unsure. Of those who identified a knowledge and skills gap on sustainability topics, more than nine in ten (94%) said it is at least moderately significant.



Practising chemists identified a range of **specific limitations in current knowledge and skills**, including those related to: green chemistry, carbon capture and the impact of chemistry on the environment.

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