

Position Statement

Global perspectives and diverse representation in chemistry education

Last reviewed: January 2025

Summary

Teaching chemistry with stories, contexts and examples enriches learning for students and fosters a connection to a subject that is conceptually rich and can therefore sometimes seem abstract. The use of contexts helps students understand how chemistry is applied in the real world, both locally and globally. It helps students to understand the relevance of the ideas studied and how the discipline is evolving, to develop scientific literacy, and to appreciate what chemistry brings to our society.ⁱ But students should also see what society brings to chemistry – the diversity of the people that carry it out and who introduce new viewpoints, fresh ideas and different ways of thinking.ⁱⁱ Representation and inclusivity in chemistry education are critical to the learning experience and will help to ensure that pathways in the chemical sciences are open and attractive to all.

From an inclusion perspective, what matters when we tell the story of science?

- **Representation** – A good chemistry education effectively portrays the practice of science, including the people that carry it out. This practice is based on historic contributions to scientific discovery across different cultures and geographical locations. Chemistry education should also reflect how science is a global endeavour.ⁱⁱⁱ
- **For people like me** – Students should be able to relate to, and identify with, people and contexts within this modern representation of science. If students feel that their identity aligns with a subject, that it is for people like them, they are more likely to pursue that subject further.^{iv} Often a young person's trajectory in STEM, e.g. whether to follow a chemistry pathway at university, is strongly shaped by the alignment between their identity and that discipline.¹

What are the issues?

- Chemistry curriculums contextualise scientific discovery with examples of scientists that lack diversity, leading to representations that are predominantly white and male.^v Science is a global endeavour, but the curriculum is currently biased towards individual western contributions to, and achievements in, chemistry.
- Many students don't identify with chemistry as we currently present it. Reinforced stereotypes and assumptions of who can be a chemist lead to many learners feeling that chemistry is “not for people like me”.^{vi}

¹ This influence of identity also seems to extend beyond undergraduate study, as data shows that there is an under-representation of Black and some minoritised ethnic groups within academic progression in chemistry, which is particularly pronounced for Black chemists. This is despite chemistry being more ethnically diverse compared to other STEM subjects at undergraduate level.

What are we calling for?

- More diverse exemplification of scientist contributions in chemistry curriculums.
- Increased global perspectives in the chemistry curriculum, to show how a diverse society participates in science and delivers innovative solutions that make a difference to lives locally and globally.

What does this look like in practice?

Global perspectives

- In the course of their studies young people are regularly exposed to more diverse global perspectives, through examples of both historic and contemporary contributions from a wider range of nations, as well as situated knowledge² and practices of a wider range of communities.³
- Contemporary science developments are presented as collaborative efforts involving intersectoral, interdisciplinary and intercultural working within diverse teams.^{vii} Better cultural contextualisation will help shape students' understanding of how science is done, and help prepare them for a potential future in chemistry that will involve working with people from different backgrounds.

Diverse representation

- More diverse exemplification is embedded into chemistry curriculums and subsequent exam specifications, rather than treated as an 'add on'.⁴
- Teachers are supported to tackle stereotypes in chemistry education. By reflecting different identities in their chemistry teaching and showing the diversity of chemistry careers and in turn the people who work in them, more students see representations of working scientists they can identify with - people who look like them and have similar backgrounds.^{viii}
- If appropriate, teachers can adopt a science capital teaching approach enabling students to contribute examples from their own lives.^{ix} This will help to enrich taught content with the diversity of knowledge amongst students and to form a greater sense of belonging amongst these students.⁵

² 'Situated knowledge' refers to how scientific knowledge is influenced by the contexts it is produced in. See:

<https://www.sciencedirect.com/topics/computer-science/situated-knowledge#:~:text='Situated%20Knowledge'%20refers%20to%20the,universal%20and%20purely%20objective%20truths.>

³ Illustrations of these contemporary global contributions can be found in the Primary Science Teaching Trust resource '[I Bet You Didn't Know](#)', and '[Education in Chemistry](#)' resources on science research.

⁴ Alice Ball, a Black female chemist who discovered an effective treatment for leprosy by isolating ethyl esters from chaulmoogra oil to create a water-soluble injection. Jabir Ibn Hayyan commonly known as the 'Father of Arab Chemistry' developed a number of techniques including distillation and went on to discover hydrochloric acid and nitric acid by distillation. Nigerian biochemist Eucharia Nwaichi is working to control pollution in the Niger delta: <https://www.chemistryworld.com/research/harnessing-plants-and-microbes-to-tackle-environmental-pollution/3010307.article>

⁵ This approach may be particularly effective in classrooms with greater ethnic diversity and more students from migrant backgrounds. In predominantly White-British classrooms the science capital teaching approach is still a useful tool in engaging students whose existing science capital is less recognised.

What do we hope to achieve?

- With richer context and representation students will feel inspired and see themselves as scientists,^x encouraging wider participation in the sciences.^{iv}
- Students see the benefits of working as diverse teams and develop a richer view of what chemistry can do, along with better considering the impact of issues on different parts of the world.
- Students appreciate science as a collaborative process where people can both benefit from scientific breakthroughs and contribute to them. They can be inspired by global scientific collaboration that is tackling global challenges and where all contributions are valued,^{xi} and aspire to be part of it.

Recommendations

1. Teaching chemistry with contexts, examples and history is vital for a good chemistry education. We recommend governments ensure that contributions of scientists from more diverse backgrounds are included and exemplified in chemistry curriculums. These examples ought to be actively embedded wherever possible and appropriate⁶ and kept under review, with clear links to curriculum content.⁷
2. Where links can be made to curriculum content, use of diverse scientist biographies can ensure all students see representations they identify with.⁸ It is important that this starts in primary school where stereotypes formed in early years can impact career progression.^{xii} Teachers could be supported to do this with classroom resources (such as posters), curriculum linked example banks, and through professional development that showcases a wider range of careers, and the diverse people in those roles.
3. We recommend that governments support schools with guidance on developing a more inclusive education experience, alongside more diverse curriculum content. To compliment this, school inspectorates in all nations could monitor school efforts to develop student understanding and appreciation of cultural diversity, and a fascination in the world around them.⁹
4. Publishers of chemistry and science textbooks have a role in highlighting more diverse contributions to chemistry throughout future publications, providing teachers and students with relevant diverse examples linked to their learning.^{xiii}
5. Where possible, we recommend Initial Teacher Education (ITE) discusses embedding global perspectives and diverse representation with trainees, as well as inclusive teaching practices that promote and celebrate diversity.¹⁰
6. We recommend the use of quality professional development and learning to support teachers in exposing students to contemporary cutting-edge research from diverse teams of scientists across the world and using more diverse representation.¹¹ Over time, we recommend science departments review curriculum content to ensure that the support provided is relevant and up to date.

⁶ Not limited to one off occasions such as Black history month.

⁷ Recommend care be taken to ensure that a range of examples are used but not repeated at different stages of education.

⁸ A suggested resource is 'A Scientist Just Like Me' by the Primary Science Teaching Trust. See: <https://pstt.org.uk/unique-resources/a-scientist-just-like-me/>

⁹ For example, in England Ofsted may consider the use of 'Spiritual, Moral, Social and Cultural (SMSC) development' as a means of measuring this.

¹⁰ Leeds Beckett University and Newcastle University have published an anti-racism ITE framework: https://www.ncl.ac.uk/mediav8/humanities-research-institute/files/LBU_Anti_Racism_11-compressed.pdf

¹¹ In Wales anti-racist professional learning is currently freely available to all educational professionals.

For any queries relating to this position statement, please contact: EducationPolicy@rsc.org

References

- ⁱ Royal Society of Chemistry (2020) *The elements of a successful chemistry curriculum: The Royal Society of Chemistry's vision for 11-19 chemistry education*. Available at: <https://www.rsc.org/globalassets/22-new-perspectives/talent/chemistry-curriculum-framework/chemistry-curriculum-brochure.pdf> (Accessed 21 October 2024).
- ⁱⁱ Berkeley, University of California (2024) *The scientific community: diversity makes the difference*. Available at: <https://undsci.berkeley.edu/understanding-science-101/the-social-side-of-science-a-human-and-community-endeavor/the-scientific-community-diversity-makes-the-difference/> (Accessed 8 May 2024).
- ⁱⁱⁱ Royal Society of Chemistry (2020) *Inclusion and Diversity strategy to 2025*. Available at: <https://www.rsc.org/policy-evidence-campaigns/inclusion-diversity/strategy/> (Accessed 21 October 2024)
- ^{iv} Archer, L., DeWitt, J., Godec, S., Henderson, M., Holmegaard, H., Liu, Q., MacLeod, E., Mendick, H., Moote, J. and Watson E. (2023) ASPIRES3 Main Report. London, UCL
- ^v BDSIP (2022) *Diversity and the science curriculum*. Available at: <https://bdsip.co.uk/diversity-and-the-science-curriculum/> (Accessed 21 October 2024)
- ^{vi} Royal Society of Chemistry (2020) *Is chemistry accessible for all?* Available at: <https://www.rsc.org/globalassets/22-new-perspectives/talent/is-chemistry-accessible-for-all/rsc-is-chemistry-accessible-for-all.pdf> (Accessed: 21 October 2024).
- ^{vii} Alison J. Trew, Craig Early, Rebecca Ellis, Julia Nash, Katharine Pemberton, Paul Tyler, Caroline Skerry, Lucy Bird, Naomi K.R. Shallcross, Timothy G. Harrison & Dudley E. Shallcross (2023) Can current science research in the biological sciences be used in primary school children's scientific enquiry?, *Journal of Biological Education*, 57:3, 455-468, DOI: 10.1080/00219266.2021.1924229
- ^{viii} Barnardo's Education Community, 'Representation matters in promoting positive mental health'. <https://www.educators-barnardos.org.uk/resources/m-a-representation-matters> (Accessed 21 October 2024)
- ^{ix} Godec, S., King, H. & Archer, L. (2017) *The Science Capital Teaching Approach: engaging students with science, promoting social justice*. London: University College London.
- ^x Chemistry World (2023), 'Big Manny's viral science content is making chemistry relatable and accessible'. Royal Society of Chemistry. Available at: <https://www.chemistryworld.com/careers/big-mannys-viral-science-content-is-making-chemistry-relatable-and-accessible/4018322.article> (Accessed 15 November 2024)
- ^{xi} OECD, 'International collaboration in science'. Available at: <https://www.oecd.org/en/topics/sub-issues/international-collaboration-in-science.html> (Accessed 21 October 2024)
- ^{xii} Chambers, N. (2021) *New research on the stereotypes formed at a young age, their long-term impacts and what can be done to tackle them successfully*, *HEPI*. Available at: <https://www.hepi.ac.uk/2021/12/14/new-research-on-the-stereotypes-formed-at-a-young-age-their-long-term-impacts-and-what-can-be-done-to-tackle-them-successfully/> (Accessed: 25 July 2023).
- ^{xiii} Murray, C., Anderson, Y., Simms, C.H., Seery, M., (2022) *Representations of women and men in popular chemistry textbooks in the United Kingdom and Republic of Ireland*, *Chemistry Education Research and Practice*, 23, 373-384, DOI: 10.1039/d1rp00187f