The role and relevance of science in addressing global concerns

Berry Billingsley

The theme within this edition of *School Science Review* is 'The role and relevance of science in addressing global concerns'. The duration of the COVID-19 pandemic and the extent of its impacts on society, education and individual lives continue to emerge, and several articles in this theme consider the short- and longer-term consequences of those impacts. With the group I lead at the Epistemic Insight Initiative, we consider a range of perspectives on practical work to argue that, despite the challenges, it remains an essential aspect of science education. The article describes a free scheme for children in years 4–7 (ages 8–12) that is designed to promote scientific enquiry. 'Essential experiences in science' includes bright, friendly investigation cards that can be easily moved between home and school for homework or in the event of a local lockdown (Figure 1).

Fostering sophisticated epistemology of science among students has been a longstanding and cherished goal of science education. Despite decades of research, interventions and educational reform, teachers and curriculum planners continue to accept that the challenge of how to improve student perceptions of the nature of science and scientific inquiry remains. COVID-19 has been heralded as creating unprecedented times. Could it also have an unprecedented consequence for how science is presented and understood in school? Seeing science at work in the context of addressing real-world problems reminds us that the nature of truth in science is not absolute. In his article, John Wood reminds us of a quotation by the historian Edward Gibbon that the laws of probability are true in general, but fallacious in the particular (Bonnard, 1969). We can use scientific methods and mathematical modelling to discern patterns and probabilities in nature. We can write laws and computer algorithms to explain and predict patterns that emerge. But although these are useful and important descriptions of nature in general, they can create injustice and unhappiness if they are applied to individuals to make decisions. A contemporary example concerns the now aborted use of algorithms to regulate students' A-level and GCSE exam results in England, Wales and Northern Ireland. The incident is likely to prompt discussions in staffrooms and classrooms for some time. It is a chance to critique the strengths and limitations of technology and highight that there is no replacement today for human insight. There is no machine today that can walk in our shoes or experience what a student will feel when opening the envelope on results day (Figure 2). John Wood makes a case that scientific enquiry has to be combined with epistemic insight to make the possibility of tackling many of the grand challenges facing society a reality. He also describes his relationship with the European Commission on Open Science and Open Innovation. The Open Science movement seeks

Figure 1 These and other investigation cards can be taken home in the event of a local lockdown to support children's continued access to 'essential experiences in science'

Figure 2 A decision to use an algorithm to moderate students' marks is likely to be a talking point for some time

to tackle global challenges by sharing information across cultures and disciplines. John explains that the nature of Open Science is focused on the fact that knowledge can be shared via the internet, and it is how we use that knowledge that is important.

Continuing our review of ways to understand science, Sibel Erduran discusses media reporting of science during the pandemic and gives some practical ideas about how teachers can unpack information about science presented in the media. Her article unpacks the issue of framing of science in schools by asking, '*how do scientists do science?*' and '*how does reasoning in science compare with reasoning in other school subjects?*' As Sibel explains, these questions can potentially help us to identify similarities and synergies across school subjects as well as features that differentiate science from other ways of knowing.

Global concerns, including the COVID-19 pandemic, call for expertise across a wide range of disciplines. The Epistemic Insight Initiative seeks to broaden students' appreciation of the distinctive role of science and its similarities and differences with other disciplines and ways of knowing. In his article, Stephen Thompson describes the work and interests of Professor Sir Colin Humphreys, a materials scientist who seeks to advance the frontiers of knowledge in engineering and in the humanities. This article proposes that Sir Colin Humphreys would make a good case study for teachers and students to consider how a research scientist can have interests that bridge the cultural divide between science and religion.

Michael Reiss invites us to consider a contentious and challenging question for science education. He asks, 'Should we teach about the genetics of intelligence?' Michael explains that our genes are central to who we are and how we come across to others. As he notes, the links between genetics and intelligence are likely to be of interest to students and of value to society. Genetics explains how the theory of evolution through natural selection works and it is central to such applied topics as plant breeding and biotechnology. Michael goes on to make three claims, which are that '*education needs to stop ignoring the possible role of genetic inheritance in school performance*', that '*genetic inheritance can play a significant role in how well children do in schools*' and that '*this does not mean that children's school performance is predetermined, that is, fixed in advance*'.

If secondary school teachers are to work with more topics that bridge disciplines, they will probably find it useful to collaborate with colleagues in other curriculum areas. In the article I share with Robert Campbell and Matthew Dell, we reflect on an intervention that brought together trainee science and RE teachers. As the authors explain, there are many topics that lend themselves to a cross-disciplinary exploration and thus a collaborative approach. One such example is the '*nature of families, including: the role of parents and children*' (AQA, 2017: 21). The UK has recently changed its position on family law and what the legal grounds are for parents accessing genetic selection technology. In the intervention, trainees considered two case studies that prompt an examination of the scientific and ethical perspectives of using this technology to create a child who is designed to save the life of an older poorly sibling.

Finley Lawson, Megan Hunt, Daniel Goodwin and Stefan Colley extend our exploration of the benefits and outcomes of providing students with opportunities to examine science in wider contexts. Their intervention and research were focused on teenagers taking part in an informal learning activity. Their article explains the activities that students explored and is called, 'Inspiring Minds: how big questions can build students' epistemic insight and improve attitudes towards STEM'.

Within an uncertain environment, young people who are already experiencing uncertainty about how best to make successful transitions between school, university and beyond, may feel an exacerbated sense of anxiety. It becomes particularly important to ensure that students can access advice and accurate information about science-related careers. The last article, by Keith Taber and colleagues, provides some useful background to this issue. It reports an interview study that asked students to talk about the nature of scientific knowledge in the context of considering a selection of science-related careers. Students' comments revealed a range of goals that they associate with careers and the role that science plays. These included understanding the world and our place within it and using science to engineer changes.

References

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Berry Billingsley is Professor of Science Education at Canterbury Christ Church University. Berry's experience includes school and teacher education, television production and writing content for textbooks. Her current focus is national and international research relating to epistemic insight.
Email: berry.billingsley@canterbury.ac.uk