

Science with and for society

Ruth Amos, Marie-Christine Knippels, Elena Kyza and Ralph Levinson

Over the last 30 years there have been many debates about the links made in science lessons between science and society. Curriculum innovations in the UK such as Salters' Science and Twenty First Century Science have promoted ways in which science can be taught through social contexts. However, curriculum changes, particularly those in recent years, often make it understandably difficult for teachers to focus on science–society connections in their teaching as it comes at the expense of not sufficiently covering the core material for examinations.

So how can science be taught through social contexts without sacrificing substantive knowledge? Responsible Research and Innovation (RRI) is a European Commission initiative promoting citizen participation in the development of science and technology. Its purpose is to ensure that techno-scientific innovations reflect society's needs and that they are socially desirable, ethically acceptable and sustainable. Its thematic elements include gender equality, ethics, open access, public engagement, governance and, importantly, science education. Science education should aim to attract young people into STEM-related careers, supporting them in understanding that the products of science are both *for* and *developed with* people. In this way, science becomes democratised and ethically underpinned.

PARRISE (Promoting Attainment of Responsible Research and Innovation in Science Education) (www.parrise.eu) is a European Commission-funded project that supports the aims of RRI through inquiry-based tasks that also enable understanding of science and its social aspects. The resources of PARRISE are directed towards the professional development needs of science teachers at all stages of their careers, whether they are pre-service or in-service teachers. Characteristic of PARRISE is the teaching of science through inquiry in contemporary controversial issues. A pedagogical model called socio-scientific inquiry-based learning (SSIBL) has been developed that

links students' authentic questions through inquiry with taking action to effect change. The first article, by Ralph Levinson, introduces the SSIBL model and some ways in which it can be implemented. It provides the background on SSIBL taken up by the other authors.

Dianna Radmann, Franz Rauch and Bernhard Schmölder illustrate a multi-agency approach to SSIBL, an initiative called Mobility, Traffic and Renewable Energies, in which in-service teachers, pre-service teachers, climate region managers, teacher educators, school students and other interested partners in the Austrian province of Carinthia develop inquiry programmes exploring ways to ameliorate effects of climate change. Spain is the national context for two other inquiry projects devised by teachers. Marta Romero-Ariza, Ana Abril and Antonio Quesada outline inquiries that focus particularly on aspects of risk and ethics, which are highly relevant when discussing new technologies. Marie-Christine Knippels and Michiel van Harskamp describe a teacher development programme in the Netherlands supporting pre-service teachers in developing their own SSIBL ideas through an ethical framework.

Teacher collaboration and co-learning is an important aspect of PARRISE. Eleni Kyza, Yiannis Georgiou, Andreas Hadjichambis and Andria Agesilaou present an activity in which in-service science teachers in Cyprus assume the roles of learners and reflective practitioners to investigate the controversial socio-scientific issue of antibiotics in livestock. Finally, Ruth Amos and Andri Christodoulou explain how teachers can support students in asking meaningful SSIBL questions and working with and understanding the nature of evidence about global and local issues.

Brexit may take the UK out of the EU, but these articles illustrate that, as European neighbours, we face common challenges. We can still learn and collaborate through science education.

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