EDITORIAL

Trust in Science and Science Education—Part 2

Sibel Erduran[1]

This issue of *Science & Education* is the second part of a thematic set of papers on "Trust in Science and Science Education." October 2022 issue included 13 papers and an editorial, covering some epistemic and societal perspectives about science, and what they imply for trust in science. In this issue, 12 papers question a range of topics including the actors, voices, and contexts of science, drawing attention to issues such as social justice, ethnicity, and gender. Educational examples are discussed including in the context of informal learning environments, and trust in science is related to critical rationalism and realism. A theme across some papers is the importance of scientific knowledge in ethical and political education. In the following paragraphs, a brief review of the content of the papers is presented with implications for future research.

In considering the role of the social context of science, Fernandez, Benitez, and Romero-Maltrana argue that even though the social character of science is evident, it does not entail epistemic relativism with respect to scientific knowledge. Rather, the social context of science itself increases the reliability of scientific outputs. The authors believe that science education needs to pay closer attention to the scientific community as a social group. Smith draws on the media accounts of the COVID-19 vaccination debate in Australia, arguing that science education should make explicit the ways in which the community of science interacts to produce and verify knowledge, and equip students to recognize uncertainty and dissent as being central to science. Allchin on the other hand posits that the core question for the citizen-consumer is not philosophically "why trust science?" but sociologically "who speaks for science?" The next two papers focus more closely on issues related to social justice. Waight and colleagues contrast narratives of successes of science and technology with narratives of vaccine hesitancy and mistrust in science among particularly minoritized groups. They argue for reframing the scientific, technological, and science education communities to address racism and injustice. Focusing on learning in museum contexts, Piequeras and colleagues present a study based on an out-of-school educational activity, where teenagers explore and discuss hominid reconstructions. Their results show that the exhibition displays human evolution in the form of a linear sequence from a primitive African prehistory to a more advanced European present. Behind this depiction of human evolution lies stereotypic notions of ethnicity and gender.

✉ Sibel Erduran
  sibel.erduran@education.ox.ac.uk

[1] Department of Education, University of Oxford, 15 Norham Gardens, Oxford OX2 6PY, UK

Educational interventions that integrated trust-related themes in science teaching and learning are discussed by the following three papers. Bateman presents a study where students explored a complex, real-world geological problem about which expert scientists had previously made competing claims through geologic maps. Provided with data, expert uncertainty ratings, and the previous claims, students made new geologic maps of their own and presented arguments about their claims in written form. She argues for explicit instruction around uncertainty can be introduced during undergraduate courses. Nation and Feldman examine the complex nature between science teacher beliefs and the impact on their instructional practices of climate change–centered curriculum. The teachers involved in their study did not espouse these beliefs within their instruction of the curriculum and instead remained "neutral" when teaching about climate change. Estigarribia and colleagues discuss an educational innovation through design-based research, which was oriented to the treatment of information disseminated in the media and social networks related to COVID-19. They identified criteria that students applied to trust or not to trust the circulating information and a series of strategies to corroborate the information.

The final set of papers raise questions about rationality and critical realism in relation to trust in science. Duarte and colleagues note that despite advances in discussions about the nature of science, there is still a paucity of discussion on the ontological dimension of science in science education research. The authors argue that the reestablishment of trust in science and its teaching requires an effort to understand the contemporary social contradictions, problems, and challenges. Ferguson highlights the dichotomy between trust in scientific evidence and scientists as experts, versus critiques of the limitations of scientific knowledge and a mistrust in scientists as biased professionals and political agents. The author presents the argument that society can both trust in scientific evidence and question scientific bias in the same space, holding these two seemingly opposite positions in productive tension. The author further advocates that we should teach students to do the same. Critical realism is presented as an ontology and epistemology to frame science education with a focus on the development of critical scientific literacy by teaching students what is real and what is arbitrary about science. Chmielewski too considers whether the critical rationalist philosophy of science may provide a rationale for trusting scientific knowledge. The author considers insights of Karl Popper's social and political philosophy in order to see whether they may be of help in offsetting the distrust of science and visits how the theoretical principles of the critical rationalist philosophy of science may afford a foundation for building trust in science. Toscano and Millar investigate rationality and its relationship to trust in science in the context of three proposed spaces of science education: the formal, informal, and casual. They discuss how each space privileges particular forms of rationality as a means for understanding trust in science.

Overall, the second and final set of papers provides a range of perspectives for the history, philosophy, and sociology of science as well as science education communities to draw on about trust in science and science education. In our age of misinformation and fake news, the ability to engage in scientific reasoning and particularly evidence-based reasoning has become ever more important. Yet, as several articles in the two thematic issues illustrate, fostering scientific habits of mind may be necessary but not sufficient in navigating the complex set of science-related problems that the planet faces including the climate emergency. The continuing legacy of racism, sexism, and colonialism around the world marginalize some individuals and communities from active and equitable engagement with and in science, disadvantaging not only them but also the

very institution of science itself given the set of voices contributing to scientific debate becomes restricted as a consequence. A constructive way forward will be through nuanced considerations about the opportunities as well as the tensions surrounding the epistemic, ontological, and social dimensions of science in the context of science education where polarized dichotomies and simplifications are avoided.