Scientific Literacy, Socio-Scientific Reasoning, and the [RI]$^2$ Approach

Scientific literacy is a broad idea with diverse, sometimes conflicting interpretations, and yet is often mentioned as a goal of curriculum and instruction. The concept has been around in various forms for more than 60 years. Douglas Roberts addressed the concept of scientific literacy as a way of conceptualizing outcomes of science education in comprehensive reviews of research on the topic (Roberts, 2007). He proposed a contextualized vision of scientific literacy that involves student engagement embedded in the context of societal issues impacted by scientific phenomena. These issues have come to be known as socio-scientific issues (SSI). The complex and controversial SSI are illuminated by understandings of interwoven scientific processes and content. Robert’s perspectives are more challenging to achieve than traditional views of scientific literacy and may be absent from many students’ science learning experiences.

The [RI]$^2$ approach prioritizes student engagement with SSI to promote the ambitious form of scientific literacy advocated by Roberts. Issues such as hydraulic fracturing (fracking), climate change, and gene editing, serve as a central organizing feature of the [RI]$^2$ approach. Research on teaching and learning indicates that promoting contextualized scientific literacy is critical for science education and that the [RI]$^2$ approach can be an effective means of supporting learning aligned with scientific literacy goals (Sadler, 2011; Zeidler, 2014).

Teaching with SSI through the [RI]$^2$ framework promotes significant critical thinking and reasoning for students. Sadler, Barab, and Scott (2007) suggested specific competencies associated with the negotiation of SSI as a means of more precisely operationalizing what students ought to learn through participation in [RI]$^2$ learning opportunities. They called this set of related competencies socio-scientific reasoning. The list below presents the field’s current thinking regarding what students should be able know, do, and apply across different SSI as a result of learning through the [RI]$^2$ approach.

1. Accounting for the inherent complexity of SSI,
2. Analyzing issues from multiple perspectives,
3. Identifying aspects of issues that are subject to ongoing inquiry,
4. Employing skepticism in analysis of potentially biased information, and
5. Exploring how science can contribute to the issues and the limitations of science.

These five socio-scientific reasoning competencies are consistent with Roberts’ ideas about scientific literacy, and they can and should be directly addressed during [RI]$^2$ unit design and implementation. Deliberate attention to socio-scientific reasoning is one of the features that distinguishes [RI]$^2$ teaching from other approaches. We think it is important to be purposeful in unit design to incorporate opportunities for students to explore and develop socio-scientific reasoning competencies.

References: