Engaging Students in Argumentation and Sense-Making Activities to Improve Science Learning

To be proficient in science, students not only need to understand science content, but they also need to be able to construct evidence-based explanations in classrooms through scientific inquiry. The importance of both science content and practice is emphasized in the recently released Next Generation Science Standards (2013). Specifically, students are expected to learn disciplinary core science ideas in the context of science and engineering practices. The Next Generation Science Standard identifies eight science and engineering practices that are essential for students to learn: (1) Asking questions/defining problems; (2) Developing and using models; (3) Planning and carrying out investigations; (4) Analyzing and interpreting data; (5) Using mathematics and computational thinking; (6) Constructing explanations/designing solutions; (7) Engaging in argument from evidence; and (8) Obtaining, evaluating, and communicating information. This symposium will touch on many of these science practices, as these practices are interconnected and overlap, but the main focus will be on the use of argumentation and student engagement in sense-making activities (i.e., interpreting data, warranting claims, and communicating findings). Argumentation and sense-making activities can help provide students with a deeper understanding of the science content as well as improve their critical thinking and metacognitive skills.

To that end, this symposium will highlight two interventions that are currently being developed and will present findings on the potential promise of these approaches. In the first study, researchers are exploring the promise of the Argument-Driven Inquiry (ADI) instructional model to increase students’ science proficiency. The ADI instructional model emphasizes student engagement in scientific practices, such as argumentation and writing, as a means for students to make sense of science concepts. In the second study, researchers are exploring the relationship between students’ experimentation during inquiry and their sense-making of the data collected (i.e., interpreting data, warranting claims, and communicating findings) to determine the promise of an intelligent tutoring system to assess and scaffold students’ scientific inquiry skills. This symposium will also include a third study that focuses on evaluating the impact of the Science Writing Heuristic approach as a means of learning the big ideas and theories in science. This approach uses argumentation, with an emphasis on language, as a central component of science learning.

Together, these three projects will highlight the potential promise of interventions focusing on argumentation and sense-making activities to help improve student learning in science. The implications of the findings for future research will also be discussed.