

## Science Teachers in Research Labs: Expanding Conceptions of Social Dialogic Dimensions of Scientific Argumentation

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**Tweet:** Professional development that includes lab experiences in research settings can broaden teachers' views of scientific argumentation. Educators observe how scientists build knowledge socially through dialogue and reflect on classroom implications.

**Audience:** Professional development providers; Teacher educators; Formal and informal educators; Science outreach staff

### Key Points

- Science can be viewed as a set of socially negotiated practices enacted by members of a knowledge-building community; argumentation is one such key practice.
- Professional development opportunities for teachers in science research settings have the potential to provide educators with deeper, contextual understandings about how scientists use social and dialogic argumentation to manage uncertainty.
- Focusing teachers' attention on examples of argumentation, allowing them to share and reflect on their observations, and providing scaffolds for classroom dialogue can help teachers shift how they think about and enact argumentation in their classrooms.
- Including social dialogic argumentation in science classrooms can broaden student opportunities for sensemaking discourse and provide students with deeper engagement in, and understanding of, scientific practices.

**INTRODUCTION** The Next Generation Science Standards highlight the key role argumentation plays in science and the importance of engaging students with this practice. Professional development in formal scientific research settings has the potential to provide educators with a deeper understanding of argumentation, including awareness of the importance and role of its social and discursive ("social dialogic") dimensions. In this study, a cohort of 21 secondary science educators participated in a professional development program at a cancer research center. Teachers were embedded in labs and observed lab meetings and other instances of scientific discourse and argumentation. This study investigated what teachers learned about social dialogic argumentation and its role in scientific sensemaking through participation in the program. It also examined how teachers' observations and experiences influenced their conceptions of the role of argumentation in science and in secondary science instruction.

### FINDINGS

Teachers described gaining a heightened awareness of argumentation as a ubiquitous, embedded feature of authentic scientific activity; expanded ideas about forms, uses, and purposes of argumentation; and developed an understanding of how contexts for argumentation such as collaborative sensemaking and critique can help manage uncertainty and build knowledge. A year after their program participation, all teachers responding to a follow-up survey agreed that their thinking about communication in science and argumentation as a scientific practice had changed. In addition, teachers recounted shifts in pedagogical practices, including desettling traditional classroom talk patterns,

scaling back their epistemic authority, providing students with more agency and ownership of ideas, and recognizing the value of establishing a culture of community and collaboration.

**TAKEAWAYS** Students' ability to engage in scientific practices requires shifts in common and deeply ingrained instructional approaches – which in turn rely on teachers' awareness of, and commitments to, incorporating those practices. Purposeful and targeted professional development embedded in research settings may be an effective strategy for broadening science teachers' understanding of the social dialogic dimensions of argumentation and could help motivate them to make classroom shifts. The ability to witness the central role of social dialogic argumentation in research labs was a powerful motivator for teachers, particularly when combined with resources, practice seminars, and pedagogical scaffolds to support classroom enactment. For the teachers highlighted in this article, incorporating social dialogic dimensions of argumentation represented a major shift in how discourse appeared in their classrooms – not only away from teacher-driven and teacher-centered talk patterns and towards meaningful student-student talk, but also towards opportunities that allowed students to put forth ideas and arguments to be interrogated and critiqued by others. Providing students with an expansive view of science may have impacts beyond simply increasing their scientific literacy: it may allow broader access to the social, cultural, and material aspects of science as well as a deeper and more meaningful engagement with its practices.