

Email Emily Weiss ([weisse@berkeley.edu](mailto:weisse@berkeley.edu)) for access to the complete handbook.

## **The Leaders Handbook for the Practicum Academy to Improve Science Education (PRACTISE): A professional learning program to support scientific argumentation in grades 3-5**

### **OVERVIEW**

We are pleased to present this new resource for improving the quality of science professional learning experiences for elementary school teachers. We hope that these materials will be relevant and useful to anyone in a school or district, university or other science-rich educational institution who designs, coordinates or provides science professional learning opportunities for classroom teachers, especially teacher leaders. The materials should also be helpful to anyone who prepares teachers-on-special-assignment or curriculum and instruction professionals to deliver professional learning to teachers.

This *Leaders Handbook* is the result of four years of work, funded by a grant from the National Science Foundation Discovery Research for pre-K-12 (DRK-12) program. Over the life of the project, teams from the Lawrence Hall of Science at the University of California, Berkeley and the Graduate School of Education at Stanford University worked together closely to design, deliver, study, re-design and re-deliver a two-year long professional learning program focused on helping teachers from Grades 3-5 to facilitate scientific argumentation among their young students.

The professional learning and related research study were carried out in a large, urban California school district. The students represented our amazing California diversity along nearly every dimension possible: ethnic, cultural, linguistic, socio-economic, height, hair styles and fashion choices! The project was carried out in the very beginning stages of districtwide efforts to implement the Next Generation Science Standards (NGSS). Scientific argumentation was not the easiest place to begin in helping teachers to shift their practice toward the ambitious new vision for science teaching and learning represented by NGSS. We chose to start there because of the deep, decades-long experience that both the Lawrence Hall of Science and Stanford University teams have with understanding the central role that discussing ideas plays in helping students to understand complex ideas about the natural world. We know that when students (even and especially English learners) engage in academic discourse, listen carefully and respectfully to their peers, talk about and make sense of their ideas, and learn to evaluate evidence supporting various claims, they will understand concepts rather than simply recall answers. When students are able to explain why one explanation is best, and why other explanations are not the best, they are able to use science persuasively to solve social, environmental and economic problems, improve their lives and communities, and perhaps most importantly of all, contribute to civil and pro-social discourse in our society. We

think that scientific argumentation is (arguably!) the lynchpin that holds together or the key that unlocks all of the Science and Engineering Practices, Disciplinary Core Ideas, and Cross-cutting Concepts that represent high quality, three-dimensional, 21<sup>st</sup> century science teaching and learning.

PRACTISE professional learning experiences are distinguished by at least two main characteristics. First, every experience is designed to model best practices in classroom teaching and/or adult learning. We try to model the particular aspect of pedagogy that we are addressing in the session and are hoping that teachers will incorporate into their practice. We like to say, “We practise what we preach!” You won’t find any lectures about why lectures are sometimes ineffective, nor will you find notes to tell teachers how important it is to leave time at the end of a lesson for meaning making—even though we weren’t able to make time for them to make meaning at the end of their adult learning experience. Second, our approach integrates adult learning experience like workshops and institutes among peers with what teachers do in their classroom. We believe whole-heartedly in the old joke: A guy stops someone on the street in New York City and asks, “Excuse me, can you tell me how to get to Carnegie Hall?” The person answers, “Practice, practice, practice.” In British English, practice (with a “c”) is a noun, while practise (with an “s”) is a verb. We know how hard teaching can be, and that changes in teaching don’t occur overnight or because of a good workshop—no matter how good! Our message is, in order to steadily improve, teachers need to practise, practise, practise, and then have structured, safe, non-evaluative, growth mindset-oriented opportunities to reflect on their practice with colleagues and coaches using video of themselves and each other, and then to try it again.

Professional learning practitioners can use this Leaders Handbook as a comprehensive, orderly professional learning program, or can use individual resources in a more modular way. There are likely dozens of ways the resources can be used, but we have only tested and studied the way that we used them. Our PRACTISE professional learning system is comprised of three elements:

- 1) **A week-long Summer Institute** that introduces teachers to scientific argumentation and the role it plays in high quality science teaching and learning, and also introduces them to the idea and mechanics of a teaching practicum in which their teaching will be videotaped, and the video will be used for reflection and discussion with peers. During the Institute, teachers engage in several student activities (or learning experiences) that model best practices related to several aspects of argumentation. These activities are drawn from the instructional materials that these teachers will be teaching to students the following weeks during the Teaching Practicum. This section of the Handbook includes detailed information (session write-ups, slides, handouts, agendas) for leaders on how to conduct a week’s worth of professional learning sessions. Each session is 2-3 hours long and focuses on topics such as: An Introduction to Argumentation; Argumentation in the Next Generation Science Standards; Strategies for Establishing a Culture of Talk;

Discourse and Learning; Argumentation for English Learners; Making Thinking Visible with Models; Using the Argumentation Continuum; etc.

- 2) **A two week-long Summer School Teaching Practicum** that allows teachers to immediately try out approaches and strategies they learned in the Institute, reflect on how that went with peers and a coach, and make plans to adjust their instruction for the next day. The PRACTISE Practicum takes place in a summer school setting. Teachers who participated in the week-long Summer Institute are put in pairs or trios and placed to teach a two-week long science unit for about two hours each day in a regular summer school classroom. Each summer school classroom has a teacher of record who is not participating in the professional learning experiences (but who also benefits from them by observing and interacting with PRACTISE teachers and coaches). This allows the Practicum teachers to drop in each morning, teach two hours of science, and spend the rest of the day in reflection, discussion and planning for the next day. The instructional materials that Practicum teachers teach from are the same units that they experienced in the Summer Institute.

Each day, one of the teachers in each pair/trio leads an hour-long whole group science lesson, with support from the other teacher(s). After a short recess, each teacher takes a small reading/discussion group for about 30 minutes to engage at close quarters in reading, writing and discussion about the concepts introduced in the first hour. Every day, one of the teachers in each pair/trio is videotaped, and selects a seven-minute segment to share with colleagues the next day. The teacher poses a question to the group, e.g., “My students are agreeing and disagreeing with each other, but not saying why. How can I help them to critique each other’s explanations rather than simply agreeing or disagreeing?” We use a structured video reflection protocol to facilitate a discussion of what the group sees in the segment, and to make suggestions for different choices or decisions that a teacher might make that could respond to the question posed. This section of the Handbook includes practicum daily schedules, planning tools, the Video Reflection Protocol, and a discussion of how to select instructional materials for the Practicum. Summer School Teaching Practicums provide teachers with a low stakes, low stress, highly scaffolded opportunity to take risks and try out new approaches. In the absence of grading homework, tests, high stakes assessments, pacing guides and highly structured daily bell schedules, we have found that teachers are more likely to try new strategies, to take the time to let discussions play out, and to really understand what students have learned and what additional support they need before feeling the pressure to move on to the next topic.

- 3) **School Year Follow Up Days** take place approximately four times throughout the year following the Summer Institute and Practicum. These Follow Up Days allow teachers to continue to practise and reflect on new

approaches they are incorporating into their regular teaching. Several weeks before each Follow Up Day, teachers are given an assignment of something that they all should try out. Several teachers are assigned to video themselves trying out the assignment with their students. The assignment might be to lead a unit-culminating meaning making discussion that results in some evidence of conceptual understanding, or it might be to use a particular strategy such as concept cartoons or Four Corners, that helps students to make claims and support them with evidence. Each Follow Up Day is comprised of some new, timely input that addresses the needs of the group (and results in the assignment for the next Follow Up Day); small group video reflections related to the current assignment; and peer planning time to incorporate new approaches and learning goals into the science unit that teachers are currently teaching in their class.

This Leaders Handbook takes the form of an online tool kit. Each folder of the tool kit is dedicated to one the three program elements described above. All the tools are free and downloadable.

We hope you will find these resources helpful and usable. They continue to evolve and we continue to add to them. Please check back now and then to look for additions and updates. We eagerly welcome your comments and feedback.

Craig Strang  
Emily Weiss  
Co-Principal Investigators  
PRACTISE Project  
Lawrence Hall of Science, University of California, Berkeley