Refining Our Focus

By Washington Regional Science Coordinators

Washington's pK-12 teachers of science place a high value on quality-learning opportunities for their students. The state has launched several initiatives spanning more than 10 years to further enhance and support teachers in providing those quality-learning opportunities in science. Since 1999 Washington has been growing the National Science Resource Center's LASER (Leadership & Assistance for Science Education Reform) model statewide. During that time, Washington State LASER has built strong partnerships among formal and informal science educators K-16. In the last three years the state legislature funded a regional science coordinator for each of Washington's nine Educational Service Districts (ESD). Collaborating with the statewide science education network, the coordinators built on the groundwork laid by Washington State LASER, bringing the characteristics of effective instruction into sharp focus.

The Washington State LASER model includes a professional development (PD) component. The early PD emphasis was on *what* teachers needed to know about *how* to use science materials. As science education research progressed and the science community expanded its knowledge of effective science instruction, the 'what' grew to include deeper understandings of inquiry, science content, assessment, and how to integrate science into other content areas. Preparing to further expand its PD focus, Washington State LASER recently brought together stakeholders from across our robust science education network to help develop a logic model for PD. (The logic model is available *www.wastatelaser.org*.) Logic models can increase PD effectiveness by clarifying the necessary components of effective science instruction and the PD system that supports it. We, the Washington Regional Science Coordinators, saw an opportunity to enhance the logic model, with a document describing the characteristics of effective instruction.

As we began developing the document, now called the Elements of Effective Science Instruction (EESI, aka "easy"), we reviewed the current literature on science instruction. Resources such as *Designing Effective Science Instruction; Effective Science Instruction: What Does the Research Tell Us?; Classroom Assessment for Student Learning; Inside the Black Box; How People Learn; Ready, Set, Science;* and *LASER Classroom Observation Protocol and Transformative Assessment* were consulted, to name just a few. From these sources a variety of elements and organizers were identified. In keeping with the idea put forth by Alvin Toffler, author of "Future Shock" (1971), that "overchoice occurs when the advantages of diversity and individualization are canceled by the complexity of the buyer's decision-making process", we decided teachers would benefit most from a distillation of the "elements" in the literature organized into categories consistent with the contexts in which they have been working and learning for the last 12 years. The resulting EESI elements are Science Content, Designing Instruction for Understanding, Sense Making, and Classroom Culture & Environment.

Science Content

Student acquisition of science content involves opportunities to meet state standards and recognize how the big ideas fit within a large conceptual framework. Access to this learning is best achieved through sequencing learning objectives into learning progressions that inform teacher's instructional decision making.

Designing Instruction for Understanding

Effective instruction is built on an understanding of students' initial and developing ideas, identifying the gap between students' current understanding and learning targets. This evidence should inform instructional decisions and allow the teacher to provide specific feedback so that students become owners of their learning. Students are intellectually engaged when they investigate, reason, discuss, and make sense of science concepts. In order to construct understanding, science experiences should help students make sense of the phenomena under study.

Sense Making

To ensure sense making, instruction should intentionally facilitate an understanding of the connections between the activity and the intended learning targets and previous learning. Teachers must make certain that students draw appropriate conclusions and see the purpose of their activities. Additional opportunities should be given to apply the learned concepts to new situations and for students to reflect on their thinking and how it has changed over time.

Classroom Culture and Environment:

The classroom should reflect the belief that all students can learn science. Effective science instruction makes science accessible to each student. Science is a social enterprise requiring active participation in classroom discourse, with the opportunity to understand and practice the appropriate norms. The classroom environment should include motivation and attitudes providing a foundation for students to be actively and productively engaged in science that is relevant and connected to their lives.

In addition to a brief description of each element and a reference to the supporting literature, the EESI document includes suggestions for what teachers need to know about the elements and what students do in a classroom where this type of instruction is occurring. The EESI document represents a meta-synthesis of the best local and national work on effective science instruction we could find. Go to *http:/effectivescienceinstruction.net* to learn more about EESI.

The clarity around instruction, attained by the coordinators through the process of EESI development, is already affecting the PD we provide in our regions. Even before EESI is debuted at the state conference in March, teachers and students are beginning to benefit. We hope EESI will help both classroom teachers of science and PD providers alike to focus on that most critical school factor—instruction.

Georgia Boatman, Mike Brown, Mark Cheney, Craig Gabler, Jon Hanson, Kirk Robbins, Jeff Ryan, Adrienne Somera, and Mark Watrin are the regional science coordinators in Washington.