Panel 4: Inquiry is Not the Best Way to Teach Science

Inquiry is not the best way to teach science. In fact, to believe that any one instructional strategy single-handedly brings student success is a fantasy. To persuade this point, I will discuss the National & California Science Content Standards, the reality of the classroom, and the cognitive development of adolescents. To clarify what inquiry is, I will define the word as student-centered and student-constructed instruction: Students select a question to explore. Students design and conduct experiments. Students propose explanations based on their results. Students construct the information.

California Science Content Standards and Framework states: Effective science programs reflect a balanced, comprehensive approach that includes the teaching of investigation and experimentation skills along with direct instruction and reading. Effective science programs use multiple instructional strategies and provide students with multiple opportunities to master the content standards. Inquiry by itself will not reach all learners. An effective teacher addresses multiple intelligences and learning modalities.

National Science Education Science Inquiry Standards lists the following expectations: Understanding of scientific concepts. An appreciation of "how we know" what we know in science. Understanding of the nature of science. Skills necessary to become independent inquirers about the natural world.
The dispositions to use the skills, abilities, and attitudes associated with science. Before students could understand the scientific concepts and the nature of science, they need to learn what they are. Instruction comes directly from the teacher. The delivery of this content is not restricted to one teaching method. Actually, the inquiry standards do not actually require implementing inquiry instructional strategy. Knowing the students’ weaknesses and strengths, the teacher then decides how to appropriately teach all learners the skills necessary to become inquirers. This knowledge cannot derive from student self-directed discovery.

In the International Journal of Science Education published on January 23, 2004, researchers addressed the constraints experienced by beginning secondary science teachers in implementing scientific inquiry lessons. Data were collected in regards to the teachers’ content knowledge, teaching beliefs, views on the nature of science, and pedagogical knowledge. Although all the teachers had been trained by ASIST to practice inquiry in their teaching, only four out of fourteen studied successfully practiced inquiry in the classroom throughout the school year. The rest did not satisfactorily meet one or more of the above factors influencing the implementation. Particularly for the beginning teachers, Inadequate teaching training and limited time and resources further constrain. For these reasons, the study shows that inquiry is not always the best method in teaching science.

According to Piaget, most secondary students fall in the concrete or formal operations stage. Student-centered and student-constructed inquiry heavily
relies on student’s formal operation. Not all students develop at the same pace or in all areas of their cognition. A lot of them still operate in the concrete stage where they need more direction and structure from their teachers.

How People Learn discusses the students’ prior knowledge coming into the classroom. More often than not, what the students already know are misconceptions. In such cases, the students’ understanding needs to be reconstructed. This takes time and multiple instructional strategies from the teacher.

At the end of the school year, all students in the state are assessed in their content knowledge of the standards. As all other standardized tests are, these tests are multiple-choice. Student-performance is defined by these state-mandated measurements. Inquiry is not always the best way to teach all the contents in the standards.