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Hands-on and Minds-on Science Instruction

Inquiry n. - a seeking or request for truth, information, or knowledge; the act of inquiring or of seeking information by questioning

For more than 30 years, the literature in science education has documented increased achievement and improved retention of science concepts when students are taught using curriculum materials that have an inquiry approach. The benefits of inquiry-based science are well documented, yet is that emphasis unintentionally obscuring the importance of understanding science ideas?

Earlier this month, Vista math and science teacher Mike Montgomery and I attended the Science Instructional Materials Showcase in Seattle. The keynote speaker outlined ways in which science teachers can both practice inquiry science and ensure that students grasp content knowledge. The Biological Science Curriculum Study developed “the Five Es”: Engagement, Exploration, Explanation, Elaboration, and Evaluation. By guiding students through these five ways of approaching science concepts, teachers can give students the freedom to discover through exploration, yet guide the search so that students can’t help but bump into the target knowledge (Educational Leadership, January, 2007).

As we have worked to design Vista’s science curriculum, we’ve subscribed to three principles about how students learn –

1. Students come to class with preconceptions about how the world works. The science curriculum must engage students in a process of conceptual change.
2. Competence in science includes a foundation of factual knowledge, a conceptual framework, and a means to organize scientific knowledge.
3. Students can learn to take control of their own learning by defining goals and monitoring their progress in achieving them. The science curriculum must include experiences that require metacognition (thinking about thinking) and provide opportunities for students to engage in metacognitive practices (Martinez, 2006).

At Vista, students will have daily opportunities to discover the wonders of science. But in order for this to happen, you have to show your students that science is fun, not just assert that it's fun. We expect our students to understand science concepts and be able to support those concepts with scientific evidence. Vista's program transmits to students the excitement of science and scientific discovery, as well as the sheer delight of doing and thinking science.

At one time, science educators engaged in a "process versus content" debate, thinking that spending time teaching the processes of science meant trading off time teaching the "real" content of science. Fortunately, we are no longer in this debate. Inquiry *is* content. If science is a way to ask questions about and develop explanations for phenomena in the natural world, then there is no science without inquiry.

Vista Academy believes that instructional materials, teaching practices, and classroom climate must promote a learning sequence that allows sufficient time for students to explore concepts in depth, providing opportunities to link hands-on science activities to content. To understand science, students need to *do* science, by participating in activities, completing projects, investigating questions, and discussing interactive readings. As they model how scientists do their work, students develop a better understanding of the process of scientific inquiry.

We have mentioned many times that Vista students will be writers, although not all of them will naturally love to write, especially in the traditional areas of essay questions and writer's workshops. Yet placed in the context of scientific inquiry, students can record questions of interest, document how they have set up investigations, represent data they have collected, and develop explanations for the phenomena they are investigating. Scientific literacy helps promote effective reading, writing, and speaking. Students are able to read and understand a variety of science texts to form valid conclusions and participate in meaningful conversations about science.

Identifying questions that can be answered through scientific investigations, thinking critically and logically to discover the relationships between evidence and explanations, communicating scientific procedures, developing descriptions, predictions, and models using evidence, and using mathematics in all aspects of scientific inquiry are just some of the skills students will cultivate as part of their Vista experience. It is an experience that goes beyond hands-on instruction, where students are given opportunities to not only develop their scientific inquiry abilities, but practice them as the scientists and researchers of tomorrow.

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