



Commentary

November 2009, Thoughts on Science Education

Seven Steps to Teaching With Inquiry

Step 1: *Admit you have a problem.* You claim to believe in inquiry, which allows students to understand the diverse ways that scientists study the natural world, and teaching that is based on the constructivist theory of learning—but you lecture. For many years now, you have heard the buzzwords in science education—*inquiry, constructivism, hands-on learning*—and you think they are important. In fact, when asked in your hiring interview about your teaching philosophy, virtually all of these buzzwords spilled out as you talked about your future student-centered classroom, where all students would be really doing science. But if someone stopped by your classroom on a given day, would he or she see you stationed at the front, clicking away at PowerPoint slides? I know, you have to cover the content. So you have resorted to these methods just this one time to stay on schedule and help students pass the test.

Step 2: *Believe in a better way to teach.* During that interview, why did you talk about your belief in constructivism and inquiry learning (aside from the fact that your science education professors told you that you should)? Consider what you think it really means to learn science. Science is more than a collection of facts—it is a way of thinking and exploring our world that leads to understanding about what is happening around us (McComas 2005; Rye et al. 2007). How can students experience this way of thinking and doing while sitting in their desks taking notes from a screen? The answer is obvious—they cannot.

Step 3: *You are in control of your classroom.* The following is a common misconception: If you teach through inquiry, your students will each work on individual projects, and you will quickly lose control of your classroom. This should not be the case. Remember that you are the teacher—you are in charge of what happens in your classroom. Inquiry should mean that you are teaching the concepts you want to teach in a way that allows students to explore them.

Step 4: *Believe that inquiry and standards are not mutually exclusive.* Students can pass your state content test when you teach through inquiry (Akkus, Gunel, and Hand 2007; Schroeder et al. 2007; Wolf and Fraser 2008). Remember Step 3—you are still in charge of the content

your students are learning; you are merely changing the way you present it. Set up activities that engage your students with the topics in your state standards and push them to explore their thinking. Hook new vocabulary words to what they learn. Students will remember this come end-of-year test time.

Step 5: *Determine the level of inquiry in your classroom.* Inquiry can happen in varying degrees. Use either the Science Teacher Inquiry Rubric (STIR; Beerer and Bodzin 2004) or the Reformed Teaching Observation Protocol (RTOP; Sawada et al. 2002) to determine how inquiry-based your classroom is on a typical day. Ask yourself, for example, if the level of inquiry changes from day to day. Are classes more inquiry-based on “lab days,” but much less so the rest of the time?

Step 6: *Set goals to advance.* You can become more inquiry-based in your teaching. The simplest way is to rearrange your “normal” schedule. Instead of first presenting a content lecture and then doing a laboratory activity, switch up the order. Then, rewrite your traditional lab activities. This is not difficult; it mostly involves deleting! Most labs are very directive and even contain a purpose statement at the beginning that tells students what they are about to learn. Cut out this purpose section, the premade data tables, and as many of the step-by-step directions as you safely can. Keep the question(s) students are trying to investigate, safety guidelines, and as little else as possible (Backus 2005).

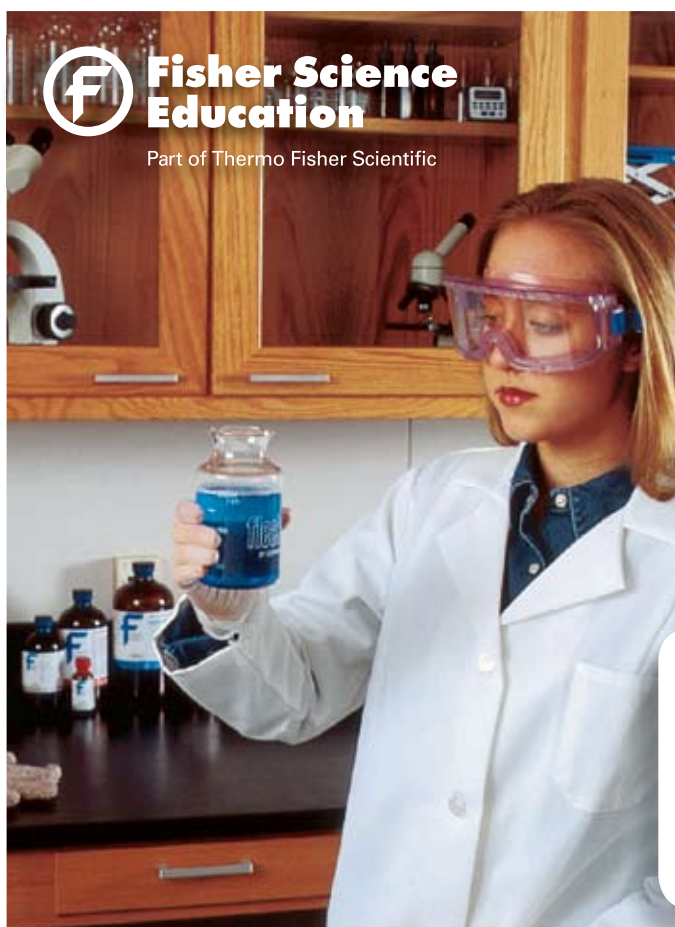
Step 7: *Get a support system to hold you accountable.* It is difficult to do this by yourself. You may have to change the culture of your classroom, so it may take a little time. Students are accustomed to receiving information and giving it back—they may become frustrated at first when trying to find answers independently. A good way to accomplish this culture change to inquiry-based learning is to use the 5E method of lesson planning (Bybee 1993). Make a pact with a science neighbor that you are both going to make progress along the inquiry continuum this year. Check in with each other. Share your successes and challenges, and stick with it. You can do this!

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Science is more than a collection of facts—it is a way of thinking and exploring our world that leads to understanding about what is happening around us.

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