Reflections and Suggestions from a Science Coach

by Kirsten Nesholm

When I began teaching in Seattle Public Schools, I was nervous about teaching science. I had learned about teaching inquiry science in graduate school, but I did not feel prepared to teach it. I was lucky enough to be involved from the very beginning in the district’s inquiry-based science program and the Expository Writing and Science Notebooks Program. As a result of this support and my students’ excitement about science, it became my favorite subject to teach.

Before my current position as an elementary science coach (specializing in pre-kindergarten through first-grade science), I taught first grade for seven years and second grade for one year in an inner-city school where many of my students were on free or reduced-price lunch and/or spoke a language other than English at home. A high percentage of them began first grade with undeveloped academic skills and little exposure to science. Despite these challenges, my students were able to be successful scientists. People were amazed by the level of scientific thinking and conceptual understanding in these young students’ writing. I often was asked how I got my students to act and think like scientists and to write independently in their science notebooks. It was hard for me to explain what I did, but now, after three years of working with teachers in the classroom as a science coach and reflecting about my own teaching, I can articulate some suggestions that you might consider as you move your teaching of science and science writing to higher levels.

High Expectations and Patience

I often hear from kindergarten teachers that their students cannot do the science writing, but I have seen pre-kindergartners be successful. Pre-kindergarten students primarily draw pictures to show their observations and thinking. Although some just scribble while others are able to do more accurate scientific illustrations and add a few words to their drawings, the students all are learning how to use and make entries in a science notebook. So what is the difference between the two situations? The teachers of the pre-kindergartners expect that their students can make entries and the teachers have learned how to provide not only the inquiry science experience but also the modeling and scaffolding that help students learn how to write in a meaningful way. To succeed with this approach, you must truly believe your students can learn to think, act, and work like scientists. This will become easier as you implement the strategies in this approach to science writing and see the growth in your students’ thinking and writing skills.

Be patient with yourself and your students as you implement this approach. I was told that it takes three years to be comfortable with and effective in teaching an inquiry-based science curriculum, and I found this to be true. After seven years of teaching the first-grade units, I felt confident and effective in teaching my students. But when I looped up to second grade with them and had to learn three new science units, I no longer felt that way.

It also takes time to understand the science-writing strategies and to be able to use them naturally when teaching. For example, students need to be taught to use because so that they include their reasoning, or I observed before they describe their observations, or My evidence is before they provide the data that support their claims. At first, I (and most
Modeling and Scaffolding

In addition to having high expectations and patience, you need to provide a great deal of modeling and scaffolding. For example, I would have students talk with each other about their observations and thinking, and then we would have a reflective discussion as a whole class. If students did not use complete sentences when they were talking, I would have them repeat what they had said using complete sentences. And, as noted in the previous section, I would model specific words they could use. That way they could practice using the language appropriately as they were expressing their ideas and thinking, and hear how the scientific language sounds, before using that language in their notebooks.

During these discussions and the separate writing sessions, I also modeled how to write scientifically as I wrote down what the students were saying. I would ask them to tell me where I could find the word in the room and have the students help me spell the word. Also, I would model how to draw illustrations and diagrams in order to show what the students were observing and thinking. After a shared-writing experience, I would read the writing with them, so that students could hear how their scientific thinking and writing sounded as well as develop the skill of rereading what they write.

Thinking Out Loud

One of the things that made the biggest difference in teaching scientific writing was learning how to talk about what I was thinking as I did the shared writing with my students. For example, if I was adding data about how many times the Ping-Pong ball bounced, I would wonder out loud, “How many times did the Ping-Pong ball bounce in our fair test?” I would show how I needed to look in my notebook to find the data and then I would say, “I see that the Ping-Pong ball bounced sixteen times.” In this way, I modeled the importance of recording data in a science notebook and using the data in thinking and writing. It also showed students that I needed, just as they did, to think about my observations, results, and so on, and how I best could communicate with other scientists, through my writing, about my investigations.

More Independent Writing

After I had been using the strategies in the science-writing approach for a year or so, I started giving my students more choices in their science writing. For instance, they could use the writing frame that I gave them or do their writing on their own following some general guidelines. Interestingly, it was not always the students with more developed academic skills who would choose to write independently. Sometimes, students with lower or average skills seemed to welcome and enjoy the challenge of writing without the frame. To support this increasing independence, I would show students the words and phrases they needed without a frame. For example, instead of giving the students a particular phrase, I would ask...
students where in the classroom they could find the phrase. I also would show them how to use the word bank, the focus question, and other parts of the classroom environment to help them spell words they wanted to use. If the word was not in the classroom, I would model how to sound out the word, relate it to word families they knew, or use inventive or transitional spelling. With students who were not yet able to write complete sentences, I would have them draw pictures and include a few labels or phrases with their pictures. And with all students, I would show them how to cross out words and insert words they left out rather than erasing a lot of writing.

I also would move students toward writing, rather than gluing in, a focus question at the beginning of their dated notebook entry. Although it is easier and faster for young students to glue in the question, by January of first grade, I would begin teaching students how to write the focus question in their notebook. This would take time at first, but it was time well spent and students became increasingly efficient in writing the question. At the same time, they were learning to read and spell the scientific terms as well as understanding how scientific questions are worded. I then would ask them to touch the words as they read the question with me, and then circle the important words. This whole process not only helps students learn scientific language, but also focuses their attention on the scientific investigation they will be conducting during the science lesson.

Shared Reflection

In many classrooms, I have observed that when an investigation is over, many teachers just end the lesson, usually because it is time for recess, lunch, or whatever is next in the schedule. It is important to have at least a few minutes of discussion about what the students have discovered. The discussion will help students begin to make connections about their observations and testing. With my students, I would stop the lesson five minutes early, even if we were not quite finished, in order to have this discussion. Then the following day, I would have a longer discussion, beginning with a review about what the class had discussed the day before.

Notebook Entries as Rough Drafts

I have found that many teachers have a hard time letting go of aspects of the notebook writing that are not important. In part, this is because many teachers see science notebooks as final published writing instead of rough drafts. As a result, they expect their students’ notebook writing to be perfect in terms of spelling, grammar, and handwriting. However, the most important thing about writing in science notebooks is that students communicate their scientific thinking and understanding, which is exciting even for students who otherwise are “reluctant writers.”

Assessing Notebook Entries

I often hear from primary teachers that they do not have time to look at their students’ science notebooks, but it takes only a few minutes to read your students’ notebook entries and provide two to three sentences of oral feedback. As my students were writing, I would walk around the room and read their entries. I would ask my students to keep the notebooks open
on their desks until I had looked at them. After I had read a student’s entry and given feedback, the student would put the notebook away. I found that primary students need immediate feedback. If I waited a few weeks or even a few days to talk to the students about their entry, they would forget what they were trying to say. Consequently, I found that looking at the notebooks every day was the most effective way of assessing and giving oral feedback. I also taught expository writing primarily in science, so this was a significant literacy component in my instruction and well worth the time spent.

Certain key entries served as formative assessments, which I would use during the unit to help me assess where my students were in their learning and plan what I needed to do in further instruction. Later on, whenever I had a question about a grade for a particular student, I would read through his notebook, especially those key entries, to assess his conceptual understanding and scientific thinking. In preparing for parent-teacher conferences, I also would use sticky notes to highlight the key entries in the science notebook and share these with the parents or guardians in order to show them their child’s growth in science and science writing. In addition, I would photocopy entries to keep in the students’ portfolios.

Positive, Constructive Feedback

The more I gave students feedback about their entries, the more I realized how important it is to praise students about specific strengths in their science writing, especially when the student is a reluctant writer or has low self-esteem. For example, when a student had written about the results of a fair test (a controlled investigation or experiment), I would emphasize that he had communicated a strong scientific conclusion to other scientists. If the sentences were not complete or if the writing was not organized, I would not mention those traits to the student because they are not essential in a rough draft. The proud look on a student’s face when he successfully has communicated his observations in his science notebook is priceless. Students need to feel successful in order to grow and move to the next level.

Another idea that made a huge difference in my students’ acting like scientists was to talk to them as if they were scientists, and to let them know that the audience for their entries was other scientists, not me or other students in the classroom. If I had a question about the content or thinking in an entry, I always would ask the student a question that another scientist might have. Because the questions did not communicate judgment about the student’s work, the student would respond to the question as a scientist, not as a student who had just lost points.

The Next Generation

When I finished graduate school and began teaching, I never imagined that teaching science would become my passion, but it did. I have seen how science incorporates different skills and content areas, so students learn reading, writing, and math skills in a relevant and natural way. And in using the science-writing approach, I have seen students learn thinking and writing skills that they do not learn in other parts of the school day.

Because of this integration and because learning science builds on students’ natural curiosity and excitement about things around them, it is easy to see why science should be an integral part of the classroom experience for all students. After everything I have experienced, I see this as an incredible, exciting opportunity to provide a strong scientific foundation for the next generation of scientists and scientifically literate citizens of the world.