Tips and strategies for teaching the nature and process of science

Overall:

- Be *explicit* about how your classroom activities and content relate to the nature and process of science.
- Model the behaviors, strategies, and scientific language that you want from your students.
- Incorporate the nature and process of science throughout the year. Re-emphasize the same ideas in multiple contexts so that students can see the general applicability of these ideas to all of science.
- Use activities in which students apply/develop scientific processes themselves (i.e., How do I do science?) and activities in which students examine the workings of science from the outside in (i.e., How do they do science?).
- Use examples from the history of science. Incorporate popular accounts of scientific discoveries that emphasize the nature and process of science.
- Wherever possible, get students to ask and answer "how do we know this?"
- Be aware of common misconceptions about the nature and process of science. Put students in situations that challenge those misconceptions. Remember to be *explicit*!
- Begin the year with a discussion of what is and is not science and what characteristics make science different from other human endeavors. Revisit these topics in multiple contexts throughout the year.
- Apply the science checklist to different situations throughout the year.
- Apply the science flowchart to different situations throughout the year.
- Take advantage of current research and breakthroughs (especially when they challenge something in your textbook) and bring this material into your classroom.
- Use assessments to monitor students' understandings of the nature and process of science.
- Look for collaborative opportunities with local research institutions that might provide structures for interactions between your students and scientists.
- Use photos and video to emphasize that science is done in many different ways by many different people.

During student investigations:

- Avoid overemphasizing the term experiment. Many scientific tests do not take the form of experiments. When discussing evidence garnered through these other sorts of scientific tests, be sure to make this explicit.
- Take advantage of labs and activities that "go wrong." De-emphasize the idea of the "right" answer and allow students to wrestle with ambiguity.
- Instead of giving the "right" answer, direct student skepticism back at methods, evidence, and interpretation.
- Instead of cookbook labs, incorporate student-designed investigations with available lab equipment.
- Have students present their evidence and interpretation to each other and come to a consensus about the outcome of the lab or activity.
- Have students keep a journal with personal reflections on their learning and on how knowledge is built.
- Have students write up lab results in the form of a scientific paper.
- Remember, be *explicit* about how student investigations relate to the nature and process of science.