

## V. Standards and Thinking Strategies in Science

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Scientific inquiry is the vehicle for enhancing student understanding of scientific theories and processes. Such inquiry demands that students actively engage both with the world and with difficult text. PEBC staff developers support science teachers in implementing inquiry-based science instruction that align with the National Science Education Standards. We recognize the role that literacy plays in the lives of scientists as they record data and share their findings with the greater scientific community.

### **Students read and understand a variety of materials.**

*(Colorado Model Content Standards for Reading and Writing, Standard 1)*

We help teachers design and construct research projects with their students. They support teachers as they show students how to pull information from multiple sources and media, to understand the differences and appropriate times to use one material over another.

### **Students read to locate, select, and make use of relevant information from a variety of media, reference, and technological sources.**

*(Colorado Model Content Standards for Reading and Writing, Standard 5)*

We offer demonstration lessons, modeling instructional and reading comprehension strategies for teachers. They think aloud about their own metacognitive process as they research their topics on the WEB, showing how they monitor meaning while they take notes, ask questions, and determine importance throughout the inquiry process. Teachers debrief these demonstration lessons with the staff developers, deciding how to incorporate these strategies into their own instruction.

### **Students understand the process of scientific investigation and design, conduct, communicate about, and evaluate such investigations.**

*(Colorado Model Content Standards for Science, Standard 1)*

We help teachers to create a research process for their students while showing teachers how students can learn to ask questions to develop a hypothesis, map a topic to design a process, and explore resources to test a theory or find answers to a question.

### **Teachers of science design and manage learning environments that provide students with the time, space, and resources needed for learning science.**

*(National Science Education Standards, Teaching Standard D)*

PEBC staff developers help teachers analyze their learning environments and make modifications to increase their effectiveness with students. This may include the implementation of the workshop model, increasing students' use accessible text, maximizing student dialogue or developing formative assessments that provide timely information regarding student learning.

Below we highlight how students use specific thinking strategies in Scientific Inquiry.

<b>Thinking Strategy</b>	<b>Cognitive Behaviors</b>
Monitoring for Meaning	<ul style="list-style-type: none"> <li>• Scientists reflect on the validity of their hypotheses in light of new data and assess the possibility of errors in their experiments.</li> <li>• Scientists repeat their investigations to ensure that their results are replicable.</li> </ul>
Activating, Using and Building Background Knowledge (schema)	<ul style="list-style-type: none"> <li>• Scientists form hypotheses and draw inferences based on their background knowledge.</li> <li>• Scientists build their background knowledge by reading the publications of other scientists, attending scientific meetings, and participating in peer reviews of their work.</li> </ul>
Asking Questions	<ul style="list-style-type: none"> <li>• Scientists focus each investigation by posing specific, testable questions and designing experiments that can give definitive answers.</li> <li>• Scientists often pose new questions or modify their hypothesis after gathering new data.</li> </ul>
Drawing Inferences	<ul style="list-style-type: none"> <li>• Scientists develop hypotheses based on their inferences.</li> <li>• Scientists examine existing and new data and draw inferences to explain their observations.</li> </ul>
Determining Importance	<ul style="list-style-type: none"> <li>• When designing investigations, scientists determine the sequence of steps to take in the process.</li> <li>• Scientists take data and carry out a statistical analysis to determine its significance and try to communicate the importance of their work to the larger community and public.</li> </ul>
Creating Sensory Images	<ul style="list-style-type: none"> <li>• Scientists gather qualitative data using their five senses.</li> <li>• Scientists record their qualitative observations with illustrations.</li> </ul>
Synthesizing Information	<ul style="list-style-type: none"> <li>• Scientists analyze and interpret quantitative data using tables, charts, graphs, and diagrams.</li> <li>• Scientists draw conclusions from their data by synthesizing what they learned with what they already knew before an investigation.</li> </ul>