

The Seeds of Science/Roots of Reading Inquiry Framework

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Science Inquiry

Inquiry is curiosity-driven. It involves wondering, posing questions, and making observations. It involves reading books to find out what others have learned, planning investigations, gathering and analyzing information, reflecting on what was learned in the light of new evidence, and proposing explanations and predictions. Inquiry requires the use of critical and logical thinking, consideration of alternative explanations, and the ability to change one's ideas. Not only do scientists inquire, but good readers inquire as well, and information gathered from text is an important source of evidence. For those reasons, inquiry serves as one of the central strategies in the learning and teaching of science and literacy in the *Seeds of Science/Roots of Reading* program.

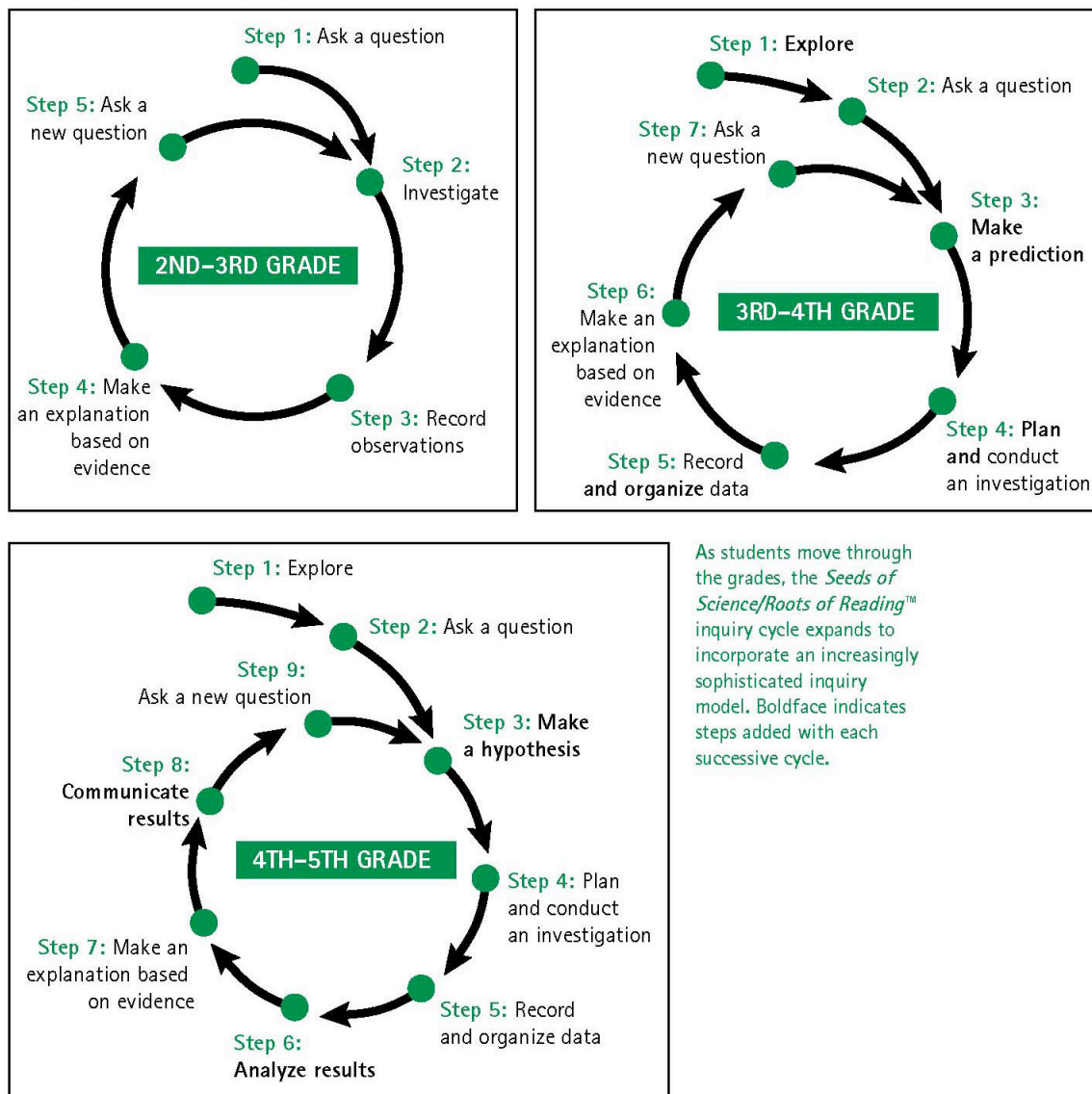
A cycle for inquiry investigations. Much has been written about cycles of inquiry and instructional models that aid in teaching students about the processes involved in inquiry (American Association for the Advancement of Science *Benchmarks for Science Literacy* 1993; Chinn and Malhotra 2002; Hapgood, Magnusson, and Palincsar 2004; Krajcik et al. 1998; White and Frederiksen 1998). The *Seeds of Science/Roots of Reading* cycle for inquiry investigations is grounded in this research, as the sequence serves to help students better understand how the inquiry process can be applied to answering important questions in science.

In each *Seeds of Science/Roots of Reading* unit, we incorporate selected aspects of inquiry. Additionally, one unit for each grade-level span involves students in a complete inquiry investigation that includes reflection on the cycle and how it is used to develop new ideas in science. In this way, students participate in each phase of the cycle as they investigate scientific questions, whether posed by the teacher or generated by the students themselves as they design their own investigations and make scientific explanations.

Through *Seeds of Science/Roots of Reading*, we introduce students to an inquiry cycle and help them learn that scientists don't just march through the steps in order, but will often go back and forth between steps as they refine their ideas and use growing evidence and experience to modify their plans.

One widespread misconception is that there is only one correct "scientific method." It is important that students discover that, while scientific investigation is logical, it does not necessarily follow a mechanical step-by-step process. Recognizing this aspect of science also acknowledges the creativity and individual contributions of scientists to the always-expanding body of scientific knowledge.

Seeds/Roots Inquiry Cycle



Seeds of Science/Roots of Reading stages of inquiry. At the heart of all inquiry is using evidence to make explanations. Throughout the *Seeds of Science/Roots of Reading* program, we focus specifically on developing the critical thinking skills associated with developing well-supported explanations. To help students develop this important ability, we have defined a trajectory of increasing sophistication in the ways that students employ evidence to form logical explanations.

Initially, students are occupied with searching for evidence to support their ideas, identifying the pertinent clues that relate to what they are trying to find out. Next, they are involved in using evidence they have found to make inferences and create explanations and predictions, while following the logical course of the data before them. Building on this level, they may now seek additional evidence to support their ideas, thereby expanding their confidence in the conclusions that can be made. Finally, students are ready to substantially change their ideas and explanations when they are confronted with conflicting evidence and are convinced the new evidence is substantial and persuasive.

The chart below shows the relationship of individual inquiry skills to the foundational process of making and revising explanations based on evidence.

Seed/Roots Stages of Inquiry

Inquiry Stage (increases in sophistication from bottom up)	Inquiry Skill
4. Change explanations based on new evidence.	Critiquing models, comparing and contrasting explanations, revising explanations, evaluating evidence, making connections
3. Probe for additional evidence.	Posing questions, investigating scientific questions, planning an investigation, conducting systematic observations, conducting experiments, using models, organizing and representing data
2. Make inferences from firsthand and/or secondhand evidence and create an explanation.	Making inferences, determining cause and effect, making predictions, creating hypotheses, making explanations from evidence, visualizing and using mental models, comparing and contrasting, analyzing data, drawing conclusions, summarizing, accessing and applying prior knowledge, sorting and classifying based on evidence
1. Search for evidence to support ideas.	Making observations, using tools to extend senses, recording data, using features of informational text to locate information, taking notes, sorting

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