

Guide to Lesson

A Guide to the Knowing Science® Activity Format

The Knowing Science lessons are presented in a format familiar to teachers. Each activity moves from the purpose of the investigation to instructional delivery to an assessment of what students have learned. The following elements make up the format of each lesson.

Purpose

The purpose of the lesson combines an introduction to the concepts central to the content focus of the activity, a brief description of the investigation, and a statement of learning outcomes for students.

Preparing for the Lesson

This section features the practical aspects of preparing for the lesson, including a guide for the time required to do the activity, grouping recommendations, and materials that need to be gathered or prepared.

Teaching the Lesson

This section starts with a question that guides the students' investigation of a concept or skill and includes a step-by-step procedure for teaching the activity. Some lessons are divided into several classroom sessions. The procedures emphasize guided student discovery through the use of teacher modeling and questioning. Teacher questions help to establish a focus, to encourage higher level thinking skills, and to assess student understanding.

Most lessons conclude with a discussion. The discussion provides an opportunity for teachers to model the kinds of questions scientists ask themselves when interpreting and analyzing the results of their work. The discussion guides students towards higher-level thinking and allows teachers to monitor the level of student understanding.

Building Language for Literacy

Each lesson also provides an opportunity to develop students' acquisition of vocabulary, as well as oral language structures to talk about the scientific subject matter. For example, sentence frames guide students to communicate about aspects of the lesson in correct grammatical form. The repeated use of this approach fosters fluent expressive language skills around the content of the curriculum.

A reading selection accompanies each lesson. Non-fiction texts reinforce the content of the activity through teacher questioning. Fiction selections provide an opportunity for students to apply their knowledge of science to their understanding and enjoyment of stories.

Extending the Lesson

This section includes suggestions for additional investigations, learning center activities, and recommendations for projects students can do at home to solidify the content and skills of the investigation.

Assessing Student Learning

In addition to monitoring student understanding during the activity, teachers use performance rubrics to gauge the level of content and skill acquisition. The rubrics are based on the learning outcomes for the activity and provide descriptors of observable student behavior along the continuum of *emerging*, *achieved* or *advanced* understanding. Patterns of rubric ratings guide pacing and identify the need for additional practice with concepts and skills.

Crosscutting Concepts

There are seven concepts that are widely applicable across specific scientific and engineering disciplines. Cause and effect, for example, is one of them. This concept is as relevant to the growth of plants (Life Sciences) as it is to the motion of objects (Physical Sciences). Teachers can help students achieve a coherent view of the world by actively guiding students to make these connections among disciplines. A brief narrative follows each lesson and places it in the context of specific crosscutting concepts.

Scientific and Engineering Practices

Eight scientific and engineering practices characterize how the work of science and engineering takes shape. Examples include analyzing and interpreting data and planning and carrying out investigations. A brief narrative at the conclusion of each lesson describes how one or more of these practices are incorporated in the lesson.

Texas Safety Standards

All lessons in this book adhere to safety guidelines. Schools and School Districts must obtain a copy of the “Texas Safety Standards Kindergarten Through Grade 12 Science – A Guide to Laws, Rules, Regulations, and Safety Procedures for Classroom, Laboratory, and Field Investigation”. A Publication of the Charles A. Dana Center at The University of Texas of Austin.

