Educational Product	
Educators and Students	Grades 1–2

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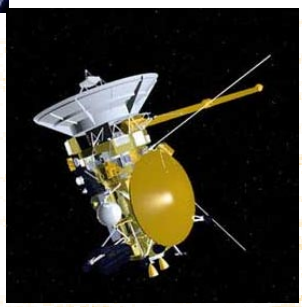
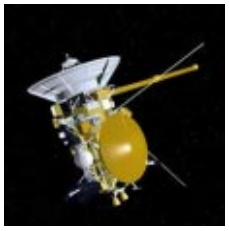
Mission to Saturn Educator Guide

Reading, Writing & Rings!

Grades 1–2



Lesson List



1 What Do You Know About Saturn?

This lesson starts students thinking about Saturn. They draw and write to express their knowledge of Saturn and the rings and moons.

- Language Arts Focus — Descriptive Writing
- Science Focus — Assessment through Writing and Illustration

2 Where Is Saturn in the Solar System? Where am I in the Solar System?

This lesson introduces students to Saturn and its place in the solar system. Students participate in a whole-class read-aloud and participate in a structured writing activity.

- Language Arts Focus — Nonfiction Texts: Listening and Structured Writing
- Science Focus — Learning About the Structure of the Solar System

3 Wow, Saturn Is Much Bigger than Earth!

Students explore the comparative sizes of Saturn and Earth; they make to-scale illustrations and caption their illustrations using scientific language.

- Language Arts Focus — Scientific Captions and Labels
- Science Focus — Creating an Earth–Saturn Model

4 Amazing — Saturn Is So Far, Far Away!

Students create an outdoor, to-scale model of the distances between the Sun, Earth, and Saturn to get a glimpse of the vastness of space.

- Language Arts Focus — Writing an Informational Postcard
- Science Focus — Using a Playground Model to Explore Distance

5 My Spacecraft Model

Students engage in basic problem-solving as they design and construct a model of a spacecraft, document their work, and complete a Design Review Summary.

- Language Arts Focus — Written Reporting and Oral Peer Presentations
- Science Focus — Planning, Building, and Explaining a Spacecraft Model

6 Earth to Saturn, Earth to Saturn!

In this lesson, students use drawing and writing to explore the comparative features of Saturn and Earth.

- Language Arts Focus — Descriptive Analogies
- Science Focus — Understanding the Attributes of Earth and Saturn

7 Rotating Rings of Ice

Students create a three-dimensional model of Saturn and its rings and write about the model; students draft and write a paragraph explaining what they know about the ring system.

- Language Arts Focus — Drafting and Writing a Paragraph
- Science Focus — Modeling Saturn's Icy Ring System

8 Titan and the Other Moons of Saturn

Students learn that Saturn has many moons and that the Cassini–Huygens mission may discover more moons; they examine characteristics of Saturn's moons and sort the moons by attributes, then write about the moons and explain how they sorted them.

- Language Arts Focus — Descriptive Scientific Language
- Science Focus — Sorting by Scientific Attributes

9 Focus on Saturn's Fascinating Features

In this lesson, students create a multilayered book showing Saturn's layers, ring system, and moons; then develop their own texts to explain their Saturn diagrams.

- Language Arts Focus — Writing and Illustrating Expository Texts
- Science Focus — Creating Saturn Books: Rings, Moons, and Other Features

10 Awesome Saturn

Students generate a word list, then create one or more poems about Saturn.

- Language Arts Focus — Using Poetry to Describe Saturn
- Science Focus — Summative Reflections on Saturn

Foreword

Children begin rudimentary scientific thinking from the time they are born as they explore their natural environment and seek to make sense of it. When they acquire language, they begin asking questions about what they experience, observe, and think. Once they are in school, children's natural curiosity links closely with science learning, which offers an ideal opportunity to help young students expand their budding knowledge about the world. Science learning is also an ideal opportunity to involve students in rich reading and writing activities that not only help improve the quality of their learning but also help make them better readers and writers — a key goal in the elementary years.

A Saturn storm as seen by the Hubble Space Telescope.

The sets of lessons you are about to encounter purposefully bring together reading, writing, and science in ways that underscore the belief that scientific thinking and the intelligent use of language go hand-in-hand. These lessons build good language use into the science curriculum, helping students use reading and writing to learn. In doing so, the lessons also help spur students' growth in vocabulary as they acquire new words through their engagement in authentic learning experiences.

A view of Saturn's rings by Voyager 2.

While the lessons are grouped for grades 1/2 and 3/4, they can readily be used interchangeably as needed. Older students with little space science background might benefit from the grades 1/2 lessons. English learners might benefit from the early grades' reading and writing activities, too, finding them more accessible. The upper-grade lessons can also be used for enrichment for younger students who are ready for further study. We encourage teachers to look at the lessons as a whole and use them as best suits their teaching context.

Most important, the lessons open up the world of Saturn and emerging data about this planet to young children, and invite them to be part of space exploration. The scientific concepts, language, and content have been reviewed for accuracy by NASA's Jet Propulsion Laboratory staff.

Connecting Theory and Practice

Common to the reading and writing activities found in the lessons is an underlying belief that metacognitive skills practiced in socially interactive situations can contribute to young children's capacity to think scientifically.

The lessons aim to improve science learning by enhancing metacognitive skills. For example, in science notebooks and logs, students are asked to think about what they have learned and think about how they have learned, both key components of metacognition, which concerns the ability to reflect on our own cognitive processes (the process of knowing) and knowledge about when, how, and why to engage in various cognitive activities (Flavell, 1981). A number of key sci-

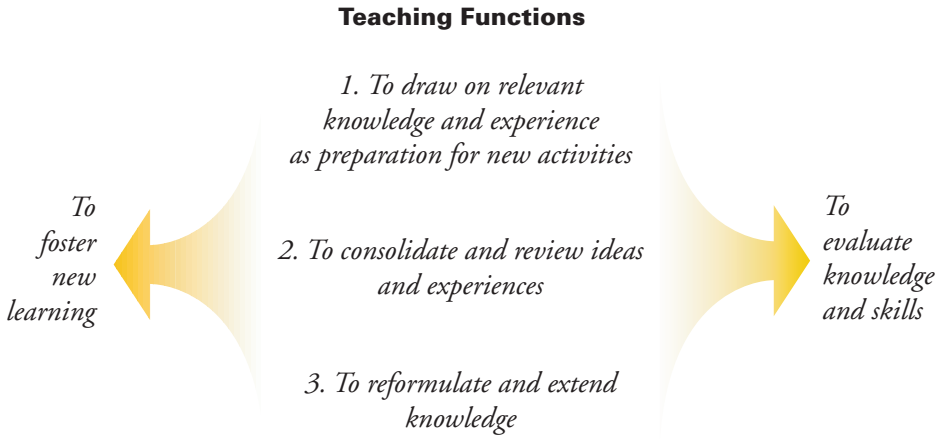
ence process skills are metacognitive in nature and have close correspondence with the skills of reading and writing. The skills of observing, classifying, comparing, predicting, describing, inferring, communicating, interpreting data, organizing information, and drawing conclusions are among the skills young children engage in as they explore a scientific concept, read a text, draw a picture, or compose a piece of writing. The lessons seamlessly integrate and reinforce these important skills.

The instructional activities enable students to be active learners and take responsibility for their own learning. Children first learn how to engage in various problem-solving tasks such as those listed above through social interaction with others (Vygotsky, 1978). The lessons highlight social interaction through exploratory talk (Barnes, 1976) with teachers, partners, and in small groups, and the use of expressive language (Britton, 1990) in talk and writing. This kind of language use among adults and peers helps students clarify ideas and work through new concepts. Little by little, students begin to internalize these new skills and processes.

Connecting Reading, Writing, and Science Learning

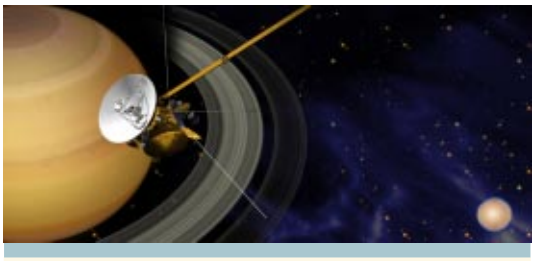
Reading and writing are central activities in each lesson. The lessons focus mainly on expository (explanatory) reading and writing. This kind of reading and writing tends to take a back seat to personal narration in the early grades. As a result, young students become very familiar with structure of a story but less familiar with the structure of expository and informational texts, even though learning how to read and write to explain, analyze, and report are essential skills for students as they move through the grades. Through engaging reading and writing activities, the lessons enable deeper learning by involving students in using writing to help organize and clarify their thinking.

Writing is essential to learning both the content and the processes of science. Langer and Applebee (1987) have identified three important teaching functions of writing that can scaffold students' learning of new content (see table at end of Foreword that relates functions to writing activities in the lessons):



Writing encourages active engagement in learning and helps students activate their schema for the concepts to be explored. Expressive writing in notebooks and logs in children's own everyday language is their thinking written down, made permanent so that students can revisit their first impressions and revise their thinking as their understanding deepens. Writing helps students gain awareness of their developing knowledge and helps teachers to assess what students are learning and not learning, what they are interested in, and what difficulties they are experiencing. Further, research has shown that the more that scientific content is manipulated through analytic writing tasks, the better it is recalled (Langer, 1986, Wotring, and Tierney, 1981).

Reading also encourages active learning by students and has much in common with science process skills. Whether exploring a new area of science or reading a text connected to science, students are engaged in several of the same problem-solving processes. The reading skills of visualizing, questioning, determining important ideas, and understanding text structures resonate with the science process skills of making inferences, making predictions, and drawing conclusions.



The Cassini–Huygens Mission

During an exciting four-year mission of discovery, the Cassini spacecraft will study Saturn's rings, magnetosphere, and atmosphere, and observe the planet-size moon Titan and a number of the icy satellites. The Huygens probe will collect data about the atmosphere, winds, and surface conditions of Titan. Cassini–Huygens is an international collaboration of the National Aeronautics and Space Administration (NASA), the European Space Agency, and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology, manages the Cassini–Huygens mission for NASA's Office of Space Science.

Effective vocabulary development is essential as well, especially in science where children's limited meanings for words can limit their understanding of concepts and the subject being studied (Herber, 1978). New vocabulary learning in science is developmental, where a definition is a start, but expanded meaning and knowledge require multiple experiences with the word. Through well-planned reading and writing activities and hands-on experiences with new content, children begin to learn, retain, and then use their newly acquired knowledge of scientific concepts and terms.

Strong reading and writing skills can unlock the doors to unlimited learning for our students. Students need practice, though, in reading and writing in a broad range of genres and content areas to reach this level of literacy. The design of the lessons in this program offer students chances to use their emerging literacy skills for real scientific learning, while giving them much needed experiences in reading nonfiction texts and using writing to describe, compare, and explain.

Teaching Functions and the Lessons

This table illustrates the Langer and Applebee teaching functions as they relate to grade levels and writing activities in the lessons.

TEACHING FUNCTION	GRADES / LESSONS
1. To draw on relevant knowledge and experience as preparation for new activities	Grades 1/2: Lesson 1 Grades 3/4: Lessons 1, 2, 3, 4, 5
2. To consolidate and review ideas and experiences	Grades 1/2: Lessons 2, 3, 4, 5, 7, 8 Grades 3/4: Lessons 4, 5, 9, 10, 11, 12
3. To reformulate and extend knowledge	Grades 1/2: Lesson 6, 8, 10 Grades 3/4: Lessons 6, 9, 12

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