

ARIES: ASTRONOMY-BASED PHYSICAL SCIENCE

ARIES is an astronomy-based physical science program consisting of eight modules—four for grades 3–6 and four for grades 5–8. The modular structure of the program and its focus on only the physical and earth/space sciences allows teachers the opportunity to use any number of modules in any sequence to supplement their programs.

Publisher:	Charlesbridge Publishing	Grade Level:	3–8
Year Published:	2000	Scientific Domain:	Physical, earth, and space science
Developer:	Harvard-Smithsonian Center for Astrophysics	Web Site:	www.charlesbridge.com/school/instruction/mathsci/aries/home.htm

CONTENTS Each *ARIES* module consists of a total of 13–17 explorations divided into 3–5 units. Each module requires 10–16 weeks of instructional time and includes suggestions for extensions, such as how to gather data from season to season. The module titles for the *ARIES* program are listed below.

GRADE LEVEL	MODULE TITLES
3–6	Exploring Time: Sundials, Waterclocks, and Pendulums Exploring the Earth in Motion: Daylight, Sun, and Shadow Patterns Exploring Light and Color: Filters, Lenses, and Cameras Exploring Energy: Waterwheels, Windmills, and Sunlight
5–8	Exploring Waves: Wave Tanks, Vibrations, and Sound Exploring Navigation: Location, Direction, and Latitude Exploring Space: Sun, Moon, and Stars Exploring Motion and Forces: Friction, Velocity, and Acceleration

FORMAT Each *ARIES* module consists of a Teacher Binder, student science journals, and an apparatus bin.

Teacher Binder: Each module’s Teacher Binder includes the following sections:

- *Overview of the ARIES Curriculum:* This section, which is the same in all modules, describes the philosophy behind the program and suggestions for implementing the *ARIES* curriculum.
- *Module Introduction:* Each module introduction provides background knowledge for the teacher about the major science concepts introduced in that particular module. It also includes a section about the *ARIES* approach to these particular concepts (e.g., “The *ARIES* Approach to Energy”) and common prior ideas children are likely to have at the outset of the module. Learning objectives and concepts within each exploration are listed in the Introduction.
- *Units and Explorations:* Most of the Teacher Binder contains the 3–5 units and specific explorations that will be taught in the module. The beginning of each unit states the general purpose of the unit and what students will be doing in each of the unit’s explorations. The explorations include teaching sequences and suggested questions and lesson extensions.

- *ARIES Assessment:* A section outlining assessment strategies appears after the unit’s explorations. It explains the variety of assessment methods available, including a student self-assessment (along with an evaluation rubric), an observation chart, a unit summative test with scoring guide, and suggestions for conducting interviews and performance assessment tasks.
- *Resources:* A selection of print resources for teachers and students appears at the back of each Teacher Binder.

Science Journal: The science journal supports student learning by asking them to articulate their prior ideas, formulate questions, make predictions, record observations, organize data, and draw conclusions.

Apparatus Bin: The apparatus bin contains materials needed to conduct the explorations. Consumable items can be reordered.

INSTRUCTIONAL DESIGN The *ARIES* program is based on a constructivist approach to science teaching and learning. The program assumes students come to the classroom with some prior ideas about topics such as light and energy, and that those ideas must be discussed at the outset. Explorations in the module are designed to immerse children in the science processes of observing, describing, recording, modeling, and predicting, and in doing so, students will be likely to rethink their current ideas and refine them based on evidence. Each *ARIES* module begins by encouraging students to share their current ideas about the topic. As stated in the Teacher Binder, the explorations begin:

“...in a context familiar to your students and leads to an improved knowledge of the related science. The sequence of activities flows organically so that students make a chain of linked discoveries. Frequently, the activities follow paths that are similar in sequence to the historical development. We therefore strongly recommend that you follow the sequence as provided.”

ARIES is a discovery-based program. Students become engaged in the process of constructing equipment, e.g., shadowboxes, pinhole cameras, and waterclocks. The teacher’s role in the discovery approach is to become involved in questioning, predicting, and recognizing the need to rethink ideas.

ASSESSMENT *ARIES* suggests several formative assessment strategies, many of which are embedded and ongoing. Formative assessments include the student journal pages, student observation charts, and interviews. A summative paper-and-pencil test appears in each module. It is suggested that this test be given as a pre-test to guide instruction.