INTRODUCTION

The Planetary Science kit contains

- Teacher Toolkit: Planetary Science
  1 Investigations Guide: Planetary Science
  1 Teacher Resources: Planetary Science
  1 FOSS Science Resources: Planetary Science
- FOSS Science Resources: Planetary Science (class set of student books)
- Equipment for 5 classes of 32 students

Each investigation in this course is divided into two to four parts. Each part has a Materials section that details the materials in the kit and the materials supplied by the teacher that will be used by each group of students and the class. The kit includes most of the learning equipment needed by students. There are enough consumable materials in the kit for 5 classes of 32 students each. Some of the teacher-supplied items can also be ordered through Delta Education.

For each investigation, you will need one computer with Internet access that can be displayed to the class, either by an LCD projector, interactive whiteboard, or a large screen.

For updates to information on materials and access to the Safety Data Sheets (SDS), go to www.FOSSweb.com. Links to replacement-part lists and customer service are also available on FOSSweb.
## KIT INVENTORY List

### Drawer 1—permanent equipment, unique items

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOSS Science Resources: Planetary Science, student books *</td>
<td>32</td>
</tr>
<tr>
<td>Book, The Moon Book, by Kim Long</td>
<td>1</td>
</tr>
<tr>
<td>Card sets, cosmos, 36 cards/set</td>
<td>16</td>
</tr>
<tr>
<td>Card sets, Solar System Origin, 10 cards/set</td>
<td>8</td>
</tr>
<tr>
<td>Globe and base sets</td>
<td>8</td>
</tr>
<tr>
<td>Map, The Earth's Moon, National Geographic Society</td>
<td>1</td>
</tr>
<tr>
<td>Maps, Lunar Landing Site Chart</td>
<td>16</td>
</tr>
<tr>
<td>FOSS® orrery</td>
<td>1</td>
</tr>
<tr>
<td>Poster, Moon Log, laminated</td>
<td>1</td>
</tr>
<tr>
<td>Poster, Moon Photo</td>
<td>1</td>
</tr>
<tr>
<td>Poster set, Solar System Origin, 10 posters/set</td>
<td>1</td>
</tr>
<tr>
<td>Puzzles, Phases of the Moon Sequence</td>
<td>9</td>
</tr>
</tbody>
</table>

### Drawer 2—permanent equipment, unique items

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basins, round</td>
<td>8</td>
</tr>
<tr>
<td>Bead packages, aqua, 1 mm</td>
<td>1</td>
</tr>
<tr>
<td>Bead packages, blue, 1 mm</td>
<td>1</td>
</tr>
<tr>
<td>Bead packages, green, 1 mm</td>
<td>5</td>
</tr>
<tr>
<td>Bead packages, orange, 1 mm</td>
<td>7</td>
</tr>
<tr>
<td>Bottles, plastic, with flip-up shakers</td>
<td>4</td>
</tr>
<tr>
<td>Lamp, clip-on</td>
<td>1</td>
</tr>
<tr>
<td>Lightbulb, 75 watt</td>
<td>1</td>
</tr>
<tr>
<td>Lightbulb, blue, 60 watt</td>
<td>1</td>
</tr>
<tr>
<td>Rocks, 20 each of 5 sizes</td>
<td>1</td>
</tr>
<tr>
<td>Spectroscopes</td>
<td>45</td>
</tr>
<tr>
<td>Spheres, white, polystyrene, 3.5 cm (1.4”)</td>
<td>32</td>
</tr>
<tr>
<td>Spoon, midi, white, short handle</td>
<td>1</td>
</tr>
<tr>
<td>Spoon, mini, green</td>
<td>1</td>
</tr>
<tr>
<td>Spoon, white, long handle, 2 mL</td>
<td>1</td>
</tr>
<tr>
<td>Straws, slim, short</td>
<td>250</td>
</tr>
<tr>
<td>Thread, carpet, spool</td>
<td>5</td>
</tr>
<tr>
<td>Vials, clear, with caps, 0.5” × 1.5”</td>
<td>32</td>
</tr>
</tbody>
</table>

* The student books are shipped separately in two boxes of 16 hardbound books each.

**NOTE**
The teacher toolkit is shipped separately. However, there is space in drawer 1 to store your toolkit.
# Drawer 3—permanent equipment, common items

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batteries, AA</td>
<td>4</td>
</tr>
<tr>
<td>Container, 1/2 L</td>
<td>1</td>
</tr>
<tr>
<td>Cups, plastic, 250 mL (9 oz.)</td>
<td>25</td>
</tr>
<tr>
<td>Flashlights</td>
<td>2</td>
</tr>
<tr>
<td>Marbles</td>
<td>50</td>
</tr>
<tr>
<td>Marking pens, permanent, black, ultrafine</td>
<td>8</td>
</tr>
<tr>
<td>Marking pens, wet-erase, red</td>
<td>8</td>
</tr>
<tr>
<td>Meter tapes</td>
<td>16</td>
</tr>
<tr>
<td>Poster, FOSS Outdoor Safety</td>
<td>1</td>
</tr>
<tr>
<td>Poster, FOSS Science Safety</td>
<td>1</td>
</tr>
<tr>
<td>Straws, flex</td>
<td>100</td>
</tr>
<tr>
<td>Straws, superjumbo</td>
<td>50</td>
</tr>
<tr>
<td>Syringe, 35 mL</td>
<td>1</td>
</tr>
<tr>
<td>Tape transparent, rolls</td>
<td>5</td>
</tr>
<tr>
<td>Zip bags, 1 L</td>
<td>10</td>
</tr>
<tr>
<td>Zip bags, freezer strength, 4 L</td>
<td>10</td>
</tr>
</tbody>
</table>

*These items might occasionally need replacement.*
**MATERIALS Supplied by the Teacher**

Each part of each investigation has a Materials section that describes the materials required for that part. It lists materials needed for each student or group of students and for the class.

Be aware that you must supply some items. These are listed separately in the materials list for each part of the investigation. Here is a summary list of those items. Some of the supplies and tools are available from Delta Education. Check the replacement-part list for the course on FOSSweb.

**Technology equipment**
- 1 Computer with Internet connection
  - Google Earth™
- 1 Light sensor (optional, see Investigation 9, Part 2)
- 1 Projection system

**Measuring tools**
- 1–2 Balances, electronic (0.1 g accuracy)
- 32 Calculators
- 1 Meterstick
- 32 Rulers

**Paper**
- 8 Cardboard pieces, 10 × 20 cm (4" × 8")
  - Chart paper
- 2 Pieces of construction paper, 1 white, 1 other color (optional)
  - Index cards (optional)
  - Newspaper
  - Paper towels
- 1 Piece of poster board, 35 × 50 cm (14" × 20")
  - Science notebooks (composition books)
  - Self-stick notes
  - Tagboard (optional)
  - White paper, 22 × 28 cm (8.5" × 11")

**NOTE**
Throughout the *Investigations Guide*, we refer to materials not provided in the kit as “teacher-supplied.” These materials are generally common or consumable items that schools and/or classrooms already have, such as rulers, paper towels, and computers. If your school/classroom does not have these items, they can be provided by teachers, schools, districts, or materials centers (if applicable). You can also borrow the items from other departments or classrooms, or request these items as community donations.
Resources
  • Aerial photographs of your community (optional)
  1 Large ball (e.g., soccer, basketball)
  1 Cart, AV (optional)
  1 Earth globe on a stand, 23–30 cm in diameter

Supplies
  • Aluminum foil (narrow roll) or toilet tissue
  8 Brass fasteners (optional)
  • Cocoa powder, about 1 lb.
  • Colored pencils, marking pens, and highlighters
  1 Dime
  • Flour, 20 lb.
  • Glue sticks
  1 Marking pen, wet-erase, fine-tipped, colored
  1 Marking pen, wet-erase, black or blue
  • Marking pens, whiteboard
  • Masking tape, 2.5 cm wide
  1 Quarter
  2 Rubber bands, stout
  10 Sticky dots, colorful, 13 mm
  • String, 4 m
  • Super glue (optional)
  2 Transparencies (optional)
  • Water
Other tools

- Binoculars, spotting scope, or telescope (optional)
- 32 Calculators
- 8 Compasses, pencil (optional)
- 1 Extension cord (optional)
- Fluorescent ceiling lights or lamp
- 1 Hobby or craft knife
- 1 Knife or nail file
- 1 Additional light sources (optional)
- 1 Oven mitt or towel
- 1 Overhead projector or other strong light source
- 16 Scissors
- Shim (tapered piece of wood, metal, or stone; optional)
**IMPORTANT Information for First-Time FOSS Users**

If this is your first time using a FOSS middle school course, you should become familiar with a few items before beginning instruction. These steps will also prepare you to teach any other FOSS middle school course.

1. **Plan for student notebooks**
   In FOSS, students keep science notebooks both as organized records of their scientific investigations and as places to reflect about their thinking. Notebook opportunities appear in each part of each investigation.

   Students will need their own notebooks dedicated for use in science class, in which they can record focus questions, observations, data, conclusions, their own questions, and so on. These notebooks are typically bound composition books in which students make entries and glue or tape photocopied notebook sheets or other artifacts.

   In preparation for each part of each investigation, you will print or make copies of the specified notebook masters. You can print or copy the preprinted notebook masters from *Teacher Resources* or download digital versions from www.FOSSweb.com. Each notebook master consists of two copies of a notebook sheet, so each page will need to be cut in half. Sometimes you might prefer to project a notebook master and have students copy some information from the notebook sheet into their notebooks, adding their own data and responses.

   In the first investigation, make sure students have prepared their notebooks by setting up a table of contents, creating an index for vocabulary words, and numbering the pages. For more information on notebook use in FOSS, see the Science Notebooks in Middle School chapter.

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**TEACHING NOTE**

Notebook sheets are available on FOSSweb in several formats. For each notebook sheet, you can select “to photocopy,” which will be identical to the printed notebook masters in Teacher Resources, or “to project,” which is rotated and zoomed for easier display. You can also type into these notebook sheets while projecting them.
2. **Plan for online activities and projection**
   Throughout this course, you will need to project digital components through your computer for the class to see. The Getting Ready section for each part will indicate what to prepare.

   In general, you will need regular access to a computer with Internet access, a document camera, and either an LCD projector or a large-screen display. If regular projection is difficult given your classroom setup, you could use the notebook masters and teacher masters to make transparencies for use with a document camera or an overhead projector.

   For other projection needs, such as displaying a FOSSweb program, you will need to make sure students can see the computer display.

3. **Become familiar with FOSSweb**
   If you have never logged into FOSSweb before, visit the site to set up your account. The site is used throughout the course. Review the print and digital resources available for this course, including the eGuide, eBook, Resources by Investigation, Assessment Coding Guides, and Teacher Resources including the grade-level Planning Guide. Be sure to check FOSSweb often for updates and new resources. For more information on how to set up an account and to access the digital resources, see the Technology chapter in this *Investigations Guide*.

   Once you’ve logged in, familiarize yourself with the layout of the site and the additional resources available to you there. The easiest way to access resources is by clicking the icon for the course and going to Resources by Investigation.

4. **Review teaching slides**
   The teaching slides are a series of editable slides for you to use with your class as an instructional tool. There is one set of slides for each part of each investigation. Look for the teaching slides under “Digital-Only Resources” on FOSSweb.

5. **Plan groups**
   Plan to organize students into groups of four around lab benches or tables. Seating should facilitate students’ working together and sharing observations and ideas. The “for each group” section of the materials list will always describe the materials needed by a group of four students.

6. **Display safety posters**
   Display the *FOSS Science Safety* poster in a prominent location in the classroom. There is also a *FOSS Outdoor Safety* poster.
7. **Set up a materials station**
   Plan to establish a materials station where students will always pick up and return materials. Select a location that minimizes congestion and provides easy supervision as needed.

8. **Assess progress throughout the course**
   Embedded (formative) assessments provide a variety of ways to gather information about students’ thinking while their ideas are developing. These assessments are designed to be diagnostic. They provide you with information about student learning so that you know if you need to plan a next step to clarify understanding before going on to the next part of the investigation. Each Getting Ready section describes an embedded-assessment strategy you may find useful in that part. Two assessment masters, *Embedded Assessment Notes* and *Performance Assessment Checklist*, are provided as tools to help you analyze students’ data (see the Assessment chapter for more on how to use these tools). The *Performance Assessment Checklist* is in two formats, one for individual study and one for groups.

At the end of most investigations, there is an I-Check benchmark assessment. The questions on these assessments are summative—they examine all the concepts students have learned up to that point in the curriculum. You can find out more about I-Check assessments in the Assessment chapter and in Investigation 2. Use *Assessment Record* to record results. Check FOSSweb for downloadable spreadsheets for *Performance Assessment Checklist* and *Assessment Record*. 

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**Performance Assessment Checklists**

**Embedded Assessment Notes**

**Assessment Record**
PREPARING the Kit for Your Classroom

Some preparation is required each time you use the kit. Doing things before beginning the course will make daily setup quicker and easier.

Each part of each investigation includes a section called Getting Ready, which describes what you need to do or consider to be prepared to conduct the part.

Science Notebooks

You will need to print or make copies of science notebook sheets before each investigation. See Getting Ready for Investigation 1, Part 1, for ways to organize the science notebook sheets for this course. You can download, print, and project electronic copies of the sheets from FOSSweb.

One-Time Preparation

Some of the preparation will need to be done only once. Here are things that require one-time preparation.

Investigation 1, Part 1

Install Google Earth™ and check for the latest version of Flash plug-ins for your browsers on computers for you and your students. Get aerial photos of your local area if students won’t be using computers. This investigation can be done with the photos provided in FOSS Science Resources: Planetary Science, but the experience will be much richer for students if it involves their own school, neighborhood, and community.

Investigation 1, Part 3

Cut out a paper Moon.

Investigation 2, Part 1

Plan the location of the light source, and rearrange furniture if necessary. Cut out a paper star, and tape it on the north side of the classroom, near the ceiling.

Investigation 2, Part 2

Trace a quarter in the center on a piece of poster board. Cut out the hole with a hobby knife.
Investigation 3, Part 2
Cut a piece of string 3.61 meters (m) long to represent the distance between Earth and the Moon in a scale model.

Investigation 5, Part 1
Prepare millimeter rulers by printing or copying teacher master M, *Millimeter Rulers*, and rough cut the rulers. Students can finish by cutting on the solid lines and folding on the dotted line.

If you don’t have a pencil compass for each group, construct dividers, following the instructions on teacher master N, *Tagboard-Divider Construction*.

Prepare the cardboard graders by cutting a piece of cardboard into 10 × 20 cm pieces for each group.

Investigation 7, Part 1
Prepare a scale model of the solar system for classroom demonstration. This model will include the Sun, Mercury, Venus, Earth, Mars, and possibly Jupiter.

Investigation 7, Part 2
Prepare atmosphere models using small, clear vials and beads of four colors. Put each set of four in a 1 L zip bag.

Investigation 8, Part 1
Assemble a spectroscope for each student. You could let your first class assemble them for use by all classes.
Gather Tools and Supplies

Some of the preparation involves gathering supplies. Here are some examples.

**Investigation 1, Part 3**
Get binoculars, a spotting scope, or a telescope for students to view the Moon.

**Investigation 5, Part 1**
Purchase 20 pounds of white flour for all the classes and about 1 pound of cocoa powder per class for the cratering simulation.

Provide one or two electronic balances for students to determine the mass of their rocks for the cratering investigations. Weighing can be done at a central station.

**Investigation 8, Part 1**
Collect several light sources for students to observe: bug light, black light, LED lights, overhead projector, LCD projector, computer flat screen, or CRT screen.

**Investigation 9, Part 2**
The FOSS orrery is used in this part to introduce planet transits. Read the Preparation Details for using a light sensor with the orrery. If you provide a light sensor, the data can be graphed using a computer.

Review Safety Guidelines

There are safety posters in the kit. Consider how to introduce the class rules so that everyone has a safe science experience. When going outside to look for the Moon or when using the spectroscopes, caution students not to look directly into the Sun.
Reserve Computers
In a number of investigations, students should have access to computers in pairs or individually. Plan ahead to use multiple computers at these times.

Investigation 1, Part 1 (with Google Earth™)
Investigation 2, Part 3
Investigation 4, Part 3
Investigation 7, Parts 3 (optional) and 4
Investigation 8, Part 2
Investigation 9, Part 2

Consider Outdoor Observations
Students go outside in Investigation 1 to search for the Moon. Plan how you will organize students to go outside, where they will go, and the guidelines for behavior while outdoors.

In Investigation 8, Part 1, students will view sunlight with spectroscopes. If the classroom does not have windows, you will need to move to a location where sunlight is visible.

Sequential Classes
The materials are designed to be used with sequential classes. Organize a materials station in a central location in the classroom. Set up the materials at the station before first period. Each period, the appropriate materials are picked up for each group by a Getter, used for the investigation, inventoried by students at the end of the period, and returned to the materials station by a Getter. You can quickly review the materials station to ensure that all the materials came back (and take appropriate action if they didn’t) and that the materials are ready for the next class.
CARE, Reuse, and Recycling

When you finish teaching the course, inventory the kit carefully. Note the items that were used up, lost, or broken, and immediately arrange to replace the items. Use a photocopy of the *Kit Inventory List*, and put your marks in the “Equipment condition” column. Replacement parts are available for FOSS by calling Delta Education at 1-800-258-1302 or by using the online replacement-part catalog (www.DeltaEducation.com/FOSS/buy).

The items in the kit have been selected for their ease of use and durability. Make sure that items are clean and dry before putting them back in the kit. Small items should be inventoried (a good job for students under your supervision) and put into zip bags for storage. Any items that are no longer useful for science should be properly recycled.