First Grade Star Lab
Space Systems: Stars and the Solar System

One of the great benefits of the STARLAB is the ability to control time. An entire year of patterns can be compressed into minutes or seconds. Students can watch where the sun rises and sets throughout the year for our latitude (39 degrees North) or the cycle of the moon phases. This becomes a real exercise in observation for students. They are able to watch the motion, see patterns and make predictions about the sun, moon and stars.

Day 1

1ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted.

Analyzing and Interpreting Data

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific question.

ESS1.A: The Universe and Its Stars

- Patterns of the motion of the sun, moon and stars in the sky can be observed, described, and predicted.

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Activity 1: Seeing Stars
(approximately 5-10 minutes)

STARFIELD CYLINDER
Procedure:

1. Begin with the side lamps on. Slowly turn down the side lamps. Adjust the projector brightness to its lowest setting. No stars should be seen. **Ask the students to describe what they see.**

2. Slowly increase the brightness of the projector with the Starfield Cylinder in place. **Ask students to tell you when they see the first star.** Continue to turn the knob until the entire starfield is lighted. Students should see thousands of stars.

3. Turn the projection brightness knob down from full brightness about ½ turn. Slowly turn on the slide lamps. This is like our sun rising.

4. **Tell the students that our sun is a star and the only star that we see during the day**.

1-ESS1-2: Make observations at different times of year to relate the amount of daylight to the time of year.

Planning and Carrying Out Investigations

- Make observations (firsthand or from media) to collect data that can be used to make comparisons.

ESS1.B: Earth and the Solar System

- Seasonal patterns of sunrise and sunset can be observed, described, and predicted.

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

Activity 2: Sunrise and Sunset (seasons)

(approximately 20 – 30 minutes)

STARFIELD CYLINDER (set latitude at 39 degrees)

The Sun: The Starfield Cylinder has twelve magnetic buttons around its circumference. These buttons mark the position of the Sun along the ecliptic and when one is removed, it shows where the Sun would appear in the sky for each month of the year. Each button is located directly above the name of a particular month listed on the cylinder platform on the projector. The position of the Sun has been set for approximately mid-month with the exception of March, June, September and December. On these months it has been offset to show the Sun on the 22nd of the month to represent the equinox. To remove a button, simply pull it out. Set the projector for the desired latitude (39 degrees north) and turn the cylinder so that the "Sun" is seen on the eastern horizon. This is sunrise. By turning on the daily motion switch, you will see the Sun slowly move across the sky until it finally sets. This allows you to observe the elevation of the Sun, location of sunrise and sunset and the relative amount of time it takes to cross the sky for each month of the year making it easy to demonstrate the reason for the seasons.

Procedure:

1. Prepare the Starfield cylinder by removing the button above December on the date scale. This opening will provide the light that will represent the sun.

2. Have the projector set so that the "sun" is about to rise in the east. This will place the "sun" in its most southern position. This will represent the position of the sun during December. Leave the side lights on as you turn up the projector brightness light. Keeping the side lights on will obscure most of the stars and will create a daylight effect, to some extent.

3. Begin the lesson by telling the students that it is called sunrise when the sun first appears in the sky.

4. Tell the students to look toward the east as you turn on the motion of the projector, simulating sunrise. Have them follow the sun on its journey through the sky. Stop the motion when the sun sets in the west. Explain that this represents Winter. **Ask students to describe Winter characteristics.**

5. Remove the button located above March on the date scale. Place that button in the opening above December. Repeat the procedure from sunrise to sunset. **Ask the students what was different in the path of the sun from December to March.** They should notice that this path takes the sun higher in the sky. Explain that this represents Spring. **Ask students to describe Spring characteristics.**

6. Remove the button above June on the date scale. Place the button in the opening above March. Once again, set the projector to have the sun rise in the east. Turn on the motion and have the students follow the path of the sun again. **Ask the students to explain what has happened to the path of the sun as you have moved from March to June.** Explain that this represents Summer. **Ask students to describe Summer characteristics.**

7. Remove the button above September on the date scale. Place the button in the opening above June. Once again, set the projector to have the sun rise in the east. Turn on the motion and have the students follow the path of the sun again. **Ask the students to explain what has happened to the path of the sun as you have moved from June to September.** Explain that this represents Fall. **Ask students to describe Fall characteristics.**

8. Explain that during the winter months, the sun appears lowest in the sky (shorter days, colder weather). During the summer months, the sun appears higher in the sky (longer days, warmer weather).

9. Choose one of the four months from above, **tell the students the month and have the students predict the motion of the sun and the season.** Turn on the motion to see if they are correct.

Day 2

1ESS1-1: Use observations of the sun, moon, and stars to describe patterns that can be predicted.

Analyzing and Interpreting Data

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ESS1.A: The Universe and Its Stars

- Patterns of the motion of the sun, moon and stars in the sky can be observed, described, and predicted.

Patterns

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Activity 3: The Moon

(approximately 20 – 30 minutes)

STARFIELD CYLINDER (set latitude at 39 degrees)

The Moon

The reason we see the moon is because it's reflecting sunlight back to us on Earth. While half the moon is always being lit by the Sun, we don't always see the lit side.

In order to show the phases of the moon, two identical sets of 5 magnetic moon phase magnets have been included in the STARLAB plastic container.

One set of magnets can be used to show the waxing phases while the second set can be used to show the waning phases. Each set includes a slim crescent, a wide crescent, a quarter, a narrow gibbous and a wide gibbous. A full moon is projected by removing the button on the cylinder and leaving that completely open. For a new moon, leave the button on. Use the following procedure for setting a specific moon phase.

Background

There are 29.5 days in one lunation, or complete set of moon phases. If the moon is full on the 15th of a particular month, then it will be full about the 14th or 15th of the following month. Because our months have lengths from 28 days (February) to 31 days, the phase repetition does not occur on the same day each month. In calendars that are true lunar calendars, like the Jewish, Chinese, or Muslim calendars, the phases repeat exactly each month, so the 1st of each month will be a new moon.

Procedure

1. Place the moon phase magnets in order on the Starfield cylinder. Remember to leave the button in place for the new moon and to not place anything over the hole to represent the full moon.
2. Have the projector set so that the “moon” is about to rise in the east.
3. Turn the side lights down as you turn up the projector brightness light. This will simulate the sun setting.
4. Remind the students that we only see one moon phase at a time and that it takes a month to see all of the phases but in the STARLAB we can speed up time and see all of the phases. We see all of the phases in the same order each month.
5. Identify each moon phase as it moves across the sky.
6. Remind students that the moon rises and sets much like the sun but the moon is also different; it rises and sets at different times of the day and night. This is why we can sometimes see the moon during the day.

Silver button represents the new moon

No button represents the full moon