

Lesson 4: Star Clocks

Our daytime concept of time is based on the motion and position of the Sun. In this activity students are challenged to tell time at night with a Star Clock. They will determine the correct orientation needed for the Star Clock to function. Keeping track of the positions of constellations with the Star Clock helps students visually understand the relationship between the constellations' changing positions and our concept of passing time.

Concept

The apparent motion and position of constellations can be used to tell time.

Objectives

Students will:

- construct Star Clocks;
- determine local time using the Star Clocks;
- make observations about the passing of time using their Star Clocks; and, explain the relationship between the motion of the stars and our concept of time.

Materials

- Star Clock pattern
- Star Finder from Activity Two
- Large cardboard model of constellations on Star Clock (optional)
- Paper fastener
- Scissors
- Glue
- Astronomy Notebook

Procedure

Advanced Preparation

Make copies of the Star Clock pattern for each student. You may wish to create a large classroom version of the constellation section of the Star Clock to use as a teaching tool.

- 1. Ask students to tell you the time. Have them explain how they got that information. Ask how people long ago might have told time. What instruments could they use? (Take suggestions: for example, using the stars, using the Sun, dripping water or pouring sand. If you did the first unit of *Astro Adventures II*, Sun Watching, students will already have a good grasp of this concept and will probably be able to recall some of the ancient time-keeping devices that were introduced.)
 - 2. Ask students to describe how a person might tell time at night before watches and clocks were invented. Try to steer their discussion toward including the ideas about stars and changing star positions.

- 3. Have students take out their Star Finders. Ask them to set their Star Finders for the position of the stars at 10 p.m. tonight (don't forget to adjust for Daylight Saving Time if necessary), using the simple constellation field. Allow time for them to observe the position of the stars and constellations. Reset the star finder for 4 a.m. Ask students to describe the differences they notice between these two settings. Discuss their observations and conclusions that stars are found in different positions at different times. (This is due to the daily rotation of Earth.)
- 4. Distribute copies of the Star Clock and paper fasteners. Have students cut out all of the pieces and assemble their Star Clocks by putting the disk with the words "The Time Is" on top of the disk with the months. A paper fastener (brass braid) through the center of both disks will hold them together.
- 5. Refer students back to the Star Finder, reminding them that the positions of stars are different at different times. Explain to them that the Star Clock is a simplified star finder that can be used to tell time at night.
- 6. To use a Star Clock, have students face the northern night sky, holding the Star Clock so the current month is at the top of the circle. Turn the black disk until the picture of the Big Dipper lines up with the Big Dipper's position in the night sky. (You can construct a large version of the black disk with the star constellations to allow students to practice aligning the constellations of their clocks.) Ask students to tell the time by reading the time off their Star Clocks.

Teacher Note: If it is daylight saving time students need to add one hour to their clock. Daylight saving occurs between the first Sunday in April and the last Sunday in October.

- 7. To practice using the Star Clock, have each student select a time to leave on a trip to the Andromeda Galaxy and set their clocks. Have them carefully note the position of the constellations on their clocks; slowly rotate the large classroom model. When the model matches the position each of the students have selected on their Star Clocks, they should make a ringing sound like an alarm clock. Since students have selected different times, be prepared for alarm clock sounds at different times.
- 8. The Star Clock can be used two different ways. It can be used to tell what time it is by the position of the stars or to tell where the Big Dipper will be at a specific time, which makes it easier to find in the night sky. Remind students that they must always be facing the North Star when using the Star Clock. Challenge them to try to use their clocks at home in the evening.

Evaluation

1. Have students determine the position of the Big Dipper at 9 p.m. for different months of the year using their Star Clocks. The process for doing this is a bit different than using the Star Clocks for telling time. Students need to face north (or the North Star if outside) with

228

the present month at the top of the Star Clock. They then turn the inner dial so the time reads 9 p.m. They should pinch the inner and outer disks together so the time will remain 9 p.m. If they then turn both disks while facing north the month will change and the position of the Big Dipper at 9 p.m. for the various months can be seen.

Star Finding

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2. Ask students to come up with short phrases that help them remember how the Big Dipper looks in the early evening during different times of the year. Students should develop one phrase for each season. It could have to do with the weather or holidays that occur during that time of year. Let them be creative.

Examples of possible answers:

Spring — high in the sky upside down raining on us Summer — scooping up ice cream for us Fall — down low on the horizon catching leaves as they fall from the trees Winter — handle hanging down like an icicle

