SOCIAL STUDIES CAREER ADVENTURES

Astronomer: Aztecs and Astronomy

Adventure Description:

In this adventure, students will think like an astronomer and build a solar calendar that uses shadows to determine the season.

Activity

Step 1: Background on Aztecs and Astronomy (10 minutes)

- Show Video: Astronomy and Aztec Civilization.
- Explain to students that astronomers study the stars, including the closest star to Earth- the Sun. Astronomy is the study of the sun, moon, planets, stars and galaxies. It is also one of the oldest sciences in the world, dating as far back as 1600 BCE. Some astronomers study current astronomical events, while others study ancient views.
- Explain to students that in ancient times, people often thought the Sun was a god that had the power to give us different amounts of light. Also explain that many civilizations have used the sky to keep track of time.
- One group that tracked the movement of the sun were the Aztecs. The Aztecs not only tracked the movement of the Sun and other stars, but also believed that human sacrifices were required to make sure that the Sun stayed on its course. The Aztecs made sure to keep the sun god happy because without the Sun, crops would not grow and people would starve.
- Today, we know that the reason the Sun seems to move in the sky is because the Earth is moving. Because the Earth rotates on its axis, the Sun appears to move from east to west each day. Because the Earth is tilted and travels in a predictable orbit around the Sun, the position of the Sun in the sky changes in a predictable way and solar calendars and clocks can be created.
- Provide students with Handout: How Solar Calendars Work and read through it as a class.
- Explain to students that solar calendars and clocks track the location of the Sun by tracking the shadows that are created as the Sun moves. The length and direction of the shadows can be measured to determine information about the time or season of a given place.

Step 2: Activity Set-Up (5+ minutes)

- Explain to students that they will build and test a solar calendar.
- Provide students with Handout: Creating and Testing a Solar Calendar and read through the steps as a class.
  - Teacher Note: Each student will need to be assigned a location to use for their solar calendar. There are 5 different location cards on Handout: Location Cards for Students. Make enough copies of the handout so that each student can have one location card.
- Provide students with the following materials:
  - 1 location card from Handout: Location Cards for Students
  - 24"x 24" piece of cardboard
  - Ruler
  - Standard washable marker - approximately 6" long
  - 1" round ball of clay

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Step 3: Making a Solar Calendar (15-20 minutes)

- Instruct students to complete step one on the handout.
- While students are working, ask the following questions:
  - Why did civilizations use the Sun to help make their calendar? (The Sun repeats the same pattern every year on the same day.)
  - Why might a solar calendar not be the most reliable form of time keeping? (They aren't able to be used on cloudy days, they have to be made for a specific location - meaning a calendar made for Chicago wouldn't work for L.A., etc.)
- Once students have built their calendar, instruct them to use a flashlight to create the shadows cast by the Sun during each of the 4 seasons. Remind students that the flashlight will simulate the direction the Sun's rays are coming from, meaning they will need to alter the angle at which they hold the flashlight to create the correct shadow.
  - Tip: Students can use a protractor and the "Sun angle" measurement on their cards to help them determine how to hold their flashlight.
  - It is important to emphasize that while in our model, the Sun (flashlight) is moving, in reality, the Sun stays in one location and the Earth is what moves. Remind students that the tilt and orbit of the Earth is what causes the Sun to appear in different parts of the sky during different parts of the year. The rotation of the Earth is what causes the Sun to appear to move across the sky throughout the day.
- Extra time? Once students have successfully created each of the four shadows, encourage them to try to see how the shadows outside their classroom change. For example, watch the actual shadow of a tree or building outside of their classroom. Ask students to predict whether shadows will get longer or shorter over the next few months (if it is fall going into winter they will get shorter, if it is winter going into spring they will get longer, if it is spring going into summer they will get longer).

Step 4: Modeling and Discussion (10+ minutes)

- Have all groups set up their models in one direction. For example, have all of the north ends facing the front of the classroom and all the south ends facing the back of the classroom.
- Have groups turn on their flashlights and demonstrate their model for Dec 21st. Have students observe the difference between the angle of the flashlights and the length of the shadows for different groups. The flashlights for locations closer to the equator will be at a greater angle than for locations further from the equator.
- Repeat this process for Mar 21st, June 21st and Sept 21st. All flashlights will be held higher as groups demonstrate Mar 21 and then higher again for June 21st, with locations closest to the equator being the highest. As groups move on to demonstrate Sept 21st, all flashlights will be at a lower angle than June 21st, but not as low as they were on Dec 21st.
- Have a concluding discussion about the similarities and differences in each model. Examples include:
  - All locations see the longest shadows in the winter and the shortest shadows in the summer.
  - For each date, each location receives a different angle of sunlight. This is why even though all locations are seeing the longest shadows in the winter, each student demonstrating winter shadows needs to hold their flashlight at a different angle.
- Have a concluding discussion about the impact the angle of the sun has on the shadows that are created. Then, ask students to think about the following:
  - What role did the Sun play in everyday life for the Aztecs? Why was this important?
  - What can modern-day astronomers learn from studying Aztec astronomy?
  - What did you learn about Aztec astronomy that surprised you?
  - Why is it important to understand how earlier civilizations used astronomy?

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Materials List

Provided online:

- Video: Astronomy and Aztec Civilization
- Handout: How Solar Calendars Work
- Handout: Creating and Testing a Solar Calendar
- Handout: Location Cards for Students

Not Provided Online:

- 1 location card from Handout: Location Cards for Students
- 24"x 24" piece of cardboard
- Ruler
- Standard washable marker - approximately 6" long
- 1" round ball of clay
- Optional: Protractor

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