SCIENCE CAREER ADVENTURES

Computer Scientist: Solar Panels for Cities

NGSS Standard: 5-ESS1-2

Adventure Description:

In this adventure, students will think like a computer scientist and create a video app that people can use to track shadows!

Activity

Step One: Background Information on Computer Scientists, Video Learning Apps, and Shadows (5 minutes)

- Show Video: Solar Panels for Cities.
- Explain to students that computer scientists create apps for people's smartphones. Show Handout: Smartphone Apps.
  - Tell students that apps can be very useful to teach people about different subjects, or help solve problems. There is an app for everything from life hacks to football highlights!
- Explain to students that computer scientists often create video learning apps, where users can create a channel and upload videos to the app. These videos can often reach millions of people, and teach them about a whole new subject, like how to make the best chocolate cake ever, or even how mountains form!
- Tell students that computer scientists want to create a video about why shadows change throughout the day. Explain that students will think like computer scientists and create a wireframe for a video learning app with a video to teach people about shadows!
  - Explain to students that a wireframe is like an outline with pictures and words that describe what your app will look like.
- Next, review why the shadows that we see outside change during the day. Show Handout: Changing Shadows. Explain that the Sun is in different places during the day. This changes the direction and size of the shadows that objects make.
  - When the sun is low and to the left, it creates long shadows to the right.
  - When the sun is higher up in the middle of the sky, it makes very short shadows in the direction opposite to the sun.
  - When the sun is low and to the right, it creates long shadows to the left.

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Step Two: Creating an App Wireframe (10–15 minutes)

- Explain to students that they will first create a wireframe for their video learning smartphone app.
- Divide students into pairs or small groups.
- Provide students with Handout: Steps to Make a Video Learning App. Walk through the steps together as a class.
- Have students complete Step 1 on the handout, creating an app wireframe.
- While students are working, ask them the following questions:
  - How are you creating buttons to make your app easy to use?
  - How many buttons are in your app?

Step Three: Designing a Demonstration (15–20 minutes)

- Explain to students they will now design the first video that will be uploaded to their video learning app! This video will be the standard for people to compare their videos to before they upload them to the app.
- Tell students demonstrations are a great way to teach people about different subjects. Students will include a model of shadows in their video, which will show people how shadows work!
- Provide each group with the following materials:
  - Piece of cardboard
  - Piece of light colored paper to represent the ground
  - Art supplies and building materials (cardboard, construction paper, popsicle sticks and tape)
- Have students complete Step 2 on the handout. When students are ready to use their flashlights to simulate the Sun, dim the lights in the room if possible.
- As students are working ask them the following questions:
  - When is the Sun lowest in the sky? What kind of shadow does that create? (Morning or night, a long shadow falls the opposite direction from the Sun.)
  - When is the Sun the highest in the sky? What kind of shadow does it create? (At noon, a shorter shadow falls the opposite direction from the Sun.)

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Step Four: Write a Script (15 minutes)

- Explain to students that they will now write their script. Have students complete Step 3 on the handout.
- As students are working, ask the following:
  - How are you going to teach viewers about shadows?
  - Will you use a funny, humorous tone, or a more serious one?
- Extra time? Have students record their videos!

Step Five: Discussion (5–7 minutes)

- Have all groups present their shadow models and talk about their favorite part of their wireframe.
- Have a concluding discussion about how shadows change during the day because of the movement of the Earth. Explain that the same pattern happens every day:
  - Because the Earth spins, the Sun appears to move across the sky.
  - The Sun starts out low in the east every morning. By noon, the Sun gradually moves to almost straight above, and then is low in the west each night.
  - The change in the position of the Sun causes shadows to change each day.
  - Shadows start out long and towards the west. By noon, shadows gradually change to short in the opposite direction from the sun, then end up long and to the east.

Materials List

Provided online:

- Video: Solar Panels for Cities
- Handout: Smartphone Apps.
- Handout: Changing Shadows
- Handout: Steps to Make a Video Learning App

Not provided (each pair of students needs):

- Piece of cardboard
- Piece of light colored paper to represent the ground
- Art supplies and building materials (cardboard, construction paper, popsicle sticks and tape)

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