LESSON PLAN

Solar Mobile Design Challenge

Lesson 1: Introducing the Solar Mobile Design Challenge

AUTHOR

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DESCRIPTION

This lesson is aimed to engage students and build excitement for their future engineering design challenge of building the fastest Solar Powered Mobile. Through multi-media resources, Students will encounter real life solar aircrafts and a room-sized Solar Mobile. Then, students will be given the scenario of designing a solar mobile for a Children's Technology Museum with an additional challenge to articulate why their design should be chosen by the Museum's Board of Directors to be part of the new Renewable Energy display.

GRADE LEVEL(S)

6, 7, 8

SUBJECT AREA(S)

Solar power, real life solar connections, solar aircraft, mobile

ACTIVITY LENGTH

1 ~55 minute class period

LEARNING GOAL(S)

1. Students will be introduced to solar aircraft.
2. Students will form and write questions about solar aircraft into their Engineering Notebooks setting the stage for future questions.
3. Students will be introduced to a room sized solar mobile and add additional questions to their engineering notebook.
4. Students will be introduced to the engineering design scenario.

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CONTNET BACKGROUND

STUDENT BACKGROUND

This lesson is used to engage students and no prior knowledge is necessary. Expectations for using an Engineering Notebook would be helpful but can be taught through the lessons.

EDUCATOR BACKGROUND

Educators should be familiar with using YouTube videos and online articles. If using Engineering Notebooks with students they should be familiar with having students record all information in the notebook (questions, brainstorming, drawings, graphs, ideas, etc.).

MATERIALS NEEDED

HANDOUTS/PAPER MATERIALS

- Student Engineering Notebooks

CLASSROOM SUPPLIES

- Internet access, projector
- Student Internet access or a printed copy of NASA article, NASA Armstrong Fact Sheet: Pathfinder Solar Powered Aircraft, https://www.nasa.gov/centers/armstrong/news/FactSheets/FS-034-DFRC.html).
- Document camera for projecting the “Scenario” and “Design Challenge”

ACTIVITY SUPPLIES

- Each student’s engineering notebook for recording notes

LESSON PROGRESSION

PLANNING AND PREP

This introductory lesson is designed for one day. Students will need an engineering notebook for each day they are working on the solar mobile lessons.

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To start this unit, students watch a short video about a solar powered aircraft prototype, the Solar Impulse, that flew around the world in 2016. This event helped engineers learn that both manned and unmanned aircrafts CAN be powered by solar alone. Present the videos embedded in these web sources: http://www.solarimpulse.com/, https://aroundtheworld.solarimpulse.com/adventure

Next, students read the online NASA document, "NASA Armstrong Fact Sheet:Pathfinder Solar Powered Aircraft:" https://www.nasa.gov/centers/armstrong/news/FactSheets/FS-034-DFRC.html.

Following the video and reading, students record questions in their engineering notebooks

Questions that might arise from the video and article to prepare for are:

- How was the aircraft able to run just on solar power?
- Is there a way to power small aircraft inside a classroom and learn more about solar power?
- How can various solar panels be connected in order to power motors with propellers?
- How can the motors and solar panels be mounted on the aircraft in order to balance the aircraft?
- What kind of light could be used to power solar panels if the sun is not available?
- How can we fly the planes at night and store energy in batteries?
- What is the best reflector in order to reflect light to the solar panels?

Keep in mind that at the end of the unit, students will solve a design challenge and engineer a mobile, powered by solar panels mounted on the top of foam aircrafts to move propellers balanced on a central pole. The challenge is to transfer the most energy from a light source transformed in PV panels to

power motors that turn propellers. An end goal of this project is for students to design the fastest, most efficiently spinning Solar Mobile.

Their final project will be a team proposal and demonstration for the Museum's Board of Directors to choose their design.

LESSON SEQUENCE:

DAY 1: INTRODUCING THE SOLAR MOBILE DESIGN CHALLENGE

1. **(10 min)** Engage students with the Solar Impulse Video about the historic flight: http://www.solarimpulse.com/
2. **(5 min)** Students record questions they have about solar flight in their engineering notebooks.
3. **(5 min**) Lead a short discussion and have students share one or two questions they had about solar flight, generating a classroom list of questions.
4. **(15-20 min)** Students will read the NASA article, NASA Armstrong Fact Sheet: Pathfinder Solar Powered Aircraft either online or a printed copy. Students should record additional questions they have about solar and/or solar aircraft.
5. Introduce students to the initial design challenge and scenario at the end of the class period. Let them know that we will be revisiting this after explore several more lessons of content. Here is the text to provide them:

Scenario

"A small Children's Technology Museum needs to attract more visitors with sustainability ideas. They asked our class to help them by creating a special display as part of a Renewable Energy exhibit. They want an interactive solar mobile that will be in the center of the exibit to attract kids. Specifically, they want visiting kids to like it so much that they want rebuild it themselves!

The Museum's Board of Direcor's knows that kids like the challenge of things moving fast, so the objective of this Solar Mobile design challenge is create the fastest spinning machine!"

Design Challenge

"As a team, design and build a fun, fast and attractive solar mobile that will draw visitors into the Museum's Renewable Energy Center. Your team needs

to build a stand, balance multiple airborne objects and make it spin as fast as possible without falling or breaking!"

ASSESSMENT AND EXTENSIONS

FORMATIVE ASSESSMENT

As students share their solar flight questions and discuss the video and article, instructors can assess student's prior knowledge and understanding about solar energy.

SUMMATIVE ASSESSMENT

N/A