LESSON 3

DESIGN LAB: Create a sustainable solar solution for people living without electricity

GOALS

a. Provide students with a background on solar energy and details on why renewable energy is better option than non-renewable energy

b. Excite students about new innovations taking place in the other side of the world

c. Help students realize the full implications of life without electricity/energy

d. Allow students to be creative and come up with a portable, innovative and sustainable solar solution for people living without electricity

MATERIALS

a. Videos

b. Projector for slide show

c. Whiteboards, Poster papers and markers

d. Miscellaneous items like rubber band, push pins, scratch paper, craft stuff, glue, scissors, scotch tape and other decorative items

BENEFITS

a. Build creative confidence among students

b. Can use this work towards their community service project

ADVANCE PREPARATION

Review the presentation and lesson materials ahead of time.

HANDOUT REFERENCE LIST

1. Presentation: Solar Energy Explained
2. Country Resource: Presentation
3. Cool Innovation videos listed below:

Solar powered space station:

<http://www.boeing.com/defense-space/space/spacestation/systems/solar_arrays.html>

Solar powered plane:

<http://biofriendly.com/blog/solar/6-cool-solar-powered-machines-wvideos/>

Solar powered boat: <http://www.bbc.co.uk/news/business-15330936>

Solar roadways:<http://www.youtube.com/watch?v=Ep4L18zOEYI>

Solar powered gadgets:

[http://www.treehugger.com/clean-technology/10-strange-solar-powered-](http://www.treehugger.com/clean-technology/10-strange-solar-powered-gadgets.html) [gadgets.html](http://www.treehugger.com/clean-technology/10-strange-solar-powered-gadgets.html)

PROCEDURE

Duration: 2 days

Day 1: 60 minutes

Day 2: Presentation: Student solution to developing country energy issue, 50 minutes

Targeted Students: 9-12 Grade

 **Lesson Agenda (Day1):**

1. Introduction: Cover Lesson 1, 30 minutes
2. Interactive Session with teacher, 15 minutes
3. Assignment Explanation (10 minutes): Divide the group into 4 teams. Let groups choose their country to study – Kenya, Philippines, Ethiopia, Argentina
4. Student Questions (5 minutes)

**1. Introduction**

Use the materials used in Lesson 1 to introduce Solar Energy, its benefits

 and its application all around the world.

**2. Interactive session with Teacher**

* Guess the number/percentage of people in the world living without access to electricity (correct answer 1.4 billion, full 20% of the world’s population)
* Ask students the disadvantages of living without electricity
* Answer with general challenges of using kerosene everyday
	+ Average person only makes around $1 a day, kerosene consumes 30-50% of their income
	+ Kerosene lanterns are unsafe and can cause fires and burns
	+ Respiratory diseases owing to inhaling toxic gases emitted from the kerosene lamps is same as smoking 40 cigarettes a day
* Share general facts about solar
	+ How much sunshine is required to power California?
		- How much energy does California use a year?
		- How much energy does one square mile of solar plant produce in a day
	+ What is the unit of measure for solar and how does that equate to other measures that we are familiar with; example: 40 watt light bulb equals xxx solar
* Why renewable is better than non-renewable - some facts about carbon emissions, global warming etc.

**3. Assignment:**

- Divide the team into 4-5 groups

 - Let each group choose a country of their choice and study it

 - Students in their project need to explore these topics

a. First present general statistics for their focus country (i.e. number of people with electricity, infrastructure, health care, literacy, etc.)

* Use BBC and CIA country profile
* *Country packets/statistics*

b. Propose a plan with the following factors into consideration

* Solar application choice: Choice of application you want to focus on solar plant, solar lights, solar stoves, commercial solar panels, solar charging stations, etc. (research the most efficient and cost-effective option), garden lights, solar water heaters, calculators, watches.
* Focus on: hospitals, businesses, homes, villages, schools
* Objective: address the current problems along with the lack of electricity and focus on hospitals, businesses, homes, villages, schools

- Education

- Future development/more savings

- Jobs

- Safe Living Standards

- Environmental benefits (less greenhouse gases, no dangerous by-products)

- Reliable and free “fuel”

- Use the most efficient way with least amount of money

* Challenges: Take into consideration the following challenges

- Cost of implementation

- Available infrastructure (cannot have a solar plant without a way to distribute electricity)

- Workers/materials needed for long-term sustainability

- Country specific issues (natural disasters, humidity, cold) that may affect solar efficiency

**4. Student Questions:**

 Time allocated for students to ask questions regarding the assignment.

 **Lesson Agenda (Day2): Duration (50 minutes)**

1. **Welcome back:** 1 minute

 Welcome back the teams and introduce the order in which they will present.

1. **Group Presentation**: 10 minutes each, so total of 40 minutes

 All groups will present their cool innovation.

1. **Student questions**: 4 minutes

 Students can ask questions after the presentation too.

1. **Evaluation and Vote**: 5 minutes

 Evaluate and vote for the best cool innovation.