

“Energy”

ESO



Course on Maker Education by Jennifer Schmidt
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UNIT SECTIONS

Energy

1. Forms and Sources
2. Renewable -What do you need to power? Where?
3. Machines - Materials
4. Consume - How would it be implemented?

Grammar focus: Conditionals

<https://www.alternative-energy-news.info/technology/inventions/>

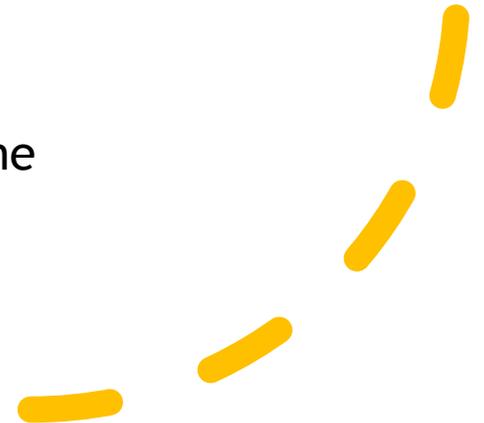




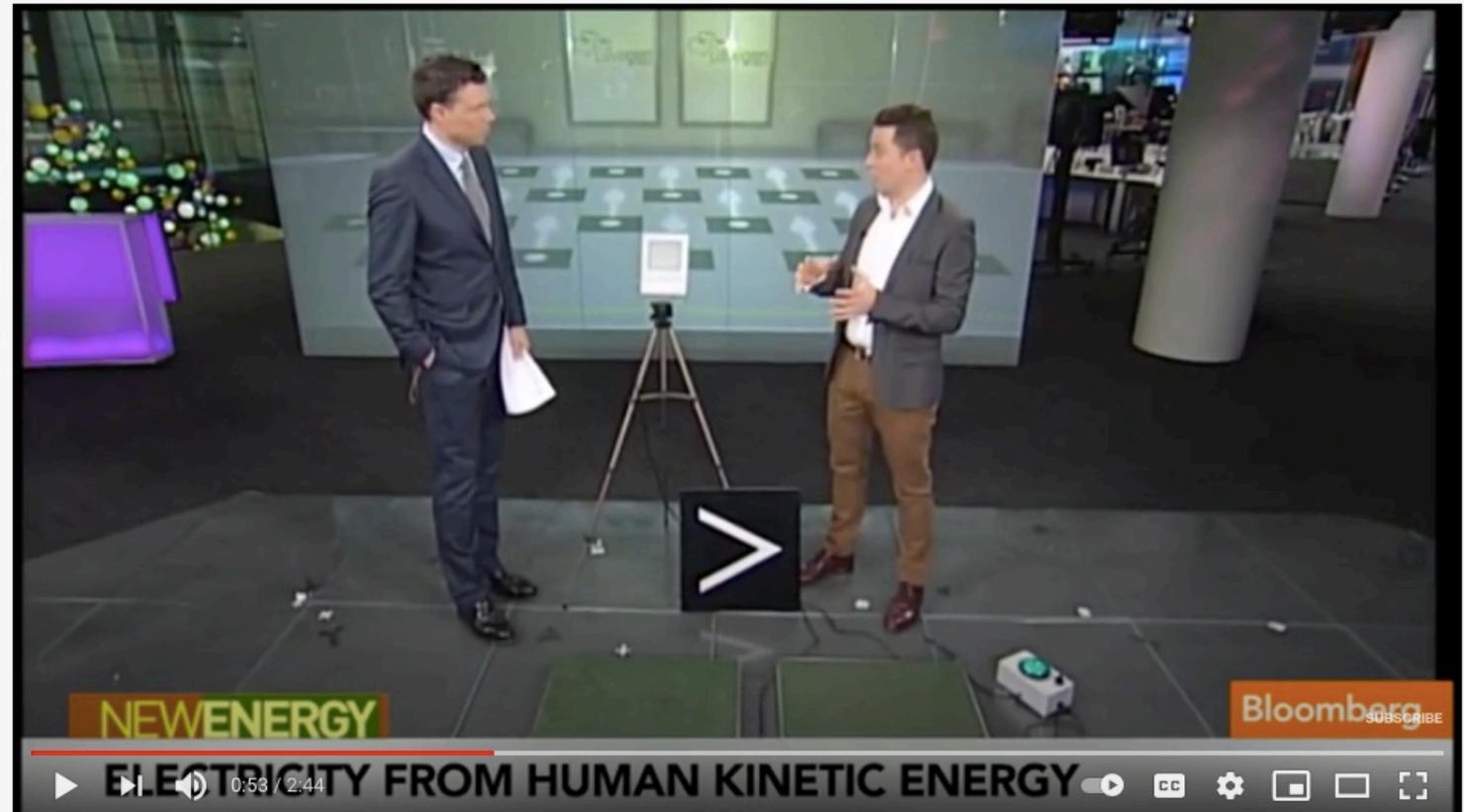
CALP

Electrical
Energy
Equilibrium
Fan
Fossil fuel
Geothermal
Gravity
Hydroelectric
Kinetic
Mechanical
Natural gas
Non-renewable
Nuclear
Oil
Petrol
Plant
Potential

Power
Renewable
Solar
Thermal
Tidal
Tide
Transference
To harness
To hinder
To rotate
To transfer
To turn
Wave
Wind
Wind turbine



Advance Organizer



How Walking on the Street Converts to Electricity

48,465 views • Jan 27, 2014

399 19 SHARE SAVE ...

<https://www.youtube.com/watch?v=szDuMz-T7b4>

Advance Organizer Questioning

1. What is a sidewalk?
2. How could you generate electricity from a sidewalk?
3. What material did he use? Why?
4. What do you need to think about when creating a source of renewable energy?

Driving question: What goes into creating a machine that generates renewable energy?



Section 1

Lesson 1

Types of Energy



Mechanical Energy



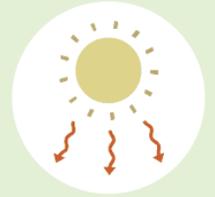
Thermal Energy



Nuclear Energy



Chemical Energy



Electromagnetic Energy



Sonic Energy



Gravitational Energy



Kinetic Energy



Potential Energy



Ionization Energy



Section 1 Lesson 2

Describe things you use that run on energy.
What is the object?
What type of energy does it use?

Electricity Explained

KWh ? VOLTS ?
WATTS ? Amps ?
Ohms ? Power ?
Current ?

What is a kWh

Calculate monthly electricity invoice

Item	Power	Time	Energy
Lights	0.24kW (4x 60W)	120 Hrs (4 hr/day x 30days)	28.8kWh (0.24kW x 120 Hrs)
TV	0.05kW (1x 50W)	150 Hrs (5 hr/day x 30days)	7.5kWh (0.05kW x 150 Hrs)
Heater	2kW (1x 2kW)	90 Hrs (3 hr/day x 30days)	180kWh (2kW x 90 Hrs)
Total:			216.3 kWh's (28.8 + 7.5 + 180)
Cost:			\$21.63 (216.3kWh x \$0.10 /kWh)



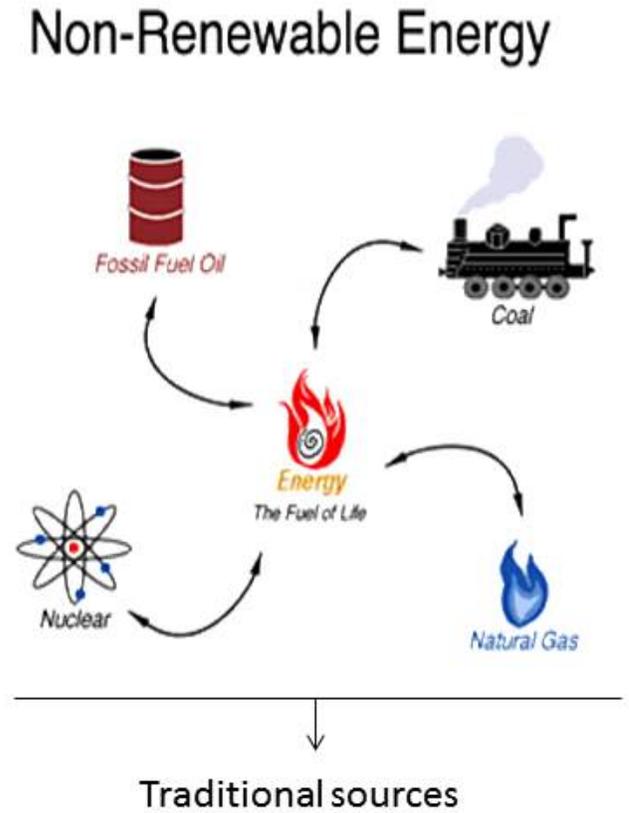
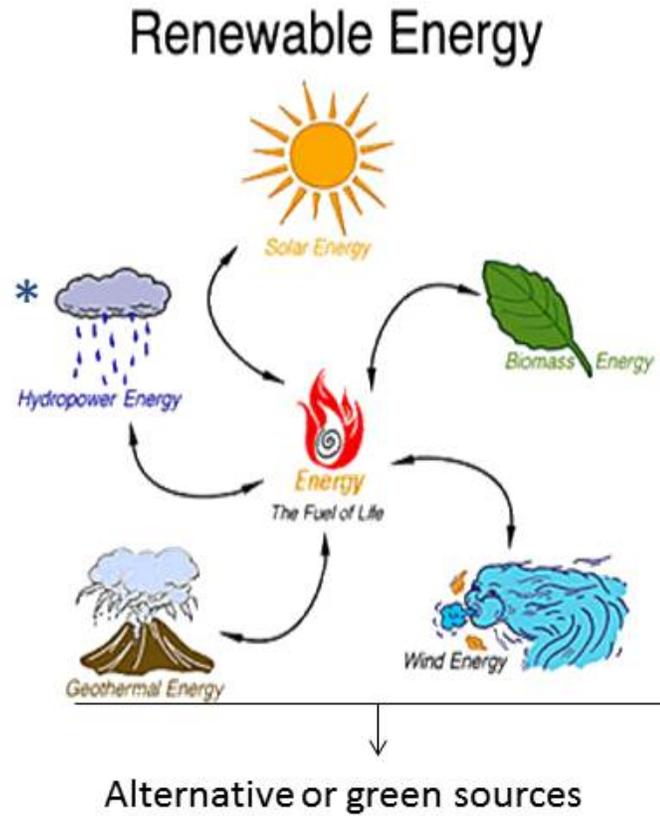
Household Electricity Use



Shrink That Footprint

3. Sources of energy

Section 2 Lesson 1



The French city of Toulouse has some 70,000 streetlights - and hefty electricity bills. The city has been working with Toulouse's Technical University on ways of cutting lighting costs without compromising safety. The aim of the Trott-Élec project – the name derives from the French for 'electric pavement' – is to harness footsteps as an alternative energy source that can, for example, be used to power lighting in pedestrian areas. One of Trott-Élec's biggest headaches is 'harvesting' the kinetic energy we produce as we walk.



Section 2

Lesson 2

TRAFFIC TURBINE
New device harnesses energy from busy roads

TRT is a Turkish public broadcast service. [Wikipedia](#)

Traffic Turbine: New device harnesses energy from busy roads

<https://www.youtube.com/watch?v=XTYVgoJVRqA>

Section 2

Lesson 2

Think of an object(s) that is powered in traditional ways.

Think of at least 3 ways to generate energy to power that object in another way..using renewable energy. (Think outside the box on what you are powering..You can think big...like powering city lights)

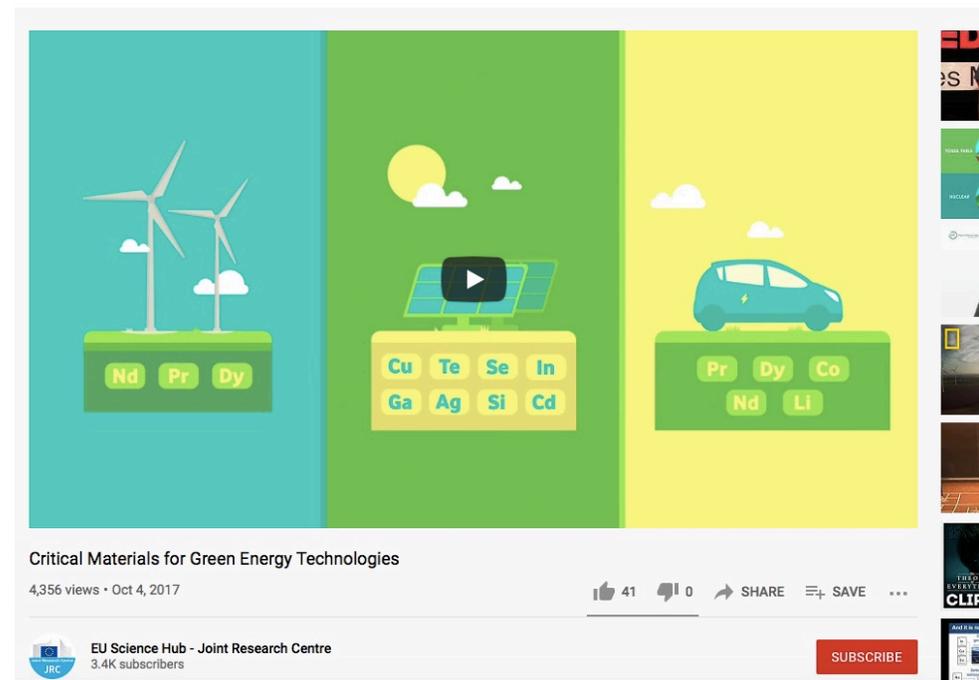
At least one of the 3 ways must be human power.

Work in groups. Present your idea to the class.



Section 3

Lesson 1



<https://www.youtube.com/watch?v=hHtzlqygD3Y>

After I teach the main content from section 3 about machines and materials, the students will now take the ideas they came up with in section 2 creative thinking task and start designing their prototypes.

Exemplars

Section 3 Lesson 1 and 2



William Kamkwamba: How I built a windmill

<https://www.youtube.com/watch?v=gXucEPZ9srs>



After we see this video and review the machine he created and the materials used... We go on to the design thinking task. The students will fill out the next 4 slides. (As we did in class for our spy gadgets.)

Section 3

Lesson 2

Design Thinking

Instructions:

In groups:

You know the object your group has decided on
Choose one of the alternative power sources you created in section 2
Come up with an invention that would create power in that way
Follow the design thinking:
For whom or for what is the invention?
Are there any limitations or possible problems
that must be taken into consideration?
Ideate: brainstorm
Sketch your prototype and label it with details



#1: EMPATHIZE

Who is my viewer?

A large, empty rounded rectangular box with a thick blue border, intended for students to write their answer to 'Who is my viewer?'.

Who is going to need it?

A large, empty rounded rectangular box with a thick blue border, intended for students to write their answer to 'Who is going to need it?'.

Design Thinking

Students fill this out...individually or in groups as needed.

#2: DEFINE



What's the goal?

A large, empty rounded rectangle with a thick green border, intended for students to write their goal. A small, light-colored arrow points from the right side of the box towards the right.

What are the restrictions or limitations?

Five horizontal, light-colored lines stacked vertically, each preceded by a small green target icon. The target icons are identical to the one at the top of the page.

Reflection questions

A large, empty rounded rectangle with a thick green border, intended for students to write reflection questions. A small, light-colored arrow points from the right side of the box towards the right.

Students fill this out...individually or in groups as needed.

Two empty orange rounded rectangular boxes are positioned horizontally, with a large orange question mark centered between them. The background features decorative elements: a red diagonal hatched pattern on the left and right sides, and a solid light green shape in the upper left and lower right corners.

#3: IDEATE Brainstorm ideas

Two empty orange rounded rectangular boxes are positioned horizontally, with a large orange question mark centered between them. The background features decorative elements: a red diagonal hatched pattern on the left and right sides, and a solid light green shape in the upper left and lower right corners.

Choose an idea or solution!

Students fill this out...individually or in groups as needed.

#4: PROTOTYPE



Students fill this out...individually or in groups as needed.

Make a materials list

Sketch it out!

A large, empty pink rounded rectangle with a thick border, intended for sketching a prototype. A small yellow triangle is visible on the right edge, suggesting a page fold.

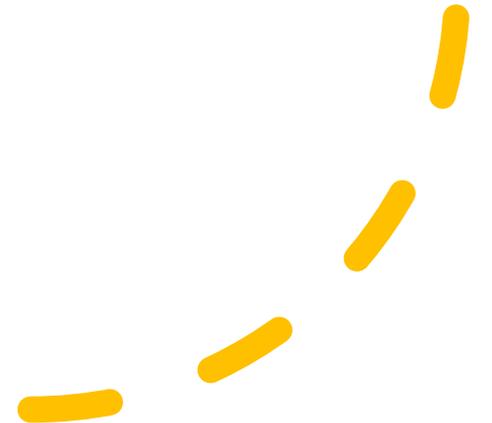
Tinkering

Section 3 Lesson 3

Now we are going to attempt to create a physical prototype of the sketch we made in the design thinking lesson.

Students must think about:
the materials they would need
time management
organization
planning
flexibility
problem-solving

individual / group ..who does what

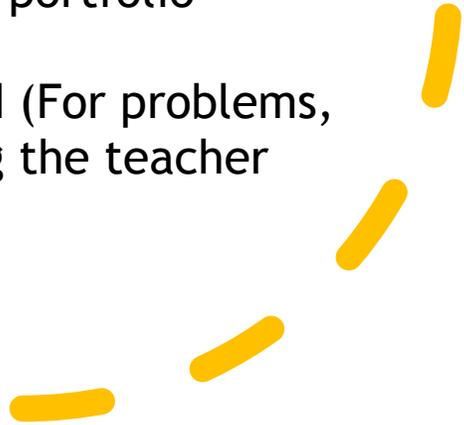


Section 3

Lesson 3

Tinkering

Rules

1. Construct a prototype of your sketch for a new way to power XXX
 2. Use recycled materials whenever possible
 3. The prototype must move in the way you expect it to
 4. The materials are “representative” of the actual materials
 5. The materials and movement will be explained
 6. If something isn't working use the “3 times you're out” idea
 7. Be open to modification if needed
 8. Document your progress: photos, log, journal, portfolio
 9. Speak in English as much as possible
 10. Ask for feedback from the teacher as needed (For problems, be ready with at least one solution before asking the teacher to solve your problem.)
- 



Tinkering

Problem solving

Section 3

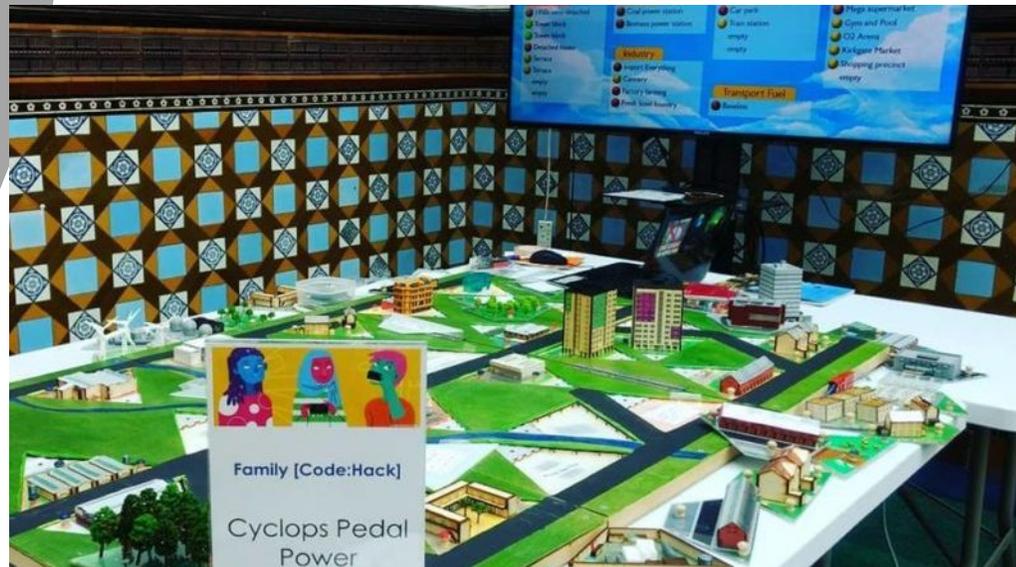
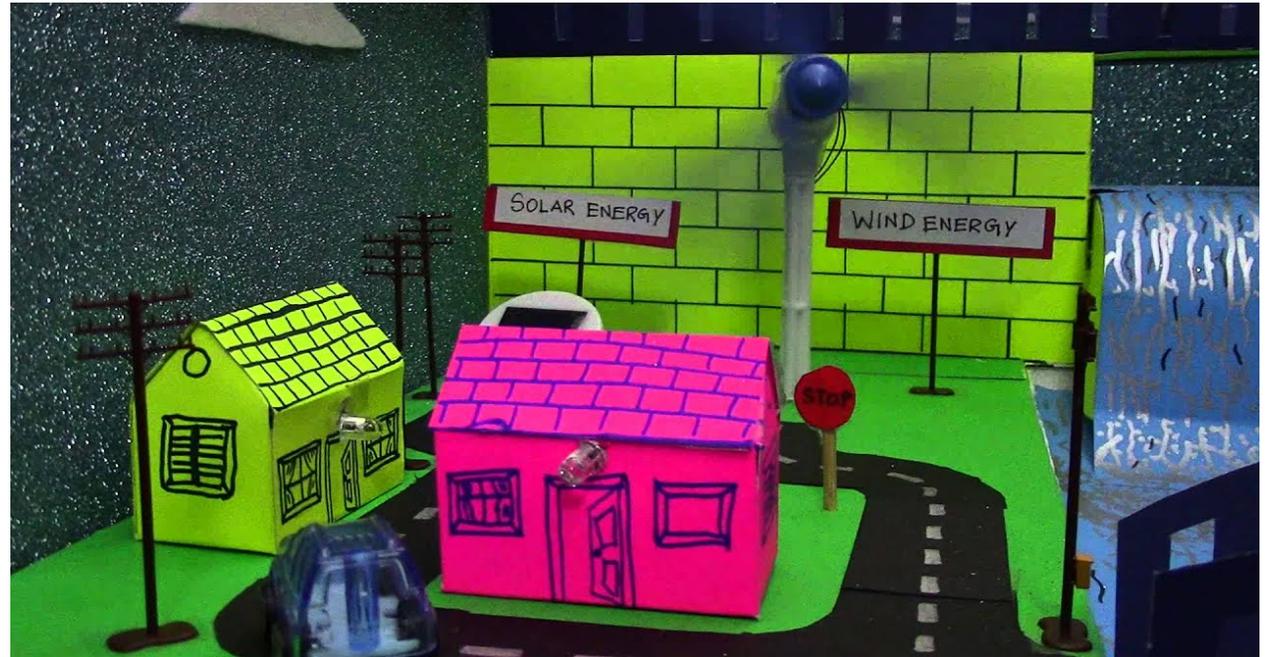
Lesson 4



Tinkering

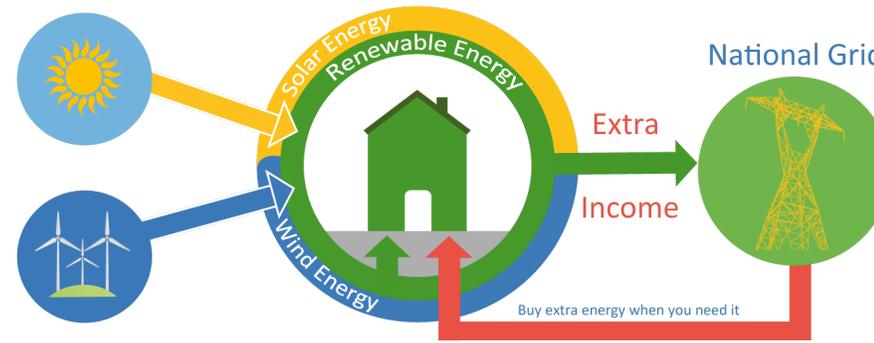
Complete final prototypes

Section 3
Lesson 4



Implementation Plan

Adding complexity to the project



Section 4 Lesson 1

At a minimum, during the planning phase financiers, developers, and project managers should consider the project's impact on these elements:

- Biodiversity disturbance
- Noise
- Aesthetics
- Water quality
- Air quality
- Soil quality

4

Environmental Impacts of Renewable
Electricity Generation

Section 4

Students will present their prototypes

Reasons

Materials

Use

Function

They will also discuss possible ways to implement them

They will also make note of possible secondary issues from their machines and offer possible solutions

