

## INSPIRE GK12 Lesson Plan



<b>Lesson Title</b>	It's Electric!
<b>Length of Lesson</b>	Two (50 minute) class periods
<b>Created By</b>	Calista Guthrie
<b>Subject</b>	Earth Science
<b>Grade Level</b>	8 <sup>th</sup> grade
<b>State Standards</b>	8 <sup>th</sup> : 1d, 1f, 1h, (Inquiry); 2d, (Physical Science); 4d, 4g(Earth Science)
<b>DOK Level</b>	DOK2, DOK 3
<b>DOK Application</b>	Infer, Identify patterns, Construct, Modify, Predict, Compare, Interpret, Relate, Make Observations, Draw Conclusions, Explain Phenomena
<b>National Standards</b>	5-8: A (Inquiry); B (Physical Science); E (Science and Technology)
<b>Graduate Research Element</b>	Fossil fuels can be harmful to the environment through the burning of fuels for power generation, as well as accidents incurred while retrieving them. Example: BP Deepwater Horizon Oil Spill.

### **Student Learning Goal:**

#### MS 8th Grade:

1(d) Analyze evidence that is used to form explanations and draw conclusions. 1(f) Develop an argument to explain why perfect solutions do not exist. 1(h) Analyze different ideas. 2(d) Relate how energy is transferred through electric circuits, generators, and power grids. 4(d) Research the importance of conservation of renewable and nonrenewable resources. 4(g) Justify the importance of continued research and use of new technology in development of potentially useful natural products.

#### National Science Education Standards of Content 5-8:

A: Inquiry: Identify questions that can be answered through scientific investigations. Develop descriptions, explanations, predictions, and models using evidence. Think critically and logically to make the relationships between evidence and explanations. Understandings about scientific inquiry.

B: Physical Science: Transfer of Energy; Students will explore how different types of energy are converted into resources that we use to generate electricity.

E: Science and Technology: Identify appropriate problems for technological design. Design a solution or product. Implement a proposed design. Evaluate completed technological designs or products. Understanding about science and technology.



**Materials Needed (supplies, hand-outs, resources):**

Class Videos (see Teacher Notes), Instructions to build generator (see link in Teacher Notes), Energy PowerPoint, Instructions for building a steam model (Modeling a Steam Turbine.doc), Lab Questions (Checks for Understanding.doc)

To build steam model:

- Instructions sheet: Modeling a Steam Generator.doc
- Hot plate
- Tea pot (or something to boil water and direct it through a small hole)
- Aluminum pie pan
- Pinwheel
- Push pin

To build Generator:

- 4 - 1cm x 2cm x 5cm ceramic magnet (Radio Shack #64-1877)
- 1 - 30-gauge magnet wire, 200ft (Radio Shack spool kit #278-1345)
- 1 - miniature incandescent lamp (light bulb), 1.5V/25mA (Radio Shack #272-1139)
- 1 - cardboard strip (or Plexiglas or thin wood), 8cm x 30cm
- 1 - large nail, at least 8cm long
- sandpaper to strip the wires
- tape to secure wires
- Optional: hand drill (best) or electric drill to spin the nail/magnets

**Lesson Performance Task/Assessment:**

This lesson demonstrates how power plants generate electricity. Class will begin by discussing the different forms of energy students have used that day. Next, students will build their model of a steam turbine (Modeling a Steam Turbine.doc). The class will discuss how the spinning pinwheel relates to generating electricity. Next, students will build a generator model (see link for Generator Model) and answer the questions following. The Energy 101 video (see link in Teacher Notes) will be shown demonstrating how a spinning turbine generates electricity. The second class period will begin by discussing the questions answered in the previous lab. The PowerPoint will be presented on where energy comes from (Energy.ppt). After the PowerPoint presentation, the some videos will be shown on child energy geniuses (see Teacher Notes). Students will then be assigned to develop some type of energy-generating design, draw it and label the parts and what they are made of.

**Lesson Relevance to Performance Task and Students:**

Through building models, students will understand how energy is generated. By knowing how energy is generated, students can then explore the different types of energy and the challenges of electricity generation. After gaining experience and knowledge on how electricity is generated, students will design their own idea for electric generation.



**Anticipatory Set/Capture Interest:**

The capture activity will be that students are working in the lab building models.

**Guided Practice:**

Students will be given lab instructions and will be guided through lab concepts by answering questions involving why the models work in such a way and how they demonstrate real world power generation.

**Independent Practice:**

Students will be expected to stay on task, reading and following directions as they go through the lab. Though they will be working and discussing in groups, they should make their own inferences based on what models illustrate. Students will each have their own worksheet with questions to answer.

**Remediation and/or Enrichment:**

Remediation – Have students draw a diagram of the turbine generator system and list different mechanisms that can be used to spin the turbine.

Enrichment- Have students attempt to build their models for homework or extra credit.

**Check(s) for Understanding:**

Checks for understanding include questions in the lab as well as understanding demonstrated in lab review the next day and in design presentations.

**Closure:**

Groups will present their designs to the class. They should explain how their design works and provide appropriate justification for the materials used in their design.

**Possible Alternate Subject Integrations:**

Physical Science



### Teacher Notes

Instructions for building generators

<http://www.discoverthis.com/project-simple-electric-generator.html>

Energy Flows

<http://www.need.org/needpdf/Energy%20Flows.pdf>

Videos:

Energy 101

<http://www.youtube.com/watch?v=20Vb6hILQsg&feature=related>

Modeling a Steam Turbine

<http://www.youtube.com/watch?v=xY96nJ2en5M>

Magnetism: Motors and Generators

[http://www.youtube.com/watch?v=d\\_aTC0iKO68&feature=related](http://www.youtube.com/watch?v=d_aTC0iKO68&feature=related)

Child Energy Geniuses:

<http://www.youtube.com/watch?feature=endscreen&v=n3XyvcIsrjo&NR=1>

<http://www.youtube.com/watch?v=x1fXAdODGvA&feature=related>

<http://www.youtube.com/watch?v=arD374MFk4w&feature=related>

Additional videos:

School House Rock: Energy Blues

[http://www.youtube.com/watch?v=0dn\\_pV9fbCE](http://www.youtube.com/watch?v=0dn_pV9fbCE)

School House Rock: Electricity

<http://www.youtube.com/watch?v=3RzN7T5xpVc>

Gulf Power: A change will do us good

<http://www.youtube.com/watch?v=sHHyN7IEz8g>

How Magnets Produce Electricity

<http://www.youtube.com/watch?v=FehUCQKKRwo&feature=related>

Volts Ohms and Amps

<http://www.youtube.com/watch?v=zYS9kdS56l8&feature=related>