



Electricity Lesson 3: *The Engineer* Student Handout

Your Challenge: You've been hired as an engineer for Energy Justice, and have been asked to design an advocacy campaign for homeowners living near power lines.

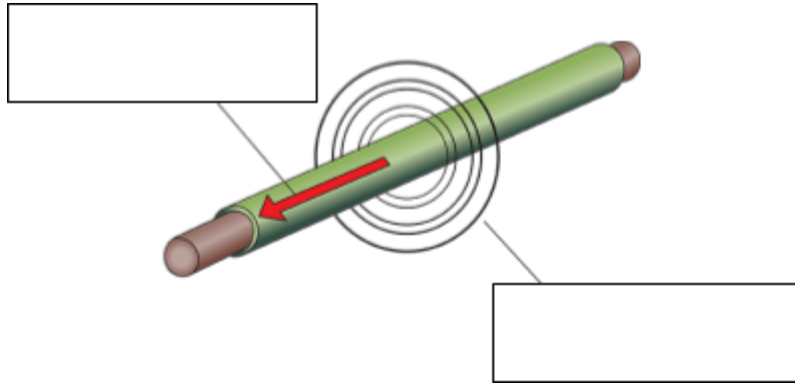
Directions:

1. Choose a medium for your advocacy campaign. It could be a billboard, informative brochure, infographic flyer, video, or town hall meeting presentation.
2. Prove that magnetic fields exist around conductors of electricity and that these magnetic fields increase in force as electricity increases.
3. Research the negative impacts of exposure to magnetism.
4. Design and present your advocacy campaign:
 - a. Educate homeowners about how electricity and magnetism workAND
 - b. Advocate for avoiding negative impacts of exposure to magnetism from high current power lines.



Magnetism Notetaker

1. On the diagram, label which part shows electricity flow and which part shows a magnetic field.



2. Fill in the blank with **increases** or **decreases**.

As the electric current flow increases, the force of the magnetic field also _____.



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Magnetism Investigations

Fill in the boxes below during the lab demos.

Investigation: Invisible Force Fields	
Record Observations and Diagrams Below	Discussion Questions 1. What happened when you placed the positive side of one magnet next to the negative side of the other magnet? 2. What happened when you placed the negative side of one magnet next to the negative side of the other magnet?
Investigation: Interacting Magnets	
Record Observations and Diagrams Below	1. What happened when you placed the South side of the magnet next to the North side of the other magnet? 2. What happened when you placed the South-South or North-North sides of the magnets together? 3. What does this prove about the law of magnetic attraction and repulsion?



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Investigation: [The Confused Compass](#)

Record Observations and Diagrams Below

Discussion Questions

1. Why was everyone's compass needle pointing in the same direction at first?
2. What happened to the compass needle after you connected the circuit? Why do you think this happened?
3. What happened to the compass needle after you disconnected the circuit? Why do you think this happened?



Planning Organizer

<p>Choose a medium for your advocacy campaign. It could be a billboard, informative brochure, infographic flyer, video, or town hall meeting presentation.</p>



Part A: Plan Your Advocacy Campaign

<p>In your advocacy campaign, you must explain electricity and magnetism to homeowners who don't know anything about it. Use the questions below to help plan your explanation.</p>		
Planning Question	Explanation	Visual Diagram
How does electricity work?		
How does electricity travel from one location to another?		



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Planning Question	Explanation	Visual Diagram
What is present around an electrical conductor, like a power line?		
How do we know a magnetic field is even there? What lab evidence do we have for that?		
Electricity flows through all types of wires that we live near. Why are we making a bigger deal about power lines than appliance wires?		
What are the potential negative impacts of living near high current power lines? <i>(Use your own computer research or resource card provided)</i>		



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Part B: Plan Your Advocacy Campaign

Make a recommendation to homeowners.	
What is your recommendation to homeowners?	
Give a brief 1-2 sentence summary to justify your recommendation.	



Design Your Advocacy Campaign

1. Identify materials you will need <ul style="list-style-type: none">•••	Teacher Approval Stamp
2. Construct your billboard, informative brochure, infographic flyer, video, or town hall meeting presentation	
3. Assess your advocacy campaign	Evaluate: <ul style="list-style-type: none"><input type="checkbox"/> If someone didn't know anything about electricity, would they understand electricity after your advocacy campaign? <input type="checkbox"/> If someone didn't know anything about magnetism, would they understand magnetism after your advocacy campaign?



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	<ul style="list-style-type: none"><input type="checkbox"/> Did you give lab evidence to prove magnetic fields exist? <input type="checkbox"/> Did you give examples of negative impacts from exposure to magnetism? <input type="checkbox"/> Did you make a clear and justified recommendation to homeowners about living near power lines?
4. Make Modifications	What will you change based on your assessment and why?
5. Present your final advocacy campaign	<p>*Use the Electricity Engineer Checklist to meet all requirements</p> <ul style="list-style-type: none">● Billboard, informative brochure, infographic flyer, video, OR town hall meeting presentation.● Explains how your campaign educates homeowners about how electricity and magnetism work AND advocates for avoiding the negative impacts of exposure to magnetism from high current power lines.



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Assessment: Final Presentation

You designed an advocacy campaign that helps homeowners avoid the negative impacts of magnetism exposure from power lines. Next, using a medium of your choice to present your ideas, prepare to present to an audience of local homeowners.

Use the Electricity Engineer Checklist and Science & Engineering Practices Rubric to ensure you have addressed all aspects of *The Engineer* with quality work.

Electricity Engineer Checklist: Content Concepts and Practices

Your Challenge: Design an advocacy campaign for homeowners living near power lines

Project Completion:

- Completion of all aspects of Engineering Planning Guide including:
 - Magnetism Investigations
 - Planning of Advocacy Campaign
- Advocacy Campaign:
 - Advocacy campaign is in the form of a billboard, informative brochure, infographic flyer, video, or town hall meeting presentation
 - Contains explanations and visuals for the following points:
 - How electricity works
 - How electricity travels from one location to another
 - Magnetic field surrounding electrical wires
 - Comparison of power line wires to electrical appliance wires
 - Negative impacts of living by high current power lines
 - Recommendation to homeowners
 - Presentation is well-organized and filled with visuals that are neat and in color

DCI Standards Checklist:

- Magnetism Investigation Data:
 - Accurately communicates magnetic forces
 - Accurately communicates the relationship between electricity and magnetism
- Advocacy Campaign:
 - Accurately explains how electricity works
 - Explanation includes an identification of the materials that allow electricity to travel from one location to another
 - Corresponding visual is accurate and labeled
 - Accurately connects electricity to magnetism
 - Gives multiple sources of accurate and detailed lab evidence to support the claim that magnetic fields exist
 - Corresponding visuals are accurate and labeled
 - Explains how the strength of the electric current corresponds to the strength of the magnetic field
 - Applies this specifically to power lines versus other conductors of electricity
 - Accurately outlines the negative impacts of living near high current power lines



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- ❑ Makes a recommendation to homeowners about living near power lines and gives a brief but persuasive justification to support this recommendation.

Science & Engineering Practices Rubric

	Emerging (1)	Developing (2)	Proficient (3)	Advanced (4)
Designing Solutions	Applies no scientific principles and/or data to design, construct, and/or test a design of an object, tool, process, or system.	Applies minimal scientific principles and/or data to design, construct, and/or test a design of an object, tool, process, or system.	Applies adequate scientific principles and/or data to design, construct, and/or test a design of an object, tool, process, or system.	Applies complete scientific principles and/or data to design, construct, and/or test a design of an object, tool, process, or system.
Communicating Findings/Design (Oral Presentation)	Findings/design are incompletely and inaccurately communicated. Or no evidence of using appropriate eye contact, adequate volume, or clear pronunciation.	Findings/design are completely communicated with some misconceptions. Or uses minimal eye contact, inappropriate volume, or inconsistent pronunciation.	Findings/design are completely communicated but lacking depth and complexity. Or often uses eye contact and engaging and appropriate volume and pronunciation, but is inconsistent.	Findings/design are completely communicated with depth and complexity. Or mostly uses eye contact and engaging and appropriate volume and pronunciation.