



Education 432: Secondary Principles & Practices
Lesson Plan Template

Science 9: Electricity Lesson 1

Teachers' Name: Mr. Andrew Kroon	Grade: 9
Subject: Science 9	Topic: Electricity (Static – Lesson 1)

A. Learning Goals & Success Criteria

Learning Goals: For this lesson we hope to...

- Review the basics of static electricity & create a general understanding
- Understand positive and negative charges in objects and interactions between them
- Explore how charges can be induced and what induced charges do

Success Criteria: Success will be demonstrated by students' ability to...

- Identify examples of electrostatics in the real world
- Explain the law of attraction and repulsion, and how induction may play a role
- Explain how sparks and lightning occur
- Identify good conductors & insulators
- Briefly define subatomic particles (specifically electrons and protons)
- Explain grounding

B. Lesson Outcomes

GCOs/Competencies: Knowledge, Skills, and STSE

SCOs:

Students will be expected to...

- Identify properties of static electric charges (308-14)
- Explain the production of static electric charges in some common materials (308-13)
- Provide examples of how science and technology affect their lives and their community (112-7)
- Communicate questions, ideas, intentions, plans, and results, using lists, notes in point form, sentences, data tables, graphs, drawings, oral language, and other means (211-2)
- Investigate materials and describe them in terms of their physical properties (307-12)
- Describe changes in the properties of materials that result from some common chemical reactions (307-13)



Education 432: Secondary Principles & Practices
Lesson Plan Template

C. Lesson Phases	
Intro Time: 5 minutes	Introduction: <ul style="list-style-type: none">- Start question to get everybody thinking:<ul style="list-style-type: none">• Have you ever heard of static electricity, what does it mean, where have you heard of it, and what do you think of when you hear the term?• I would ask students to chat with their elbow partners or table partners to discuss the question, and then bring everybody back after a couple minutes to chat as a class.- Get students to volunteer and share, if people are a little nervous to share then give some examples to get the ball rolling (socks on a carpet floor, dryer sheets from a laundry machine, lightning, balloon rubbed on your head, etc.)
Body Time: 45-50 minutes	Body: <ul style="list-style-type: none">- ABOUT ME!!<ul style="list-style-type: none">• I'm originally from New Brunswick (small town only 1 school, had to drive or take the bus in for middle and high)• Went to UNB for my science degree and now I'm at X (where both my camp sisters went)• I work at a summer camp for people with disabilities (aka best place on the planet in my opinion) where people call me Wasabi• My family (brother, parents, pets & sisters)• I would also ask everybody to introduce themselves and a fun fact about them (a singer they like, a sport they play, a club they are a part of, anything at all)- Insulators<ul style="list-style-type: none">• Have you guys heard the term before? Does anybody have any idea what it means? Let students think and chat about it with elbow/table partners for a minute or so.• Materials that do not allow charges to move freely through or on• Charges stay stationary on the surface & don't spread or transfer• Primarily non-metals• Rubber, wood, plastics, can students think of any others?- Conductors<ul style="list-style-type: none">• Have you guys heard the term before? Does anybody have any idea what it means? Let students think and chat about it with elbow/table partners for a minute or so.• Materials that allow charges to move freely through or on



Education 432: Secondary Principles & Practices
Lesson Plan Template

- Charges are free to spread through the object and transfer to others
- Primarily metals
- Copper, aluminium, water (sometimes), can students think of any others?

- Law of Attraction and Repulsion
 - Like charges repel and unlike charges attract
 - Positive charges and Negative Charges are attracted to one another because they want to be neutralized/balanced.
 - What about neutral objects?

- Neutral objects & charge
 - If neutral objects are chargeless then how do charged objects attract them?
 - Rather than being chargeless, neutral objects are charge balanced
 - The positive charges in the neutral objects are attracted to negative objects and vice versa
 - Positive charges don't move but negative charges do

- Induction
 - Charge in one object creates a charge in another (sometimes temporary)
 - Electroscope sphere gets temporarily induced when charged objects come near without touching it. Negative charges induce a positive charge in the sphere and negative in the leaves, while positive charges do the opposite. Leaves repel. When charged object is moved away, electroscope goes neutral
 - When touched with a charged object, induced charge remains even after charged object moves

- Electrons (and other subatomic particles)
 - Start by asking students if they know what an electron is or if they had heard of it.
 - Negatively charged particles in atoms, counterpart to protons (positive particles within atoms)
 - Protons and neutrons remain stationary within the center of an atom (nucleus), electrons can move from one atom to another (within a substance or between substances depending on conductivity)
 - Within conductors, electrons are easily passed from atom to atom. Electrons are held loosely.
 - Within insulators, electrons are held onto tightly, so they do not easily move from atom to atom.



Education 432: Secondary Principles & Practices
Lesson Plan Template

- Sparks
 - Air isn't a good conductor (at least dry air isn't)
 - Strong opposing charges can split molecules in the air around it into oppositely charged ions
 - This channel of ions acts as a conductor
 - Electrons move incredibly fast through it colliding with air molecules and emitting light (sparks)

- Grounding
 - Start by asking the students to think about the term for a minute and see if they can figure out what it might mean before giving any definition. Let them chat with their groups for a minute or so.
 - Grounding means connecting an electrical apparatus to the ground. Earth isn't a conductor but it can accept or release many electrons without its charge changing
 - Grounding wires remove excess electrons from an apparatus by attaching to a metal object that goes deep into the ground (for example, grounding wires in light fixtures in a house are wrapped around any metal part of the house that frame).
 - Grounding is also used to protect technology that is sensitive to surges, like computers for example. The 3rd prong on electrical wires connects to a grounding wire.

- Lightning
 - Water particles in the air build up and with more particles, more collisions and friction happen, more charges created.
 - Negative charges collect at the bottom of the cloud and positive charges at the top.
 - Negatively charged clouds repel electrons on the earth's surface, pushing them deeper into the ground, making the surface positive.
 - The attraction of these strong opposing charges creates channel of ions in air and makes a BIG spark (lightning)
 - With this knowledge in mind, how do lightning rods work (being some of the highest points from the ground, they are closer to the negative clouds and thus more likely to create ion channels for lightning)



Education 432: Secondary Principles & Practices
Lesson Plan Template

Closing Time:
5-10 minutes

Closing:

- How can we apply electrostatics knowledge in real life?
- Some guiding questions I might ask :
 - How could you apply induction and the law of attraction and repulsion to something like painting (car painting uses induced positive charge on the car parts and a negatively charged nozzle so that paint particles expelled by the nozzle gain a positive charge and are easily attracted and spread over the car part surface)
 - How about electrical appliances like refrigerators and stoves? What would happen if the wiring inside got frayed and came in contact with the outer frame? (This would cause a suerer to get shocked by touching the handle or frame, thats why grounding is so important and the frames of such appliances must be grounded)
 - How about dryer sheets? Anybody have any ideas how they reduce static electricity? (They have a waxy like material on them so in the dryer the waxy material coats the clothes in the dryer and that reduces the friction between the clothes)
- Before students leave the class I would hand out Static Stations sheet (has instructions for the learning stations they will be doing the following day as well as charts where they can record their observations from the stations) and I'll get them to choose their groups of 5 for the stations before they leave as well.

D. Assessment Tasks

Introduction Phase Assessment(s):

- Asking the intro question will allow me to see what students already know about the subject so I can base what topics I spend more time on off of their prior knowledge.
- Getting students to discuss the question in small pairs or groups, I can walk around and observe to see who all is participating in discussion to make sure everybody is getting a chance to get a word in. This way I can also see who feels confident with the subject matter and who may need some extra guidance.
- This question also is a little open ended so it can give me a peek into what the students are doing outside of school by hearing where and when they may have heard the term mentioned before.



Education 432: Secondary Principles & Practices Lesson Plan Template

Body of Lesson Phase Assessment(s):

- Asking open questions before defining the key topics is a good way to get students thinking about the subject matter so that they want to know more so that they can connect it to things they have heard outside of the classroom. Material that is made relevant to the student's lives outside of the class is material that students will remember more easily.
- Asking these open questions and getting students to discuss gives the teacher an opportunity to roam and see who is actually participating and who is trying to engage and think about the content.
- Having students discuss thoughts with those around them gives students an opportunity to collaborate and build teamworking skills with their peers.

Closing of Lesson Phase Assessment(s):

- Having these questions open to discuss with the entire class allows students that have gotten a good grasp on the material a chance to speak and those who haven't yet grasped the material or who may be a little nervous to speak a chance to listen and further digest the material.
- These questions specifically being related to real world applications allows students to connect the material to things in their own world, helping them to form a connection with the content to help it stick in their minds.

E. Resources

- Projector/smart board
- White board
- Balloons and other example materials to show evidence of electrostatics

F. Inclusive Practices

- Supplementary materials for any activities will be provided as students or their parents shouldn't have to supply those, and some may not be able to.
- Effort would be made to find latex free balloons in case of any latex allergies.
- Included physical activities (next class) as well as visuals to help engage those who learn better from a physical or visual stimulus as opposed to just lecturing.