THOMPSON RIVERS UNIVERSITY | Education & Social Work

Bachelor of Education (Elementary) & Bachelor of Education (Secondary) STEM Unit Plan Template

Unit Title:	Electricity and Magnetism	Number of Lessons	7	Time (in weeks):	5-6
Name:	Maddie Irvine & Noah Woods	Subject(s):	Science	Grade(s):	6/7

Rationale:

This unit is important because electricity and magnetism are essential parts of modern life. All of our electronics, appliances, and gadgets use electricity, and it is important to understand how this energy is created and how it works. Magnets are also vital for many of the items in our day to day life, and having a good understanding of these two elements builds a foundation students will need to work in engineering, mechanics, technology, the energy sector, and many other fields of labor once they are finished school

Overview:

This unit is designed to provide a basic understanding of electricity and magnetism and the relationship they share in a hands-on, inquiry based manner. Each lesson in this unit has an accompanying activity that allows the students to play around with concepts such as magnetism, insulators and conductors, and positive and negative charge. The unit starts with the basic concepts, and then moves on to more advanced topics to allow for greater understanding of some of the principals involved. At the end of the unit, students will have completed a project based on electricity and magnetism, in which they envision the future and some possible advances in technology/industry and create a plausible concept for a new invention or idea.

CORE COMPETENCIES

Communication	Thinking	Personal & Social

● Communicating
  ○ Focusing on intent and purpose - Students communicate with intention and purpose.
  ○ Acquiring and presenting information - They inquire into topics of interest and topics related to their studies.
● Collaborating
  ○ Working collectively - Students combine their efforts with those of others to effectively accomplish learning and tasks.
  ○ Determining common purposes - Students develop shared
	● Critical thinking
	  ○ Analyzing and critiquing - Students learn to analyze and make judgments about a work, a position, a process, a performance, or another product or act.
	  ○ Questioning and investigating - Students learn to engage in inquiry when they identify and investigate questions, challenges, key issues, or problematic situations in their studies, lives, and communities
	● Creative thinking
		● Social responsibility
		  ○ Contributing to community and caring for the environment - Students develop awareness of and take responsibility for their social, physical, and natural environments by working independently and collaboratively for the benefit of others, communities, and the environment.

understandings of information, issues, situations, and problems in pursuit of common purposes and goals.	○ Generating and incubating - Students may generate creative ideas through free play, engagement with other's ideas, or consideration of a problem or constraint, and/or because of their interests and passions. ○ Evaluating and developing - Students reflect on their creative ideas in order to decide which ones to develop.	

BIG IDEAS

(multiple subject areas for integrated unit)

Subject Name: Science 7	Subject Name	Subject Name
The electromagnetic force produces both electricity and magnetism.		

LEARNING STANDARDS

Curricular Competencies	Content

- **Questioning and Predicting**
  - Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest
  - Make observations aimed at identifying their own questions about the natural world
  - Identify a question to answer or a problem to solve through scientific inquiry
  - Make predictions about the findings of their inquiry
- **Planning and Conducting**
  - Measure and control variables (dependent and independent) through fair tests
  - Observe, measure, and record data (qualitative and quantitative), using equipment, including digital technologies, with accuracy and precision
  - Ensure that safety and ethical guidelines are followed in their investigations
- **Processing and Analyzing Data and Information**
  - Use scientific understandings to identify relationships and draw conclusions
- **Communicating**
  - Communicate ideas, findings, and solutions to problems, using scientific language,
	- Electricity
	  - generated in different ways with different environmental impacts
	- Electricity
	  - electromagnetism

representations, and digital technologies as appropriate	

Prerequisite Concepts and Skills:

- A basic understanding of matter (protons and electrons) and the elemental table
- Students should be familiar with generating scientific questions, doing research, and reflecting on their own work
- Students need to be comfortable with a science journal and how to use it, plus have one already

Teacher Preparation Required:

Lesson #	Teacher Preparation Required (See Unit Plan Sample)
Lesson 1	- Atoms and Static Electricity PowerPoint - Science Journals, pencils - Just How Small is an Atom? | Ted-Ed: https://www.youtube.com/watch?v=yQP4UJhNn0I
Lesson 2	- Batteries and Bulbs Kit from Henry Grube Ed. Centre - If not: Copper wire, D-cell batteries, wire strippers - if needed, metal objects, magnets - Car/boat battery, electromagnet stuff - How to Make an Electromagnet - Science Experiment - https://www.youtube.com/watch?v=na_FpTXLFa8 - Science booklets/journals
Lesson 3	- Powerpoint https://docs.google.com/presentation/d/1DQwhVZYBzTRspGwRVyw477cpD49LJxVhxakYNd9dQi8/edit?usp=sharing - Video of cohort pop can race - Pop cans (various sizes) - Balloons - Fabrics - Green tape - Science booklets/journals
Lesson 4	- Scientific Tuesdays - Cool Magnet Trick https://www.youtube.com/watch?v=HZpoT3j063U - Magnetism PowerPoint - Magnets Kit from Henry Grube - Science journals, pencils
Lesson 5	- Khan Academy Youtube Video - https://www.youtube.com/watch?v=ZgDIX2GOaxQ - Batteries and Bulbs Kit from Henry Grube Centre - Science booklets/journals - 3-2-1 sheet
Lesson 6	- Energy 101: Electricity Generation - https://www.youtube.com/watch?v=20Vb6hlLQSg - Science booklets/journals, pencils - Buzzers? - Mini whiteboards, markers
Lesson 7	- Brookfield Hydro: https://www.virtually-anywhere.com/portfolio/brookfield-power-plant-virtual-tour/ - Science journals, pencils - Whiteboard, markers - Chromebooks

Cross-Curricular Connections:

Social Studies - looking at energy use and how it affects climate change/developing countries

Aboriginal Connections/ First Peoples Principles of Learning:

Learning ultimately supports the well-being of the self, the family, the community, the land, the spirits, and the ancestors.

Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).

Learning involves patience and time.

Universal Design for Learning (UDL)

- Font and colour of text os good for all
- Volume and rate of speech is good for all
- Closed captions for videos
- Pre-teach vocabulary
- Clarify any unfamiliar terms
- Activating prior knowledge
- Chunking information - big ideas into smaller ideas
- Stop and think prompts
- Students have lots of autonomy
- Outcomes are genuine

Differentiated Instruction (DI):

- Cash, Mateo, Hunter - keep separated (distract each other, and when they are distracted they end up not following the rules)
- Brayden and Kayden - keep separated (distract each other)
- Kayden - encourage him to add more details, to slow down and read the instructions thoroughly. He misses many marks based on not reading instructions all of the way through.
- Ever - continue helping her (work with Mr. Blower on guidance with her IEP)
- Daniel - gets overwhelmed easily. Big tasks into small tasks. Breaks can help. Lots of guidance.
- Grant - work with Mr. Blower with his IEP. Grant has been pretty good this entire time.

Overview of Lessons:

Lesson 1

Name & Time (Minutes Allotted):	Protons & Electrons, Scientific Method - 50 mins
Learning Standards: Curricular Competencies	- **Questioning and Predicting** - Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest - Make observations aimed at identifying their own questions about the natural world - **Communicating** - Communicate ideas, findings, and solutions to problems, using scientific language, representations, and digital technologies as appropriate
Learning Standards: Content	- electricity - electromagnetism
Instructional Objectives	- SWBAT identify and recognize various parts of an atom - SWBAT recognize and differentiate the different steps of the scientific method

Assessment:	- Atom drawing - Reflection in science journal - Conversation/participation
Teaching Strategies:	- Direct teaching - Youtube video - Student participation
Materials:	- Atoms and Static Electricity PowerPoint - Science Journals, pencils - Just How Small is an Atom? | Ted-Ed: https://www.youtube.com/watch?v=yQP4UJhNn0I
Lesson Activities:	
Introduction/Hook:	- Just How Small is an Atom? | Ted-Ed: https://www.youtube.com/watch?v=yQP4UJhNn0I - Ask students what they thought about the video - Explain today we will be breaking down what is in an atom
Body:	**Scientific Method:** - Ask students if they have heard of the Scientific Method when writing out experiments - Explain steps: ask a question, prediction/hypothesis, test, analyze, draw conclusion (was your prediction correct/not correct?) - Explain to students that we will be working with these terms and writing them down in our science booklets as we work our way through experiments **Atoms:** - Atoms and Static Electricity PowerPoint - Have students draw and label an atom in their science journals - What part has a negative charge? - What part has a positive charge? - What part has a neutral charge?
Closure:	- Write a 2 sentence reflection on what they have learned today in this class

Lesson 2

Name & Time (Minutes Allotted):	Intro to Electricity and Magnetism - 50 mins

Learning Standards: Curricular Competencies	- **Questioning and Predicting**
	  - Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest
	  - Make observations aimed at identifying their own questions about the natural world
	  - Make predictions about the findings of their inquiry
	- **Communicating**
	  - Communicate ideas, findings, and solutions to problems, using scientific language, representations, and digital technologies as appropriate

Learning Standards: Content	- Electricity - Electromagnetism
Instructional Objectives	- SWBAT formulate 5 questions related to electricity and magnetism - SWBAT successfully create an electromagnet that is functional
Assessment:	- For this lesson: - Small list of questions generated about the subject - Introduce main project for the unit: Electricity and the Future

	- A project where students take what they've learned about electricity and magnetism and apply it to future technology
Teaching Strategies:	- Put students into groups using Flippity & shuffling - Science journals - Show video to help with instructions
Materials:	- Batteries and Bulbs Kit from Henry Grube Ed. Centre - If not: Copper wire, D-cell batteries, wire strippers - if needed, metal objects, magnets - Car/boat battery, electromagnet stuff - How to Make an Electromagnet - Science Experiment - https://www.youtube.com/watch?v=na_FpTXLFa8 - Pencils, erasers - Science booklets/journals
Lesson Activities:	
Introduction/Hook:	**Big Battery:** - Gain students' attention - Demonstrate a heavy duty electromagnet using a car/boat battery
Body:	**Scientific Method:** - Give a brief talk about asking good scientific questions and some other specific practices: observing, questioning, gathering data, analyzing, and discussing - Students will be encouraged to start practicing these skills in this lesson - The main focus in regards to science skills will be questioning **Experiment:** - Students will be broken into as many groups as we have batteries/materials - They will watch How to Make an Electromagnet - Science Experiment - https://www.youtube.com/watch?v=na_FpTXLFa8 - They will then get the supplies needed and work on building their own - They will be encouraged to play around a bit by tweaking different variables, they can change the strength of the magnet - As they are doing this, they will be instructed to start generating a list of questions in their science journals, as well as any observations or analyses they may have
Closure:	- Have a class discussion on electricity and magnetism and how they are related based on what we have discovered by playing around - We will look at exactly what electricity is - Students will hand in their top 5 questions they want to learn more about

Lesson 3

Name & Time (Minutes Allotted):	Static Electricity Pop Can Races - 50 mins

Learning Standards: Curricular Competencies	- **Questioning and Predicting**
	  - Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest
	  - Formulate alternative "If…then…" hypotheses based on their questions

	- Make predictions about the findings of their inquiry - **Applying and Innovating** - Cooperatively design projects - **Communicating** - Communicate ideas, findings, and solutions to problems, using scientific language, representations, and digital technologies as appropriate
Learning Standards: Content	- Electricity - Generated in different ways with different environmental impacts
Instructional Objectives	- SWBAT write and describe their predictions in their science journals - SWBAT test and modify different elements of the experiment as a group - SWBAT decide their fastest combination and race against other students
Assessment:	- Students predicting what will happen in their science journals before experimenting - Teamwork and inclusive environment - Participation
Teaching Strategies:	- Teamwork - Science journals - Powerpoint - Video to show how it works
Materials:	- Powerpoint https://docs.google.com/presentation/d/1DQwhVZYBzTRspGwRVyw477cpD49LJxVhxakYNd9dQi8/edit?usp=sharing - Video of cohort pop can race - Pop cans (various sizes) - Balloons - Fabrics - Green tape - Science booklets/journals
Lesson Activities:	
Introduction/Hook:	- Gain students' attention - Show students a video of cohort doing pop can races
Body:	**Static Electricity:** - Go through Powerpoint and review protons and neutrons - Explain the shift in energy from one object to another - Students raise hands for any input/questions **Experiment:** - Students will be in their table groups - Each group will get to select 1 regular sized pop can and 1 regular balloon - Students will use the scientific method to predict what will happen when they rub their hair on the balloon and hold it near the pop can - Just like in the demo - Students can then make another prediction for a different sized can, a different sized balloon, or a different fabric - Students experiment again - Students can keep experimenting as long as they predict first - Prediction is the key skill being developed

	Race: - Have students clear tables and chairs to the side - Mark start and finish line on the floor with tape - Give students 5 mins to decide in their groups what experiment was the fastest, and who will be racing - Start the race! - If there is time, do multiple heats so all group members can rotate in to race
Closure:	- Gain students' attention - Ask each group what worked for them/did not, and why they thought? - Did they gather enough static electricity? - Ask for students to hand in their science booklets/journals - Mark based on predictions - Students can help clean up the classroom

Lesson 4

Name & Time (Minutes Allotted):	A Closer Look at Magnetism - 50 mins

Learning Standards: Curricular Competencies	- **Questioning and Predicting**
	  - Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest
	  - Make predictions about the findings of their inquiry
	- **Planning and Conducting**
	  - Observe, measure, and record data (qualitative and quantitative), using equipment, including digital technologies, with accuracy and precision
	- **Applying and Innovating**
	  - Generate and introduce new or refined ideas when problem solving

Learning Standards: Content	- Electricity: electromagnetism
Instructional Objectives	- SWBAT write reasonable predictions based on prior knowledge in regards to magnetism - SWBAT compare and contrast the differences between static electricity and magnetism
Assessment:	- Science journals - Group/class discussion - Observation from conversations - Participation
Teaching Strategies:	- Students partnering/grouping up - Student lead engagement - Powerpoint - Hands-on
Materials:	- Scientific Tuesdays - Cool Magnet Trick https://www.youtube.com/watch?v=HZpoT3j063U - Magnetism PowerPoint - Magnets Kit from the Henry Grube - Science journals, pencils
Lesson Activities:	
Introduction/Hook:	- Gain students' attention - Show students Scientific Tuesdays - Cool Magnet Trick https://www.youtube.com/watch?v=HZpoT3j063U

	- Ask students if there were enough needles, would the magnets separate?
Body:	**Magnetism Powerpoint** - Teacher will briefly talk with class about magnetism using the PowerPoint - We will discuss predicting and hypothesizing as well - Students will be expected to build off of the science skills from the last lesson, and start making predictions in this lesson - Predictions is the key skill being developed **Magnets** - Students will be paired/grouped (depending on the amount of magnets), and handed out various sizes and types of magnets - Students will be encouraged to play around with the magnets, trying them out on various materials - Before they do, however, they are to record their prediction of what will happen in their science journal, and what happened after - Teacher will warn them not to use magnets on electronics (unless some old ones can be brought in)
Closure:	- Students will write a short paragraph/draw a picture with description of an idea that they have in which a gigantic magnet would be useful - They are to use their prediction skills to predict what large magnets would be able to accomplish - Students that finish quickly will help clean up

Lesson 5

Name & Time (Minutes Allotted):	Conductors and Insulators - 50 mins
Learning Standards: Curricular Competencies	- **Questioning and Predicting** - Make observations aimed at identifying their own questions about the natural world - **Planning and Conducting** - Observe, measure, and record data (qualitative and quantitative), using equipment, including digital technologies, with accuracy and precision - Ensure that safety and ethical guidelines are followed in their investigations
Learning Standards: Content	- Electricity: generated in different ways with different environmental impacts
Instructional Objectives	- SWBAT explain the difference between a conductor and an insulator - SWBAT classify objects as conductors or insulators in an experiment
Assessment:	- 3-2-1 sheet (3 things I learned, 2 things I found interesting, 1 question I still have) - Student's list of conductors and insulators
Teaching Strategies:	- Using Khan Academy to explain a concept - Partnering/grouping students via Flippity - 3-2-1 formative assessment

Materials:	- Khan Academy Youtube Video - https://www.youtube.com/watch?v=ZgDIX2GOaxQ - Batteries and Bulbs Kit from Henry Grube Centre - Science booklets/journals - 3-2-1 sheet
Lesson Activities:	
Introduction/Hook:	**Light Bulb Circuit:** - Students will partner up/group up depending on how many circuits we have - Students will be given an electrical circuit connected to a light bulb - They will be given numerous objects (plus they can use stuff around the classroom) tp put into the circuit to see if the light lights up - They are to create a list of what triggers the light and what doesn't - Make observations about the types of materials they use
Body:	- The science skill to focus on today is classifying, as well as building on the ones they know - Show students Khan Academy Youtube Video - https://www.youtube.com/watch?v=ZgDIX2GOaxQ - Provide students some questions that they can fill out while they watch - After the video, discuss how/if what the video says lines up with what they found in their own experiments - Have students classify all the objects they tested into either category: insulator or conductor - If students want an additional challenge, ask them if they think any materials were superconductors or insulators
Closure:	- Students complete a 3-2-1 and hand it on to the teacher - Students hand in their lists of 5 conductors and 5 insulators they used in the opening activity - Students help clean up the classroom and put materials away

Lesson 6

Name & Time (Minutes Allotted):	Electricity Jeopardy - 50 mins

Learning Standards: Curricular Competencies	- **Questioning and Predicting**
	  - Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest
	- **Processing and Analyzing Data and Information**
	  - Use scientific understandings to identify relationships and draw conclusions
	- **Communicating**
	  - Communicate ideas, findings, and solutions to problems, using scientific language, representations, and digital technologies as appropriate

Learning Standards: Content	- electricity:
	  - generated in different ways with different environmental impacts
	  - electromagnetism

Instructional Objectives	- SWBAT recognize and define different electricity terms - SWBAT apply and demonstrate their electrical knowledge of what we have learned over the unit

Assessment:	- Teamwork - Inclusion - Participation - Reflection
Teaching Strategies:	- Electricity video - Teamwork - Gamify - Reflection
Materials:	- Energy 101: Electricity Generation - https://www.youtube.com/watch?v=20Vb6hlLQSg - Science booklets/journals, pencils - Buzzers? - Mini whiteboards, markers
Lesson Activities:	
Introduction/Hook:	- Gain students' attention - Watch video on how electricity is made - Energy 101: Electricity Generation - https://www.youtube.com/watch?v=20Vb6hlLQSg - Ask students what they thought of the video - Allow students time to reflect
Body:	**Electricity Jeopardy:** - 1 student from each table will grab a mini whiteboard and 1 marker for their table - Each table will be a team - Just like in jeopardy, we will take turns letting table groups choose which question they would like, and for how much - They must answer like in Jeopardy "What is….."
Closure:	- Students will write a reflection in their science journals about the lesson today - About what they have learned today, anything interesting, a fact they never knew about, etc. - Hand in to teacher

Lesson 7

Name & Time (Minutes Allotted):	Electricity and Magnetism in the Real World - 50 mins

Learning Standards: Curricular Competencies	- **Questioning and Predicting**
	  - Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest
	  - Make observations aimed at identifying their own questions about the natural world
	  - Identify a question to answer or a problem to solve through scientific inquiry
	- **Processing and Analyzing Data and Information**
	  - Use scientific understandings to identify relationships and draw conclusions

Learning Standards: Content	- electricity
	  - generated in different ways with different environmental impacts
	  - electromagnetism

Instructional Objectives	- SWBAT identify areas in which we use electricity and magnets day to day - SWBAT develop a pros and cons list of a hydroelectric plant

Assessment:	- Ticket out the door - Science journals with evaluation activity
Teaching Strategies:	- Teacher led class discussion - Chromebook online activity - Giving students choice
Materials:	- Brookfield Hydro: https://www.virtually-anywhere.com/portfolio/brookfield-power-plant-virtual-tour/ - Science journals, pencils - Whiteboard, markers - Chromebooks
Lesson Activities:	
Introduction/Hook:	- Students will have 5 mins to list as many items/areas in real life where we use magnets and/or electricity - We will continue to compose a list with everyone's answers once the 5 mins are up - If necessary, the teacher will add in some of the lesser known ones such as electronics using magnets
Body:	- Class discussion on the importance of electricity and magnetism in our everyday lives - We will also talk about the science skills of evaluating and reflecting, which will be the main skills of the lesson **Virtual Tour:** - Students will go on a virtual tour of a hydroelectric plant: https://www.virtually-anywhere.com/portfolio/brookfield-power-plant-virtual-tour/ - Brookfield hydroelectric plant: Canada's largest hydroelectric power producers - Ask students pros and cons of a hydroelectric plant
Closure:	- Students will write an exit ticket (in their journals) on 1 key part of their life that magnets or electricity would affect the most

Resources:

- Youtube (National Geographic & Khan Academy)
- Batteries and Bulbs Kit - Henry Grube Centre
- Teachers Pay Teachers

Extensions to Unit:

- Field trip to power plant
- Looking at solar energy and how it generates electricity
- Building a compass
- Field trip to the Big Little Science Centre

Reflections and Revisions

n/a until after practicum