THOMPSON RIVERS UNIVERSITY | Education & Social Work

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

Unit Title:	Fasten Your Heat-belts!	Number of Lessons	9	Time (in weeks):	4-5
Name:	Jenna Churchill	Subject(s):	Science/Language Arts/ Art	Grade(s):	

Rationale

This unit is important as students will explore thermal energy and the transfer of thermal energy. This unit is intended to be taught in nine lessons which are planned in a way that allows for scaffolding of each concept. Each lesson includes moments for students to make predictions, observe, and demonstrate their findings or learning. This is an integrated unit where we will focus on three curricular areas, Science, English Language Arts, and Arts Education. Students will be given thermal energy booklets in lesson one which they will add to throughout each lesson. These will be used as both formative and summative assessment. The booklets will include worksheets for each experiment, activities for students who are done early, and have space for students to demonstrate their learning in a way of their choice (written or pictorial). This unit includes several experiments that require student involvement. This will allow them to have clear visuals of each concept and engage students by being hands-on and learning what is required to conduct scientific experiments. Once we have covered all three thermal energy forms through lessons one to six, students will take part in a drama activity where they will work in groups to create skits that demonstrate either conduction, radiation, or convection. This unit will support students in better conceptualizing the three forms of transfer in familiar contexts, which they may then apply to concepts which require higher levels of thinking such as states of matter, climate change, and sources of energy in the world.

Overview:

The summative goal of this unit is for students to understand and define the three forms of thermal energy transfer. We will progress toward this goal in the following lessons:

Lesson one: In our first lesson of the unit, we will review the concept that all matter is made of particles. Particles are made of smaller molecules. Students will learn that the movement of these particles is energy and energy generates heat. We will break down this concept in multiple ways during the lesson including a slideshow, class discussion, and a visual example where we will place food coloring in both hot and cold water and observe the interaction.

Lesson two: In the following lesson, the three forms of thermal energy transfer will be introduced. Students will learn about conduction, radiation, and convection in a Bill Nye video that gives examples of all three. We will create visual charts as a class that we can refer to throughout the unit and add to as we learn more. The teacher will also demonstrate the forms of thermal energy by melting an ice cube.

Lesson three: In lesson three, we will focus on conduction. We will go through a slideshow with simple graphics where students will learn that conduction is energy transfer through touch. We will have a class tea/hot chocolate party where students will observe what their hands feel like before and after touching their cups.

Lesson four: In this lesson, we will explore conduction further by answering the question, "what materials conduct the most heat?" Students will be split in groups to complete the experiment where they will test how long it takes for heat to travel from hot water to their hand while holding spoons made from different materials. We will debrief the experiment using a physical response technique and then discuss our findings.

Lesson five: In lesson five we will explore radiation through engaging videos and a slideshow to facilitate discussion. We will then conduct an experiment where students will use heat lamps to observe heat transfer and which materials absorb heat the most. After the experiment we will discuss our findings and students will be asked to brainstorm different examples of radiation we see every day, i.e., microwaves.

Lesson six: Convection will be the final thermal energy transfer form we explore. To introduce this lesson, teacher will conduct a mini experiment for students to see heat rising through liquid. This will engage students and activate schema. We will then do another experiment as a class so students can have a visual of how convection works. Students will assist teacher in carefully placing drops of hot water into an ice-cold glass of water. We will observe what happens and debrief how this demonstrated convection.

Lesson seven: In this lesson, we will review each of the thermal energy sources using slideshow visuals and student discussion, as well as responding to class questions using individual whiteboards. Teacher will then introduce

thermal energy charades project. Students will receive one of the three energy transfer forms and create a silent skit to demonstrate their energy form. Students will have time to practice.
Lesson eight: In lesson eight, students will have time to go over their skit with their partner, some groups may choose to do more than one. Groups will take turns presenting their skit and each student will guess what energy form they are demonstrating. Every student will write their guess on their whiteboard and show it.
Lesson nine: In our final lesson of this unit, we will do a class kahoot! Students are engaged in kahoots and it will be an opportunity to present their learning. Students will also hand in their completed energy booklets to the teacher which will be used as summative assessment for the unit.

CORE COMPETENCIES

Communication	Thinking	Personal & Social
Communicating • Connecting and engaging with others through various group work opportunities in the unit. • Focusing on intent and purpose though assigned tasks where students will be asked to demonstrate their thoughts and understanding. • Acquiring and presenting information in the final activity where students will use drama to present their understanding of thermal energy transfer. Collaborating • Working collectively as a class and in small groups to make inquiries and predictions. • Supporting group interactions when working with peers to make sure all voices are respectful and heard.	Critical thinking • Questioning and investigating in every lesson when being introduced to new concepts. • Reflecting and assessing in every lesson in thermal energy booklets to present any questions, thoughts, or findings. Creative thinking • Evaluating and developing new ideas through class activates and final group activity to creatively demonstrate their thinking.	Personal awareness and responsibility • Self-regulating in each lesson as there will be a lot of movement and stimulation with engaging activities. Students will need to practice awareness of surroundings to ensure they are being safe and keeping others safe. Social responsibility • Resolving problems which may arise during any group or class work through patience and communication.

BIG IDEAS

(multiple subject areas for integrated unit)

Subject Name- Science	Subject Name- English Language Arts	Subject Name- Drama
Thermal energy can be produced and transferred.	Curiosity and wonder lead us to new discoveries about ourselves and the world around us.	Creative experiences involve an interplay between exploration, inquiry, and purposeful choice.

LEARNING STANDARDS

Curricular Competencies	Content
Science *Questioning and predicting* -Demonstrate curiosity about the natural world -Make predictions based on prior knowledge *Planning and conducting* Suggest ways to plan and conduct an inquiry to find answers to their questions -Safely use appropriate tools to make observations and measurements, using formal measurements and digital technology as appropriate *Processing and analyzing data and information* -Compare results with predictions, suggesting possible reasons for findings *Evaluating* -Make simple inferences based on their results and prior knowledge *Communicating* -Represent and communicate ideas and findings in a variety of ways, such as diagrams and simple reports, using digital technologies as appropriate	-Sources of thermal energy -Transfer of thermal energy
English Language Arts *Comprehend and connect (reading, listening, viewing)* -Use sources of information and prior knowledge to make meaning -Make connections between ideas from a variety of sources and prior knowledge to build understanding -Use developmentally appropriate reading, listening, and viewing strategies to make meaning *Create and communicate (writing, speaking, representing)* -Communicate using sentences and most conventions of Canadian spelling, grammar, and punctuation -Develop and apply expanding word knowledge	*Story/text* -Text features *Strategies and processes* -Oral language strategies -Metacognitive strategies *Language features, structures, and conventions* -Sentence structure -Conventions
Arts Education *Exploring and creating* -Create artistic works collaboratively and as an individual, using ideas inspired by imagination, inquiry, experimentation, and purposeful play. *Reasoning and reflecting* Refine ideas, processes, and technical skills in a variety of art forms Connect knowledge and skills from other areas of learning in planning, creating, and interpreting works for art *Communicating and documenting* Apply learned skills, understandings, and processes in new contexts	-a variety of dramatic forms -symbolism as ways of creating and representing meaning

Prerequisite Concepts and Skills:

- Students should be able to express their thinking either visually, orally or through simple written words and sentences.
- Students should be able to read simple sentences or make inferences based on simple pictures and oral instruction.
- Students should be able to make connections through prior knowledge.
- Students should be able to work in groups and communicate appropriately.

Teacher Preparation Required:

Lesson #	Teacher Preparation Required (See Unit Plan Sample)
Lesson 1	-Energy booklets -Matter Slideshow -2 mason jars -Food Coloring -Thermometer
Lesson 2	-Bill Nye energy video- https://www.youtube.com/watch?v=n7ko1F0gEU4 -Observation booklet. -Chart paper -Markers -Ice cubes -Heat lamp
Lesson 3	-Conduction slideshow -Hand warmers -Chart paper -Markers -Paper cups -Hot chocolate/tea
Lesson 4	-Conduction slideshow -Mugs -Wooden spoons -Metal spoons -Plastic spoons -Kettle
Lesson 5	https://www.youtube.com/watch?v=tZliZyoYT80 https://www.youtube.com/watch?v=2JZciWtK6vc -Radiation slideshow -popsicle sticks -Thermometer sticks -Black fabric -White fabric
Lesson 6	-Clear jar -water -freezer (staff room) -Coffee mug -Food coloring -Spoon -Dropper -Convection slide show -Convection chart
Lesson 7	-Review slideshow -Knowledge charts for thermal energy sources -Slips of paper with energy sources on them.
Lesson 8	-Whiteboards -Popsicle sticks
Lesson 9	-Charts for conduction, convection, radiation -Kahoot -iPads -Whiteboards

Cross-Curricular Connections:

This unit was planned as an integrated unit, so it has strong curricular connections to Science, English Language Arts, and Arts Education. As we study the scientific concept of thermal energy students will demonstrate their understanding using ELA (reading, writing, oral communication) and drama/art in the final activities. The connection to Math can also be noted here as students will practice collecting and recording data (temperatures).

Aboriginal Connections/ First Peoples Principles of Learning:

Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place). This unit was planned with intention of using a holistic approach. Students will learn thermal energy through experiments (experiential), class discussion, reflection, and communication by working closely with one another.

Learning involves patience and time. By using a holistic approach to teach thermal energy, we will emphasize the importance of being patient when it comes to waiting for results or working with groups. Students will also be encouraged to draw on curiosities and ask questions. This means we can slow down, revisit concepts when needed, and the teacher will be sure to move through material at a pace where students are engaged and enjoy learning. We will allow for flexibility in this unit so we can make stronger connections to the material.

Universal Design for Learning (UDL)

MULTIPLE MEANS OF REPRESENTATION – **I provide for multiple means of representation in this unit in the following ways:**

-Use of videos and slideshows
-Slideshows will have simple graphics/wording to minimize visual overstimulation
-Visual presentations of oral material, charts for each form of energy
-Graphic organizers (thermal energy booklet)
-Oral instruction/ instructions written on board
-Visual presentations (charts for each energy form visible in the classroom)

MULTIPLE MEANS OF ACTION AND EXPRESSION – **I provide multiple means of action and expression in this unit in the following ways:**

-Students will have opportunities to communicate their understanding using words, drawing pictures, orally, and through dramatic forms
-Students will conduct hands-on experiments

MULTIPLE MEANS OF ENGAGEMENT – **I provide multiple means of engagement in this unit in the following ways:**

-Partner/group work
-Frequent check ins for understanding
-Additional time granted when needed
-Time to process information and directions
-Frontloading instructions before beginning a task or experiment
-Opportunities to move around the classroom

Differentiated Instruction (DI):

-Calm space provided (back room, exercise bike) for students who need time to regulate
-Strategic group formations for students with similar abilities
-Scribe/reader (CEA) for students who need assistance recording info
-Students requiring extra assistance will be seated near the front

Overview of Lessons:

Lesson 1

Name &Time (Minutes Allotted):	Introduction to Heat Transfer – 50 mins
Learning Standards: Curricular Competencies	**Science** -Demonstrate curiosity about the natural world -Make predictions based on prior knowledge -Compare results with predictions, suggesting possible reasons for findings -Make simple inferences based on their results and prior knowledge -Represent and communicate ideas and findings in a variety of ways, such as diagrams and simple reports, using digital technologies as appropriate **ELA** -Use sources of information and prior knowledge to make meaning -Use developmentally appropriate reading, listening, and viewing strategies to make meaning
Learning Standards: Content	**SC**-Sources of thermal energy -Transfer of thermal energy **ELA**--Oral language strategies -Metacognitive strategies
Instructional Objectives	-Students will be able to communicate their understanding of energy as the movement of molecules. -They will be able to communicate that molecules move faster in hot water and slower in cold water
Assessment:	-Formative Assessment through observation of class and partner discussion. -Formative and summative assessment through thermal energy booklets (KWL chart). -Formative/summative assess. kept in assessment binder for this unit which includes a tab for each student to note student progress (Discussions, responses, student work).
Teaching Strategies:	-KWL charts for schema activation -Engaging visuals in slideshow -Think-pair-share! -Visual demonstration -Popsicle sticks for fair participation -Frequent pauses for check-ins
Materials:	-Energy booklets -Matter Slideshow -2 mason jars -Food Coloring -Thermometer
Lesson Activities:	
Introduction/Hook:	-KWL chart about energy- What do you know? What are your questions? -Think-Pair-Share! -Would anyone like to share with the class? -Record student answers.
Body:	-Write “Kinetic energy” on the board. -We are going to talk about how molecules move to create heat. -What do we know? All matter is made of particles or molecules. -When energy is present, heat is created. The speed of the molecules will make something hotter or colder. -Go through heat transfer slideshow. -Experiment time! We are going to see how kinetic energy works. -Place two jars on the table one with hot water and one with cold water.

	-I am going to put 3 drops of food coloring in each of these jars of water. -If I have one jar with hot water, and one with cold water, we know there are molecules in there that are moving at different speeds. -Teacher takes temperature of water in both jars. -Write temp of jar 1 and 2 on the board. -Which jar do you think is going to make the food coloring move around in more? Write it down on the "jar test" page of your booklet where it says "predictions" -Let's test! -I need two volunteers! (Choose from popsicle sticks) -Okay my assistants are going to drop the food coloring in at the same time to see which one has faster molecules. Ready, set, go! -Write or draw what you see. -Let's talk about it! -Which jar did the food coloring move around in faster? -Were the molecules moving faster or slower?
Closure:	-Flip back to your KWL chart and you can write or draw what you learned today. -When you're done you can start the wordsearch! Lesson complete!

Lesson 2

Name &Time (Minutes Allotted):	Hello Thermal Energy! 50 mins
Learning Standards: Curricular Competencies	**Science** -Demonstrate curiosity about the natural world -Make predictions based on prior knowledge -Compare results with predictions, suggesting possible reasons for findings -Make simple inferences based on their results and prior knowledge -Represent and communicate ideas and findings in a variety of ways, such as diagrams and simple reports, using digital technologies as appropriate **ELA** -Use sources of information and prior knowledge to make meaning -Make connections between ideas from a variety of sources and prior knowledge to build understanding -Use developmentally appropriate reading, listening, and viewing strategies to make meaning -Develop and apply expanding word knowledge
Learning Standards: Content	-Sources of thermal energy -Transfer of thermal energy -Oral language strategies -Metacognitive strategies -Text features
Instructional Objectives	-Students will be able to name the three forms of thermal energy transfer
Assessment:	-Formative assessment will be completed using the thermal energy booklets, teacher will circulate and add checkmark to each student in assessment binder who correctly labels the diagrams. This will inform which students may need extra support. -Formative/summative assess. kept in assessment binder for this unit which includes a tab for each student to note student progress. (Discussions, responses, student work)
Teaching Strategies:	-Engaging visuals in slideshow -Fun video to support understanding -Think-pair-share!

	-Visual demonstration -Popsicle sticks for fair participation -Frequent pauses for check-ins
Materials:	-Whiteboard -Bill Nye energy video- https://www.youtube.com/watch?v=n7ko1F0gEU4 -Observation booklet. -Chart paper -Markers -Ice cubes -Heat lamp
Lesson Activities:	
Introduction/Hook:	-Thermal Heat Brainstorm to Activate Schema -First, I'd like us to do some brainstorming together. I'd like everyone to close their eyes… -Brief visualization of going camping May with their family. The weather starts warm, then gets a bit cold. How do they stay warm? -On a whiteboard, in pairs, brainstorm some ways that they could stay warm with their family (fire, coats, movement). -Students to share some of their ways, record ideas on the white board in written and pictorial forms. -These are all examples of heat, or thermal energy! -Thermal energy is one of the most important types of energy on Earth. Without thermal energy from the Sun, the Earth would be frozen. -We are going to be exploring the three types of thermal energy!
Body:	-Watch Bill Nye Energy Video. -Students fill out "thermal energy doodles" sheet while they watch. -Keep track of anything you hear about our three energy sources! -Can anyone tell me what conduction is? How did Bill show that? -What about Convection? -What about Radiation? -Write all answers on chart paper as a class to re-visit each lesson. -Everyone put your hands on your cheeks. Now rub your hands together really fast then touch your cheeks? -Can anyone tell me what type of heat transfer this is? (Conduction through friction). -Scientist coats on! We are going to do an experiment. -Teacher will choose a volunteer to hold an ice cube in their hand and melt it as fast as they can. -Students record how long it took! What did they do to melt it? -What is this called? (Conduction) -Okay what if I get a new ice cube and put it under a heat lamp? -How long do you think it will take? -Place ice cube under heat lamp and set a timer. -How long did it take for the ice cube to melt? What did I do to melt it? -What is this called? (Radiation) -You can add this to your doodles and notes in your booklet!
Closure:	-Ask students to turn to their partner and tell them which type of energy they are most excited to learn about and why? -Can anyone share with the class what their partner said? -Tidy up!

Lesson 3

Name &Time (Minutes Allotted):	Conduction Introduction! 50 mins
Learning Standards: Curricular Competencies	**Science** -Demonstrate curiosity about the natural world -Make predictions based on prior knowledge -Compare results with predictions, suggesting possible reasons for findings -Make simple inferences based on their results and prior knowledge -Represent and communicate ideas and findings in a variety of ways, such as diagrams and simple reports, using digital technologies as appropriate **ELA** -Use sources of information and prior knowledge to make meaning -Make connections between ideas from a variety of sources and prior knowledge to build understanding
Learning Standards: Content	**SC**-Sources of thermal energy -Transfer of thermal energy **ELA**-Text Features -Oral language strategies -Metacognitive strategies
Instructional Objectives	-Students will be able to define conduction. -Students will be able to demonstrate their understanding by providing everyday examples of conduction.
Assessment:	-Assessment through class discussion and observation. -Formative/summative assess. kept in assessment binder for this unit which includes a tab for each student to note student progress (Discussions, responses, student work).
Teaching Strategies:	-Engaging visuals in slideshow -Think-pair-share! -Visual demonstration -Popsicle sticks for fair participation -Frequent pauses for check-ins
Materials:	-Conduction slideshow -Hand warmers -Chart paper -Markers -Paper cups -Hot chocolate/tea
Lesson Activities:	
Introduction/Hook:	-I always have cold hands and feet, luckily, I have hand warmers and feet warmers. -Take a hand warmer out and open it. Explain that your hands are already getting warm just by holding it! Pass it around. -Would anyone like to share what type of thermal energy this is? (Conduction) -Write it on the board. -Would anyone like to share something they remember about conduction? -Write all answers on the board.
Body:	-Slideshow about conduction to accompany discussion. -Has anyone ever cooked with their parents or grandparents before? -If I boil a pot of water to make mac and cheese, what is the hot part? -What is the cold part? How does the water boil? -We know that when heat is transferred through touch it is called… (conduction). -Make chart for conduction as a class. -What do we need to add first? Students raise hands (popsicle sticks).

	-Time for a tea party! -Students can choose between tea or hot chocolate. -Helpers set up. -Boil water and pour for students. - Hands off cups until teacher says. -In your booklets, write how your hands feel right now. -Now look at your cup, what do you see? Write it/draw it. -Now put your hands on the cup, what do you feel? Write it/ draw it. -Let's talk about it, what were your observations, hands up! -Write student answers on the board. -Your hands felt warm when they touched the cup, this is conduction! -The cup was hotter than your hand, the heat from the cup transferred to your hand through touch.
Closure:	-Think of some other examples of conduction energy that happen in our lives every day, you can work with a partner, write it in the booklet! Lesson complete!

Lesson 4

Name &Time (Minutes Allotted):	Conductors of Heat- 60 mins
Learning Standards: Curricular Competencies	**Science** -Make predictions based on prior knowledge -Suggest ways to plan and conduct an inquiry to find answers to their questions -Safely use appropriate tools to make observations and measurements, using formal measurements and digital technology as appropriate -Compare results with predictions, suggesting possible reasons for findings -Represent and communicate ideas and findings in a variety of ways, such as diagrams and simple reports, using digital technologies as appropriate **ELA** -Use sources of information and prior knowledge to make meaning -Make connections between ideas from a variety of sources and prior knowledge to build understanding -Use developmentally appropriate reading, listening, and viewing strategies to make meaning
Learning Standards: Content	**SC**-Sources of thermal energy -Transfer of thermal energy **ELA**-Text features -Oral language strategies -Metacognitive strategies
Instructional Objectives	-Students will be able to define conduction. -Students will be able to determine what material is the best conductor and present their knowledge through writing, pictures, or physically with closing exercise.
Assessment:	-Formative assessment through: -Observation of experiment and observation of closing exercise to physically demonstrate learning (record in binder). -Teacher will collect thermal energy workbooks to check in on student learning and progress.
Teaching Strategies:	-Engaging visuals in slideshow -Think-pair-share! -Visual demonstration -Popsicle sticks for fair participation/grouping -Frequent pauses for check-ins -Students will participate in experiment -Physical response to demonstrate learning

Materials:	-Conduction slideshow -Mugs -Wooden spoons -Metal spoons -Plastic spoons -Kettle
Lesson Activities:	
Introduction/Hook:	-Begin with conduction slideshow for visual guidance/review -Class discussion on what we remember about heat/energy/conduction -Has anyone seen an example of conduction since our last lesson? Tell your seat partner!
Body:	-Experiment time! -Today we are going to test which materials are better at transferring heat from something that is hot to something that is cold by touching. -You are all the scientists today, so we need to practice our observation skills. -Guiding question: what material is the best at transferring heat from something hot to something cold? A wood spoon, a metal spoon, or a plastic spoon? -As we move through the experiment you will need to record all of your observations in your booklet. -Record predictions first! -Here are our steps: (teacher will guide and time class all together through these steps, running one step at a time) -Pour hot (warm) water into mug for each group (teacher does this) -One person places object into cup -One person times how long it takes for the person to feel the heat. -One person records the observations (pictorial or written) -Switch roles for next test of a new object. -Repeat x 3. -Students record their observations (pictorial or written) -Students practice recording the information from each test -Groups of 3
Closure:	-Debrief What did we find? (Physical expression) -Describe an invisible line in the room. One end of the line represents a FAST conductor of thermal energy, the other end represents a SLOW conductor of thermal energy, and the middle is a MEDIUM conductor of thermal energy. -Students move around the room, teacher says a material out loud (one that we focused on). -Students must physically move to where they think that material belongs. -Run 3 rounds with the materials they used. -Discuss the findings together during each round. -Revisit predictions, were you correct? Why did you predict what you did? -Hand in your booklets to teacher today please!

Lesson 5

Name &Time (Minutes Allotted):	Radiation- 50 mins
Learning Standards: Curricular Competencies	**Science** -Demonstrate curiosity about the natural world -Make predictions based on prior knowledge -Compare results with predictions, suggesting possible reasons for findings -Represent and communicate ideas and findings in a variety of ways, such as diagrams and simple reports, using digital technologies as appropriate **ELA** -Use sources of information and prior knowledge to make meaning -Make connections between ideas from a variety of sources and prior knowledge to build understanding -Use developmentally appropriate reading, listening, and viewing strategies to make meaning
Learning Standards: Content	**SC**-Sources of thermal energy -Transfer of thermal energy **ELA** -Oral language strategies -Metacognitive strategies
Instructional Objectives	-Describe thermal radiation -Compare thermal radiation to thermal conduction -Describe how heat is more readily absorbed by darker materials
Assessment:	-Observation of class discussion and experiment. -Formative assessment in thermal energy booklets. -Formative/summative assess. kept in assessment binder for this unit which includes a tab for each student to note student progress. (Discussions, responses, student work)
Teaching Strategies:	-Engaging visuals in slideshow -Think-pair-share! -Visual demonstration -Popsicle sticks for fair participation/grouping -Frequent pauses for check-ins -Students will participate in experiment
Materials:	https://www.youtube.com/watch?v=2JZciWtK6vc (Radiation video) -Radiation slideshow -popsicle sticks -Thermometer sticks -Black fabric -White fabric
Lesson Activities:	
Introduction/Hook:	-Begin with YouTube video. -Radiation slideshow visuals to accompany discussion. -What is the number one biggest, strongest heat source that we ALL experience and need to survive? Sun! -Last class we talked about how heat transfers to cold when it touches the cold item. What was that called? Conduction. -The sun is REALLY far away from us, isn't it? Why can we still feel its heat then?! This transfer of heat method is called radiation. Can anyone think of a time they experienced heat radiation? -Tell me, hands up!
Body:	-Experiment time! -Today we are exploring radiation and how different materials absorb heat radiation. Split students into groups of 3 (intentional popsicle stick grouping) Here are our materials:

	Heat lamps, white paper, black paper, 3 thermometer strips. What are your predictions? Short Think-Pair-Share: Students discuss their predictions together and record them. (Booklets) Here are our steps: (teacher will guide and time class all together through these steps one at a time. Hand out thermometer strips each round.) Record the temperature on the thermometer strip (color in thermometer graphic) Place the thermometer strip under a piece of white paper Place the white paper under the heat lamp Wait 3 minutes. (Brain break dance party during this time, each round) Check the temperature on the thermometer strip Record the new number (color in the thermometer strip. 3 Roles (doer, observer, recorder) Switch roles for next test of a new object. Repeat x 2. Run tests Students record their observations (pictorial or written) Debrief: What did we find out? Were your predictions, right?
Closure:	-Let's brainstorm some examples of radiation energy that we use every day. -Can anyone think of one? Hint: popcorn! -Write any examples in your booklet! -Lesson complete!

Lesson 6

Name &Time (Minutes Allotted):	Convection Time! – 60 mins
Learning Standards: Curricular Competencies	**Science** -Demonstrate curiosity about the natural world -Make predictions based on prior knowledge -Compare results with predictions, suggesting possible reasons for findings -Represent and communicate ideas and findings in a variety of ways, such as diagrams and simple reports, using digital technologies as appropriate **ELA** -Use sources of information and prior knowledge to make meaning -Make connections between ideas from a variety of sources and prior knowledge to build understanding -Develop and apply expanding word knowledge
Learning Standards: Content	**Science** -Sources of thermal energy -Transfer of thermal energy **ELA** -Oral language strategies -Metacognitive strategies
Instructional Objectives	-Students will be able to make predictions on conduction based off knowledge from prior lessons. -Students will be able to define conduction.
Assessment:	-Formative assessment through observation of both experiments. -Formative assessment through class discussion and responses -Formative/summative assessment through booklets. -Formative/summative assess. kept in assessment binder for this unit which includes a tab for each student to note student progress. (Discussions, responses, student work)

Teaching Strategies:	-Visual demonstration -Popsicle sticks for fair participation/grouping -Frequent pauses for check-ins -Students will participate in experiment
Materials:	-Clear jar -Dish -Tealight -Lighter -Water -Freezer (staff room), coffee mug, food coloring, spoon, dropper -Convection slide show -Convection chart -Table
Lesson Activities:	
Introduction/Hook:	-Today we are going to learn all about convection! -Would anyone like to share what they remember about convection (reference Bill Nye) or have any guesses? -I am going to show you an example. -Place tealight in a shallow dish of water (add food coloring for visual) light the candle. -What do you think will happen to the water in this dish if I put a jar over top? -Write or draw your predictions for me on the "convection" page of your booklet. -Are we ready? Place jar on candle and water will rise in the jar. -What happened? Were your predictions correct? Record it in the booklet.
Body:	-Open slideshow about conduction. -Convection happens when heat is transferred by the movement of gas or liquid. -Would anyone like to share how convection was happening in the experiment I showed you? -Pull up slideshow to go through convection. -Let's do another experiment to understand convection. -Grab cold class of water from the freezer. -Fill a glass with a ¼ of hot water and add food coloring. -If I have a glass of really cold water and I add a few drops of hot water, what do you think the hot water will do? -Make your predictions in the booklet! -Volunteers carefully add drops of hot water. -What happened and why? Was your prediction correct? Write it in the booklet. -Would anyone like to share their thought process? -We know now that when there is movement in a liquid, the heat rises (choral response) and the cold water sinks. -Would anyone like to share why heat rises? Think back to when we did this with two jars!
Closure:	-What do we need to add to our chart about convection? -Add student responses to the chart and fill in any gaps that are missed. -Can anyone think of an example of convection we might see every day? Draw it for me in your booklet! Lesson complete!

Lesson 7

Name &Time (Minutes Allotted):	Convection Review/Charades – 60 mins
Learning Standards: Curricular Competencies	**Science** -Make simple inferences based on their results and prior knowledge -Represent and communicate ideas and findings in a variety of ways, such as diagrams and simple reports, using digital technologies as appropriate **ELA** -Use sources of information and prior knowledge to make meaning -Use developmentally appropriate reading, listening, and viewing strategies to make meaning **Arts Education** -Create artistic works collaboratively and as an individual, using ideas inspired by imagination, inquiry, experimentation, and purposeful play. -Refine ideas, processes, and technical skills in a variety of art forms -Connect knowledge and skills from other areas of learning in planning, creating, and interpreting works for art -Apply learned skills, understandings, and processes in new contexts
Learning Standards: Content	**SC**-Sources of thermal energy -Transfer of thermal energy **ELA**-Oral language strategies -Metacognitive strategies **AE**-a variety of dramatic forms -symbolism as ways of creating and representing meaning
Instructional Objectives	-Students will be able to define convection, conduction, and radiation. -Students will be able to work in groups to demonstrate their understanding through a dramatic skit that they create.
Assessment:	-Formative/summative assess. kept in assessment binder for this unit which includes a tab for each student to note student progress. (Discussions, responses, student work)
Teaching Strategies:	-Strategic grouping -Frontload instructions and provide examples of skits -Allow students to do more than one skit for challenge -Frequent check ins
Materials:	-Review slideshow -Knowledge charts for thermal energy sources -Slips of paper with energy sources on them.
Lesson Activities:	
Introduction/Hook:	-Show what you know! -Slideshow of different pictures that represent forms of thermal energy transfer. -Write on your whiteboards what type of thermal energy it is! (2 examples of each) -Use student answers as discussion and gauge what needs to be reviewed. -Hang charts up and go through each one. Include everyday example with each.
Body:	-We are going to be doing some drama to show our thinking! -Students will be put in groups of 2 or 3 then pick a slip of paper from the hat that says “conduction” “convection” or “radiation” -You and your group are going to think of a skit that demonstrates one of the three thermal energy transfers we have talked about. -Show example. -These are silent skits! The audience will write what they think you’re trying to show us on their whiteboard.

	-If anyone would like an extra challenge, you can do more than one. -What are your questions? -Today will be a planning/rehearsal session, we will perform next class! -By the end of today you need to decide what your plan is and why as I will be asking for it!
Closure:	-Tell the teacher what your group is doing for their skit and how it shows the thermal energy transfer you picked. Either write it or tell me. -Be ready to preform next class!

Lesson 8

Name &Time (Minutes Allotted):	Thermal Charades- 50 mins
Learning Standards: Curricular Competencies	**Science** -Represent and communicate ideas and findings in a variety of ways, such as diagrams and simple reports, using digital technologies as appropriate -Demonstrate curiosity about the natural world **ELA** -Use sources of information and prior knowledge to make meaning -Make connections between ideas from a variety of sources and prior knowledge to build understanding **AE** -Create artistic works collaboratively and as an individual, using ideas inspired by imagination, inquiry, experimentation, and purposeful play. Refine ideas, processes, and technical skills in a variety of art forms Connect knowledge and skills from other areas of learning in planning, creating, and interpreting works for art Apply learned skills, understandings, and processes in new contexts
Learning Standards: Content	**SC**-Sources of thermal energy -Transfer of thermal energy **ELA-** Oral language strategies -Metacognitive strategies **AE** -a variety of dramatic forms -symbolism as ways of creating and representing meaning
Instructional Objectives	-Students will be able to demonstrate their understanding of thermal energy transfer using dramatic performance. -Students will be able to demonstrate their understanding by using prior knowledge to make guesses of dramatic interpretations of thermal energy transfer. -Students will be able to work in groups to create a dramatic performance that demonstrates a thermal energy form.
Assessment:	-As students preform and guess, keep note in assessment binder. -Formative/summative assess. kept in assessment binder for this unit which includes a tab for each student to note student progress. (Discussions, responses, student work)
Teaching Strategies:	-Popsicle sticks for choosing performance order -Time to prep with team -Warm up game for engagement -Time for discussion and questions -Whiteboards for assessment
Materials:	-Whiteboards -Popsicle sticks
Lesson Activities:	
Introduction/Hook:	-Warm up drama game (What's in the box?) 10 mins
Body:	-Get in your groups from last class, you have 5 minutes to go over your skit and make sure you ready to go!

	-Students sit on carpet, bring their own whiteboards and pens. -Popsicle sticks to pick which group goes first. -Group performs skit of their interpretation of conduction, radiation, or convection. -Remember if you have a guess, don't shout it out, write it on your whiteboard! -Each group performs skit. Students guess, discuss after each! -Debrief when every group is done. -Did you enjoy this activity? -What were some of the challenges?
Closure:	-Students can use remaining time to work in thermal energy booklets. (Word search to familiarize with the vocabulary) -Lesson complete!

Lesson 9

Name &Time (Minutes Allotted):	Review / KAHOOT- 60 mins
Learning Standards: Curricular Competencies	**Science** -Make simple inferences based on their results and prior knowledge -Represent and communicate ideas and findings in a variety of ways, such as diagrams and simple reports, using digital technologies as appropriate **ELA** -Make connections between ideas from a variety of sources and prior knowledge to build understanding -Text features -Oral language strategies -Metacognitive strategies -Sentence structure -Conventions **Arts Education** -Create artistic works collaboratively and as an individual, using ideas inspired by imagination, inquiry, experimentation, and purposeful play. -Apply learned skills, understandings, and processes in new contexts
Learning Standards: Content	**SC**-Sources of thermal energy -Transfer of thermal energy **ELA**-Text features -Oral language strategies -Metacognitive strategies -Sentence structure -Conventions **AE**- Image development strategies
Instructional Objectives	-Students will be able to answer questions about thermal energy, conduction, convection, radiation. -Students will be able to provide real life examples of the three thermal energy transfer forms. -Students will be able to communicate their learning through words or drawing.
Assessment:	-Assessment through Kahoot game. -Assessment through whiteboard responses. -Assessment through students drawing or writing about their understanding of thermal energy. -Teacher will collect thermal energy booklets (summative) -Formative/summative assess. kept in assessment binder for this unit which includes a tab for each student to note student progress. (Discussions, responses, student work)

Teaching Strategies:	-Allow for partners during Kahoot and response time. -Choice for demonstrating learning. -Discussion time for student responses.
Materials:	-Charts for conduction, convection, radiation -Kahoot -iPads -Whiteboards
Lesson Activities:	
Introduction/Hook:	-Let's do a final review of our thermal energy charts for conduction, convection, and radiation! -Do we need to add anything? -What do you think is the coolest form of energy transfer? Tell your desk partners.
Body:	-We are going to end our fun journey with thermal energy transfer with a KAHOOT! -Students get iPad -Would you like to work in partners or by yourself? (choice) -Run through 3-4 rounds of Kahoots on thermal energy transfer. -Final Challenge! You can work with a partner or by yourself, get whiteboards out please. -Can you tell me one example of conduction? Write it on your whiteboard and don't flip until everyone is ready. -Students flip at the same time. -Use answers as discussion. -Repeat for radiation and convection.
Closure:	-Get your thermal energy booklets out, on the last page, I would like you to draw or write anything you learned about thermal energy transfer. -If you choose to draw, please color it! (10 mins) -Hand in to teacher. -Lesson complete!

Resources:

-https://curriculum.gov.bc.ca
-https://study.com/academy/lesson/conduction-lesson-for-kids-definition-examples.html
-https://www.steampoweredfamily.com/heat-transfer-projects-for-kids-stem-activities/
-https://coolscienceexperimentshq.com/water-temperature-experiment/

Extensions to Unit:

Weather Unit -Now that students understand conduction, radiation, and convection they can better conceptualize weather systems such as thunderstorms, heat domes and lightening.
Composting- Students could learn about how the different thermal energy transfers work to decompose organic matter
-Students could explore how Indigenous communities heat their homes prior to colonization
Climate Change ready City Building- Now that we understand radiant heat absorption, how can we design a city that is resilient in extreme, fluctuating climates? A city that stays cool in hot temperatures. How about city that stays safe in Icey temperatures?

Reflections and Revisions

N/A

KWL- Lesson 1 and 9

K	W	L
What I Know	What I'd Like To Know	What I Learned

JAR TEST

What are your predictions?

_____

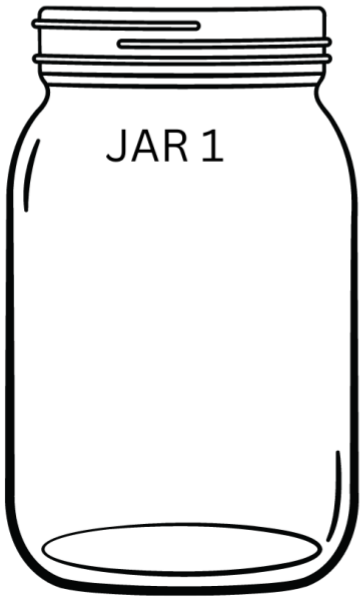
_____

What happened?

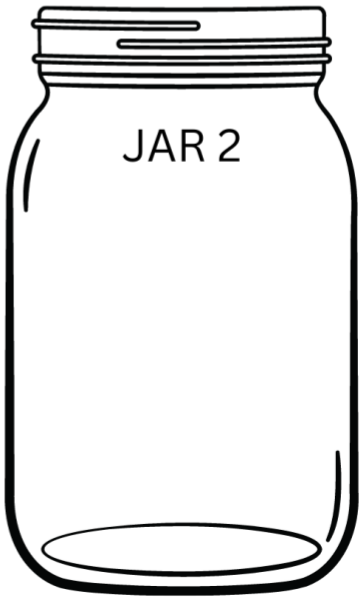
_____

_____

Temperature _____



Temperature _____



FASTEN YOUR HEAT-BELTS!

Conduction

Radiation

Convection

CONDUCTOR EXPERIMENT

Wooden Spoon	Metal Spoon
Plastic Spoon	What was the fastest?