

# Unit Plan:

## Diving into the Earth's Surface (Rock Cycle)

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### Grade: 5

### Big Idea:

Earth materials change as they move through the rock cycle and can be used as natural resources

### Cross-Curricular:

- *Art (Big Ideas):*
  - Works of art influence and are influenced by the world around us
  - Dance, drama, music and visual arts are each unique languages for creating and communicating.
  - (e.g. rock collage activity, scientific drawing of rock formations on field trip, final creative presentation)
- *Social Studies (Content & Curricular competencies):*
  - First Peoples land ownership and use
  - Differentiate between intended and unintended consequences of events, decisions, and developments, and speculate about alternative outcomes (cause and consequence)
  - (e.g. indigenous/cultural connections)

### Content:

Rock Cycle:

- Rock cycle
- Local types of earth materials
- First Peoples concepts of interconnectedness in the environment
- Nature of sustainable practices around BC's resources?
- First Peoples knowledge of sustainable practices?

### Curricular Competencies:

- Make observations in familiar or unfamiliar contexts
- Identify questions to answer or problems to solve through scientific inquiry
- Observe, measure, and record data, using appropriate tools, including digital technologies.
- Experience and interpret the local environment
- Identify First Peoples perspectives and knowledge as sources of information
- Identify some of the social, ethical, and environmental implications of the findings from their own and others' investigations
- Co-operatively design projects
- Express and reflect on personal, shared, or others' experiences of place

### First Peoples Principles of Learning:

- Learning recognizes the role of indigenous knowledge.

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- Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).
- Learning involves recognizing the consequences of one's actions.

### Formative Assessment:

- Journal entries / scrapbook throughout lessons – staple in exit slips when necessary
- Make observations and notes on (online) student portfolios as time moves forward
- Take pictures and upload to online grading system as time moves forward, with captions to sum up the lesson for the day and show evidence of student work

### Summative Assessment / Evaluation:

- Completion of journal/scrapbook entries
- Creative Inquiry-based Presentation
  - o Students have choice → song, skit, video, interactive, slideshow, etc.

### Adaptations & Rationale:

It is important that you know your students and make adaptations where you see necessary. A lot of the formative assessment in this unit is through journal entry and exit slips – students should have the freedom to write, draw, or present their information in whichever way they see fit in their journal/scrapbook, as long as they are somewhat fulfilling the questions or reflection prompt. The summative assessment is mainly based on the completion of their journal/scrapbooks and their creative presentation. It is important to give the students creative freedom in how they wish to present what they learned – but ensure there is enough guidance in terms of criteria that should be fulfilled.

Reference to Indigenous culture and Indigenous ways of knowing are woven throughout this unit – I believe it is important that this is emphasized throughout the unit, especially when talking about the *land* around us and the history of how it was formed. Ensure the students know that indigenous peoples have been here the longest and their oral stories of land formation and their connection to the land is important to listen to and learn from. As part of the focus on Indigenous ways of knowing, I would suggest to start off each class by circling up (e.g. talking circle) for the introductory story or discussion. The First Peoples Principles of Learning I have chosen for this unit summarize where the focus should be while you are teaching. Recognize the role of indigenous knowledge and ensure you incorporate it. Remember that learning is holistic, reflective, and experiential, which is why I want to use journals/scrapbooks as well as ensure the students are experiencing real, local landscapes and get the chance to see some in person (field trip). It is also important to keep in mind that learning involves recognizing the consequences of one's actions and touch on this by bringing in sustainability and the consequences of various human action on the land.

Overall, this should be a unit where students learn about the makeup of our earth and how land is shaped and formed, but students should walk away with more knowledge surrounding indigenous ways of knowing and their own relationship with the land.

**Sequence of Lessons:**

Lesson	Outcomes or Expectations	Assessment or Evaluation	What will the teacher do?	What will the students do?
<b>Introduction: Mother Earth</b>	Students are introduced to the coming unit through an indigenous perspective. They get an idea of what they will learn and what is expected of them.	N/A	<p>Invite a member of the local First Nations (possibly working in sustainability or an Elder) → in a circle, read/tell a story based on respecting mother earth.</p> <p>Display indigenous works of art to add to the story.</p> <p>Lead discussion with students on what they know about the earth and its formations/characteristics, how humans use it, and how we can take care of it.</p> <p>Introduce the students to an overview of the unit, their journal assignment, and let them know there will be a presentation at the end.</p> <p>Allow time for questions and discussion.</p>	Participate in circle story time and class discussion.

<p><b>1: Diving into Earth's Surface</b></p>	<p>Students will be able to list and describe seven processes that change the Earth's surface, as well as apply this information to decipher what land changes are occurring in photos presented to them.</p>	<p><i>Exit slip:</i> Students are presented with various landscape photos (before and after) and are tasked with naming the process occurring, as well as writing a short description.</p>	<p>Read Indigenous story on how land came to be (e.g. <i>People of the Land: legends of the Four Host First Nations</i>)</p> <p>Introduce vocabulary that will be used throughout the unit.</p> <p>Presentation on earth's changing landscapes. (Share local landscapes and Indigenous names of each)</p> <p>Lead discussion through questions like "Can you describe what causes landscapes to change and think of examples?"</p> <p>Lead students through vocabulary matching &amp; photo matching activity.</p>	<p>Make notes of their thoughts and new vocabulary in their journals.</p> <p>Participate in class discussion.</p> <p>Participate in vocabulary matching &amp; photo matching activity in partners.</p>
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<p style="text-align: center;"><b>2: Structure of the Earth (1/2)</b></p>	<p>Students will be able to describe the four main layers of the Earth.</p>	<p><i>Journal entry:</i> Reflection on what they learned that day. They can summarize information from their graphic organizer. Also, how can scientists benefit from studying the earth's changing geology from a First People's perspective?</p>	<p>Read a traditional Indigenous narrative on how land was formed and discuss how these narratives about geologic events from the past contain important understandings about Earth's changing geological history.</p> <p>Lead students in drawing map of local area including significant geological features that have connections to local First Nations.</p> <p>Guide students through gallery walk of Earth's layers.</p> <p>Observe and ask questions throughout activities.</p> <p>Lead a class discussion.</p> <p>Introduce the journal questions.</p>	<p>Participate in class discussion.</p> <p>Draw map of local geological features.</p> <p>Answer question: "Is it possible to dig your way to the other side of the Earth?" in their journals.</p> <p>Participate in gallery walk guided by teacher to learn about each layer.</p> <p>Fill out graphic organizer as they go through the walk.</p>
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<p><b>3: Structure of the Earth (2/2)</b></p>	<p>Students will be able to identify and describe the four main layers of the Earth (crust, mantle, outer core, inner core) using a <i>model</i>.</p>	<p><i>Journal Entry:</i> Students record their work and thought processes in their journals.</p> <p><i>Photos for online portfolios:</i> Teacher takes photos of scale models for online portfolios.</p>	<p>Review last lesson.</p> <p>Explain activity for the day (creating models of Earth's layers)</p> <p>Show a video of a simulation of Earth's layers and "scale models" of other objects to help students get started (<a href="http://www.youtube.com/watch?v=3xLiOFjemWQ">http://www.youtube.com/watch?v=3xLiOFjemWQ</a>)</p> <p>Hand out conversion table to aid students in scaling down.</p> <p>Take photos of student models.</p>	<p>Create a scaled model of Earth's layers in small groups, using information they recorded in the last lesson.</p> <p>Record their thoughts and work in journals.</p>
<p><b>4: Physical Weathering (1/2)</b></p>	<p>Students will be able to explain how physical weathering slowly changes the Earth's surface and conduct a simulation.</p>	<p><i>Journal Entry:</i> In pairs, students reflect on a set of questions</p> <p><i>Photos for online portfolios:</i> Teacher takes photos of students carrying out simulations</p>	<p>Review layers of Earth.</p> <p>Lead class and paired discussion while displaying weathering images.</p> <p>Explain weathering simulation activity. Walk them through writing/drawing predictions, observations, and explanations in their journals</p> <p><i>Social Studies (Indigenous) connection:</i> Study connections First Peoples have with major geologic events (Gwaii Haanas Legacy Pole, <a href="http://youtube.com/watch?v=DUI0a1DH9I8">youtube.com/watch?v=DUI0a1DH9I8</a>, Earthquakes represented in masks)</p> <p>Write reflection questions on the board.</p>	<p>Participate in class discussion.</p> <p>In small groups, conduct a simulation using a sugar cube (rock) and shaking motion (wind). Record information in journals.</p> <p>In pairs, reflect on a set of questions about the activity in their journals.</p>

<p style="text-align: center;"><b>5: Physical Weathering (2/2)</b></p>	<p>Students will be able to explain how physical weathering slowly changes the Earth's surface and construct a scientific explanation, using evidence from images, to support which physical weathering factor caused the change in Earth' surface.</p>	<p><i>Exit Slip:</i> "Claim Support" graphic organizer where students record their claim statements as they move around the room observing weathering images.</p>	<p>Have one student from each group share their experiences/observations from the simulations last class.</p> <p>Hand out graphic organizer on physical weathering (with chemical weathering column that will be used next class).</p> <p>Lead students through PowerPoint on physical weathering.</p> <p>Guide students through physical weathering images around the room.</p>	<p>One student from each group shares their experience/observations from simulations last class.</p> <p>Fill out graphic organizer while teacher presents the PowerPoint presentation.</p> <p>Fill out exit slip as they walk around the room observing images.</p>
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<p style="text-align: center;"><b>6: Chemical Weathering</b></p>	<p>Students will be able to explain how chemical weathering slowly changes the Earth's surface and conduct a simulation of chemical weathering.</p>	<p><i>Journal Entry:</i> Reflection on the simulation activity</p> <p><i>Photos for Online Portfolios:</i> Teacher takes photos of students carrying out simulations.</p>	<p>Review last lesson.</p> <p>Tell students we are exploring another type of weathering without telling them what type.</p> <p>Guide students through examination of images looking for similarities and differences and task the with finding the odd one out (chemical weathering vs. physical weathering)</p> <p>Guide students through "classroom mingle" where they mingle and find a partner to discuss the images.</p> <p>Explain chemical weathering &amp; show skittle and water demo.</p> <p>Explain simulation activity (using chalk and vinegar). Lead discussion on dissolving, effect of temperature, etc.</p>	<p>Discuss a set of questions and images with a partner during "classroom mingle."</p> <p>Explore weathering of rocks by conducting a simulation using chalk to represent rock and vinegar to illustrate effects of acid rain over time.</p> <p>Write reflections in journals.</p>
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<p style="text-align: center;"><b>7: Erosion and Deposition</b></p>	<p>Students will recognize the effects of water erosion on land and carry out an investigation on erosion.</p>	<p><i>Journal Entry:</i> Students record their experiences in the first and second investigations, and think of ways to stop erosion in real life.</p> <p><i>Photos for Online Portfolio:</i> Teacher takes photos of students doing investigations.</p>	<p>Review what we have learned.</p> <p>Show video on erosion: <a href="http://www.youtube.com/watch?v=G5Rp9MJGCU">http://www.youtube.com/watch?v=G5Rp9MJGCU</a> &amp; PBS video on Hawaiian cliffs</p> <p>Set up materials for land erosion investigation.</p> <p>Set up and guide inquiry process through investigation periods.</p> <p>Lead the vocabulary chant.</p> <p>Lead discussion surrounding erosion and deposition, building on prior knowledge</p> <p>Prep students for field trip next class!</p>	<p>Take part in carrying out investigation using a land model to simulate water erosion.</p> <p>Record observations of effect of water on land.</p> <p>Carry out investigation to <i>prevent</i> erosion on land form happening.</p> <p>Participate in discussion around erosion and deposition definitions.</p> <p>Record understanding using a concept map in journal.</p> <p>Participate in vocabulary chant: students recite word and meanings while using hand motions to represent meaning of word</p>
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<p style="text-align: center;"><b>8: Field Trip (Focus on Weathering and Erosion)</b></p>	<p>Students get hands-on, real-life experience observing and pointing out instances of weathering and erosion in nature. They also get an introduction to various rock formations.</p>	<p><i>Journal Entry:</i> Reflection on the observations made on the hike. Point out at least one instance of weathering or erosion they observed.</p> <p><i>Photos for Online Portfolios:</i> Teacher takes photos of students on the hike and various weathering patterns.</p>	<p>Guides students on a hike (somewhere local, e.g. Mt. Tolmie (<i>Pkaals</i>)). Prompt students by pointing out certain rock formations or instances of weathering/erosion and have them think through what sort of process could have happened to form the rock/soil in that way.</p> <p>Take photos of students on the hike and various instances of weathering and erosion for online portfolios.</p> <p>Try to find exposed stratification example (layers) – have students sketch the feature and discuss how it came to be.</p>	<p>Students make observations as they hike, draw and record reflections in their journals.</p> <p>Participate in discussion throughout the hike.</p>
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<p style="text-align: center;"><b>9: Minerals and their Properties</b></p>	<p>Students will be able to define mineral and use properties to distinguish between various minerals.</p>	<p><i>Exit Slip:</i> Include Mohs Scale on the slip and students have to answer various questions (e.g. naming the mineral, naming the type of mineral test, etc.)</p>	<p>Set up mineral testing stations for students to rotate through (colour, streak, hardness, lustre, etc.)</p> <p>Set up buckets for each group of student with various numbered mystery minerals.</p> <p>Tell story about your walk home yesterday, noticing various mystery minerals (that you present to the students when they are brought up in the story) – Ask students for help identifying these minerals.</p> <p>Define “mineral” and lead discussion on specific properties used to identify certain minerals (introduce Mohs Scale of Hardness)</p> <p>Prep students for final assessment assignment and lead them in signing up for presentation groups (co-create criteria for the assignment)</p>	<p>Use properties (presented by teacher) to observe a variety of unknown minerals, rotating through stations and performing tests (hardness, scratch, streak)</p> <p>Sign up for final presentation groups and think about inquiry topic.</p>
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<p style="text-align: center;"><b>10: How do Rocks Form? (1/2)</b></p>	<p>Students will be able to identify three types of rock (sedimentary, metamorphic, igneous) and describe how each one forms.</p>	<p><i>Journal Entry:</i> Students reflect on processes that change rocks (guided by questions on board)</p>	<p>Ask students to make inferences on processes previously studied by writing how a specific process might change a rock.</p> <p>Lead students in reading passages about rocks in small groups.</p> <p>Lead class discussion on passages (identify three rock types and talk about how they form).</p> <p>Guide students through examining rocks and finding characteristics.</p> <p>*Consider bringing in a local indigenous elder to talk about indigenous use of rocks and lead students through the creation of a <i>medicine wheel</i> out of various rock types.</p>	<p>Read passages in small groups.</p> <p>Participate in class discussion.</p> <p>Examine rocks and find characteristics that make them unique.</p> <p>*Participate in medicine wheel creation.</p>
<p style="text-align: center;"><b>11: How do Rocks Form? (2/2)</b></p>	<p>Students will be able to identify the processes that cause rocks to change.</p>	<p><i>Exit Slip:</i> Students must label a diagram with the correct process that changed the rocks.</p>	<p>Review processes that change rocks with <i>Fast Pass</i> activity.</p> <p>Lead activity simulating processes that change rocks using starbursts to create and change rock.</p> <p>Give students questions to work through as they carry out the activities of the day.</p> <p><i>Extra Time:</i> Guide students through working on their final presentations.</p>	<p>Participate in <i>Fast Pass</i> activity.</p> <p>Participate in starburst simulation activity and fill out questions on worksheet.</p> <p><i>Extra Time:</i> Work on final presentations.</p>

<p style="text-align: center;"><b>12: The Rock Cycle</b></p>	<p>Students will be able to describe the journey of a rock as it goes through the rock cycle and create a collage illustrating the rock cycle.</p>	<p><i>Activity:</i> Completion of the <i>Rock Cycle Collage</i></p> <p><i>Pictures for Online Portfolio:</i> Take pictures of each student's rock cycle collage to post to their portfolio.</p>	<p>Define rock cycle through a PowerPoint.</p> <p>Lead students in <i>Journey through the Rock Cycle</i> game.</p> <p>Lead students in discussion.</p> <p>Guide students through <i>Rock Cycle Collage</i> activity.</p> <p><i>Extra Time:</i> Guide students in working on final presentations</p>	<p>Participate in <i>Journey through the Rock Cycle</i> game.</p> <p>Participate in class discussion.</p> <p>Complete <i>Rock Cycle Collage</i> activity.</p> <p><i>Extra Time:</i> Work on final presentations.</p>
<p style="text-align: center;"><b>13: Human interaction with the Rock Cycle</b></p>	<p>Students will be able to identify and describe various human practices that interact with the rock cycle and use ethical judgment as they consider the effects of these practices.</p>	<p><i>Journal Entry:</i> Reflection on the good and bad that comes from human practices interacting with the rock cycle</p>	<p>Lead <i>Rock Jeopardy!</i> to review rock cycle.</p> <p>Circle up and bring attention back to start of the unit (Mother Earth story). Now read a story called <i>The Hunting of the Great Bear</i> – focusing on what kinds of rocks were used for weapons, etc. → show pictures and bring in examples.</p> <p>Lead brainstorm of human practices that interact with rock cycle (historically and today – e.g. mining, quarries, etc.)</p> <p>Present information on various human practices.</p> <p>Lead discussion on good and bad of these practices.</p> <p><i>Extra Time:</i> Guide students in working on final presentations</p>	<p>Play <i>Rock Jeopardy!</i></p> <p>Participate in brainstorm session and discussion.</p> <p><i>Extra Time:</i> Work on final presentations.</p>

<b>14: Unit Review &amp; Final Presentations</b>	Students have a chance to review their journals and ask any questions that have come up throughout the unit. They will also present their final presentations to the class.	<i>Final Presentations</i>	Guide students through a unit review, working through questions as they pop up – encourage student input.  Lead students in presenting their final projects!	Review journal and participate in unit review discussion.  Present final projects!
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### Expanded Lesson: Lesson #2 – Structure of the Earth (1/2)

#### Objective:

Students will be able to describe the four main layers of the Earth.

#### Vocabulary:

- Geological formation
- Crust
- Mantle
- Outer core
- Inner core

#### Review:

- Landslide
- Volcano
- Weathering
- Earthquake
- Deposition
- Erosion
- Sediments

#### Lesson Timeline:

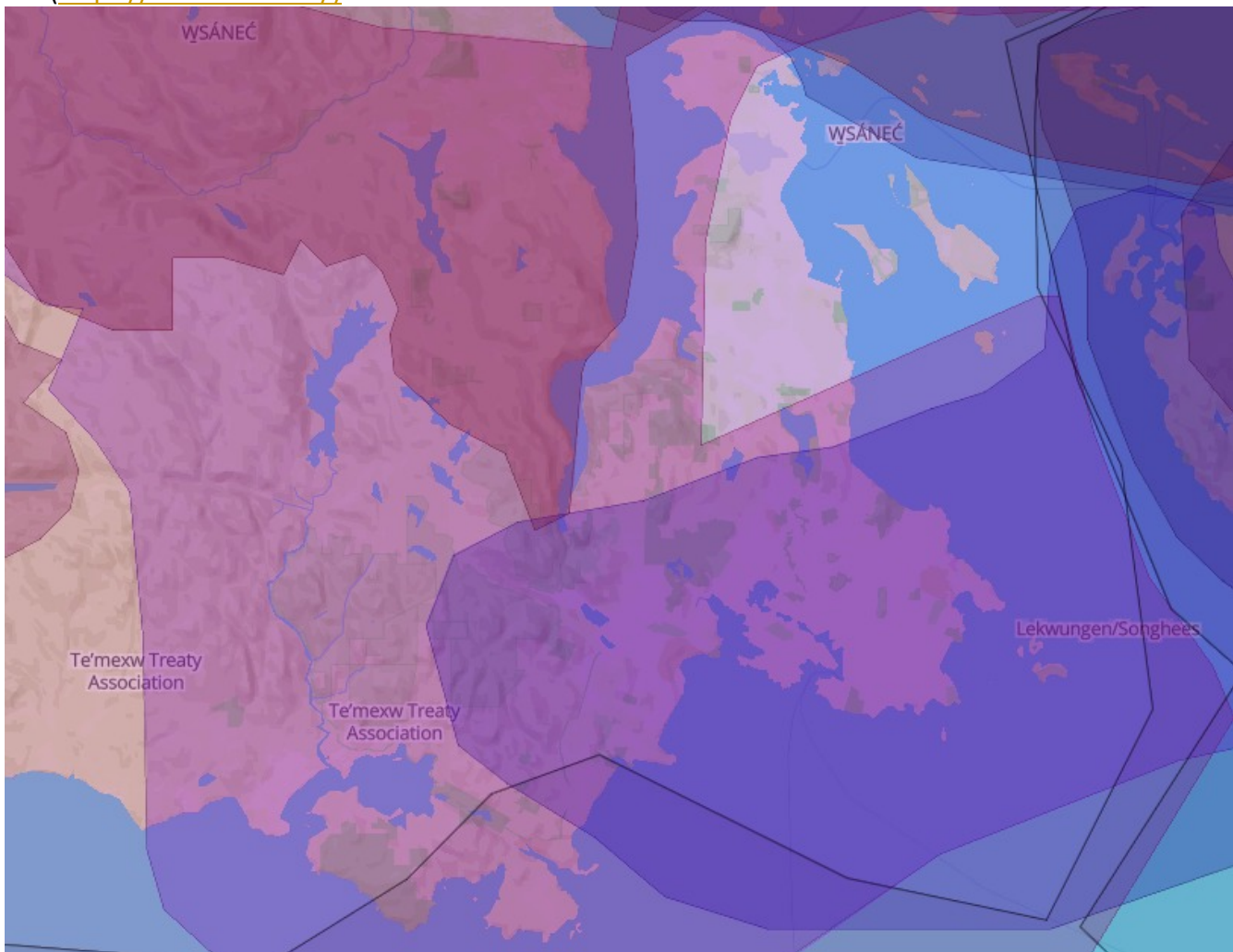
1. Read a traditional Indigenous story to do with rocks and land. Discuss.
2. Lead students in drawing map of local area including significant geological features that have connections to local First Nations. Review vocabulary and processes from last lesson.
3. Introduce a discussion question.
4. Preview what we will learn about today (Earth's structure).
5. Introduce and hand out graphic organizer.
6. Guide students through gallery walk of Earth's layers.
7. Lead a class discussion.
8. Introduce the journal prompts for the day and time for journaling.

### 1 – Traditional Indigenous Story

- Circle up
- Read the following:
  - o *Tunka-shila, Grandfather Rock*
  - o *Everybody Needs a Rock*
- Discuss how Indigenous narratives about geologic events from the past contain important understandings about Earth's changing geological history. How might this be useful for us today? What about those who study rocks and land formations?
- Allow the students to share their own thoughts and feelings on their connection to land formations and rocks.

### 2 – Activity: Map of local geological features

- Introduce students to a map of the local area and point out which First Nations land we are on (<https://native-land.ca/>):



- Review what a geological formation is and have students brainstorm local geological (rock) formations (e.g. mountains, hills, etc.) and draw a simple map of whatever formations they can think of. Examples:
  - o Mt. Tolmie
  - o Mt. Doug
  - o Mt. Finlayson
  - o Gonzales Hill



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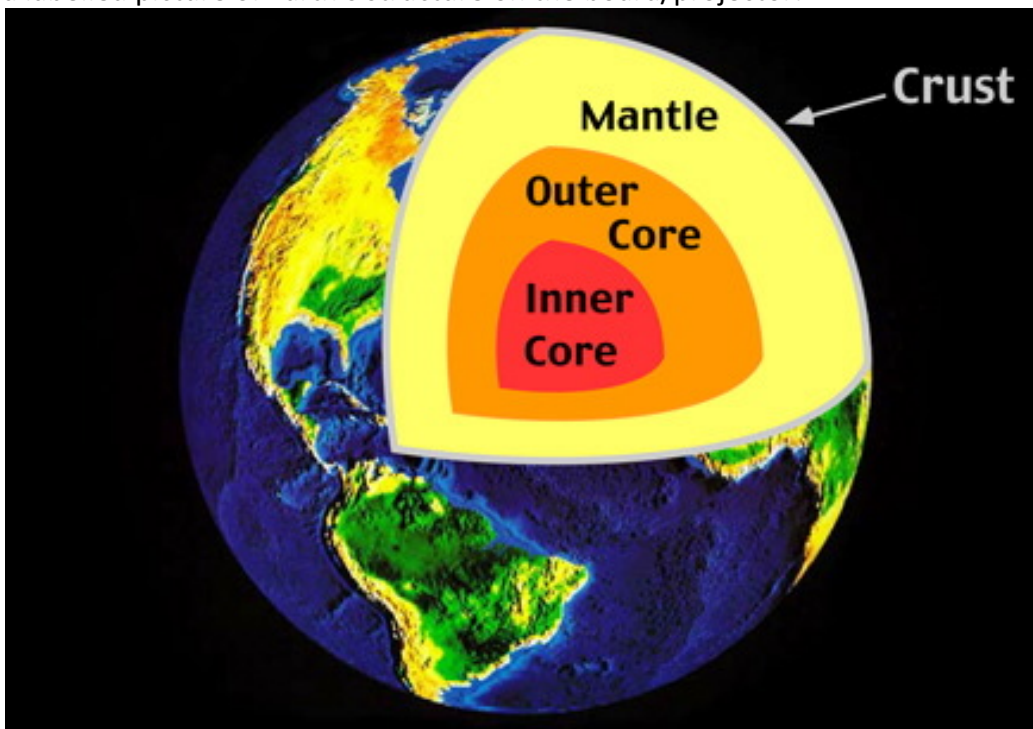
- Mt. Newton
- Discuss the indigenous names of these areas and have the students add those to their maps. Examples:
  - Mt. Tolmie = *Pkaals*
  - Mt. Doug = *PKOLS "White Head"*
  - Mt. Newton = *WELNEW*
- Review vocabulary that was learned from last lesson and brainstorm how some of the local structures were formed:
  - Landslide
  - Volcano
  - Weathering
  - Earthquake
  - Deposition
  - Erosion
  - Sediments

**3 – Introduce discussion question:** Is it possible to dig your way to the other side of the Earth? (written on board)

- Discuss in pairs and record thoughts in journals.
- Reconvene and discuss as a class
- Pick a few names from a hat to share what they discussed
- Fellow students can give thumbs up if they agree or shared similar thoughts

**4 – Preview what we will be learning (Earth's structure):**

- Display a labelled picture of Earth's structure on the board/projector:



- Key Questions:
  - What do you notice about the image?
  - Do you think this represents the exact size of the Earth and its layers?
  - Is this what you imagined the Earth to be made of?

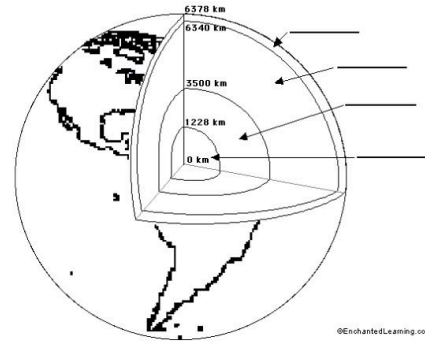


- Let the students know that they will be making a model of this in the next lesson, but today we will be doing a gallery walk!

**5 – Introduce and hand out graphic organizer**

Name:

Date:



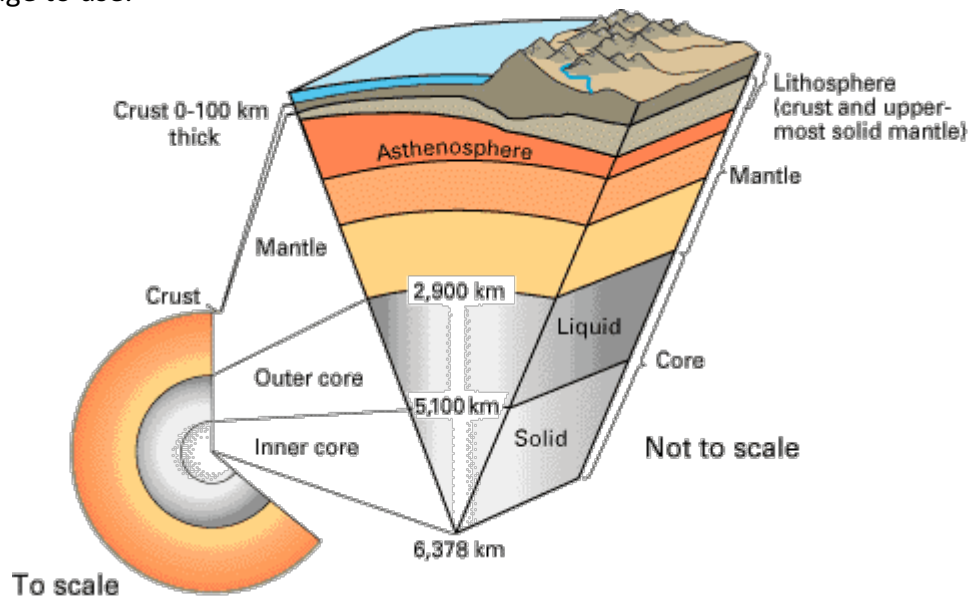
## The Structure of the Earth's Layers

- Stop at each gallery to read about the four main layers of Earth's structure.
- After reading about each layer, record information in the data table below.
- Colour and label the diagram as you go.

	Earth's Layers			
Features	Crust	Mantle	Outer Core	Inner Core
Composed of...				
Temperature				
Depth				

## 6 – Activity: Gallery Walk of Earth's Layers

- Before class begins, set up stations that students will rotate through in small groups on their gallery walk (including pictures, information, and other objects that apply to each layer)
- Students will fill in their graphic organizer as they go through the gallery walk
- Follow this format: <https://betterlesson.com/lesson/resource/3177680/information-chart>
- Possible image to use:



- Station 1: *Crust*
  - o Thinnest, outermost layer of Earth
  - o About 5-70 km thick
  - o Mostly rock and soil that is brittle (easily broken)
  - o Least dense layer
  - o Rocks are under oceans and on land
  - o Temperature of crust varies, but the further down you go, the temperature increases.
- Station 2: *Mantle*
  - o Dense, thick layer of rock below crust
  - o Earth's thick middle layer made mostly of solid rock; makes it denser than the crust
  - o This layer undergoes constant heat and pressure. Temperature range between 1000-3700 degrees Celsius.
  - o The heat and pressure causes rocks to move and bend within layer
  - o About 2,900 km of thick, dense rock
- Station 3: *Outer Core*
  - o The only *liquid* layer of the Earth (molten lava)
  - o Made of iron and nickel, in liquid form. No water.
  - o About 2,400 km thick
  - o Temperatures around 4,500-5,500 degrees Celsius
  - o Scientists know this layer is made of liquid molten lava by studying what happens when earthquakes occur
- Station 4: *Inner Core*
  - o Solid layer
  - o Centre of the Earth
  - o Made of Iron and Nickel

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- About 1250 km in depth
- Temperatures as high as 5,200 degrees Celsius
- A dense ball of solid iron crystals

### **7 – Class Discussion:** Is it possible to dig your way to the other side of the Earth?

- Return to this discussion question and get some new thoughts from the students

### **8 – Journal Prompts**

- Have the students reflect on what they learned today – they can summarize information from their graphic organizer
- Students should also record any thoughts on the question of how scientists can benefit from studying the earth's changing geology from a First People's perspective.

### **Assessment:**

- *Formative:* Observe and ask questions throughout activities.
- *Journal entry:* Reflection on what they learned that day. They can summarize information from their graphic organizer. Also focus on the question: "How can scientists benefit from studying the earth's changing geology from a First People's perspective?"

## References & Resources

### Unit outline adapted from:

Boyden, C. BetterLesson (2020). *Unit 4: Earth's Changing Surface*. Retrieved March 2020 from:

[https://betterlesson.com/lesson/633877/earth-s-changing-surface-vocabulary-preview-cornerstone-lesson?from=breadcrumb\\_lesson](https://betterlesson.com/lesson/633877/earth-s-changing-surface-vocabulary-preview-cornerstone-lesson?from=breadcrumb_lesson)

### Resource for Indigenous stories surrounding rocks:

<https://www.spiritsd.ca/learningresources/FNM%20Resources/GR4%20Rocks%20Minerals%20and%20Erosion.pdf>