**Science - Grade 9**

**BIG IDEA: Interconnectedness of Spheres**

Suggested Lesson Plan Sequence (~15 class periods)

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| **Lesson 1**  Time:  80 min | **Title: Opening / Introduction Class**  Content:   * This class will be an opener and hook for the unit. The purpose is to get students engaged in the topic and curious about the world. * Introduction to the theme and essential question of unit.   Activity:   * Walk outside to observe the world, taking notes about what they see - what they observe about life on Earth… * Return to class and write up a preliminary “life on Earth” plan - how they see the interconnectedness of earth that functions to sustain life in Earth * They will hand this in and at the end of the unit we will go on another walk - they will take notes on what they see again (they should add more things and more connections) and then they revisit what they wrote at the beginning and see that they have learned - they need to rewrite it with their new knowledge. * As an alternative, they could do a photo story (e.g. Instagram story)   Assessment:   * Students will create a document and retain in their portfolios - teacher will review to assess knowledge level * END OF UNIT, review these documents at the end of the unit and ask students how they would change them considering what they now know – it could act as an end of unit summative assessment. |
| **Lesson 2**  80 mins | **Title: What are the conditions for life on earth?**  Content:   * Discuss what the students discovered on their “walk about” last class. * Talk about the different “spheres” to be covered in class - look at each one individually but will explore how they all work together * Content to be covered: distance from the sun, albedo (reflection), - emphasis on the atmosphere,   Activity:   * Albedo effect demo: 10 students will have 10 cards with a white side and a black side, they will stand on one side of the class in a line. 10 other students will stand facing them, they will be the energy from the sun. The class will have to demonstrate different albedo numbers (scale is 0-1). The students will have to walk up to the students with the cards and if the card is black they will stay, if its white they will return to their original departure point (this is all depending on which albedo they’re creating)   Assessment:   * Exit slip on concept taught that day |
| **Lesson 3**  80 mins | **Title: Energy transfer on Earth’s surface**  Content:   * conduction, convection, radiation, latitude, temp chgs, ocean convey; greenhouse gas effect * Start discussion on human influences on energy transfers   Activity:   * Demos and activities demonstrating energy transfers - specifically heat/thermal energy   Assessment:   * Worksheet associated with their energy transfer activity (group work) |
| **Lesson 4**  80 mins | **Title: Energy transfer in Ecosystems**  Content:   * What is the biosphere? Explore biotic and abiotic, biomass, food chain, food web/pyramid, photosynthesis/cellular respiration * Relate food pyramids and to sustainability - introduce sustainability (will come back to in future lessons) * Discussion on human influences on the biosphere   Activity:   * Something to do with energy transfer through food webs - small group and then a class activity - potential to go outside and conduct this.   Assessment:   * Quiz on previous lessons |
| **Lesson 5**  80 mins | **Title: How does matter circulate in the biosphere?**  **Water and Carbon cycles. Sustainability and Climate Change Intro.**  Content:   * Nutrient cycles (water, carbon) * Questions for hydrosphere: where do we find water on our planet? Discuss different amounts of water present in different reservoirs. * Carbon cycle - relate to sustainability and climate change: How has the burning of fossil fuels affected the cycling of carbon and the climate? (human impact)   Activity:   * Play a “What-a-Cycle” game to illustrate the water cycle (see for example: <http://www.srh.noaa.gov/jetstream/atmos/ll_whatacycle.html)>. * Have students design their own game on how to demonstrate the carbon cycle   Assessment:   * Game instructions for the carbon cycle (to check for understanding) |
| Lesson 6  80 – 160 mins (up to 2 class periods) | **Title: How does matter circulate in the biosphere?**  **Nitrogen and Phosphorous**  Content:   * Nitrogen and Phosphorous cycling * Human impacts on nitrogen cycling (eutrophication) including sustainability   Activity:   * Nitrogen Atom Cycle Game   Assessment:   * Exit slip; Passport worksheets from game (students document their journey) |
| **Lesson 7**  30 mins for review  50 mins for intro to project and initial research  up to 3 classes for project presentations & voting, planning and organization | **Title: Nutrient Cycling and Relationship to Climate Change**  Content:   * Compare and contrast chart of cycles for review * Explore how human impacts on nutrient cycling affect climate   Activity (this could be introduced anywhere depending on length of unit):   * In groups, students will design a *“Sustainable Service Learning”* project. The project is meant to have students go out into the community (as a class) to contribute to a sustainable, “green” community project. Ideas could include helping with community gardens, garbage cleaning of an area or even fund raising for an organization that is already well established. * Groups will present their ideas to the group and the class will vote on the final project. Several class periods will be allotted to allow students to work on the project and the final rollout. The teacher will provide support where needed but it is mainly a student run initiative.   Assessment:   * Kahoot! Interactive game for review |
| **Lesson 8**  80 mins | **Title: Human Impacts – Pollution & Climate Change**  Content:   * types of pollution, how does it get there? * How does pollution cycle through the different spheres? * bioaccumulation, biomagnification; ppm * pollution and sustainability & climate change   Activity:   * Role playing activity to show bioaccumulation and biomagnification where students are different levels of food chain where most are the low down start off with toxin (penny or marble) and can be eaten by those higher up.   Assessment:   * Participation in game; completed worksheet associated with the role-playing activity |
| **Lesson 9**  160 min (2 class periods)  (this could be designed to be as long or short as you like – OR possibly integrated at the beginning of the unit) | **Title: Indigenous knowledge & perspectives - interconnectedness of spheres**  Content:  *First Class:*   * What can we learn from First Peoples’ traditional knowledge about the interconnectedness of the all parts of the universe? * How can we apply First Peoples’ perspectives on interconnectedness for a sustainable future? * Apply First Peoples’ knowledge of interconnectedness and sustainability (see document for information)   Assessment   * create a mind-map/concept chart or a compare and contrast chart on First People’s perspectives vs traditional Western concepts of interconnectedness   *Second Class:*  PBL - Problem Based Learning Activity   * See document for activities - would need to be modified depending on how much time allotted to this lesson (could be 1 day to 1 week) * Refer to the activities in the FNSC science document (see page 164 for descriptions) * Suggestions for projects include looking at the geography, traditions, and environment around fishing and fish farms.   Assessment: (suggestions from document)  Formative Assessment Suggestions:   * Weekly reflections (if conducted over multiple days)   Summative Assessment Suggestions:   * Prepare an impact report, presentation, or display that supports your role with Sxelcha. As a class determine the curricular competencies that need to be assessed and the content that has been learned. |
| **Lesson 10**  1 day | **Title: Field trip to Burns Bog**  Content:   * Wrap up for the unit - ties together the interconnectedness of spheres, First Nations knowledge and concepts of sustainability   Activity:   * guided tour; activity worksheets (scavenger hunts - this is handed in at end of day); short project - photojournalism report (take pictures of interconnectedness, and/or energy transfers and explain them)   Assessment:   * Summative on the project (due one week later) |