**Lesson 3 Providing Electricity to a Growing Population**

**Problem statement:** How can we provide energy to a growing population in Snohomish County and still be good stewards towards the environment?

In this lesson students will have designed a plan, using resources provided by their teacher, that produces energy for households. Students will create the design with a specific plot provided by the teacher, they will consider the environmental impacts, the costs, and other considerations.

**Learning objectives:** Students will design a plan that accommodates for the population needs of Snohomish County using the map of the land and the data they gathered about their energy type

**Standards (NGSS, CCSS, CTE):**

NGSS:

* MS-ESS3-3:Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
* (MS-ESS3-4): Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

**Soft Skills:**

* Collaboration: Students will work in small groups to research Spencer Island and their chosen type of power generation.. Having conversations with peers about sources, information, data, facts, examples will help them determine what is essential to know and utilize when they make decisions for creating their final proposal.

**Locally and/or Personally Relevant for Students:**

* Spencer Island is in Snohomish County where most of our students live. The power generated by their facility will power new homes they may live in in the future.
* Students will be made aware of how power production has an affect on climate and the environment and all the decisions their local government must consider when making decisions that affect their constituents.

**Connections to career and educational pathways:**

* Students will be given an opportunity to see opportunities in environmental engineering, geology, politics and energy production.

**Materials:**

* Internet connected device
* Spencer Island Information Google Doc (in Student Materials)
  + 3rd and 4th page of this document can be printed out in black and white for groups to create their plan, you may allow students to create their own map with their own materials if you wish
* Blank Graphic Organizer (Graphic Org-Individual Roll) for notes linked in Resources and Reference below (This graphic Organizer is the same one that was used yesterday)
* Rubric for presentations

**Lesson preparation:** Most of this lesson is student-directed, with time spent designing and refining previous research to come to a final representation of the most cost-effective and environmentally-friendly design for the plot of land and assigned energy source.

* Print out
  + black and white copies of the Spencer Island Map, 3rd and/or 4th page of the Spencer Island Information Google Doc (enough for groups to get a new one if they make a mistake)
  + Presentation rubric (1 for each group)

**Time required:** 50-55 minutes or one-two class periods.

**Grouping of students for instruction:** Students will continue in the role they were assigned in Lesson 1

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| **Teacher** | **Student** |
| Direct Instruction:  Students will be introduced to Spencer Island, the imaginary plot of land they are given for power generation. Teacher will hand out black and white copies of the map for each group. |  |
| Independent Work:  Give students time to work in their group-Teacher reminds students to work on both research and design, and presentation plan and practice.  Teacher suggests that they use the NASA graphic to help organize their thoughts (optional) | Collaborative Group Work:  Groups will research the land and topography and natural resources they could utilize to produce electricity. They will use the Spencer Island Information Document to gather more information about the land. The first link on the document will direct students to a 360 view of topography, and additional information like wildlife that calls the plot home. |
| Guided Instruction:  Teacher will direct students to the Guiding Questions on Spencer Island google doc for students to focus their research, if students are not sure where to start.  Teacher will remind students that, while all questions are not required, the more the groups can answer related to the design, the more effective and complete their design will be. | Collaborative Group Work:  Students will use Guiding Questions on Spencer Island google doc to focus their research process and design.  Students can also generate their own questions. |
| Exit Ticket:  Teacher passes out Group Presentation Rubric and asks for initial questions. Teacher provides time for students to look over rubric as a team.  Teacher asks students to identify one area of rubric that will be easy to be successful at AND one area of the rubric that will be difficult to be successful at.  Teacher will determine next steps as to what is best to help students with rubric areas of difficulty. | Exit Ticket:  Students read and discuss rubric. Students identify one area of the rubric that will be easy to be successful at AND one area of the rubric that will be difficult to be successful at.  Each student will be required to respond to both questions about rubric in a quick check-in with the teacher. |

**Accommodations:**

* Visual cues and instructions-notes on board so students don’t just “hear” my instructions
* Use of amplification system
* Copy of class notes after the lesson, or note-taking outline for students who need support to take notes during the lesson
* Students who are ELL will be taught skills to translate websites and documents to read in 1st language.
* Visual and verbal reminders for appropriate and effective group interactions (from Lesson 1), to help support all members' contributions.

**Extensions:**

* Students could draw out a plan or make a 3d model of their facility.

**Assessment:**

Formative Assessment in the Lessons

* Students will need to be able to explain how their choice in power generation fites with the property they are given.

Summative Assessment for the Unit

* Students will be presenting their final project in lesson 5 that includes their research they have done along the way.

**References/Resources:**

* Spencer Island Website

<https://snohomishcountywa.gov/Facilities/Facility/Details/Spencer-Island-76>

* Graphic from NASA; Steps of the Design Process (8 steps-other lists are available on the web, ranging from 5-12 steps). [Design Steps](https://drive.google.com/file/d/18Nw6fGa36bS6D8dySggA68rHnuctQL8N/view?usp=sharing)
* Graphic organizer created by Erin Duffy based on the Frayer Model. This graphic organizer is to be used in each lesson when students are expected to take notes in their assigned/chosen role. [Graphic Org-Individual Role](https://docs.google.com/document/d/11WOHK9iOZaf5S_MR0mfJdKA4bgre-ApNv9W6MeWFeWo/edit?usp=sharing)
* Rubric for Group Presentation (teacher will determine if groups are scored as a group, individually, or both): [Group Presentation Scoring Rubric](https://docs.google.com/document/d/1fDm9seQErxX6chAybeZz270SCk9ci-TuPpCY_0GiQoE/edit?usp=sharing)
* [Spencer Island Information Document](https://docs.google.com/document/d/1h_WQBCfTvyGZuFcF_lf3Za5NCIwra1P0XL_17ZMjWos/edit?usp=sharing) created by Chris Hazelbrook
* Additional resources that can be given to students for research at teacher’s discretion:
  + Solar: <https://news.energysage.com/solar-farms-start-one/>
  + Hydro: <https://www.teachengineering.org/lessons/view/cub_dams_lesson04>
  + Natural Gas : <https://en.wikipedia.org/wiki/Electricity_generation>
  + University of Calgary, Canada interactive website for supporting research about energy sources, use, and data: <https://energyeducation.ca/encyclopedia>