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**Lesson Number 4 and Natural Disasters**

**Problem statement:** How could natural hazards affect the energy production facility that will potentially provide energy in the form of electricity to homes in Snohomish/King County?

**Learning objectives:** Students will interpret data on natural hazards that have occured on the plot of land. This data may cause groups to redesign their project to mitigate the effects of these natural hazards.

**Lesson standards (NGSS, CCSS, CTE):**

NGSS:

* MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
* (MS-ESS3-4) [Draw evidence from informational texts to support analysis, reflection, and research.](http://www.corestandards.org/ELA-Literacy/WHST/6-8)

CCSS for English Language Arts: Research to Build and Present Knowledge:

* [CCSS.ELA-LITERACY.W.6.7](http://www.corestandards.org/ELA-Literacy/W/6/7/) Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.
* [CCSS.ELA-LITERACY.W.6.8](http://www.corestandards.org/ELA-Literacy/W/6/8/) Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.

**Soft skills:**

* Collaboration: Students will work in small groups to research natural hazards. 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.
* Critical Thinking: Student teams must discuss how they are going to rate each natural disaster and to consider ways to mitigate any consequences.

**Locally and/or personally relevant for students:**

* Students will be proposing an energy production facility in Snohomish County where most of our students live. All of the natural hazards that could affect power generation could also affect their daily lives and other careers.

**Connections to career and educational pathways:**

* Students will be given an opportunity to see opportunities in environmental engineering, geology, politics and energy production.
* Students will continue to work in roles for the benefit of the whole team, just as is often expected in real-life experiences.

**Materials:**

* Video on Japan Tsunami
* Snohomish County Natural Hazards Website
* Internet Connected Devices for research and notes if done on Google Classroom.
* Natural Hazard Graphic Organizer

**Lesson preparation:**

* Print out copies (one for each group) of the Natural Hazard Graphic Organizer for Day 4 in the student materials folder**.**

**Time required:** 55 minutes or approximately one class period.

**Grouping of students for instruction:** Students will continue in the role they were assigned in Lesson 1 with the following new added focus.

* **Project Manager:** delegates tasks, makes sure the goals of the team are clear and everyone is contributing their part.**= Manager:** Makes sure their group remains on task and that everyone’s voices are heard. Keeps track of time. **Make sure all voices are heard and everyone participates in rating the natural disaster for probability and destructiveness.**
* **Communications Director:** Presents their team's idea to a panel or board for decision making **= Presenter:** presents the group’s claim to the rest of the class. **Will share the group's ideas with the class.**
* **Scientist/Engineer:** find & record relevant data, writes lab reports synthesizing the data into claims. **= Recorder:** will write down the data/research found by the team and write up the claim. **Make sure to average the group’s ratings and notes on each natural disaster.**
* **Environmental Consultant:** Is concerned with environmental conservation and the impact changes can make. **= Reflector:** Considers the feelings of the constituents & group members, and all those that may be affected by the team’s decisions (local wildlife/population of the county) **Focused on how some of the mitigation plans could affect the local wildlife and ecosystem.**
* **Treasurer:** Is mindful of the funds they have to work with, and does the calculations for the team when considering materials to use(if a group has only four then this responsibility is shared among the team). **Will keep in mind the cost of any hazard mitigation on the overall cost of facility.**

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| Teacher | Student |
| Direct Instruction:  Teacher will show a video on the tsunami that hit the Fukushima Nuclear Power Plant to emphasize the idea that natural hazards can damage and destroy power generating facilities.  Teacher will then describe the roles of each member of the research team, as described above. Each possible natural disaster could be split up between members and the group could come back together to decide as a group on the probability and severity of each. | Direct Instruction:  Students will watch a video on Fukushima Nuclear Power Plant as a class that will show decisions on where and what type of power generation can have drastic consequences for the environment. |
| Independent Work:  Teacher will provide time for students to work on completing their graphic organizer (Graphic Org-Individual Role) and organizing their ideas for the presentation. Teacher reminds students to work on both research and design, and presentation plan and practice. | Collaborative Research:  Students will use a graphic organizer (Graphic Org-Individual Role) to take notes on possible natural disasters that could affect their power production facility. They will analyse the data given to them to determine the likelihood of each natural disaster listed on the graphic organizer. Students will rate each possible hazard by probability and magnitude and a group as either Low, Medium or High. |
| Direct Instruction:  Teacher will then tell students that they must decide if they should proceed with their facility now considering the impacts that natural hazards could have. If they choose to continue with their chosen power generation then how could the facility be protected? |  |
| Group Discussion:  Teacher will advise groups to take some time to reevaluate their plan/presentation and make changes based on the new info they were given. | Group Discussion:  Will consider their chosen type of power production and whether it was the optimal choice considering the location of their facility and the likelihood of natural disasters in their area. They must also come up with suggestions for how their facility could be protected by or mitigate damages caused by the most likely hazards. |
| Exit Ticket:  Teacher will ask group’s to share changes they made and why they made them  Teacher will collect the Natural Hazards Graphic Organizers for a quick check-off. Graphic Organizer will be returned to students during next class. | Exit Ticket:  Each group's communication manager will share whether or not their group made any adjustments to their plan with the class before handing in the Natural Hazards Graphic Organizer. |

**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.

**Extensions:**

* Students could look at other areas in our state that might be a better fit for the type of electric generation plant they propose.
* Students could also brainstorm ideas to protect the power generation proposed for damage from a natural disaster.

**Assessment:**

Formative Assessment in the Lessons

* Students will answer the following questions as an exit task.
* What are the top two most likely natural hazards that could affect your team’s proposal?
* List possible impacts the hazard could cause to your proposal:
* What are some ways to reduce the possible impact that the most likely hazards could cause to the proposal?

**References/Resources:**

* Video on Japan Tsunami <https://video.nationalgeographic.com/video/news/00000144-0a26-d3cb-a96c-7b2f4fde0000>
* Snohomish County Natural Hazards Website <https://snoco-gis.maps.arcgis.com/apps/MapSeries/index.html?appid=8924ce09ff58487ea905e63210ee7cdf>
* Snohomish County Natural Hazards Website <https://snoco-gis.maps.arcgis.com/apps/MapSeries/index.html?appid=8924ce09ff58487ea905e63210ee7cdf>
* Japan Tsunami | National Geographic

<https://www.youtube.com/watch?v=oWzdgBNfhQU>

* Video of tsunami hitting Fukushima nuclear plant

<https://www.youtube.com/watch?v=NwroEpdODWY>

* 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)