**PANDEMIC: PBL Outline**

**Target Grade Level:** Middle School

**Subject:** Health, Science, Computer Science

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**Problem Statement:**

Imagine you are an epidemiologist--someone who studies the spread and control of diseases. You work for the Centers for Disease Control and Prevention in Atlanta, GA. Reports of middle school students out sick have been pouring in from all over the country at an alarming rate. Few things are known about this mystery disease: victims are experiencing chills and high fever, and the disease is spreading quickly. There are no recorded fatalities, but there are reports of more extreme symptoms such as paralysis. Your team has been tasked with understanding and containing this new infectious disease. Your director has handed you a document with notes to start with, but it is up to you to come up with a plan to prevent, contain, or cure the disease. Time is of the essence, as symptoms are starting to appear in adults and high school students as well.

**Unit Overview and Table of Contents:**

Students will investigate how (simulated) germs are spread, research the history of disease, define and identify microbes and develop a computer simulation demonstrating the spread of disease with knowledge about prevention, containment and treatments.

1. Lesson 01: Students will be able to answer the question: What is a microbe and how are they spread? (Brainstorming, observations, class discussion.) Generate interest by modeling the spread of germs using GloGerm powder. Optional follow-up with handwashing activity. (*1 hour with more time needed for optional handwashing activity.*)

2. Lesson 02: Introduction of the problem statement. KWL: Gathering background information about viruses, determine what needs to be understood about the problem and what needs to be learned in order to contain the disease, prevent new outbreaks and develop a cure.

*(1 hour with more time needed for optional handwashing activity.)*

3. Lesson 03: Explore the Problem- Research - menu of options using articles, videos and interactive games and tutorials.

*Minimum 2 class periods with more time needed for optional interactive games/simulations available to students and extension videos suggested in teacher resources.*

4. Lesson 04: Pay it Forward In this lesson, students will be able to represent exponential growth in different ways.

* Optional Lesson #1 for high-level math: [Exponential Outbreaks: The Mathematics of Epidemics](https://mobile.nytimes.com/blogs/learning/2014/11/05/exponential-outbreaks-the-mathematics-of-epidemics/?referer=)
* Optional Lesson #2 [Detection Prevention and Treatment, Ebola in the US](https://learning.blogs.nytimes.com/2014/10/30/detection-prevention-and-treatment-researching-issues-around-ebola-in-the-united-states/?_r=0)

5. Lesson 05: Introduction Computer Model- developing StarLogo Nova Model. Begin with introducing the problem launch using a video. [Where is George.com](https://vimeo.com/4401730) - Model Swine Flu. Show basic Starlogo model that demonstrates a population becoming infected by a contagion.

6. Lesson 06: Orientation to StarLogo

7. Lesson 07: Brainstorm Possible Solutions - refer to engineer design process

Contain, Prevent, or Cure

Test ideas with computer model

1. Determine best solutions based on results of model
2. Present viable solution - present and defend against critique
   1. gallery walk
   2. fishbowl

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

**Soft Skills:**

Collaboration, Creativity, Communication, Problem-Solving, Critical Thinking, Enthusiasm

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

Several companies in the Puget Sound region, including Planetary Resources, are currently developing plans and/or technology for harvesting and processing ore from asteroids. In addition, mining is a common activity across the region and the country, allowing instructors to leverage local mining activities and companies during the unit.

**Connections to career and educational pathways:**

* Working as a partner within a larger group helps enforce 21st century skills that are needed for any career or educational pathway
* Making decisions for various scenarios and justifying those choices using risk and reward is used in almost all fields of study
* The content is based on a globally relevant need and connects directly with possible careers in similar fields or with companies that are doing this research and eventual asteroid mining
* Can also help to get more students interested in STEM fields as a whole using any number of specific interests, including asteroid mining, mining in general, clean energy sources, engineering design, and environmental engineering.