COVID-19 Curriculum Instructional Sequence

<table>
<tr><th colspan="4">Lesson 1: System Map Activity</th></tr>
<tr><td rowspan="5">Overview
The purpose of this activity is to highlight the inherent complexity of the COVID-19 pandemic. This activity asks students to create a system model of the various social and scientific factors that impact (and are impacted by) COVID-19. Students will explore positive and negative correlations, direct and indirect relationships, and how these maps can be used to predict how changes to one component will impact other components along the map.</td><td rowspan="5">Objectives
1.1 Students will be able to identify key social and scientific factors affecting or affected by the spread of COVID-19.

1.2 Students will be able to identify and represent the relationships between the key social and scientific factors related to COVID-19 through building a systems map.

1.3 Students will be able to use their systems maps to reason about the interrelationships between the social and scientific factors related to COVID-19.</td><td>Learning Task</td><td>Estimated Time (min)</td></tr>
<tr><td>Introductory slideshow</td><td>10</td></tr>
<tr><td>Brainstorming</td><td>10</td></tr>
<tr><td>Building a systems map</td><td>25-30</td></tr>
<tr><td colspan="2">Notes</td></tr>
<tr><td colspan="4">NGSS Connections
SEPs: Developing and Using Models

CCCs: Systems and system models; Cause and effect: Mechanism and explanation; Energy and Matter: Flows, cycles, and conservation</td></tr>
<tr><td colspan="4">Revist system map after Lesson 5: Comparing National Responses to COVID-19.</td></tr>
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Lesson 2: Model of Viral Spread

Overview

In this activity, students use a mathematical model, programmed within a spreadsheet (Google Sheets), to explore viral transmission and exponential growth. It enables comparisons of viruses with different reproduction numbers (R0) numerically and graphically. The activity challenges students to think through various implications of the model and to consider strategies for reducing R0 for a virus and the associated impacts and viral transmission.

Objectives

2.1 Students will be able to calculate and predict the total number of infected persons using a virus's reproduction number (R0).

2.2 Students will be able to interpret the data from mathematical modeling to explain viral transmission.

2.3 Students will be able to develop and support a claim about viral transmission using the model and their graphs.

Learning Task	Estimated Time (min)
Introducing viral outbreak	5
Reading the article (optional)	15
Worksheet	25

Notes

NGSS Connections

SEPs: Using Mathematics and Computational Thinking; Developing and Using Models; Analyzing and Interpreting Data; Engaging in Argument from Evidence

CCCs: Scale, proportion, and quantity; Systems and systems modeling; Cause and effect: Mechanism and explanation

Lesson 3: Handwashing and Face Masks

Overview

The purpose of this assignment is to introduce students to two measures that can be taken to slow the spread of COVID-19. It builds upon the previous lesson by focusing on how handwashing functions on a molecular level to neutralize viruses, and ways to disrupt the transmission process. The handwashing activity asks students to use and analyze models, as well as engage in argumentation. The face masks activity asks students to analyze data and engage in augmentation.

Objectives

3.1 Students will be able to correctly draw and label key viral structures to demonstrate the physical process of soap molecules neutralizing a virus.

3.2 Students will be able to use the concepts of hydrophilia/phobicity to explain the necessity of handwashing in slowing the spread of viruses.

3.3 Students will be able to engage in argumentation using the structural and functional characteristics of soap and viruses to justify the use of ordinary soap to mitigate the spread of COVID-19.

Learning Task	Estimated Time (min)
Watch video	4
Worksheet	20

Notes

NGSS Connections

SEPs: Developing and Using Models; Engaging in Argument from Evidence

CCCs: Structure and Function

Lesson 4: Infection Curve Simulation

Overview

The purpose of this assignment is to introduce students to modeling the spread of viruses using an infection curve simulation. This assignment asks students to explore social distancing as a way of managing and slowing the spread of COVID-19.
For this exercise, students use a computational model developed within Netlogo. The model provides a simulation of how social distancing can impact viral spread. The materials provide teachers and students with an orientation to the simulation and a series of prompts to guide experimentation and prediction with the model.

Objectives

4.1 Students will be able to collect and interpret data from an infection curve simulation to develop a claim about the impact of social distancing on viral transmission.

4.2 Students will be able to compare and contrast exponential growth of COVID-19 data from Asia, Europe, and North America to draw conclusions about government policies around social distancing and viral spread.

4.3 Students will be able to identify and evaluate their responsibilities in flattening the curve of COVID-19 spread by reflecting on the purpose of social distancing.

Learning Task	**Estimated Time (min)**
Instructional Video on how to use simulation	**4**
Worksheet	35
Extension Activities	15

Notes

NGSS Connections

SEPs: Analyzing and Interpreting Data; Constructing Explanations and Designing Solutions; Obtaining, Evaluating, and Communicating Information

CCCs: Stability and change, Patterns, Cause and effect: Mechanism and explanation

Lesson 5: Comparing National Responses to COVID-19

Overview	**Objectives**	**Learning Task**	**Estimated Time (min)**
In this activity, students interpret COVID-19 data from the United States, Italy, and Switzerland, analyze the data in relation to government policies, and draw conclusions about policy implementation and COVID-19 cases. This exercise pushes students to think critically about the government role in responding to the pandemic and the resulting consequences of government action or inaction. This activity prepares students to develop their own policy proposals by considering implications for public safety, economic repercussions, and political forces at work when implementing COVID-19 precautions and policies in the general public.	5.1 Students will be able to interpret and analyze COVID-19 data and policy implementation narratives from the United States, Italy, and Switzerland to compare and contrast government responses to the pandemic. 5.2 Students will be able to examine the role and responsibility of government responses during a pandemic and the resulting consequences of (in)action from leadership. 5.3 Students will be able to communicate their personal beliefs about the role of government responsibility during a time of crisis.	Worksheet	30
		Notes	

NGSS Connections

SEPs: Analyzing and Interpreting Data; Obtaining, Evaluating, and Communicating Information

CCCs: Cause and effect: Mechanism and explanation; Patterns; Scale, proportion, and quantity

Revisiting Lesson 1: System Maps

Overview	**Objectives**	**Learning Task**	**Estimated Time (min)**
At this point, students should be able to make significant changes and reflections on their original system map. Revisit the activity (#1) and complete pages 2 and 3.	1.4 Students will be able to revise their system maps based on the improved understandings and additional evidence collected related to COVID-19. 1.5 Students will be able to justify their system maps with evidence. 1.6 Students will be able to use their system map to reason about the system dynamics of the key factors related to COVID-19.	Answering reflection questions	30
		Finalizing System Map	20
		Notes	

NGSS Connections

SEPs: Asking Questions and Defining Problems; Analyzing and Interpreting Data; Developing and Using Models

CCCs: Cause and effect: Mechanism and explanation; Patterns; Systems and systems models

Lesson 6: Media Literacy Activities

Overview

This activity asks students to explore information sources regarding COVID-19. The purpose of this set of activities is to help teachers and students develop better media and information skills particularly in the context of Socio-scientific Issues.

Objectives

6.1 Students will be able to identify the purpose, message, accuracy, bias, intended audience, and strengths and weaknesses of possible information sources.

6.2 Students will be able determine the trustworthiness of a news source, citing evidence from their evaluation.

6.3 Students will be able to classify untrustworthy articles as clickbait, hyperpartisan, etc.

Learning Task	Estimated Time (min)
KWL for media literacy	5
Introducing media literacy slideshow	20
CRAP Test and Know-your-sources scavenger hunt	20
Nature of Science extension	30

Notes

NGSS Connections

SEPs: Obtaining, evaluating, and communicating information

CCCs: Cause and effect: Mechanism and explanation

Lesson 7: Social Vulnerabilities & COVID-19

Overview

COVID-19 has disproportionately impacted people of color, women, and people experiencing poverty. This assignment asks students to explore how and why these public-health disparities occur.

Objectives

7.1 Students will be able to identify health disparities from COVID-19 health data and determine social factors that contribute to increased risk for COVID-19.

7.2 Students will be able to indicate challenges some people may face in accessing COVID-19 health resources through storyboarding a case study.

7.3 Students will be able to identify social challenges and propose policy solutions to that mitigate COVID-19 health disparities

Learning Task	Estimated Time (min)
Data Analysis (first section of worksheet)	10
Storyboard activity and reflection	30
Take Action Extension	60

Notes

NGSS Connections

SEPs: Analyzing and Interpreting Data; Developing and Using Models; Obtaining, Evaluating, and Communicating Information

CCCs: Patterns; Systems and system modeling; Cause and effect: Mechanism and explanation

Lesson 8: Culminating Activity

Overview

This assignment asks students to create a presentation that synthesizes what they have learned throughout the learning experience. Students will propose a policy with appropriate evidence aimed at lowering the spread of COVID-19. This assessment aims to highlight not only the biology and epidemiology of the pandemic, but the complex social issues that have arisen as well. This assignment should not be considered a stand-alone assignment. Instead, this assignment is designed to serve as a summative assessment for a COVID-19 unit that incorporates assignments that cover the biology of viruses, infection curve simulations, different methods of managing the virus, media literacy, and systems thinking.

Objectives

8.1 Students will be able to develop evidence-based policy measures to help manage the spread of COVID-19 in their community.

8.2 Students will be able to use argumentation practices to justify policy choices by incorporating evidence from models and reputable third-party data sources to support their reasoning.

8.3 Students will be able to communicate the merits and limitations of various information sources considered for their product, drawing upon media-literacy practices and an analysis of the affordances and limitations of relevant models.

Learning Task	Estimated Time (min)
Culminating Activity	120

Notes

NGSS Connections

SEPs: Asking questions and defining problems; Developing and using models; Obtaining, evaluating, and communicating information; Engaging in argument from evidence

CCCs: Stability and Change; Systems and system modeling; Cause and effect: Mechanism and explanation