

Example 3: Grades 10–12 Algebra II

SPBL Unit Plan		
Stage 1: Learning Intentions (A Major Concept for the Unit and a CASEL Competency)		
<p>1. Content learning intention: I can apply mathematical skills of logarithmic and exponential functions to model an infectious disease (All.CNE.1–6; All.F.1–5; All.SE.1–3; All.Q.1–3; All.EL.1–7; All.PR.1–3; All.DSP.1–6).</p> <p>2. SEL learning intention (responsible decision making): I can use the mathematics of logarithms and exponentials to model a disease outbreak to assist the health department in making informed decisions as well as planning for such an event.</p>		
Stage 2: Success Criteria (Daily Learning Goals)		
<i>You could have multiple goals, written without context or specificity.</i>		
Surface-Level Success Criteria for Content	Deep-Level Success Criteria for Content	Transfer-Level Success Criteria for Content
<ul style="list-style-type: none"> I can identify graphs as representing either exponential growth or decay. I can identify the key elements of an exponential function and a logarithmic function. I can use the properties or definition of logarithms to manipulate expressions and solve basic equations. 	<ul style="list-style-type: none"> I can apply exponential growth and decay models to basic real-world situations. I can make precise predictions using the mathematics of logarithms to solve models of growth and decay. I can explain the relationship between exponential and logarithmic functions. 	<p>I can use the critical mathematical modeling skills to plan, model, and predict the potential real-world situation of a disease that has reached epidemic status.</p>
Surface-Level Success Criteria for SEL	Deep-Level Success Criteria for SEL	Transfer-Level Success Criteria for SEL
<ul style="list-style-type: none"> I can represent growth or decay functions numerically and graphically. I can identify the growth factor, initial value, and percentage of increase or decrease. I can find precise answers to problems that require the use of the logarithm definition or properties. 	<ul style="list-style-type: none"> I can set up the equations of growth or decay for problems involving interest, diseases, population, and the spread of bacteria. I can solve exponential models using logarithms. I can write a basic exponential model and manipulate the equation into a logarithm using the definition. I can state that exponential functions and logarithms are inverses of each other. 	<p>I can synthesize my mathematics and communication skills to inform our local health department.</p>

Stage 3: Driving Question (Written at the Transfer Level)

Driving question: Who in your hometown should address the spread of an infectious disease?

Authentic context: Students will simulate the experience of a local Center for Disease Control.

Stage 4: Tasks (Specific Strategies and Activities)

Surface-Level Content Tasks

Reading: Define key terms and define mathematics models.

Mathematics or writing:

Practice skills with textbook problems.

Speaking: In small groups, compare and contrast skills practice.

Deep-Level Content Tasks

Reading: Read examples of how to use logarithms to solve exponential models.

Mathematics or writing: Solve various examples of exponential growth or decay models.

Speaking: In small classroom groups, share solutions to applications and discuss the mathematics of the problems solved.

Transfer-Level Content Tasks

Reading: Research past diseases and analyze their spread. Examples include the Spanish flu and the black plague, among other historical disease outbreaks.

Mathematics or writing: Write models for a potential disease outbreak for your hometown.

Speaking: Share your findings in small groups.

Surface-Level SEL Tasks

Reading: Read and interact with the definitions of key terms for exponential and logarithmic functions. Examples include *growth rate*, *initial value*, and *half-life*.

Mathematics or writing:

Practice the skills and manipulation of exponential and logarithmic functions.

Speaking: In small groups, work together to check your assigned skill problems and discuss your *misunderstandings*.

Deep-Level SEL Tasks

Reading: Read articles and watch videos on examples of exponential growth and decay.

Mathematics or writing: Create various models and analyze those models.

Speaking: Present your models and discuss the mathematics of your models.

Transfer-Level SEL Tasks

Reading: Read the letter from the health department requesting help in planning for outbreak of a disease.

Mathematics or writing:

Analyze the spread of the disease and write a presentation that communicates the plan for a potential outbreak.

Speaking: In a science fair-like forum, share the plan with community stakeholders.

Stage 5: Entry Event

At the start of class, show a clip from a popular zombie film to students. The video clip focuses on the rapid spread of a disease, the panic that ensues, and the need for mathematical modeling to predict characteristics of the spread. After the video, give students a letter from the health department. In the letter, students will be asked to help plan for a disease outbreak in our hometown.

Then place students into inquiry groups to generate questions they may have about preparing for such an event. Students will write their questions on sticky notes and place them on the front board. The questions will then be sorted into “mathematics,” science,” and other categories. Based on the mathematical inquiry, provide a minilesson to students on the basics of the unit.

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Source for standards: Indiana Department of Education. (2019b). Indiana academic standards, mathematics: Algebra II. Indianapolis, IN: Author. Accessed at www.in.gov/doe/files/Algebra-II-Math-Standards-Correlation-Guide-2020-updated.pdf on October 7, 2021.