

The Mechanics of an Antiderivative Healthcare System

8-Step PBLP (Grades 7-12)

Objective: This interdisciplinary project-based lesson plan explores how mathematical, biological, technological, and social systems can work together to “zero out” disease, much like an antiderivative cancels or balances a function in calculus. Students learn to interpret “antiderivative” as a metaphor for preventative, restorative, and equitable healthcare design, applying this thinking to real-world systems such as hospitals, public health programs, and wellness initiatives.

Round Table

❖ **Opening Discussion:**

- What does “antiderivative” mean in mathematics?
- What does inflection point and concavity mean in mathematics?
- How might this concept apply to medicine, psychology, or social health?
- What would a healthcare system look like if it was designed to *neutralize* illness before it begins?

❖ **Materials:** Reflection journal

Reflection Point

❖ **Discussion Questions:**

- How can an antiderivative approach to healthcare reverse the effects of disease and imbalance within the human body and society?

❖ **Purpose:** They reflect on how prevention, intervention, and equity work like inverse functions, restoring systems to equilibrium. Learners journal their understanding of “health as balance” using analogies from calculus and physics.

❖ **Materials:** Reflection journal

Knowledge Setting

Science (S): The Science of an Antiderivative	❖ Objective: Understand disease mechanisms, immunity, and homeostasis. ❖ Activity: Model the body's regulatory systems (e.g., insulin feedback, inflammation control, cell decay).
Technology (T): Evaluating Diagnostic Tools	❖ Objective: Understand digital health technologies and data systems. ❖ Activity: Evaluate how technology anticipates and mitigates disease.
Research (R): Finding Antiderivative Variable Outcomes	❖ Objective: Understand patterns of success using empirical data and design reasoning. ❖ Activity: Conduct comparative research on identified antiderivative models across the nation.
Engineering (E): Understanding an Antiderivative System	❖ Objective: Understand process design that promotes restoration and accessibility. ❖ Activity: Study an efficient healthcare delivery mechanism using something similar to an antiderivative concept.

Arts (A): Interpreting Health Restoration	❖ Objective: Understand how storytelling can reimagine healthcare as restorative and regenerative. ❖ Activity: Identify art or media that uses math as a metaphor for disease control.
Mathematics (M): Breaking Down Antiderivative Theory	❖ Objective: Understand the concept of the antiderivative to analyze trends in health data and the inflection point. ❖ Activity: Study integrals to interpret recovery curves, wellness metrics, or cost-reduction models.
Social Studies (SS): Understanding Models of Inequities	❖ Objective: Explore how healthcare inequities contribute to systemic imbalances. ❖ Activity: Study social determinants of health (income, race, environment) and identify current restorative policy changes.

Project Examples

Progress Map for Project Delivery

❖ Step 1: Project Proposal

Students gather foundational knowledge through a collaborative knowledge-setting session to prepare for a project-based learning process. They meet with community partners (if possible) and create a written proposal outlining the project focus and intended community benefit.

❖ Step 2: Initial Project Proposal and Community Engagement Plan

Students submit proposals and reflect on community input, refining their plans. They outline how the project addresses real-world needs and aligns with learning objectives.

❖ Step 3: Research Progress Update

Students conduct research and gather data by consulting with community partners to guide their project development and ensure accuracy.

❖ Step 4: Draft of Final Project

Students compile findings into a working draft of their final project proposal.

❖ Step 5: Final Project Refinement and Approval for Implementation

Students apply final feedback to strengthen their project and submit it for approval. Approved projects move forward to the

	community involvement and assessment phases outlined in the SOP.
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Science (S): The Science of Zeroing Out Disease	❖ Project Example: Collaborate with public-health scientists to design a Community Health Antiderivative Plan that proposes biological prevention models, such as improved nutrition programs, air-quality monitoring, or immunization access, to “cancel out” the root causes of illness. Present plan to a health advisory board or city council.
Technology (T): Expanding Preventative Reach Through Innovation	❖ Project Example: Work with a community health organization or tech incubator to design a digital prevention platform that helps communities predict and reduce disease risk. Students use local health indicators (e.g., clinic access, vaccination rates, school attendance, or food-desert mapping) to program alerts and recommendations that function like an antiderivative, reversing the spread of disease through proactive outreach and information access.
Research (R): Mapping Antiderivative Variables	❖ Project Example: Partner with a university public-health program or data-analytics lab to study successful preventive-care models. Identify independent variables (income, housing, education, nutrition) and measure how policy interventions change these over time, mirroring the integration of data to form new “antiderivative curves.” Publish findings

	to share with local leaders and community boards.
Engineering (E): Designing Restorative Infrastructure	❖ Project Example: Collaborate with a local hospital's facilities team or nonprofit resource center to create a blueprint for an antiderivative-engineered model to assist healthcare delivery. Students design or diagram how physical and digital infrastructure (mobile clinics, tele-medicine hubs, solar-powered health kiosks) could distribute wellness resources efficiently to underserved areas, effectively reducing system strain and restoring equilibrium.
Arts (A): Communicating Healing and Balance	❖ Project Example: Partner with a local art collective or design studio to create a public-art campaign visualizing the concept of "zeroing out disease." Students produce pieces that depict how communities heal through collaboration, prevention, and care. Display in public spaces such as hospitals, libraries, or city halls to inspire civic wellness.
Mathematics (M): Building the Antiderivative Health Index	❖ Project Example: Collaborate with a civic-data lab to construct an Antiderivative Health Index (AHI) that quantifies community wellness. Metrics may include literacy rates, housing stability, diet quality, or healthcare access. Use integration to model how preventive measures affect outcomes over time, presenting visualizations that

	show reductions in illness rates and costs.
Social Justice (SS): Policy Models for Disease Prevention and Antiderivative Healthcare	❖ Project Example: Partner with a city council or public-health task force to develop a mock policy proposal that re-allocates funding toward an antiderivative prevention-based healthcare model. Write and present a Local Health Equity Policy Brief explaining how resource distribution can create an antiderivative for injustice within healthcare.

Community Involvement

- ❖ **Objective:** Learners implement their approved “antiderivative healthcare” proposals in collaboration with real partners, transforming theory into actionable wellness systems.
- ❖ **Activity:** After project approval, teams coordinate with the community to pilot their proposal.

Assessment

- ❖ **Objective:** Evaluate student learning through the lens of an antiderivative model, which includes preventative innovation, systemic understanding, and interdisciplinary application.
- ❖ **Methods:** Use a rubric measuring depth of knowledge, interdisciplinary integration, creativity, implementation effectiveness, and community impact. Include self-assessments, peer evaluations, and partner feedback to validate learning outcomes.

Feedback Loop

- ❖ **Activity:** Facilitate structured reflection on how *antiderivative thinking* (neutralizing or zeroing out imbalance before it escalates) can transform both healthcare and social systems.
- ❖ **Journal Prompt:**
 - How can the concept of an antiderivative be applied to both healing communities and individuals?
 - What surprised me about systems that cause or correct imbalance?

Resume Integration

- ❖ Students write resume bullet points and action statements that highlight their experience with research, systems thinking, and community engagement.

For more STREAMSS 8-Step Project-Based Lesson Plans, go to our website at www.steamsinitiative.org.

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