**Title:** Using Semi-log Graph to Demonstrate Bacterial Cell Growth

**Description**

In this activity, students will explore the concept of binary fission, generation time, and bacterial growth curves, with an emphasis on the log phase. Students will use semi-log graphs and linear graphs to plot bacterial cell growth. The activities are designed for students to participate in formative assessments that will show their plotting skills on various types of graphs including linear and semi-log graphs. Students will integrate select mathematical skills in addressing biological questions. This activity includes instructor guides, learning outcomes, student handouts, graphic organizers, and answer keys. This activity targets the undergraduate sophomore level. Therefore, remedial skills need to be addressed.

**Learning Outcomes**

In mathematics courses, students will be able to:

* Use a function that models uninhibited growth to answer questions about bacterial growth.
* Answer questions about populations that obey the law of uninhibited growth and create a mathematical model for the data.
* Find the equation of a population that obeys the law of uninhibited growth using a verbal description.
* Graph exponential functions using a semi-log graph.

In science courses, students will be able to:

* Explain microbial growth and binary fission in bacterial cells.
* Summarize the events occurring in the lag, log, stationary, and death phases in the bacterial culture growth curve.
* Demonstrate bacterial growth using generation time for a given dataset.

In both content courses, students will be able to:

* Graph given values on arithmetic and semi-logarithmic graphs.
* Compare and contrast plotted data on arithmetic and semi-logarithmic graphs.
* Discuss the x- and y-axes scaling on arithmetic and semi-logarithmic graphs.
* State the domain and range of a table or graph, as well as the independent and dependent variables.
* Relate math skills to science by graphing exponential functions using equations with formulas written with subscripted variables similar to what they might see in a scientific textbook or journal and also identifying domain and range of a scientific problem.

**Handouts and Resources**

This module includes the following documents:

* Math Instructor Teaching Notes
* Math Student Handout - Exponential Growth Models
* Science Instructor Teaching Notes
* Science Student Handout - Using Semi-log Graph to Demonstrate Bacterial Cell Growth
* Resources
  + Venn Diagram
  + Graphing Paper
  + Learning Environment Modeling Flowchart

**Tags:** Cellular and Molecular Biology, Health Science, Microbiology, whole numbers, measurements, solving equations and inequalities, exponents, graphing, functions, exponential and logarithmic functions, creating graphs, interpreting graphs, interpreting tables, manipulating equations