

Exploring exponential functions in cell growth and zombie apocalypse simulations.



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Unit Overview

Topic: Exponential Functions

Standards

Next Generation Science Standards- Developing and using models, Systems and system models, Analyzing and interpreting data, Engaging in argument from evidence, Using mathematics and computational thinking

Common Core- Make sense of problems and persevere in solving them, Model with mathematics, Attend to precision

Activity Structure

Title: Exploring exponential functions in cell growth and zombie apocalypse simulations.



Guiding Questions:

1. What characterizes exponential growth and decay graphically?
2. How can one differentiate an exponential model from a linear model given a real world data set?
3. What are real world models of exponential growth and decay?

Objectives:

1. Describe Exponential Functions
2. Describe the difference between exponential and linear functions
3. Provide examples of exponential growth in real life situations

Activity Implementation

Summary

- Groups of 2 (each member assumes role of “CDC Director” or “Mayor” of a major US City)
- Provide initial zombie population & rate
- Create exponential model of variables
- New drug is available- hypothesize if it will be effective
- Graph and tabulate population
- Compare results with another team who received a different novel drug- Which was more effective? Why?



Students completing the Zombie Apocalypse Activity

Engineering Design Process

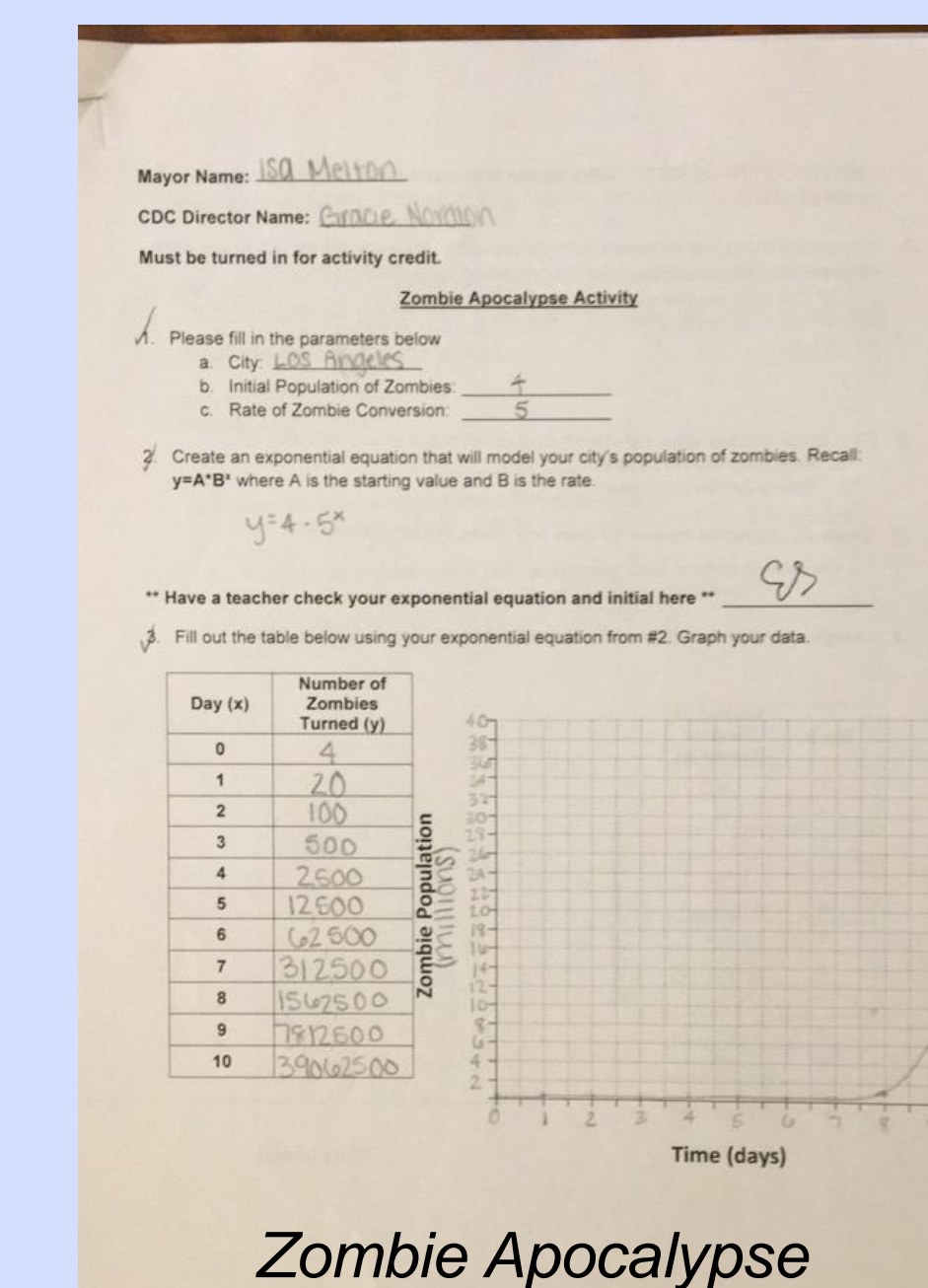
Procedure

- Develop a hypothesis based on cell growth model
- Apply hypothesis to controlling zombie population
- Tabulate results using exponential calculations
- Evaluate initial hypotheses and methods
- Analyze conclusions
- Present arguments to another group

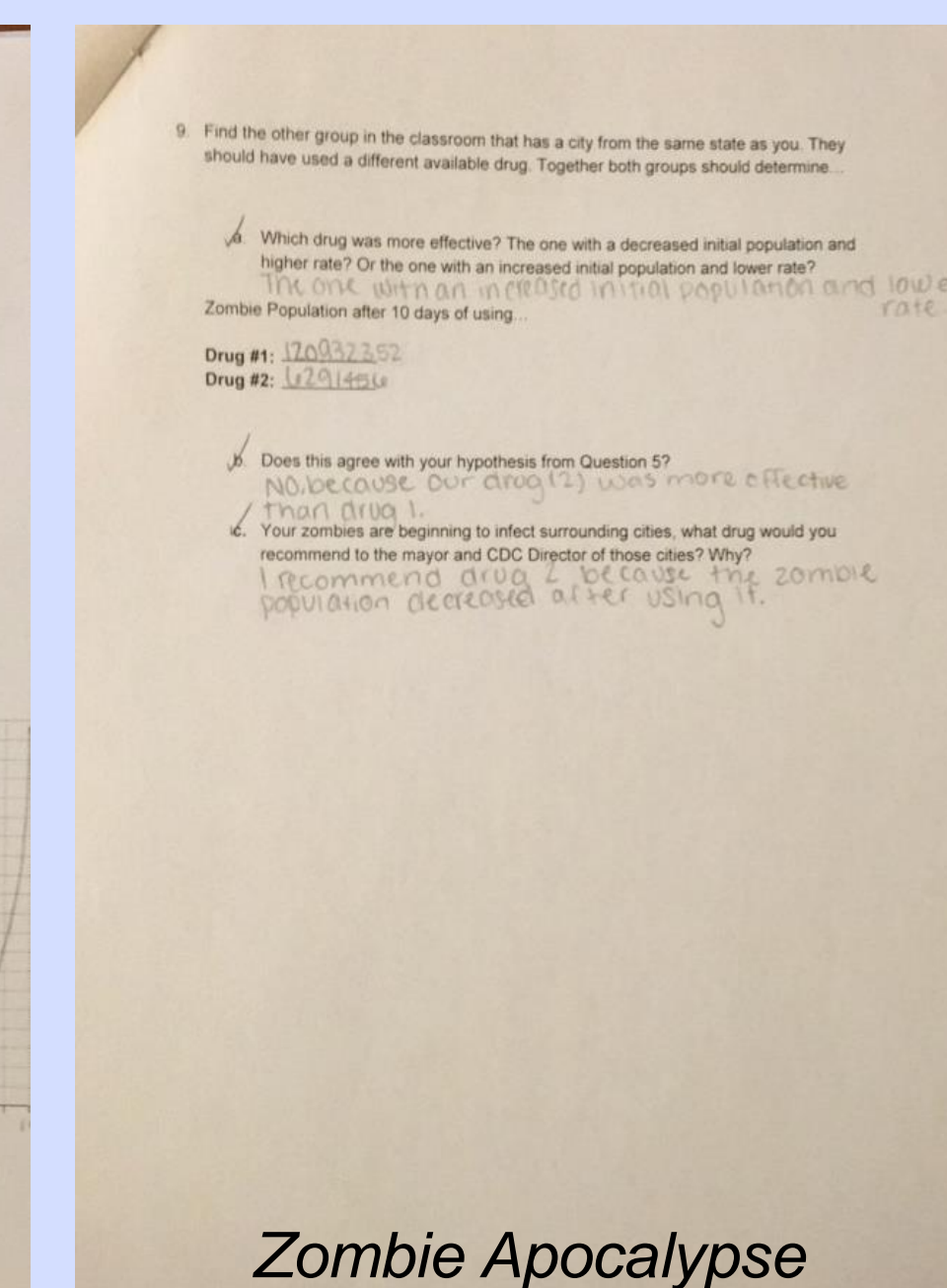
ACS

- Activities applied math and science to medical concepts and population studies.
- Discussed careers in disease control, oncology, and engineering
- How can we positively influence others' quality of life with this information?

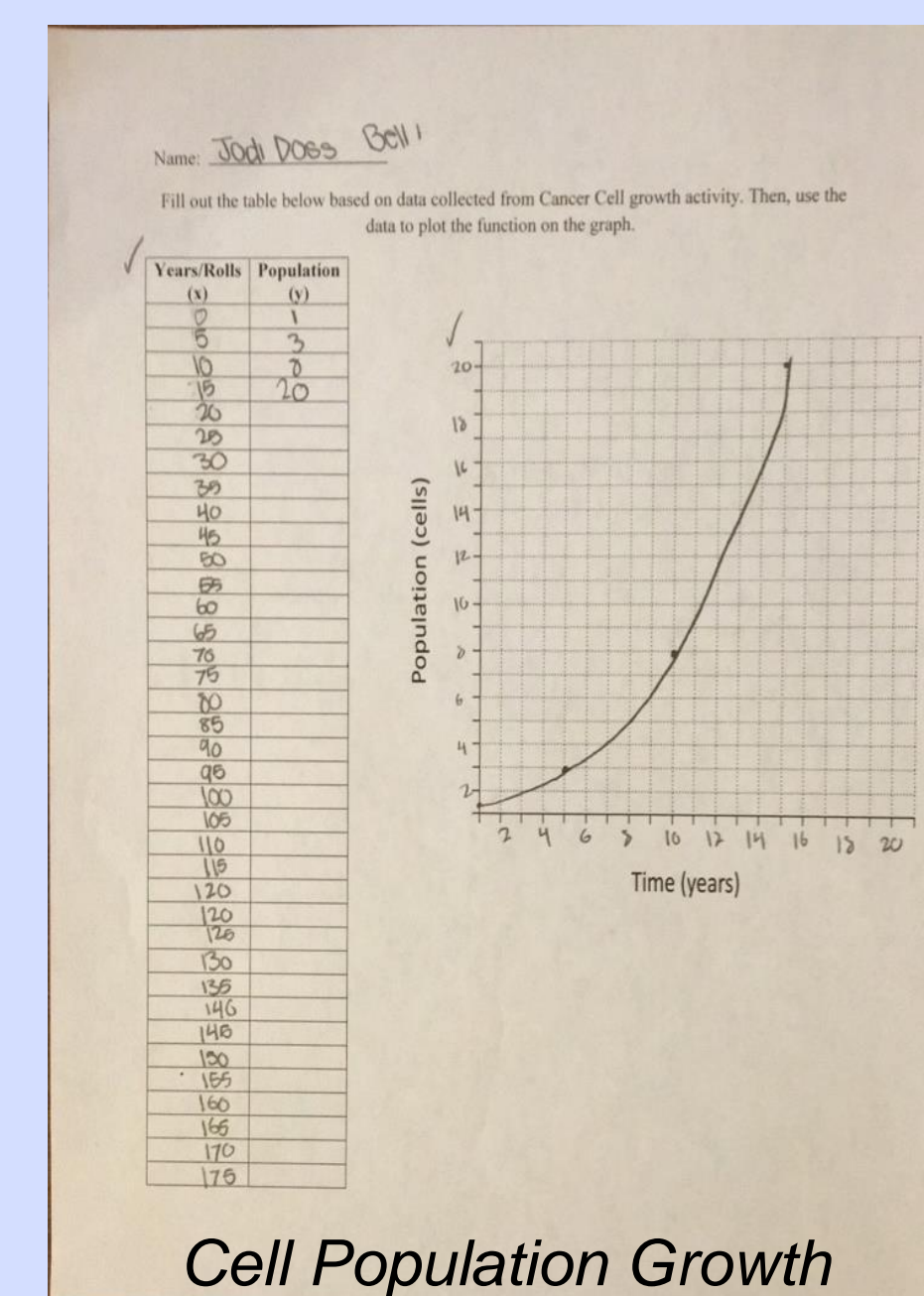
Student Work



Zombie Apocalypse



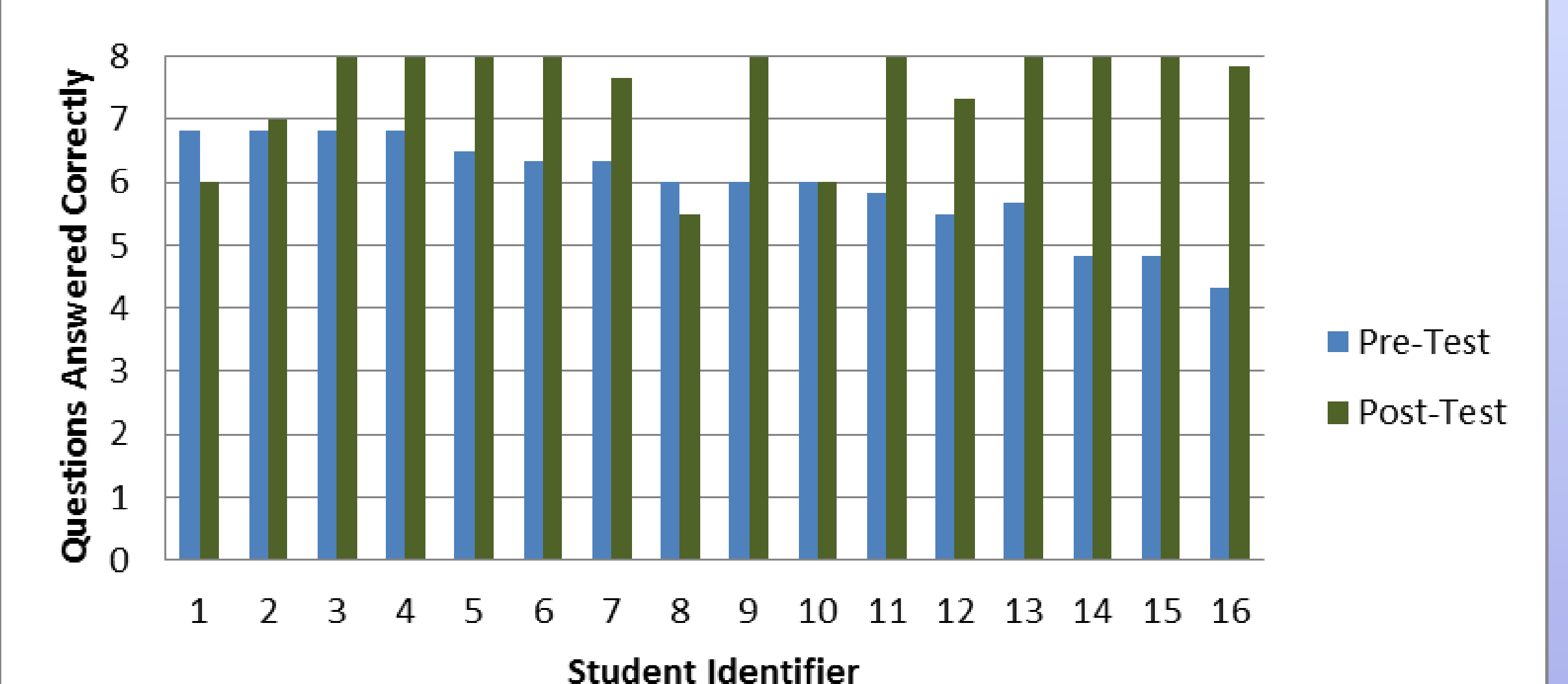
Zombie Apocalypse



Cell Population Growth

Assessment Results: Impact on Student Learning

Summative Assessment Distribution



Reflection and Conclusion

Post-Activity Assessment

- 81% improvement
- 6% no change
- Clear understanding of conceptual knowledge and mathematical concepts

Future Improvements

- More focus on real world applications
- Apply to exponential decay
- Discuss limiting factors for scenarios that do not model exponential growth