Exponential Growth in the Real World

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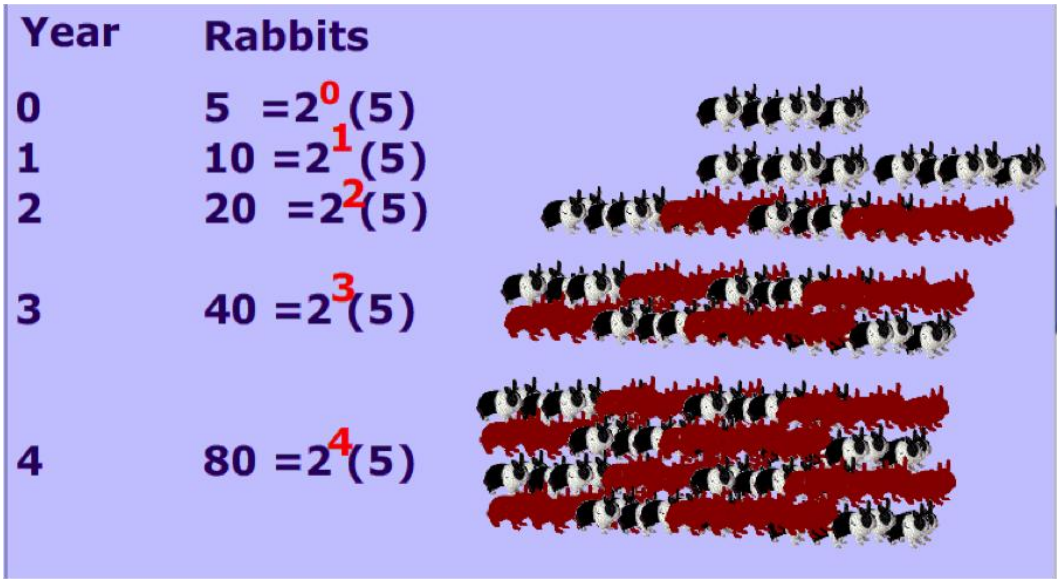

This technology showcases how exponential growth is modeled by real-world population growth. One can see how a population of rabbits grows based upon information provided. There is also an instructional component in the practice problem that is provided with step-by-step instruction.

Grade Level: Grades 8/9
PSSM Content Standard: Algebra Standard
Use mathematical models to represent and understand quantitative relationships
-identify essential quantitative relationships in a situation and determine the class or classes of functions that might model the relationships
-use symbolic expressions, including iterative and recursive forms, to represent relationships arising from various contexts
CCSSM Content Standard:
CCSS.Math.Content.8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.
CCSS.Math.Content.HSA-CED.A.1 Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions*.
Math Content: exponential growth, modeling real-world data

Evaluation

What is being learned? What mathematics is the focus of the activity/technology? Is relational or instrumental understanding emphasized?

The mathematics being learned is that of modeling real world data using exponential functions. The focus of the activity is to show how the equation formed from given data is evaluated and how this looks for population growth. Users get a thorough explanation of how to construct an exponential equation based upon data that is given provided for students a relational understanding of exponential functions, and more specifically exponential growth.

How does learning take place? What are the underlying assumptions (explicit or implicit) about the nature of learning?

Learning takes place by seeing how an exponential equation is evaluated and what it looks like in terms of a population of rabbits that grows. Students learn how to construct an exponential equation and what each variable in the standard form of the equation stands for. The underlying assumptions about the nature of learning are explicit. Students visually see how an initial population grows as new x-values are placed into the exponential equation created. Students also learn how to follow a procedure to create an equation and then evaluate it using order of operations.

What role does technology play? What advantages or disadvantages does the technology hold for this role? What unique contribution does the technology make in facilitating learning?

Technology plays the role of facilitator of learning. This activity/technology can be used an introduction to exponential growth, and be used in place of traditional notes that students typically receive in class. The advantage to using this technology are that it dynamically demonstrates a population growing by inputting values into the equation and then displaying their value in the form of images. The disadvantage to using this technology is that there are only two examples present and not really opportunities for students to practice problems of this type. The unique contribution that technology provides to the learning process is that students can physically see how a population grows based upon an exponential growth model.

How does it fit within existing school curriculum? (e.g., is it intended to supplement or supplant existing curriculum? Is it intended to enhance the learning of something already central to the curriculum or some new set of understandings or competencies?)

Exponential functions are currently embedded within an exponential unit in Algebra I. This technology could be used to supplant existing instruction. Students can explore curriculum by using this technology and then enhance their learning experience by seeing exponential growth in the form of population growth.

How does the technology fit or interact with the social context of learning? (e.g., Are computers used by individuals or groups? Does the technology/activity support collaboration or individual work? What sorts of interaction does the technology facilitate or hinder?)

Students could work collaboratively or independently to use the technology for learning. Since this technology can be used for discovery of the exponential growth equation, students can work together to see how the population grows and to make sense together of how the equation works. This technology can support student discussions and allow for collaboration to occur.

How are important differences among learners taken into account?

When explaining exponential equations many times students cannot see the impact that exponents have to the growth of an initial population. By using this technology students can visually see the growth and then see step by step how exponential equations are formed by looking at and analyzing the sample problem that is provided. Students who need step-by-step instructions have them at their disposal.

What do teachers and learners need to know? What demands are placed on teachers and other "users"? What knowledge is needed? What knowledge supports does the innovation provide (e.g., skills in using particular kinds of technology)?

Teachers and learners need to have a general idea of order of operations, percentages, and exponents. In order to use the technology students need to know how to access the website, otherwise the website is extremely easy to use and is user friendly. The technology provides easy to follow step-by-step instructions of how exponential equations are constructed, which provides them with conceptual background for exponential equations.