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Grade Level:	population growth (predator-prey scenario)
Objective:	Students will explore the effects deaths, births, immigrations, emigrations have in population growth

Science concept:

Population Birth rate Death rate Emigration Immigration

Key Idea 6:

Plants and animals depend on each other and their physical environment.

The fundamental concept of ecology is that living organisms interact with and are dependent on their environment and each other. These interactions result in a flow of energy and a cycling of materials that are essential for life.

Competition can occur between members of different species for an ecological niche. Competition can also occur within species. Competition may be for abiotic resources, such as space, water, air, and shelter, and for biotic resources such as food and mates. Students should be familiar with the concept of food chains and webs.

PERFORMANCE INDICATOR 6.1

Explain factors that limit growth of individuals and populations.

Major Understandings

6.1a Energy flows through ecosystems in one direction, typically from the Sun, through photosynthetic organisms including green plants and algae, to herbivores to carnivores and decomposers.

6.1b The atoms and molecules on the Earth cycle among the living and nonliving components of the biosphere. For example, carbon dioxide and water molecules used in photosynthesis to form energy-rich organic compounds are returned to the environment when the energy in these compounds is eventually released by cells. Continual input of energy from sunlight keeps the process going. This concept may be illustrated with an energy pyramid.

6.1c The chemical elements, such as carbon, hydrogen, nitrogen, and oxygen, that make up the molecules of living things pass through food webs and are combined and recombined in different ways. At each link in a food web, some energy is stored in newly made structures but much is dissipated into the environment as heat.

6.1d The number of organisms any habitat can support (carrying capacity) is limited by the available energy, water, oxygen, and minerals, and by the ability of ecosystems to recycle the residue of dead organisms through the activities of bacteria and fungi.

6.1e In any particular environment, the growth and survival of organisms depend on the physical conditions including light intensity, temperature range, mineral availability, soil/rock type, and relative acidity (pH).

Please provide a rich **one-page, single-spaced**, description or a *vision* of your best thinking on a way or ways you might teach the planned lesson. (approximately ½ page for the teacher role, ½ page for the student role). Also, construct a tentative rubric that you might use with your students

The Teacher will provide students with a working model of a population growth scenario. This model using STELLA will recreate a particular population growth based on how many deaths, births, emigrations and immigrations occur in the country. The model assumes that after certain growth the carrying capacity takes over and the growth turns constant.

Students will take the model and change the amounts of each of the variables that make the population change. They will have to explore the different regions of growth in the graph and explain why the growth turns constant after a specific growth.

1. How changing the different variables affect the population growth. ?
2. What are the 3 distinctive regions in the graph and what explanation can you provide for the shapes.
3. Why the plot turns constant at the end?
4. What is the carrying capacity and what determines it?
5. What other factors can affect the population growth?

Assesment:

	<i>5pt</i>	<i>4pt</i>	<i>3pt</i>	<i>2pt</i>	<i>1pt</i>
Questions	All answered	1 missing	One missing and others incomplete	More than 2 incomplete	Poorly answered/completed/missing
modeling	Student uses the model to answer the questions		Students uses model half the time		Student does not uses the model to answer the questions
programming	Students changes parameters effectively		Students is able to modify some of the variables		Students has no idea on how to modify the variables but understand what they will do if modified
Time	Student finish activity on allocated time		Student is one day late		Student is late more than 3 days
Creativeness	Students is creative in his/her ideas		Student ask for help from friends		Student copies ideas directly from friends