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African Population Modelling Using Stella

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Lesson Plan Level 2

African Population

Objectives: At the end of this lesson, the student will be able to identify factors that hinder or enhance population growth. The student will be able to hypothesize a plan that will provide population control for Africa. The student will then test their hypothesis on the model.

Materials and Tools Needed:

Stella, Worksheet

Target Audience:

Grades 9-12. This lesson can be altered to accommodate a younger middle school audience. The lesson is meant for math but could easily be incorporated into a science or social studies classroom

NCTM Standards:

Representation Standard for Grades 9–12

Instructional programs from prekindergarten through grade 12 should enable all students to—

- create and use representations to organize, record, and communicate mathematical ideas;
- select, apply, and translate among mathematical representations to solve problems;
- use representations to model and interpret physical, social, and mathematical phenomena.

Communication Standard for Grades 9–12

Instructional programs from prekindergarten through grade 12 should enable all students to—

- organize and consolidate their mathematical thinking through communication;
- communicate their mathematical thinking coherently and clearly to peers, teachers, and others;
- analyze and evaluate the mathematical thinking and strategies of others;
- use the language of mathematics to express mathematical ideas precisely.

NYS Standards for Learning:

Standard 1: Analysis, Inquiry, and Design

Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

Standard 7: Interdisciplinary Problem Solving

Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems and make informed decisions.

Activity:

The students will be given a lab-type activity sheet (attached). They will read about the problem of overpopulation and make conjectures about what things affect population growth. They will then explore the Stella model using the data that is provided. The students will be given graphs and will have to determine which graph is the graph of a stable population, and then they will need to determine what parameters give the closest the stable population graph.

Name _____

Date _____

Why Population Matters

Only in recent history has humankind discovered the means with which to increase the average human lifespan and reduce infant mortality rate: sanitation practices and modern medicines. With these discoveries, we have multiplied our numbers faster than ever before, going from 1 billion to 2 billion in only 123 years, such a brief moment in human history. As is the nature of unchecked growth, the momentum accelerated and the world went from 5 billion people to 6 billion in only 12 short years. The balance of nature has been drastically upset and the environment is already paying the price. The good news is that mankind has made another discovery, this one to check birth rates: modern contraceptives. This, coupled with the desire to have fewer children, (since now so many children are living beyond infancy) has led to a decline in birth rates, starting in the 1960s. Abstinence, delaying of marriage, education, contraceptives, empowerment of women, and the funding of family planning and reproductive health the world over will alleviate the population momentum that will result from 2 billion young people entering their child-bearing years. ...

***"It's not because people started breeding like rabbits.
It's that they stopped dying like flies."***

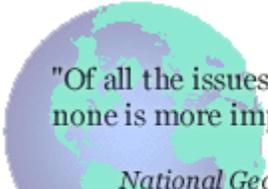
... Nicholas Eberstadt, a demographer at the American Enterprise Institute

The world is growing by more than 76 million people a year. At the current rate of growth, even accounting for a continual decrease in the growth rate, the world population is headed for double digits within 50 years. Every 20 minutes, the world adds another 3,500 human lives but loses one or more entire species of animal or plant life - at least 27,000 species per year. The world population has doubled in the last 40 years. It took just 12 years to leap from 5 billion to 6 billion. It took about 18 centuries for the earth to reach its first one billion inhabitants. The world is adding a city the size of Los Angeles every two weeks.

Birth rates are falling worldwide but death rates are declining even faster. A tiny fraction - only 7 percent - of the world's people live in countries where population is not growing.

If fertility remained at current levels, the population would reach the absurd figure of 296 billion in just 150 years. Even if it dropped to 2.5 children per woman and then stopped falling, the population would still reach 28 billion.

1.2 billion people worldwide are living on \$1.00 a day or less.



"Of all the issues we face as the new millennium nears, none is more important than population growth."

National Geographic Magazine, October 1998

Reasons Why Population Matters

- 1. Worsening water scarcity stems in large part from increases in human demand. Water tables are dropping world wide.**
- 2. Pollution in cities is the number one killer of young children because of respiratory diseases. Cities are growing at an alarming rate.**
- 3. Worldwide, 800 million people are malnourished, and the number could grow significantly. Farming lands are suffering from soil erosion and desertification.**
- 4. The poor are getting poorer due to competition for resources while governments are strained to keep up with them and economies fail.**
- 5. The world's oceans are overfished and the coral reefs are dying**
- 6. Humanity is rapidly changing the earth's atmosphere and thus its climate**
- 7. Wild habitats that shelter endangered plants and animals are giving way to human activities and needs**
- 8. Disease knows no borders, and crowding helps spread disease, and lack of education in reproductive health is a factor in the recent upsurge of infectious disease**
- 9. Migration pressures are aggravated by rapid population growth**
- 10. Civil conflict often emerges in societies where rapid population growth combines with environmental scarcity to undermine governments.**