Reading Exponential Graphs

Learning Level: Third Level (S1-S3), Senior Phase (S4-S6)

PPDAC Framework: Data|Analysis|Conclusion

Curricular Area: Maths & Numeracy, Sciences

Duration: 1 hour

Materials: Computer/device with access to the internet, Map of Tanzania

Introduction

This activity examines exponential and logistic growth and asks students to analyse the factors that influence population growth by interpreting data. The activity is intended for senior school biology and maths learners. By the end of the activity, students will be able to distinguish between exponential and logistic growth, identify carrying capacity, distinguish between density-dependent and density-independent limiting factors, apply the population models to data sets, and determine carrying capacity from population data. Students will also apply their knowledge of population growth to the human population on Earth.

Learners should understand the following before completing these activities:

- Levels of organization, including organism, population, and ecosystem

- Interactions of biotic and abiotic factors (basic)

- Simple mathematical functions and relationship between x and y (modelling)

Lesson Objectives

- Learn to make predictions and compare predictions to real data
- Learn to distinguish between examples of density-dependent and density independent factors
- Learners can compare their predictions to real data
- Learners can apply mathematical models to real population sets

Curriculum Links

- **MTH 4-13a** Having explored how real-life situations can be modelled by number patterns, I can establish a number sequence to represent a physical or pictorial pattern, determine a general formula to describe the sequence, then use it to make evaluations and solve related problems.

- **MNU 4-20a** I can evaluate and interpret raw and graphical data using a variety of methods, comment on relationships I observe within the data and communicate my findings to others.

- **SOC 4-14a** I can use specialised maps and geographical information systems to identify patterns of human activity and physical processes.

Background Work

Prior to commencing this activity learners can (individually or in class) conduct background research and reading into:

- Tanzania: where is it, understand more about the ecology of Tanzania
- Ngorongoro Conservation Area: How was the area formed? How is it managed? What animals and plants are found in this area?
- Ngorongoro Lions: Understand the history of the lion population of the Ngorongoro Conservation Area. What have been the major milestones in terms of the lion population?

Online resources to support this background research include:

- https://ntz.info/gen/n00481.html
- https://kopelion.org/ngorongoro-lions/

Main Activity

Learners can access the online activity here

Students will work through a range of graphs that encourage them to understand more about the population of the Ngorongoro Lions in recent years.

Class Discussion

At the end of the activity a discussion addressing the following questions can help learners to share their understanding:

What do you think will happen to the lions in the future? - Answers may vary. The population may increase to pre-1963 carrying capacity, the population may stabilize, another disease might wipe them out, etc.

What type of new limiting factors could be introduced? Poaching, safari tourism, a new disease, a drought, a fire, a disease that affects other animals but in turn affects the lions.

Why do we use mathematical models when we look at real data? Models help us predict the future of a population. If we can describe all the real data with a formula or a function, then we might be able to predict what happens more accurately, especially if we know about the limiting factors.

Learners can assess their understanding by applying what they've learned to considering the population of Yellowstone wolves using this SG-African-Lions-Check-In

Follow up Activities

Literacy: Prepare a report or presentation about the Ngorongoro Area of Tanzania based on notes taken during the activity (LIT 4-06a, LIT 4-09a, LIT 4-15a).

Links

Learners can make use of lesson ideas and data available at The Concord STEM Consortium