African Lions: Modelling Population Growth

Interpreting Graphs

Data Education in Schools

Level

Early First Second Third **Fourth**

Duration

1 hour

Data Education Framework

Problem Plan Data **Analysis** **Conclusions**

Curricular Areas & Outcomes

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.

Reviewing Learners' Work

Consider whether:

- Learners can make predictions about population growth
- Learners can 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

Resources & Materials

Computer or tablet with access to the internet

Access to a map of Tanzania (online or paper)

- Learners make inferences about human population growth based on what they have learned about lions

Activity Description

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)

Inclusion & ASN

Learning Intentions

What do I want learners to know?

What factors can influence how populations change over time?
What inferences can we make about the human population?

What do I want learners to understand?

The difference between exponential and logistic growth?
How can we apply population models to real data

What do I want learners to be able to do?

Identify exponential and logistic growth on a graph
Identify carrying capacity
Distinguish between density-dependent and density-independent limiting factors
Apply models to real data sets
Make inferences about new data sets, such as human population on Earth

Data Skills Description

Learners will explore a dataset about the population of lions in a conservation area in Tanzania. They will visualise the data and make predictions about how the data may change over time. These activities support the **analysis** phase of PPDAC.

Having become familiar with the dataset, learners will be encouraged to answers questions using the data, explaining what the data reveals by interpreting the output of the analysis phase. These activities support the **conclusions** phase of PPDAC.

Introduction

This lesson is adapted from resources available at: https://learn.concord.org/resources/102/african-lions-modeling-populations?parentPage=/smartgraphs

The lessons involves working through an online activity that uses data about Lions living in the Ngorongoro Crater in Tanzania. Learners can work through the resource without logging in or creating any kind of online identity. Alternatively they can create a learning account with The Concord Consortium a STEM oriented education group.

Background Information for Learners

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

- Tanzania: where is it, understand more about ecology of Tanzania
- Ngorongoro Conservation Area: How was this 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/

Learning Activity

Learners can access the online activity here: https://smartgraphs-activities.concord.org/activities/225-african-lions-modeling-populations/student_preview

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:

1. What do you think will happen to the lions in the future?
    a. Answers may vary. The population may increase to pre-1963 carrying capacity, the population may stabilize, another disease might wipe them out, etc.
2. What type of new limiting factors could be introduced?
    a. Poaching, safari tourism, a new disease, a drought, a fire, a disease that affects other animals but in turn affects the lions.
3. Why do we use mathematical models when we look at real data?
    a. 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