

Mathematics: The Language of STEM

The Human Population Growth Rate

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CONTENT AND TASK DECISIONS

Grade Level(s): 7

Description of the Task: This lesson provides teachers with a way to show students why a negative times a negative equals a positive. The lesson starts with a review of decomposition, the distributive property, and finding missing addends. Then with teacher guidance, groups of students apply these skills in a systematic way to apply properties of operations to discover the rules governing the signs of products for positive and negative factors and to multiply positive and negative numbers in mathematical and real-world problems. Finally, students independently show demonstrate mastery of the lesson objectives by completing an independent practice assessment.

Indiana Mathematics Content Standards:

7.DSP.2: Use data from a random sample to draw inferences about a population. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

Social Studies

7.ESS.7 Describe the positive and negative environmental impacts of obtaining and utilizing various renewable and nonrenewable energy resources in Indiana. Determine which energy resources are the most beneficial and efficient.

Indiana Mathematics Process Standards:

PS.8: Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated and look for general methods and shortcuts. They notice regularity in mathematical problems and their work to create a rule or formula.

Mathematically proficient students maintain oversight of the process, while attending to the details as they solve a problem. They continually evaluate the reasonableness of their intermediate results.

Mathematics Content Goals:

- The students will understand that some factors are more responsible than others for the population growth rate in different countries.
- They will also interpret that the graph gives information to be used to make mathematical calculations.
- Students will develop an understanding of how population growth can positively or negatively impact the economy of a country.

Language Objectives: If special needs or ELL students are present, each one should be paired up with a non-special need student and preferably be close to the teacher's desk.

Materials: One Computer for each group, all worksheets (most of the worksheets could be put on a smart board and discuss as a class), and pencils.

THE LESSON

Before:

The teacher introduces the topic of population growth by first looking at family growth, community growth and then population growth to make sure students understand the concept. The teacher refers to countries with a slow growth rate compared to those with a fast growth rate. The teacher asks why these fluctuations in various countries occur. Teacher makes sure students understand the topic of discussion before they begin using the data.

Example Comprehension and readiness questions:

1. What happens when there's too many of a certain species?
2. How can families control birth rate?
3. Explain what happen when communities become over populated?
4. What should be done when a plant or animal species become endangered?
5. What is the difference between a community and a population?
6. Why are some countries over populated and others not?
7. Does food play an important role in populations?

Prior Knowledge

- Students should know how to define and differentiate between family, community, ecosystem and population.
- Students must have an understanding of resource depletion and renewable and non renewable resources.
- Students should know what biotic and abiotic factors are and how they play a role in human population growth.

During:

The teacher provides clear and explicit instructions and suggestions that are appropriate for the topic of discussion. The students receive client letter 1 and dataset 1. The teacher can ask the readiness/comprehension questions (see Readiness questions) to the class or have students complete them individually on paper.

After students understand the task, they can begin to work in teams of approximately 3-4. In teams, students work on the problem and respond to the client with the requested deliverables. As students are working, the teacher circulates to each team to ask the first set of Guiding/Reflective Questions and address any issues that may arise. The teacher can provide guidance using the reflective questions to help students determine the important factors and start thinking about how they can present their solution.

The students receive the client letter 2 (Reading Passage 2), dataset 2, and additional materials (found in the Dataset 2 section), along with their work from part 1. Teams test, evaluate, and revise their first procedure as necessary with the second dataset and provide the requested deliverables as specified in the second letter. If teams finish early, they can begin preparing their presentations. After all of the teams have completed their second letters to the client, the teams will present their results to the rest of the class. Classroom discussion follow.

The teacher can start the lesson as follows: Teacher discusses and explain limiting factors and how they control a population. The teacher might ask what factors might affect population growth of the fresh water turtle. After groups brainstorm, the teacher asks how these factors affect human population growth. The class

could list factors that affect growth and use them for their rankings.

- **Guiding/reflective Questions** (answer questions as a whole class)
 - What do you think are possible reasons for the rapid increase or decrease in populations?
 - How do you know if you have an answer to the problem?
 - Would your solution work in a different situation? For example
 - What are the most important things to consider in your procedure?
 - Do you agree or disagree with your classmates' ideas? Why or why not?

- **Reading Passage 1**

[Client Letter 1.docx](#)

- **Readiness Questions** (answer questions in their groups then as a whole class)
 - What is the problem?
 - Who is the client?
 - What is the client asking your team to do?
 - What things do you need to include in your solution?
 - Have we answered all the questions and are they based on the data provided?

- **Data Set 1**

[MEA 2 Data Set 1.docx](#)

[Factors responsible for increase in human population growth.docx](#)

- **Letter Template 1**

[Letter Template 1.docx](#)

- **Comprehension/readiness questions** (answer questions in their groups then as a whole class)
 1. How does the economic situation of 1950 compare to 2000 and after?
 2. What could be determining factors for the loss of life in the 1950's?
 3. How did agriculture change the way of life between 1950 and 2010?
 4. What is the role of technology in the modern era and how did it affect human growth?
 5. Does the role of energy have any impact on population growth?
 6. What is the difference between population growth and population rate?

- **Reading Passage 2**

[Population Client Letter 2.docx](#)

- **Data Set 2**

[Population growth in US.docx](#)

[MEA 2 Data Set 2 -Human population Growth.docx](#)

[MEA 2 Data Set 2 Information Provided.xlsx](#)

[India's Population.docx](#)

- **Letter Template 2**

[Letter Template 2.docx](#)

- **Additional Instructions or Materials**

Compare and contrast any two developed and developing countries based on population growth using the same factors that influence them.

- **Reflection question** (Do individually then share on the next day. Give class time to finish reflection.)

How will you mathematically determine the growth rate of India versus the USA to give an indication of how fast or slow the developed and developing countries can be impacted by these determining factors? Once again the students will use the rankings used in the first activity of Letter One. Have each student use the keywords (post them in room or give them a copy), when writing their reflection.

Keywords: community, population, biotic, abiotic, limiting factors, natural selection, drought, technology, agriculture, medicine, over population

After:

Reflection question (Do individually then share on the next day. Give class time to finish reflection.)

How will you mathematically determine the growth rate of India versus the USA to give an indication of how fast or slow the developed and developing countries can be impacted by these determining factors? Once again the students will use the rankings used in the first activity of Letter One. Have each student use the keywords (post them in room or give them a copy), when writing their reflection.

Keywords: community, population, biotic, abiotic, limiting factors, natural selection, drought, technology, agriculture, medicine, over population

Have each student discuss in their groups first then come together as a group and discuss answers as a group.

As a whole group, have the students discuss how this applies to math, science and social studies. Make sure they give examples.

ASSESSMENT

- **Formative Assessment**

The teacher introduces the topic of population growth by first looking at family growth, community growth and then population growth to make sure students understand the concept. The teacher refers to countries with a slow growth rate compared to those with a fast growth rate. The teacher asks why these fluctuations in various countries occur. Teacher makes sure students understand the topic of discussion before they begin using the data.

Example Comprehension and readiness questions:

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- **Feedback to Students**

Students will answer a set of questions based on the topic which the teacher will check to see if the students understand the topic and were able to answer the questions correctly. This would be the Comprehension Questions. The students then receive feedback from the teacher which they will use when they work with the data that the teacher provides. Students will have the opportunity to use the feedback when they receive the data so they improve on their performance.

- **Summative Assessment**

The teacher will be able to see if students can discover the major factors involved for the increase of human population size over time. The teacher will check the students explanations of food, medicine, sanitation, agriculture, energy, technology.

The teacher will now check on the reasons for placing the factors in order of importance from the most to least responsible for human population growth.

The teacher can determine if students met the learning objectives for the lesson based on the rubric supplied.

The teacher will check if the mathematical calculations are correct where students show how India is & and half years ahead in increase of human population.

Teacher will check on the following: research done by students; Are the questions answered; Are students able to explain why they got to their answers; Are the math skills applied. Is there a definite procedure to follow in order to get to the answers?

[TEACHER RUBRIC FOR SUMMATIVE ASSESSMENT -HUMAN POPULATIONS.docx](#)

Resources:

<http://www.cpalms.org/Public/PreviewResourceLesson/Preview/49341>

Future world energy demand driven by trends in developing countries.

<https://www.eia.gov/todayinenergy/detail.php?id=14011>

Human Growth Video

https://www.youtube.com/watch?v=PUwmA3Q0_OE

Supplemental Reading

[Does Population Growth Impact Climate Change Attach.docx](#)