

MODULAR



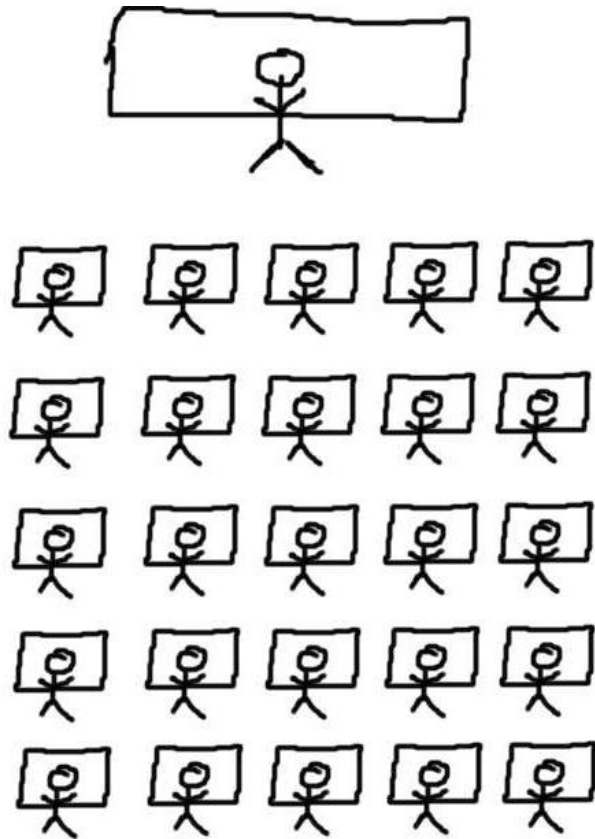
Leading Questions

- How can we make a truly integrated STEM curriculum?
- How can it be delivered in a blended/online environment?
- How can we give control of the curriculum to schools & teachers?

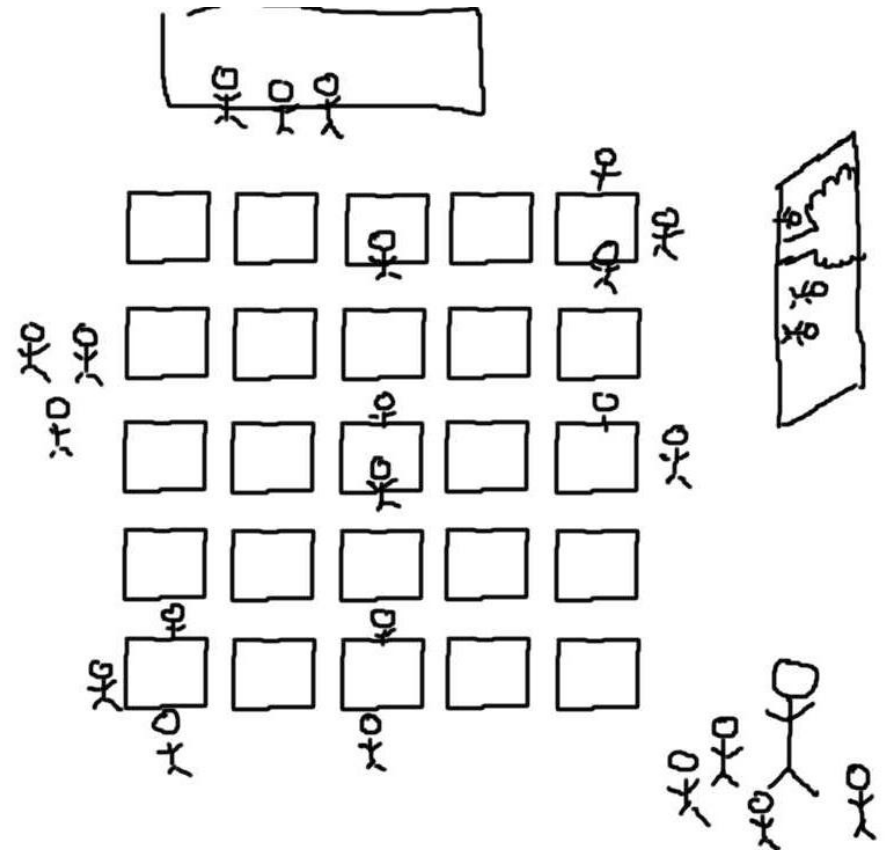
Blended/Online Instruction



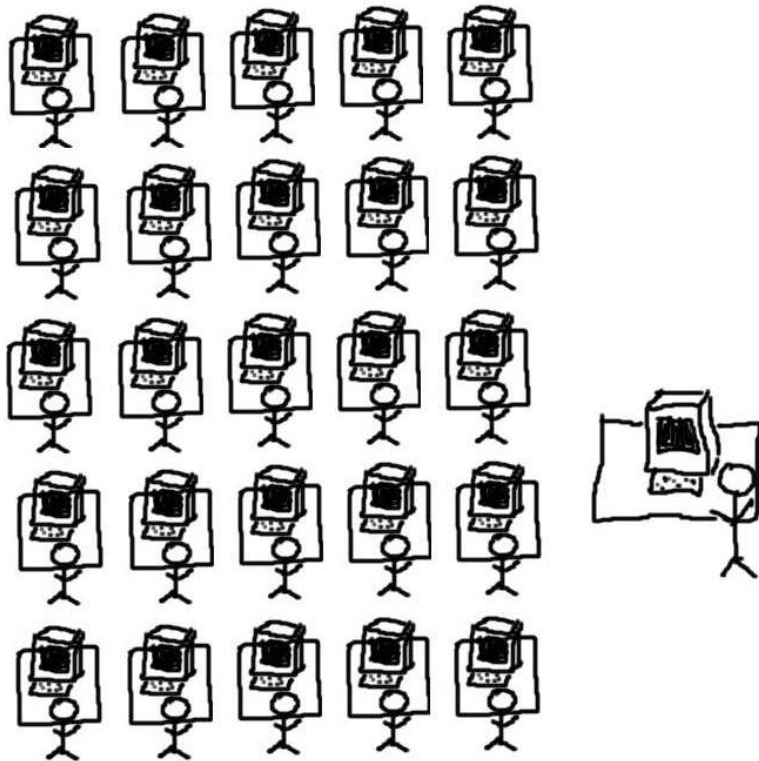
F2F Bad



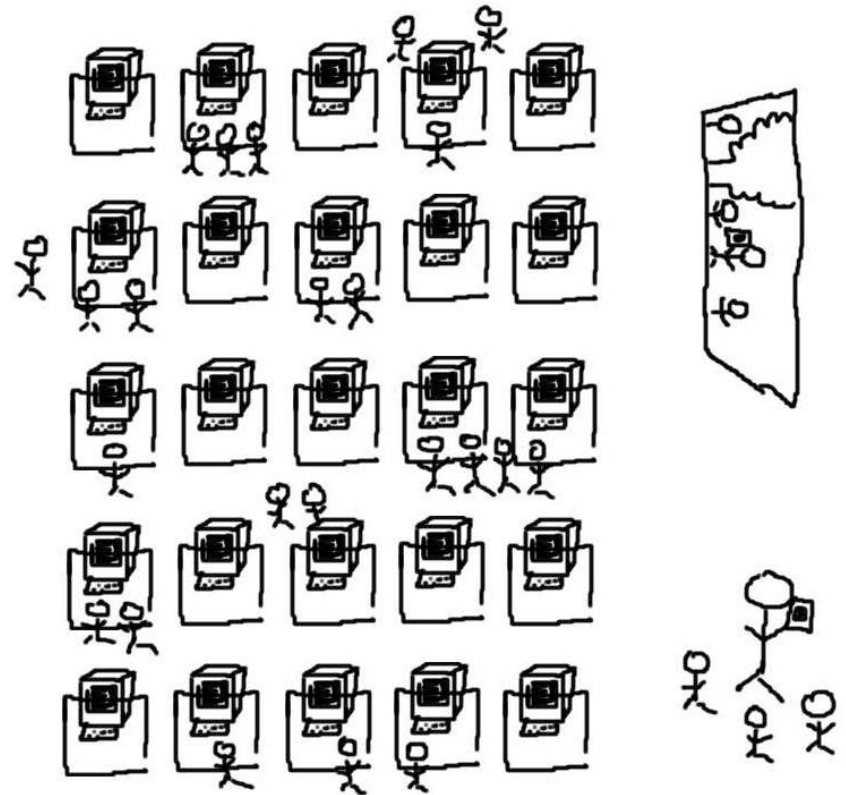
F2F Good



Online Bad



Online Good



Blended/Online Instruction

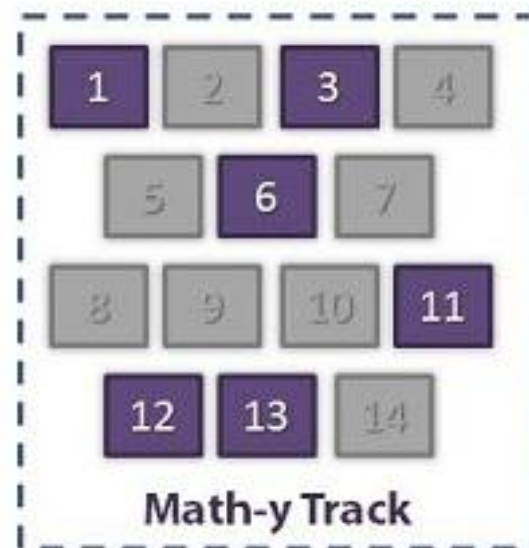


Instruction

Assessment

Collaboration

what's online?



MODULAR



Key Features:

- Digital curriculum for online or blended classroom use.
- Built using native LMS tools (not SCORM) making it fully customizable.
- Modular units that can be used in any combination or order.
- Every unit integrates science, technology, engineering, and math.

Biology
Physical Science
Earth Science
Software Tools
Space Science
Mathematics

The Game
of Life

CSI:
Cold Case

And Now for
the Weather

Riddle
Me Mars

The Dark
Universe

Sex Cell
and the City

Zen and the
Art of Ecology

Map Attack

The Green
House

R U Out
There?

All In
Your Head

DIY
Spectroscopy

Designer
Trash

Color the
Universe

Orbit
Architect

Bump,
Bump, Break

Racers, Heat
Your Engines

App
Inventor

Skyscrapers
with Sketchup

Games
of Chance

Making
Music

From Noob
to Rube

Get with the
Program

The Web
We Weave

The World
is a Stage

The Unit Projects

MODULAR



All in Your Head: Design and carry out a psychological study on a group of willing participants.

And Now for the Weather: Record and share a 2-minute national weather forecast.

App Inventor: Create an original mobile app for the Android platform.

Bump, Bump, Break: Design a packaging solution to protect an egg during transportation.

Color the Universe: Create your own color picture using Hubble Space Telescope data.

CSI: Cold Case: Analyze evidence and prepare testimony on an unsolved murder case.

The Dark Universe: Write a science fiction story about travels through hidden dimensions and deep space.

Designer Trash: Redesign a product that usually ends up in a landfill, making it sustainable.

DIY Spectroscopy: Create a kit that anyone could use to build their own simple spectrometer.

From Noob to Rube: Construct a Rube Goldberg Machine with at least five energy transfers.

The Game of Life: Design a board game based on the principles of evolution.

Games of Chance: Create an original game of chance based on a randomly occurring event.

Get With the Program: Write an original web-based program using JavaScript.

The Green House: Create a prototype of a household appliance powered by alternative energy.

Making Music: Build an instrument capable of playing several distinct chords.

Map Attack: Create a GIS presentation for a proposed sports park in your local community.

Orbit Architect: Determine an appropriate orbit for a earth-observing satellite.

R U Out There?: Design a message to be sent as a beacon to distant civilizations.

Racers, Heat Your Engines!: Design and build a heat engine powered racer.

Riddle Me Mars: Create a quiz game on earth science topics using NASA imagery data from Mars.

Sex Cell and the City: Design a city plan modeled after the parts and processes of a sex cell.

Skyscrapers with Sketchup: Build a model of a tall building using Google Sketchup.

The Web We Weave: Create a multi-page website using HTML5 and CSS.

The World is a Stage: Create your own three-act math task and share it via blog post.

Zen and the Art of Ecology: Create a multi-media art project based on an ecosit experience.

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Color the Universe

 Teacher Overview (Color the Universe)

 Introduction

 1. What is Light?

 CU-1 Pictures

 2. Mysteries of Color

 CU-2 Short Answer

 3. Light Sources

 CU-3 CheckPoint 1

 4. Stars

 CU-4 Screenshot

 5. Planets

 CU-5 CheckPoint 2


 6. Nebulas


 CU-6 Discussion


 7. Galaxies

 CU-7 Summary

 8. Camera Crazy


 CU-8 Screenshot

 9. Coloring the Universe

 CU-9 Picture

 CU Test

 CU Project Description

 CU Project

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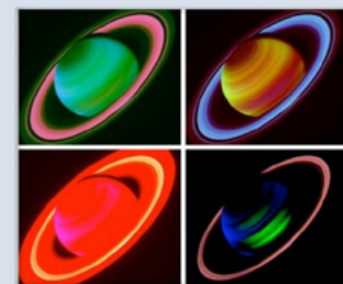
Color the Universe

INTRODUCTION

The universe is overflowing with color. Large clouds of warm dust glow in pinks, purples, greens, and reds. Most of these colors go unseen by human eyes since they are far too dim for our tiny eyes to perceive.

Through this project, though, we will learn how astronomers use electronic CCD cameras to detect light that our eyes never could. We will use real images from the Hubble Space Telescope to construct our own color images of a celestial object.

You will see that there is a great deal of artistry that goes into making beautiful scientific images. As you work on this project, reflect on how various forms of art (music, movies, and fine arts) rely on science, mathematics, engineering, and technology.



Saturn In many colors

Project Description

The Hubble Space Telescope is one of the best telescopes available to professional astronomers because it is located in space, above the blurring effects of Earth's atmosphere. Many astronomers wait years for their chance to collect images from this powerful telescope. In this project, you will use real astronomical images captured by the Hubble Space Telescope to create your own amazing color picture of a celestial object.

The final project will include:

- The final version of your color astrophotos, which you can produce using the resources found on this page (<http://bit.ly/PChkcr>)
- A written description of your object and what is visible in the image
- Written answers to the four essential questions below



Map Attack

INTRODUCTION

So, what is a "Map Attack"? Well, here's a definition:

Definition (*noun*)

1. A sudden urge to spend hours exploring online maps, scanning through satellite images of the earth.

If you have never experienced a map attack before, you better start getting used to the idea. Throughout this project, we will explore the amazing world of GIS including satellite imagery, interactive online maps, and demographics.

As you work, reflect on how environmental science, technology, sociology, and mathematics all converge in this fascinating field of study.



Niagara Falls from space

Project Description

Your community has set aside \$25,000 for the creation of a new sports park. As the local GIS expert, you have been tasked with:

- Using demographic information to identify the best location for a sports park in your community.
- Creating a map of the proposed location, shape, and size of the park.
- Putting your analysis together in an online map presentation.

The final project will include:

- A 3-slide presentation created with ArcGIS Explorer Online, which shows the location of the proposed park and relevant demographic information.
- A written description of why you placed the park in that location.
- Written answers to the four essential questions below.



Map Attack

ESSENTIAL QUESTIONS

To successfully complete this project, you will need to be able to answer the following questions:

EQ 1: What is a GIS Map?

- Watch this brief video for an introduction to GIS. (<http://bit.ly/PCu02O>)
- Find your address and try changing the "basemap" with this online GIS. (<http://bit.ly/TcHxIH>)
- Explore a GIS map with a data layer showing population change. (<http://bit.ly/OJpIVp>)

EQ 2: How do we determine locations on a map?

- Review this interactive webpage for information about coordinates. (<http://bit.ly/OAMJUH>)
- Use this simulation to learn about the coordinates on Earth's surface. (<http://bit.ly/NBor09>)
- Watch this video describing how GPS can find your location anywhere. (<http://bit.ly/QsysOJ>)

EQ 3: What does demographic information tell us?

- Watch this 1940s video describing why demographic data is collected. (<http://bit.ly/QXAp59>)
- Explore what can be learned from this GIS map of mobile phone usage. (<http://bit.ly/MwqHIW>)
- Use this tool to explore your neighborhood's demographic information. (<http://bit.ly/NCGeTa>)

EQ 4: How does one make an online map presentation?

- Explore some of the existing maps created with ArcGIS Explorer Online. (<http://bit.ly/yyowYu>)
- Watch this video for a tutorial on making an online map presentation. (<http://bit.ly/T0ZleF>)
- Return to this page and select "New Map" to try making a presentation. (<http://bit.ly/yyowYu>)

GOING FURTHER

You may choose to explore some of these resources to gain a deeper understanding of the topic.

- Watch this video to see a day in the life of a GIS analyst (<http://bit.ly/Wopabg>)
- Explore this page to learn about the "Lifestyles Tapestry Segmentation" (<http://bit.ly/PgNmMg0>)
- Use one of these ready to go map-making tools. (<http://bit.ly/hjnZwv>)
- Experiment with some of these other web mapping apps from ESRI. (<http://bit.ly/9BJoms>)

Map Attack

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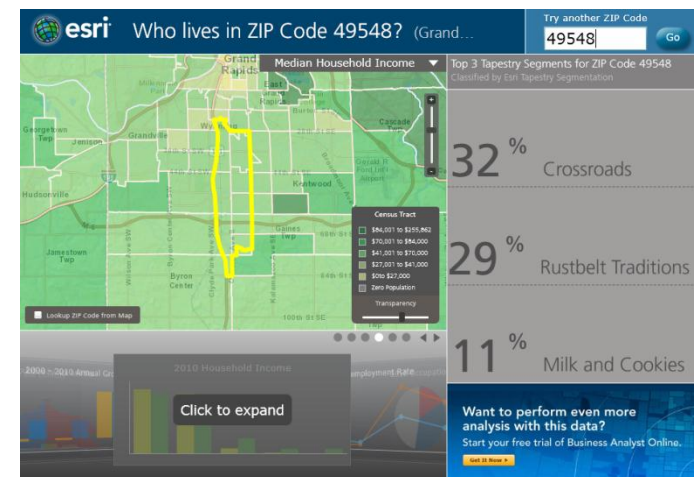
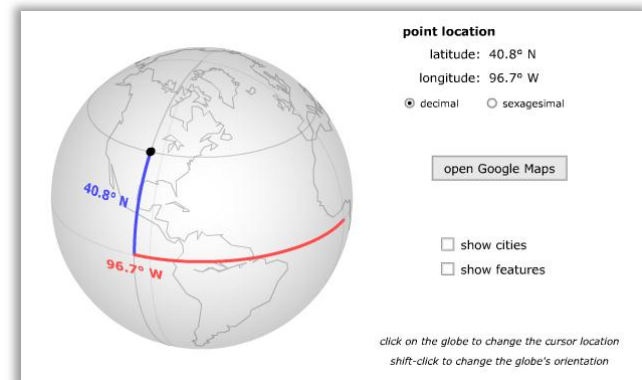
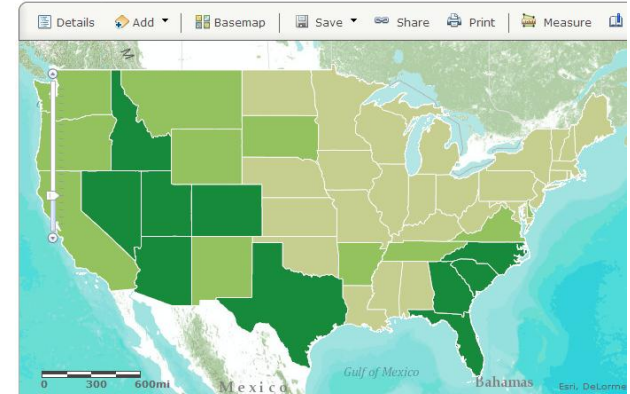
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ArcGIS US Population Change



Location of Proposed Sports Park

After investigating areas throughout my neighborhood, I have come to the conclusion that the new sports park should be placed at the corner of Division and 52nd St.

The lat/long of this location is:
42 deg, 52 min North and
85 deg, 39 min West

The park would cover an area of approximately 6 acres in size.

In the following slides, I will show the demographics data that led me to choose this location.

Proposed Sports Park

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Color the Universe

 Teacher Overview (Color the Universe)

 Introduction

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 CU-6 Discussion

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 9. Coloring the Universe

 CU-9 Picture

 CU Test

 CU Project Description

 CU Project

MODULAR



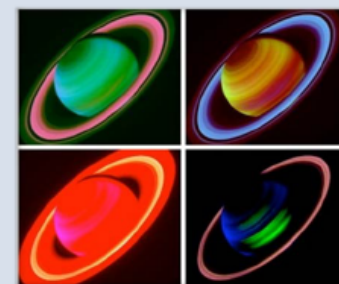
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Saturn in many colors

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Map Attack

Teacher Overview (Map Attack)

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MA-1 Map Link

2. Peeling Back the Layers

MA-2 GIS Questions

3. Who Are We?

MA-3 Discussion

4. Making a Living

MA-4: Job Posting

5. Where Are We?

MA Checkpoint 1

6. Map Making 101

MA-6 Map Link

7. Where Is That?

MA-7 Practice

8. The Lay of the Land

MA-8 Screenshot

9. Showing Off

MA-9: Map Link

MA Test

MA Project Description

MA Project

INTRODUCTION

Map Attack

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If you have never gotten a map attack before, you better start getting used to the idea. Throughout this unit, we will explore the amazing world of GIS including satellite imagery, interactive online maps, GPS, and demographics. We will see how environmental science, technology, sociology, and mathematics all converge in this fascinating field of study.

We will also gain experience in using state-of-the-art computer software that allows us create our own custom online maps and share them with the rest of the world. By the end of this unit, you will have the knowledge and skills to start addressing real issues or concerns in your local community. Who knows, maybe you can even take the next step and start working toward your certification as a GIS analyst!

The Project

Your community has set aside \$25,000 for the creation of a new sports park. Several ideas have been suggested including the possibility of tennis courts, basketball courts, a skate park, or a parkour track. As the local GIS expert, you are tasked with:

- Using demographic information to identify the best location for a sports park in your community
- Creating a map of the proposed location and size of the park
- Calculating the amount of dirt that will need to be removed to create a flat space.
- Putting all of your analysis together into an online presentation

When you are ready to begin this unit, you may continue on to Lesson 1.



Map Attack

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MA Project Description

MA Project

3. WHO ARE WE?

Introduction

Since the 1960's, the make-up of the world's population has been changing in some interesting ways - as shown in the graph at right. The percentage of the world under age 5 has been decreasing, while the percentage of the world over age 65 has been dramatically increasing.

What is this telling us about ourselves? Why are there more old people and less young people? Demographic data such as this reveals important information about how we change as a community, a country, and even as a species.

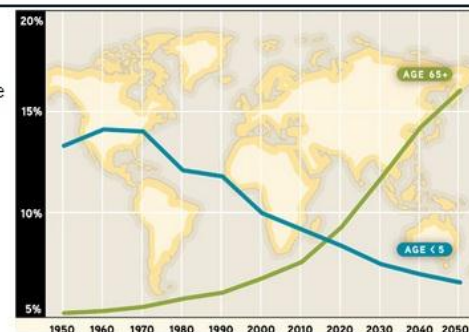
In this lesson, we will learn about the math, science, and technology behind demographics. In the process, we will develop a better understanding of the world in which we live and how it is changing in some remarkable ways.

Lesson (click here for notes)

- Every ten years, the United States takes a complete census of every person within its borders. This has been the practice since the first census was taken in 1790. Watch this fascinating promotional video from the 1940 census, which briefly explains why the census is important to the operation of our country. (<http://youtu.be/clmIPsuyR8>)
- Census information represents the foundation of demographic data for every country. Beyond the practical reasons, such as identifying the number of delegates within the national government, demographic data allows social scientists to study large-scale patterns in human health and behavior. For example, population pyramids can be constructed using census data. These graphs show a snapshot of the age distribution of all males and females in a country or community. Check out this interaction population pyramid which combines real data with predictions of what will happen in the UK over the course of 100 years. See what trends you can observe in this data. (<http://bit.ly/MaVM0n>)
- Did you notice that the life expectancy increased over this 100 year period? More and more people are living past age 85 in the graph. Did you also notice how there is often an increase in population around age 20? How can there be such a large increase in this age range - no one is born at age 20! Perhaps this is telling us something about who is immigrating to the UK and at what age they may be coming. Perhaps if we looked at the population pyramid from other nearby countries, we would see a dip in the population around the same age range, showing that young adults are leaving their native homeland for the UK. By following patterns and asking questions, social scientists can make new discoveries that have never been noticed before.
- The study of populations, and particularly how populations grow over time, is incredibly important and complex. There are legitimate concerns about how many people our planet can sustain. Watch this interesting video from PBS about the "Population Control Movement" of the 1960s and 1970s. As you will see, this is an issue that makes many people upset. As you watch, reflect on what you think about this issue. (<http://to.pbs.org/NJA6fK>)
- There are lots of concerns about increasing population growth. The environment suffers, but also people suffer as well. There is a tendency for poorer people across the world to have more children. This works to make the problem worse, since the poorest populations, those which already cannot provide for their current population, continue to grow the fastest. Watch this fascinating TED talk explaining how we can understand population growth in the developing world. (<http://bit.ly/Mb07Ra>)

Assignment

What do you think? Are there great risks to continued population growth? We have seen a few suggestions of how to limit population growth, from simply choosing to have less children to educating and feeding the poorest in the world. What, if any, measures do you think governments should take to limit population growth? If we don't need to slow the population growth now, then at what point (if ever) will we need to slow it down? Return to the main course page and post your thoughts to the MA-3: Discussion.



Map Attack

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









 MA Test

 MA Project Description

 MA Project

Post your thoughts on the urgency of population growth, and what strategies you think governments should take to limit it now or in the future.

Add a new discussion topic

Question 1 Not yet answered Marked out of 1.00  Flag question  Edit question	A wave is defined as a "traveling disturbance" Select one: <input type="radio"/> True <input type="radio"/> False
Question 2 Not yet answered Marked out of 1.00  Flag question  Edit question	A longitudinal wave consists of particles moving up and down while the wave travels sideways. Select one: <input type="radio"/> True <input type="radio"/> False
Question 3 Not yet answered Marked out of 1.00  Flag question  Edit question	An individual particle will remain in a fixed region, even though the wave may travel a great distance. Select one: <input type="radio"/> True <input type="radio"/> False
Question 4 Not yet answered Marked out of 1.00  Flag question  Edit question	When the frequency of a wave is increased, this means that fewer waves will be passing a fixed point each second. Select one: <input type="radio"/> True <input type="radio"/> False
Question 5 Not yet answered Marked out of 1.00  Flag question  Edit question	The amplitude of a wave is a measure of the size of the wave's disturbance. Select one: <input type="radio"/> True <input type="radio"/> False

process, we will develop a better understanding of some remarkable ways.

Lesson (click here for notes)

- Every ten years, the United States conducts a census. This has been the practice since 1790.



Map Attack 3: Who Are We?

Objectives:

- to understand the math and science behind demographic data
- to apply knowledge of demographic data to understand and explain current world issues and identify trends in this data
- to articulate a hypothesis based upon demographic data
- to understand slope and how slope applies to making predictions in trend lines

Terminology

Demographic Data

Census

Population Pyramid

Life Expectancy

"Population Control Movement"

Demographers

Total Fertility Rate

Key Concepts

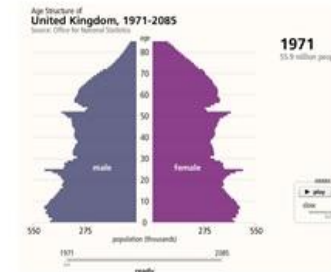
Why is the census important to the operation of our country?

What is census data?

How can census data be used to study patterns in human health and behavior?

Reflect upon your thoughts about the "Population Control Movement".

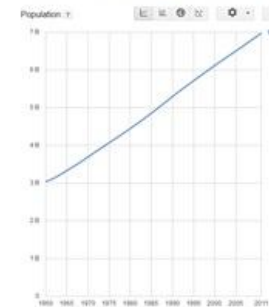
Example: What trends do you see with this data? (Animate the data)



Practice: Play the matching game to see how demographic data will shape the future of the U.S., Japan, Kenya and India. Make sure you try to analyze the population of each country and read the influences to make an educated decision.

Why do you believe the USA has much fewer deaths per births than Kenya?

Practice: Does this trend line show a positive, negative or no correlation?



Map Attack

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MA PROJECT DESCRIPTION

Sports Park Presentation

Your community has set aside \$25,000 for the creation of a new sports park. Several ideas have been suggested including the possibility of tennis courts, basketball courts, a skate park, or a parkour track. As the local GIS expert, you are tasked with:

- Using demographic information to identify the best location for a sports park in your community
- Creating a map of the proposed location and size of the park
- Calculating the amount of dirt that will need to be removed to create a flat space.
- Putting all of your analysis together into an online presentation

To complete this project, you should perform the following tasks:

- Decide what kind of sports park you would like to add to your community.
- Consider what demographic factors may be important for deciding where to place this sports park. For example, would age, income, unemployment, or any other factor play a role in where the park should be located?
- Find an available green space in your community that aligns with the relevant demographic factors.
- Etc.... Total construction cost will be \$this much per acre, how large can you make your park.
- Plot out the size of the park and make a map showing the boundaries
- Use the elevation tool to estimate how much dirt would need to be removed to make this a level space.
- Put all of this information together in a 5-slide presentation using ArcExplorer online. The 5-slides should include a title slide, a summary of your demographics analysis, your sketch of the location, shape, and size, your analysis of how much dirt would need to be removed, and any other information you think is relevant or necessary.
- Save and share you final presentation and submit it on the



What do you think?

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Color the Universe

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 ☒ CU-3 CheckPoint 1

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 5. Planets

 ☒ CU-5 CheckPoint 2


 6. Nebulas

 CU-6 Discussion


 7. Galaxies

 CU-7 Summary

 8. Camera Crazy


 CU-8 Screenshot

 9. Coloring the Universe

 CU-9 Picture

 ☒ CU Test

 CU Project Description

 CU Project

MODULAR



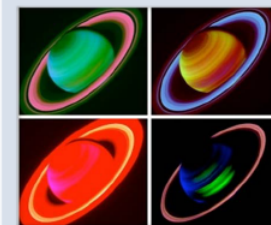
Color the Universe

INTRODUCTION

The universe is overflowing with color. Large clouds of warm dust glow in pinks, purples, greens, and reds. Most of these colors go unseen by human eyes since they are far too dim for our tiny eyes to perceive.

Through this project, though, we will learn how astronomers use electronic CCD cameras to detect light that our eyes never could. We will use real images from the Hubble Space Telescope to construct our own color images of a celestial object.

You will see that there is a great deal of artistry that goes into making beautiful scientific images. As you work on this project, reflect on how various forms of art (music, movies, and fine arts) rely on science, mathematics, engineering, and technology.



Saturn in many colors

Project Description

The Hubble Space Telescope is one of the best telescopes available to professional astronomers because it is located in space, above the blurring effects of Earth's atmosphere. Many astronomers wait years for their chance to collect images from this powerful telescope. In this project, you will use real astronomical images captured by the Hubble Space Telescope to create your own amazing color picture of a celestial object.

The final project will include:

- The final version of your color astrophotos, which you can produce using the resources found on this page (<http://bit.ly/PChkcr>)
- A written description of your object and what is visible in the image
- Written answers to the four essential questions below

What do you think?

