

5E Integrated STEM Lesson Plan – Template

Lesson Title: How Much Can The Earth Handle?

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Topic(s): Population density, population control, percents, Geometry (2D-3D figures and area)

Targeted Grade Level(s):8th grade

Time Needed: 10 class periods

Subject Integration:

S- population of organisms, environment and ‘Human Impacts’

T-Jamboard, breakout rooms to graph data in excel documents and to research trends in the data.

E- engineering a building designed to help accommodate the growing population and is eco friendly.

ELA- Citing textual evidence to support their claim.

Real world concepts: The way human needs, desires and values are driven and what factors such as climate, natural resource and economic conditions are taken into consideration. Limited farm land.***

Engage: Students will begin the unit by brainstorming and listing items that are found on the earth's crust (science).

Students will then put their thoughts onto a jamboard

https://jamboard.google.com/d/1hlo1Peas4SdEJtzx2z0dY1aV38fWtkPup_RjytQHt3M/viewer?f=0 (technology) under different categories, such as person, place, animal, thing etc. Students will then think about the “person” category where they will watch a short 4 minute video <https://populationeducation.org/resource/the-stork-and-the-grim-reaper/> over the world's population being demonstrated by using different colored water in bowls that represent the babies being born (blue stork) vs the deaths (orange reaper). They will then write their observations on a post it note and place them on flip chart paper posted around the room. Students will do a gallery walk to view peer thoughts which will begin class discussions on the trends and other things they noticed. This will then lead into the Explore section of the lesson.

Explore: Students will find percentages (math) of both male and female population in various parts of the world and graph the data on an excel document in breakout rooms (technology). Students will be able to construct and interpret a Population Pyramid. <https://populationeducation.org/resource/power-of-the-pyramids/>

Explain: Students will write about how their findings they researched (technology- social studies ie; baby boom, 1 child law in China ,slowest rate was France and US) and data trends relate to population density. Students will make correlations by the shapes of their pyramids and the growth that's happening in that country and come up with a solution and justify that solution with textual evidence and data.

https://docs.google.com/spreadsheets/d/1JNt3vyl6asnpjv_LvYS8BYOyppm3WelKBi99IPglFy4/edit#gid=1483732189

https://docs.google.com/spreadsheets/d/15uBr-CoD8S0bvb8CFPOJq4ikbH8_pwvSF3A_hJGyHA/edit#gid=0

Elaborate: Students will elaborate on the real world findings and eco friendly building design by providing textual evidence to justify their building design. <https://app.discoveryeducation.com/suite/stem/course/ee309a2e-8b6e-4448-9808-7242552b5020/unit/9970127f-e34b-4167-ae96-e5a4c7ab1f64/slide/52afe6ee-daef-4f72-ba33-3e412a805f8f>

Evaluate: The teacher will evaluate students' performances based on correct percentage findings and building design. https://www.coppellisd.com/cms/lib/TX01000550/Centricity/Domain/2931/SustainabilityChallengeRubric_4.24.18.pdf OR

<https://www.rcampus.com/rubricshowc.cfm?sp=true&code=QXA597B>

Standards:

- 08-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems
- 08-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment
- MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions
- RL.8.1 Cite relevant textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

<u>NGSS Performance Expectations</u>		
Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts:
<p>Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. Apply scientific principles to design an object, tool, process or system. (08-ESS3-3) Engaging in Argument from Evidence Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). Construct an oral and</p>	<p>Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (08-ESS3-3),(08-ESS3-4)</p>	<p>Cause and Effect Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (08-ESS3-3) Cause and effect relationships may be used to predict phenomena in natural or designed systems. (08-ESS3-4)</p> <p>-----</p> <p>Connections to Engineering, Technology, and Applications of Science Influence of Science, Engineering, and Technology on Society and the Natural World All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of p</p>

<p>written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (08-ESS3-4)</p> <p>Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1)</p>		
<p style="text-align: center;">Common Core State Standards:</p> <ul style="list-style-type: none"> ● RL.8.1 Cite relevant textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. 		
<p>ITEEA Standards</p>		

Students understand the role of technology in research and experimentation. Students engage in technology in developing solutions for solving problems in the real world. Students will use technology for design ideas.

Academic Expectations 1.1 Students use reference tools such as assigned webpages, online videos, calculators and data charts for solving problems in the real world.

2.3 Students identify and analyze the ways their components work together or affect one another.

5.1 Students use critical thinking skills such as analyzing, prioritizing, categorizing, evaluating and comparing to solve a variety of problems in real-life situations.

5.5 Students use problems-solving processes to develop solutions to relatively complex problems.

6.1 Students connect knowledge and experiences from different subject areas.

Measurable Student Learning Objectives: Students can analyze and compare data from different sources. (DOK 3). Students can make predictions about population (DOK 2). Students can identify population changes and how those changes impact their region of the world as well as ways to lower these changes (DOK 2).

Nature of STEM: Population control, population density and environmental issues and/or resources available that contribute to these items above are all real life issues that elicit students' ideas about the phenomenon with the goal of making the lesson responsive to students' lives and knowledge. While taking these into consideration, students will design multiple use items/eco-friendly items that can help benefit the lifestyle of others and earth's environment.

Engaging Context/Phenomena: How has the population changed in the United States? What are some ways I can help lower different environmental aspects to help population density and combine other environmental items to help with the increase in population.

Data Integration: https://docs.google.com/spreadsheets/d/1JNt3vyl6asnpjv_LvYS8BYOyppm3WeIKBI99IPglFy4/edit#gid=1483732189

<https://docs.google.com/document/d/1SCs2iA4PxTU1urgmNyg5NxEX5uldXF4muZlloEKyrTqs/edit>

Using the links above, the students will interpret data about how the population has changed over time. From this information they will make predictions of how their population will or might be affected in the future as well as design ways to combat a possible increase. They will compare the population in different parts of the world.

Differentiation of Instruction: Students will work in groups. If they need a reader they can use the text reader on the discovery ed page or google extensions as/if needed. Students that need a calculator can have access to a handheld or online calculator.

Real-life Connection: Human Impact; population density and environmental issues and/or resources available that contribute to these items above.

Possible Misconceptions: Due to their age and lack of research/exposure students have little concept of how the population has changed over the last several years. They have probably never considered the lack of space being limited on the earth's crust and contributing factors as well as ways to combine multiple resources into one item.

Lesson Procedure:

5E Model	5E Lesson Elements
<p>Engage <i>Students will brainstorm</i></p>	<p>Procedure: Engage: Students will begin the unit by brainstorming and listing items that are found on the earth's crust (science). Students will then put their thoughts onto a jamboard (technology) under different categories, such as person, place, animal, thing etc. Students will then think about the "person" category where they will watch a short 4 minute video over the world's population being demonstrated by using different colored water in bowls that represent the babies being born (blue stork) vs the deaths (orange reaper). In the video they use 1 cup to represent the birth rate and 1/3 cup to represent death rate. They will then write their observations on a post it note and place them on flip chart paper posted around the room. Students will do a gallery walk to view</p>

	<p>peer thoughts which will begin class discussions on the trends and other things they noticed. This will then lead into the Explore section of the lesson. Teacher(s) will facilitate learning.</p> <p>Modifications: Allow students to work in groups if needed.</p> <p>Standards Addressed 08-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment</p> <p>Formative/Summative Assessments <i>student ideas on jamboard and gallery walk.</i></p> <p>Resources https://populationeducation.org/resource/the-stork-and-the-grim-reaper/ https://jamboard.google.com/d/1hlo1Peas4SdEJtzx2z0dY1aV38fWTkPup_RjytQHt3M/viewer?f=0</p>
<p>Explore <i>Students will research and interpret data.</i></p>	<p>Procedure: Students will find percentages of both male and female population in various parts of the world and graph the data on an excel document in breakout rooms (technology). Students will be able to construct and interpret a Population Pyramid.</p> <p>Modifications <i>IEP students can use a calculator to find percentages.</i></p> <p>Standards Addressed 08-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems</p> <p>ITEEA.1.1 Students use reference tools such as assigned webpages, online videos, calculators and data charts for solving problems in the real world.</p> <p>Formative/Summative Assessments <i>Student breakout rooms and correct percentages</i></p> <p>Resources https://populationeducation.org/resource/power-of-the-pyramids/</p>
	<p>Procedure: Students will explain how their findings they researched (technology- social studies ie;</p>

<p>Explain</p> <p><i>Students will share and develop more understanding of the concepts.</i></p>	<p>baby boom, 1 child law in China ,slowest rate was France and US) and data trends relate to population density. Students will make correlations by the shapes of their pyramids and the growth that's happening in that country. (Science) How can we save farmland and still accommodate the growing population and other things needed for that growth?</p> <p>Standards Addressed: 08-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems</p> <p>ITEEA.6.1 Students connect knowledge and experiences from different subject areas.</p> <p>Modifications <i>Provide students with video links over the topics above.</i></p> <p>Formative/Summative Assessments Students justification and collaboration on building design based on the independent and dependant variables based on the organisms design.</p> <p>Resources https://docs.google.com/spreadsheets/d/1JNt3vyl6asnpjv_LvYS8BYOyppm3WelKBI99IPglFy4/edit#gid=1483732189 https://docs.google.com/spreadsheets/d/15uBr-CoD8S0bvb8CFPOJq4ikbH8_pwvmSF3A_hJGyHA/edit#gid=0 https://www.youtube.com/watch?v=h9SfMv9bbLQ</p>
<p>Elaborate</p> <p><i>Students will share their understanding.</i></p>	<p>Procedure: Students will collaborate and elaborate on the real world findings and eco friendly building design by providing textual evidence to justify their design concepts.</p> <p>Standards Addressed RL.8.1 Cite relevant textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text. ITEEA.2.3 Students identify and analyze the ways their components work together or affect one another.</p> <p>Formative/Summative Assessments: Building design, area and perimeter correctness.</p> <p>Resources https://app.discoveryeducation.com/suite/stem/course/ee309a2e-8b6e-4448-9808-7242552b5020/unit/9970127f-e34b-4167-ae96-e5a4c7ab1f64/slide/52afe6ee-daeef-4f72-ba33-</p>

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<p>Evaluate</p> <p><i>Students will share their comparisons and evaluate performances.</i></p>	<p>Procedure: The teacher will evaluate students' performances based on textual evidence provided and building design.</p> <p>Standards Addressed: MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. ITEEA.5.1 Students use critical thinking skills such as analyzing, prioritizing, categorizing, evaluating and comparing to solve a variety of problems in real-life situations.</p> <p>Modifications <i>modifications to rubric</i></p> <p>Formative/Summative Assessments <i>How well their building incorporates various accommodations to multiple environmentally friendly aspects and blend plant and human life in one building design. The design students came up with to help the growing rate of population and a limited amount of space available.</i></p> <p>Resources https://www.rcampus.com/rubricshowc.cfm?sp=true&code=QXA597B</p>

Teacher Background: Knowledge of population density and contributing factors. Percents, how to read and interpret data.

References:

<https://populationeducation.org/resource/the-stork-and-the-grim-reaper/>

https://jamboard.google.com/d/1hlo1Peas4SdEJtzx2z0dY1aV38fWtkPup_RjytQHt3M/viewer?f=0

<https://app.discoveryeducation.com/suite/stem/course/ee309a2e-8b6e-4448-9808-7242552b5020/unit/9970127f-e34b-4167-ae96-e5a4c7ab1f64>

https://docs.google.com/spreadsheets/d/1JNt3vyl6asnpjv_LvYS8BYOyppm3WelKBI99IPglFy4/edit#gid=1483732189

<https://www.rcampus.com/rubricshowc.cfm?sp=true&code=QXA597B>

<https://www.youtube.com/watch?v=h9SfMv9bbLQ>