Culturally Responsive STEM Lesson Plan:

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Research Experiences FOR TEACHERS
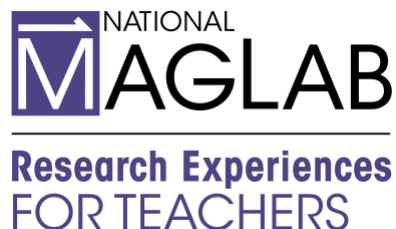
Environmental Management Lesson Plan

Lesson Objectives

- Examine how countries demographics are described and analyze the implications of the descriptions as applied to age structure and demographic transition (low-income to high-income)

- At the end of this lesson, I hope the students can identify how descriptive terms are used in demographics. The students should also be able to compare the demographics of different countries and examine how they are described. Additionally, they will be able to explain how demographic indicators are used to predict population dynamics and environmental considerations.

Next Generation Science Standard:

SC.912.L.17.1 - Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.

SC.912.L.17.13 - Discuss the need for adequate monitoring of environmental parameters when making policy decisions.

SC.912.L.17.18 - Describe how human population size and resource use relate to environmental quality.

SC.912.L.17.20 - Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.

SC.921.N.4.2 - Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental

SC.912.N.3.5 - Describe the function of models in science, and identify the wide range of models used in science.

LAFS.910.WHST.3.7 - Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

STEM Rationale for Lesson:

Essential Questions: How could environmental policy decisions be affected by the demographic description of a country? What implications does this have for resource allocation?

I will be highlighting the terminology used for this standard (in this lesson) so my students identify bias in the literature. I will ensure this connects to the students' cultural identities by providing them with a collaborative space to share their perspective. The students will be able to select a country of their choice and describe the conditions there. This can be a way for them to

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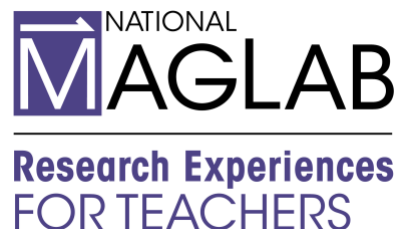
bring a mirror into the class or to use as a window and look into the culture of a country other than their own.

Population dynamics are the foundation for all other units in this class. The environmental considerations of Earth's systems will be examined within a demographic/human needs perspective. These students have already taken biology and should have an understanding of what is necessary for human life to be maintained. This lesson will put into perspective the culture of power and how it affects the distribution of resources necessary for human life. Not all countries have a location that facilitates power generation and adequate water resources for their populations needs. Nations currently in control of the resources will have an advantage and can exploit them at the expense of nations with less resources (National Geographic Society, 2021). Prior to this lesson, the students will have covered topics on the nature of science as well as engaged in classroom practices that provide an open forum and give each person's voice a chance to be heard. Following this lesson, students will learn about our planet's water resources.

Culturally responsive connection:

To allow my students (whose race is different from mine and different from that of the current power structure) to feel a sense of worth: I must set an example of responsive facilitation. Recognizing the worth of my students sets an example for their classmates and for my coworkers.

When information is produced by those in the majority (E.g., whether that be racial, gender, etc.), the influence is to marginalize the perspectives of those opposed to the dominant view. An author will write from their perspective and rarely do we see non-white biology textbook writers (Ford, 2020). Whenever possible, the origin and perspectives of content must be analyzed and supplemented to include connections to the students' own culture (Wlodkowski, 1994).

Materials Needed:
Provided by Teacher:

1. The Census.gov website, International Data Base (census.gov) https://www.census.gov/data-tools/demo/idb/#/country?YR_ANIM=2021&FIPS_SINGLE=**&dashPages=DASH&COUNTRY_YR_ANIM=2021

2. Link to the U.S. Census age structure page.

3. Collaborative space: digital or on paper - this can be a Jam board or a large piece of white paper, the students can all add their ideas to. Another modification is to give each student a piece of paper, have them write their ideas on it and then pass it around the class so each student sees their classmates ideas and can add to them or comment on them.

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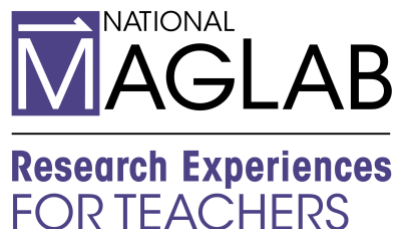
4. Literature using descriptive terms such as developing nation, developed nation, low-income country, high-income country. Excerpts from news articles are provided but can be changed to suit the teacher and students' needs.

5. age structure data obtained from the internet

6. a device capable of displaying websites and saving documents.

Activate Prior Knowledge:

1. Students can offer their experience about how they have heard populations described and how the descriptions of their culture can be inaccurate.
2. Students need to be able to communicate their ideas in any traditional format, either on paper or digitally. The only problematic traditional resource necessary would be access to the internet, but an alternative data set could be supplied.
3. It is my expectation that each student has found themselves in a situation where they have been mislabeled. When classmates who originated from, or their culture originated from, a country described as low-income or developing shares how that term is perceived, those who are placed in the perspective of the power structure can see how these terms affect others.

Lesson Introduction:

1. There will be multiple lesson activities needed for students to grasp this lesson's concepts. Each activity will build on the ideas and help the students achieve the goal of understanding demographics and how they relate to real countries and conditions.
2. To introduce the idea of terminology affecting resource allocation, I will give the students a word problem and they will draw a map based on the word problem.
   o For Example: Weird Town, Stinkyville, Amazing Beach, and Lower Upper Heights are all towns located on Random Island. Draw each town on the map of the island, add a lake, a forest, and natural springs to one town, add a garbage dump, power plant, and a wastewater treatment plant to another town. Add two other things of your choosing (for example: a stadium, museum, airport, or theme park) to the remaining towns. Label everything on the map and be prepared to discuss why you allocated what elements to what town.
   o After they have created their maps, they can discuss what affected their decisions and possibly come to a conclusion that terminology can affect resource allocation.
3. When students are able to pick a country (from any in the U.N.), they can represent their culture in a way they are comfortable with. Each country will present a different avenue for students to express their identity. This can be from a background perspective or their own identity can be reflected in that of a country they have an interest in (careers, sports, nature, history).

Lesson Activity:

1. See attached Population Profile, below.

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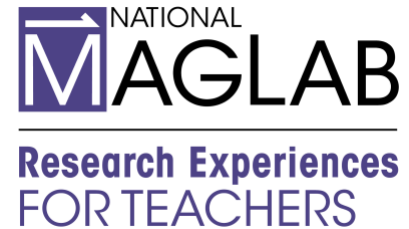
Lesson Assessment

The students will be graded on their writing. A rubric will indicate how they are scored based on their execution of command words and addressing the prompt. This technique gives points for any correct aspects and does not detract for errors. The rubric will be based on the student's ability to address the prompt, which can be accomplished in many ways. A command word, such as: describe, explain, or identify will be used in differently scaffolded prompts; ensuring students opportunities to show what they know and not be penalized for what they don't know.

**Lesson by: Erin Squires**
Contact info: squireserin@gmail.com

References

Distribution of Resources (2021). Resources Library, Ideas. https://www.nationalgeographic.org/idea/distribution-resources/ accessed on 11/22/2021

Ford, J. (2020, December 14). How textbooks, classroom resources have racism built in, and how to make education more inclusive. https://pix11.com/news/created-equal/how-textbooks-classroom-resources-have-racism-built-in-and-how-to-make-education-more-inclusive/ accessed on 11/22/2021

Wlodkowski, R. J. G. (1994, November 30). A framework for culturally responsive teaching. Educational Leadership. Retrieved November 22, 2021, from https://eric.ed.gov/?id=EJ511715.

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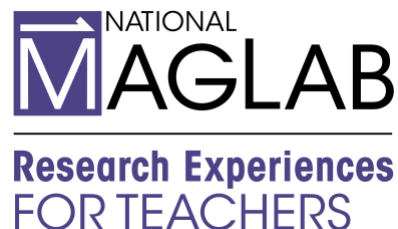
Population Profile (50 points) Name: _____

Objective: describe a population and interpret the implications of demographic data while making relevant connections to the population.

Activity: Pretend you are on an island. This island has limited water, food, and shelter. What do you think a population of humans on this island would look like? Describe this population and include where they live, where they get their water, and how they feed themselves.

highlight all the adjectives you use to describe the population

Background:

Read the excerpt below from: Population – a liability or an asset? Tribune News Service, Jalandhar, July 11th, 2021,

*highlight the adjectives used in the article and think about what those adjective mean*

"Dr Neelima Jerath, Director General, Science City, in her introductory remarks on the occasion, said population growth has both negative and positive impacts on the society. Whereas on one hand, population explosion can lead to overexploitation of resources, create resource crunch for present and future generations, affect age structure of a country, lead to local and international migration and cause economic inequality thus compromising sustainability; however, on the other side, it can provide a country with a large workforce which can help increase its commercial output and productivity, innovative potential, tax base and consumer spending, thus creating an impetus for the economy. Low population growth in high-income countries is likely to create social and economic problems while high population growth in low-income countries may slow their development."

Read the excerpt below from: South Korea, the Only Middle Power of its Kind The National Interest, By: Seong-ho Sheen, August 2nd, 2021

highlight the adjectives used in the article and think about what those adjective mean

"South Korea's soft power adds another dimension to its middle power status, especially considering cultural products such as K-pop, K-drama, movies, and food. Korean film Parasite won four Oscars at the most exclusive Academy Awards last year. It made history as the first non-English language film to win Best Picture along with Best Director, Best Original Screenplay, and Best International Feature. Korean K-pop dance groups and idols are a global sensation. BTS, the hottest boy group at the moment, has eighteen million fans around the world despite the fact that most of their songs are in Korean. The group's recent record Butter was listed number one on the Billboard Hot 100 chart for seven weeks this summer, only to be replaced by another new song by BTS. Despite diplomatic tensions between Korea and Japan, K-Drama is widely popular among Japanese audiences both young and old, marking its fourth wave in Japan. K-esports and Korean webtoons, a form of digital comic, are making their way into the global market as a new frontier in future entertainment.
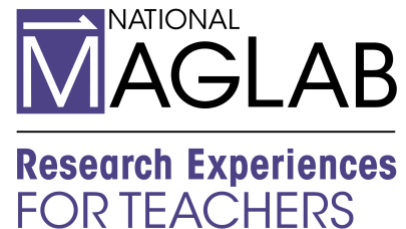
Yet, South Korea's unique aspect of its middle power comes from its historical and positional dimensions. First, South Korea's rise to a middle power status comes without much historical baggage. South Korea has no history of aggression against others nor an imperial past in its modern history. Indeed, South Korea is the only country that successfully made its transition from a former colony to an advanced economy. One could say that Australia or Canada, along with the United States, used to be a colony. Nonetheless, what is distinct about South Korea is the fact that it was colonized by former imperial Japan by coercion. As South Korea, previously an aid recipient, is now a provider of developmental aid, many other developing nations tend to take South Korea as a genuine model that shares a similar history.

Second, South Korea could play an important role in connecting the West to non-Western societies. South Korea's political evolution—from a traditional society marked by five hundred years under the Joseon dynasty to a vibrant democracy based on a Western liberal ideology—makes South Korea another unique case positioned between the West and the rest of the world. From the perspective of Western democracies, South Korea is a valuable partner and an exemplary illustration of how Western liberal democratic ideas and values can be successfully transferred to a non-Western traditional society. Along with countries like India, South Korea showcases a powerful example of the universality of liberal values. As the global democracy is at risk due to the rise of authoritarian leadership across the world, it was a timely move for the G7 to invite South Korea as an observer to this year's summit in the United Kingdom. Liberal values such as freedom of speech, basic human rights, and racial and LGBT equality could have a universal appeal if advocated by non-Western democracies like South Korea."

Observations: *Compare* the terms used to describe different countries:
Prompt #1: What do the terms: low-income, developing, high-income, developed, mean in terms of demographics?

Procedure:
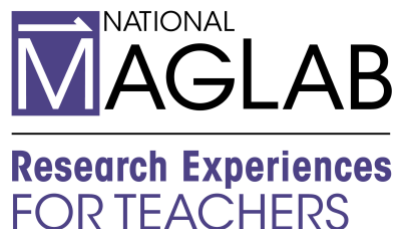**Step 1:** Go to the following website: US Census data base,
https://www.census.gov/data-tools/demo/idb/#/country?YR_ANIM=2021&FIPS_SINGLE=**&dashPages=DASH&COUNTRY_YR_ANIM=2021

    a. Select by country/area: select any country/area you can make three connections with.

       What country/area did you select? _____-
    b. Leave the year 2021

c. Download the population pyramid as a jpeg
d. Open the file
e. Click on the … in the upper right and select Save As
f. Select the folder to save the file and name it: Country Age Structure
g. Create a Word document – with some TBD formatting
h. Copy and paste the Quick Facts (2021) onto the word document and insert the age structure diagram you saved.

Step 2: Analyze the demographic information.

   Prompt #2: Describe the country you have selected and include: midyear population, average annual growth rate, density, total fertility rate, under 5 mortality rate, and life expectancy at birth.

   Prompt #3: Connect your experiences with three aspects of the country you selected. Be prepared to present this response to the class.

Step 3: Results

   Prompt #4: Compare the description of the population of the island in your hypothesis to the description of the country you selected and the overall descriptions of the countries your classmates selected. Indicate how the description of a county might influence environmental policy and resource allocation. Offer alternative descriptions to provide a more accurate description of the country.

Prompt Response Grading Rubric

Criteria	5-4 points	3-2 points	1-0 points
Addressing the prompt	The response fully addresses the prompt with supported information connected to the topic. Evidence provided is consistent with the prompt and no irrelevant content is included.	The response fully addresses the prompt with supported information connected to the topic. Evidence provided is consistent with the prompt.	The response is not addressed, and no related content is presented in the response

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Fulfilment of command words	The command word is fulfilled with clear flow of ideas connecting the material to the indicated product	The command word is indicated, but not fully or to a clear extent, however a flow of thought is present, and ideas are related	There is no connection in the response that can be related to the desired output from the command word in the prompt