Ecology and Biodiversity: How and What Do I Feed My Neighbor?

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This curriculum unit is recommended for:
Earth Environmental Sciences, Grades 9-12

Keywords: Biodiversity, Food Inequalities, Food Disparities, Food Store, Food Service, Food Marketing, Body Mass Index, Waist-Hip Index, Retail Food Environment Index, Obesity, Dietary, Socioeconomic, Rural, Urban, Coastal Plains, Piedmont, Appalachian Mountains, Farmer's Market

Teaching Standards: See Appendix 1 for teaching standards addressed in this unit.

Synopsis: This unit helps students understand and master content knowledge regarding the Biosphere with special attention to human population, growth, food, and health. As students learn about the biosphere and human impact on Earth, they should be able to use the steps of the Scientific Method (observe, research, hypothesize, experiment, analyze data, and conclude) and critical thinking skills to solve 21st century problems. During each class, students will use the inquiry-based thinking graphic organizer I SEE, I THINK, I WONDER to analyze their community's haves, needs, and wants in order to solve community issues such as food inequality and promote better emotional, mental, and physical health. When discussing food inequality, scholars study the availability of Food Stores and Food Service Places within their community answering the questions, *"What do we feed a growing population, and Do they have access to food?"* Other learning during this unit includes weekly global issues featuring CNN10 and the scholar's ability to connect the four spheres and discuss how they interact with one another. At the end of class, students share reflections on their conclusions and solutions in the Discussion Board on Canvas and receive feedback from classmates.

I plan to teach this unit during the coming year to 149 students in Earth Environmental Science, Grades 9-12.

Introduction

When studying the Ecology and Biodiversity Unit, students explore the human population and how we affect the Earth through population growth, food, pollution, usage of renewable and nonrenewable resources, and health/disease. Throughout the Earth Environmental Science course, students partake in Friday's CNN 10. This activity requires them to select a 21st century problem or event, complete research (answer the 5 Ws- What is the event?, When did it happen?, Who caused it?, Why did it happen?, and Where did it happen?) , and discuss how they would solve the problem. This activity allows students to be aware of global issues and help them become a global citizen. It also introduces them to the Biosphere before we begin this unit.

Although students are global citizens, issues and solutions may require attention at the community level. Within this unit, students observe and discuss their community (West Charlotte) without comparing it to another community in Charlotte, North Carolina. Students will use I SEE, I THINK, I WONDER to determine what they have versus what they need to care for the population growth, food, and health of their community members.

Rationale

Ecology and Biodiversity is the last unit within this course. Students have studied the lithosphere (natural events deforestation, urbanization), atmosphere (ozone layer, climate change, air pollution), and the hydrosphere (acid rain, water pollution). They learn how the spheres are connected and dependent upon one another for the survival of humanity and Earth.

The purpose of this curriculum is to allow students to (1) create awareness of their communities, (2) induce critical thinking to solve 21st century problems, (3) understand the nutritional needs of the community, (4) understand the relationship between diet and health, and (5) gain mastery of the content and North Carolina Essential Standards.

Demographics

Harding University High School is a partial Career and Technology Education (CTE) magnet and Title 1 school. The CTE magnet program offers Automotive Technology, Construction Technology, and 3D Design and Digital Manufacturing. As a Title 1 school we provide 100% free lunch. Our school offers 1:1 technology with Chromebook for all.

Our demographics include grades 9-12 with approximately 1,491 students, and a 15:1 student: teacher ratio. Our largest class size is ninth grade, 501 students followed by tenth grade, 411 students, eleventh grade, 276 students, and twelfth grade with 294 students. Genders are 47% female and 53% male. Student diversity is 59.3% African American, 35% Hispanic, 3.5% Asian, 1.5% Caucasian, 0.5% Two or more races, and 0.1% Native American.

My classroom demographics are 149 students. I teach 118 ninth graders, 30 tenth graders, and one twelfth grader. Genders are 78 females (52.3%) and 71 males (47.7%). Within my

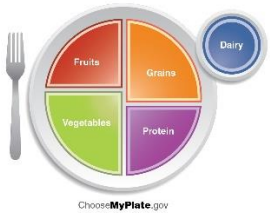
cohort, student diversity includes 105 African Americans (70.5%), 10 Asians (6.7%), 28 Hispanics (18.8%), 2 Two or more (1.3%), and 4 White (2.7%). Other statistics are 16 students with Individual Education Plans (IEP) (10.7%), 17 Students with Disabilities (SWD) (11.4%), 2 students with 504 Plans (1.3%), 5 Academically Gifted (AG) (3.4%), 21 Multi-Language Learners (ML) (14.1%), 39 Magnet (26.2%), 14 Non-Native to US (9.4%), and 9 McKinney Vento (6%).

Unit Goals

Human population is a part of the fifth unit in the Earth Environmental Science course. Within this unit students explore Ecology, Human Impact on Earth, Biodiversity of North Carolina, and Reduce, Reuse, and Recycle. While learning about the human population, we answer the question, "*How can we feed a growing population?"* I challenge my students to answer not only "*How can we feed a growing population*?", but "*What do we feed a growing population, and Do they have access to the food?*"

Students also complete a project explaining the relationship between the 4 spheres (biosphere, atmosphere, hydrosphere, and lithosphere) for a selected event (hurricane, earthquake, tsunami, etc.). Understanding this content leads to mastery of the North Carolina Essential Standards and a successful outcome on the District Earth Environmental Science Final Exam.

Content Research



In 2011, the United States Department of Agriculture (USDA) introduced the new Food Pyramid which is a plate. The plate is a diagram enforcing what individuals need to have in healthy daily meals. The plate includes Dairy, Fruits, Vegetables, Grains, and Protein. The USDA no longer has categories for sugars and processed oils because they have no place in a healthy diet.

The medical community has long established the relationship between diet and health. Recent research suggests our dietary choices may not only be influenced by taste, nutrition, and weight control, but include convenience and cost. Convenience refers to the availability of Food Stores and Food Service Places. [i]

Researchers define Food Stores as supermarkets (corporate chains such as Food Lion, Harris Teeter), grocery stores, convenience stores with gas and without gas, and specialty stores (meat markets and fruit/vegetable stores). Food Service places are

Cafeterias, Restaurants, Carryout (bagel, sandwich, or delicatessens), and Specialty Shops (smoothie or coffee). [ii]

Along with possible unavailability of Food Stores and Food Service Places, ethnic Food Marketing on television and social media compound the issue. Children, adolescents, and young adults find themselves inundated with advertisements for foods and beverages high in calories from fat and sugar (FBHFS) and influenced by celebrities.

Availability of Food/Food Services

Currently in America, research findings indicate that the types of Food Stores and Food Service Places in low income, medium-wealth, and wealthy neighborhoods, rural and urban areas, and ethnically segregated and racially mixed neighborhoods differ. When comparing poor and wealthy neighborhoods, there are over three times as many supermarkets in the wealthier neighborhoods than in low-income areas. Wealthy and medium-wealth neighborhoods also have more convenience stores with gas stations. By contrast, low-income neighborhoods have small grocery stores, convenience stores (without gas), and specialty food stores. [iii]

When exploring types of Food Services Places, Full-Service Restaurants are two times more prevalent in white neighborhoods and three times more prevalent in racially mixed neighborhoods. Sadly, fast-food restaurants are more prevalent in the low-medium and medium wealth neighborhoods and become less frequent in the highest wealth-neighborhoods. Carryout specialty eating places are more prevalent in racially mixed and white neighborhoods. As wealth increases, the number of bars and taverns declines. [iv]

Race

Researchers conclude that the locations of Food Stores and Food Service Places partner with the wealth and racial make-up of neighborhoods. Racially mixed neighborhoods tend to have better Food Stores and Services than majority black and majority white neighborhoods, with white neighborhoods remaining healthy. Overall, findings propose that supermarkets are more widespread in predominantly white and wealthy neighborhoods, while small corner grocery stores are in black and poor neighborhoods. [v]

Economics

Research suggests that low-income people cannot afford healthier foods. It has been shown that urban residents pay 3% to 37% more for groceries in their local community compared to suburban residents who buy the same goods at large supermarkets.

Unfortunately, researchers also find that as the wealth of neighborhoods decrease, the proportion of poor and black residents increases due to 8 times as many black Americans living

in the lowest-wealth areas. Within this population, the lack of private transportation also increases. The hurdle of transportation combined with the unavailability of supermarkets in low income and predominantly black neighborhoods puts residents at a disadvantage when trying to purchase healthy foods. [vi]

What can be done?

Race and wealth segregation continue to control the structure of America's neighborhoods even though the Fair Housing Act of 1968 prohibits racial discrimination in housing. The Fair Housing Act does not govern the placement of food stores or restaurants by private industry. Disappointingly, economic policies that support corporate retail chains, public and private sector loans that favor home ownership for whites, and land use policies that facilitate development of predominantly wealthy and white suburban neighborhoods affect the retail sphere. This may require fundamental local, state, and national economic and land use policies. [vii]

Geology

North Carolina divides itself into three distinct regions known as the Coastal Plains, Piedmont, and Mountains. The Coastal Plains and Mountains have both rural and urban food environments while the Piedmont is mostly urban. A 2010 study examines the association of Body Mass Index (BMI) to food environment measures (Retail Food Environment Index, fast-food restaurants/capita, and supermarkets capita) in 30 counties (10 in each of the three regions). Outcomes from the study reveal an association between Retail Food Environment Index and BMI where fast food restaurants are not associated with BMI.[viii] Further investigation by another group of researchers agree that fast-food consumption partners with Waist-Hip Ratio (WHR) rather than BMI.[ix]

While studying the Coastal Plains, researchers found that rural youth in eastern North Carolina have higher BMIs when they live closer to fast food and pizza places and lower BMIs when living closer to Farmer's Markets. Results are similar when studying nearness to convenience stores in comparison to Farmer's Markets. [x]

When focusing on rural and urban communities in western North Carolina and Southern Appalachian Mountains, they experience the same results with rural residents having a higher number of obese individuals than urban. Researchers attribute this to a disconnect between the people and their food. The study found most adults grew up with a taste for fat, sugar, and salt. They also lack cooking skills and do not place value on local farms and food. Due to the lack of cooking, they rely on processed and ready to eat foods. [xi]

What can be done?

Researchers believe that rural areas have a distinct advantage over urban. The rural community spirit can help develop community strategies to combat obesity and health problems. Local farms can provide their communities with a wide variety of fresh fruits, fresh vegetables, and lean proteins, all of which are a part of a staple diet. These local food systems can serve a community for sustainable and effective way of building health in rural areas. [xii]

They suggest two strategies. The first engages and educates families about healthy eating and physical activity. The second establishes farm-to-school programs including edible school gardens, farm field trips, classroom cooking, and serving local products in the cafeteria. The objectives are building a connection between farmers and buyers, child to vegetable growing, families and farm tours, and people sourcing their food. These connections are a vital part of building the rural food system. [xiii]

Television/ Digital Marketing

As a parent you don't [know] your child is
even seeing that and that aspect I have a
huge problem with digital marketing as it pertains
to younger people because, they're not able
to make the best decisions at a certain age.

The obesity epidemic affects black and Hispanic/Latino populations disproportionately. In data from the US National Health and Nutrition Examination Survey, obesity prevalence increased by sixteen percentage points in men and nine percentage points in women in 1999 - 2000 and 2017 – 2018. During the same time period, obesity prevalence also increased in youth ages 6-year-old and older. For example, prevalence in Black and Mexican adolescents (ages 12-19) increased by seven and eight percentage points respectively compared to an increase of only 2 percentage points in white adolescents. [xiv]

Food marketing practices contribute to consumption of foods that promote excess caloric intake and obesity. Marketing of foods and beverages high in calories from fat and sugar (FBHFS) is viewed by nutrition experts as a major hindrance to the success of obesity prevention and control efforts. [xv]

Large manufacturers easily outspend public health or non-profit investments in marketing of food that are less obesity promoting. A lot of this marketing is directed to children and adolescents in traditional channels like television and now on social media. Advertising susceptibility of older children and adolescents is related to identity formation. [xvi]

Ethnically targeted marketing takes many forms, higher exposure to FBHFS marketing results from a combination of the greater frequency of food advertisements on television programs viewed by black people and higher media use. Moreover, strategies leverage Black identity, culture, and endorsements form black entertainers and athletes adding salience. [xvii]

Lastly, regulations that target food safety do not apply. Foods and beverages are essentials for life and regulated as products presumed safe for human consumption, but food safety does not incorporate chronic disease risk. Moreover, food and beverage advertisings are protected under the First Amendment to the US Constitution. [xviii]

What can be done?

The concerns about youth-oriented marketing are consistent with evidence that Black caregivers are concerned about child obesity and feel strong responsibility for their children's eating habits. Black parents indicate specific concerns about food marketing to their children, especially from black celebrities. Within the study, parents feel that black celebrities should be sensitive to the health issues of Black communities. However, participants' comments about the potential for black celebrities to market healthy foods were optimistic. Parents were also interested in supporting certain types of policy solutions. Unfortunately, as mentioned earlier, food and beverage advertising is protected under the First Amendment of the US Constitution. [xix]

In addition, the adults in the study may have difficulty seeing how they are personally affected by marketing while seeing that their youth are affected – a phenomenon termed a "third person effect" in communication research. Caregivers or household food providers and role models need to understand they shape youth eating patterns along with media use. They all may need nutrition literacy. [xx]

Teaching Strategies

AVID

Harding University High School implemented AVID (Advancement Via Individual Determination) as a part of the School Improvement plan and goal to increase student college career readiness. Schoolwide we use the W, C, and R strategies in WICOR (Writing, Inquiry, Collaboration, Organization, and Reading). Since I have IB MYB classes, I use all five WICOR strategies in my lessons.

Writing

Students write daily to display mastery and understanding of content. They use different forms of writing completing assignments in their Science Interactive Notebook, Worksheets, Good Things journaling, and notes.

Inquiry

Students accomplish inquiry-based learning using I SEE, I THINK, I WONDER Do Now! at the beginning of lessons and Exit Ticket where they exhibit mastery at the end of lessons.

Collaboration

Students engage in laboratory experiments, discussions, and projects in small groups during class time.

Organization

Students use either Cornell Notes or Guided Notes and graphic organizers for each lesson.

Reading

Students read daily. The Do Now! at the beginning of class is usually a reading on softschool.com. Students read the passage and take the quiz. They must score 80% or higher. They can retake as needed.

Data Driven Instruction

Teachers in the Earth Environmental Science Professional Learning Community (PLC) meet weekly to discuss Common Assessments and Data. We observe exceeded mastery, mastery, near mastery, and remediation using masteryconnect.com. For students who perform below mastery, we plan the re-teach and re-assessment.

Remediation

During the Lithosphere Unit, scholars studied the three regions of North Carolina. We will revisit the three regions (Coastal Plains, Piedmont, and Mountains) in a discussion regarding the differences in farming and food availability in rural and urban areas.

Technology Integration

As a CTE magnet, we use technology as a learning tool and are one-to-one with chromes. Students navigate our Learning Management System, CANVAS, for daily lessons, including this curriculum unit, which is a part of Unit 5 Ecology and Biodiversity. Daily lessons also include Nearpod, Google drive, forms, slides, and other apps. Unit quizzes, Discussion Board, and projects also take place in CANVAS. Unit exams are taken in masteryconnect where students and teacher review exceeded mastery (blue), mastery (green), near mastery (yellow), and remediation (red).

Vocabulary Development

Within our CANVAS Earth Environmental Science Units, the District provides PowerPoints which includes vocabulary for students. They may also use either EE Science Textbook, notes, and or quizlet flashcards for engagement and learning.

In Earth Environmental Science, scholars begin the daily lesson with an outline on the board that includes the date, lesson, NC Essential Standards, scholar's objectives, and agenda (Do Now!, I Do!, We Do!, You Do!, and an Exit Ticket).

Lesson 1 - What is Healthy?

Do Now! - Scholars will complete a short reading on Nutrition that introduces them to the unit vocabulary and helps them gain background knowledge on a proper diet. They must score 80% or higher on the quiz that follows the reading. I complete a Check for Understanding (CFU) during class and record their 5 out of 6 or 6 out of 6 score.

I Do! - The teacher will publish and provide the PowerPoint, Pyramid, for scholars in Canvas. The teacher will review and explain the food Pyramid, Food Groups, and health and benefits associated with a proper diet and health problems associated with an unhealthy diet.

We Do! - Scholars will review an image, The Food Pyramid, and complete the I SEE, I THINK, I WONDER graphic organizer explaining the image. The Food Pyramid is projected to the class using the Promethean Board. (This must be completed before I Do!)

You Do! - 1) Scholars visit the Discussion Board and answer the question, "*What do you eat that is healthy*?" 2) Scholars will find a picture of a healthy person and explain why the person is healthy. The teacher will create a Google Slide deck for scholars to add their pictures and explanations. 3) Scholars record vocabulary from the Do Now! reading in their science notebook with definitions using a quizlet.

Exit Ticket - For the next twenty-four hours, scholars will record what they eat in a day. Recording can be video, Google Slides, Chart/graph with pictures, or journal style. they submit their presentation in Canvas. Presentations cannot exceed three minutes. We will use this information on Day 3.

Day 2 - How to Read a Food Label?

Do Now! - Before the reading, scholars will observe a Food Label and complete an I SEE, I THINK, I WONDER. Then, scholars will complete a short reading on Food Labels that introduces them to the unit vocabulary and helps them gain background knowledge on a proper diet. They must score 80% or higher on the quiz that follows the reading. I complete a Check for Understanding (CFU) during class and record their 5 out of 6 or 6 out of 6 score.

I Do! - The teacher will provide and publish a PowerPoint presentation, Reading Nutrition Labels, in Canvas for scholar access. The teacher will review and explain how to read a food label. CFU - Discussion Board - present a food label to scholars and ask, "*Is this product healthy, why or why not?*" Scholars must observe carbohydrates, fats, and proteins to determine if the food is a healthy choice. Advanced scholars may also review sodium and cholesterol. Scholars can see others' replies after they submit an answer.

We Do! - The class will observe and discuss items from a grocery store (teacher provides). We will pay attention to the caloric count as well as the carbohydrate, protein, and fat percentages located in the food label. Scholars will Talk and Turn with their peers and discuss if the food is healthy or unhealthy. Then, they will complete the Healthy or Not Healthy Worksheet explaining why.

You Do! - 1) Scholars will complete the Kids Health in the Classroom Food Label Activity. They write to a friend who eats nothing but fast food. They will explain to that friend why they should eat better by comparing the fats, carbohydrates, and proteins from two of the friend's meal choices, fast food portion sizes, health and energy, and alternatives for their diet. 2) Scholars will record vocabulary from the Do Now! reading in their science notebook with definitions from the PowerPoint or a quizlet.

Exit Ticket - Scholars will complete the second part of the Kids Health in the Classroom Food Label activity. They will take a quiz about Food Labels. There are five questions. They need a four out of five or higher.

Day 3 - What I Eat in a Day!

Do Now! - Scholars will complete a short reading on Food Groups, that introduces them to the unit vocabulary and helps them gain background knowledge on a proper diet. They must score 80% or higher on the quiz that follows the reading. I complete a Check for Understanding (CFU) during class and record their 5 out of 6 or 6 out of 6 score.

I Do! - 1) The teacher will open and use the Promethean Board to project the presentations to the class. 2) The teacher will create a Discussion Board for comments. 3) Scholars can upload video content to TikTok (scholars who have parent permission to partake in social media).

We Do! - Scholars will share their presentations for What I Eat in a Day! with the class. Scholars will give comments in the Discussion Board. Scholars can see replies from others when they make a comment.

You Do! - N/A

Exit Ticket – Scholars' submissions on the discussion Board will be their Exit Ticket for this lesson.

Day 4 - Food Availability

Do Now! - First, scholars will see a Farm Image and complete the I SEE, I THINK, I WONDER. Then, scholars will complete a short reading on Farms and Food that introduces them to the unit vocabulary and helps them gain background knowledge on where we get food. They must score 80% or higher on the quiz that follows the reading. I complete a Check for Understanding (CFU) during class and record their 5 out of 6 or 6 out of 6 score.

I Do! - The teacher will provide the vocabulary and definitions from the research that scholars will use to determine the food availability near Harding University High School. Therefore, food Stores are supermarkets (corporate chains such as Food Lion, Harris Teeter), grocery stores, convenience stores with gas and without gas, and specialty stores (meat markets and fruit/vegetable stores). Food Service places are Cafeterias, Restaurants, Carryout (bagel, sandwich, or delicatessens), and Specialty Shops (smoothie or coffee).

We Do! - In groups of four, scholars will research, create a chart, and make a report on the food availability near Harding University High School. They will use the same vocabulary and definitions as in the research.

You Do! - Using content scholars learned regarding food and nutrition, individually, scholars create a map of what Food Stores and Food Services they would like to have access to near their school, Harding University High School.

Exit Ticket - Scholars will engage in a Pick Your Plate Activity sponsored by the Science Department at the Smithsonian. Scholars will have three meals and two snacks with a budget. By the end of the game, they should have green bars by the food groups on the plate.

Day 5 - Field Trip

Do Now! - N/A

I Do! - The teacher will provide a Field Trip for scholars to visit a farm, garden, or a grocery store (somewhere different than one in their neighborhood - Trader Joe's, Whole Foods, Fresh Market, etc.). Note - so that we do not create a better than scenario, preface the store visit with either Trader Joe's is always seen on YouTube, Amazon owns Whole Foods, and they deliver, or "We are looking at foods they offer from other countries."

We Do! - Visit the destination.

You Do! - Scholars will engage in the content delivered during the Field Trip presentation. They will ask questions, take pictures, and exhibit understanding of the content.

Exit Ticket - Scholars will complete a 3-2-1 about their experience.

Appendix I: Implementing Teaching Standards for North Carolina Standard Course of Study

Within this unit, students will review the following North Carolina Essential Standards:

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EEn.2.2.1 Explain the consequences of human activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present.

EEn.2.4 Evaluate how humans use water.

EEn.2.7 Explain how the lithosphere, hydrosphere, and atmosphere individually and collectively affect the biosphere.

EEn.2.7.1 Explain how abiotic and biotic factors interact to create the various biomes in North Carolina.

EEn.2.7.2 Explain why biodiversity is important to the biosphere.

EEn.2.7.3 Explain how human activities impact the biosphere.

EEn.2.8 Evaluate human behaviors in terms of how likely they are to ensure the ability to live sustainably on Earth.

EEn.2.8.2 Critique conventional and sustainable agriculture and aquaculture practices in terms of their environmental impacts.

EEn.2.8.3 Explain the effects of uncontrolled population growth on the Earth's resources.

EEn.2.8.4 Evaluate the concept of "reduce, reuse, recycle" in terms of impact on natural resources.

Appendix II - I SEE, I THINK, I WONDER

I See, I Think, I Wonder Graphic Organizer

Lesson 1

I SEE	I THINK	I WONDER

Lesson 2

I SEE	I THINK	I WONDER

Lesson 4

I SEE	I THINK	I WONDER

Appendix III – Healthy or Not Healthy

Name the food on the chart. Check the healthy or Not Healthy box. Explain why.

Food	Healthy	Not Healthy	Why?

Appendix IV - 3-2-1 Exit Ticket

3	Three things I learned are…
2	Two ideas I have…
1	One question I have is…

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