NC SCHOLAR OF GLOBAL DISTINCTION 2024

Instructor: Julie Wyatt

Department: Science

Community College: Gaston College

Course Description: BIO 110: Principles of Biology

This course provides a survey of fundamental biological principles for non-science majors. Emphasis is placed on basic chemistry, cell biology, metabolism, genetics, evolution, ecology, diversity, and other related topics. Upon completion, students should be able to demonstrate increased knowledge and better understanding of biology as it applies to everyday life.

Number of students enrolled in course: 24-30

Description of Module:

This global learning module will be embedded throughout the semester and will focus on Asian countries with the topics of deforestation, adaptation, and nutrition. Students will learn about tropical rainforest deforestation in Asia for palm oil. They will assess personal palm oil consumption and possible sustainable solutions. Students will investigate the physiological stress of high-altitude environments in the Himalayan mountains and how natural selection has enabled adaptations. They will then use this example to design adaptations in organisms to other Asian ecosystems. Students will also compare food availability, consumption, and nutrition in low-, middle-, and high-income Asian countries.

Student Global Learning Outcomes:

1. Assess the role of Asian rainforests in the carbon cycle, the implications of deforestation for palm oil production, personal consumption, and solutions for sustainable practices.
2. Design organisms adapted to Asian ecosystems using the high-altitude environment of the Himalayans as an example.
3. Investigate food consumption patterns and nutrition in low, middle, and high-income Asian countries.

Student Global Learning Activities:

Global Learning Activity 1:

Title: Deforestation of Asian Rainforests

Objective: Students will assess the role of rainforests in the carbon cycle, the implications of deforestation for palm oil production, personal consumption, and solutions for sustainable practices.

Procedure:

Assignment 1: Students will learn about Asian rainforests by watching the video: *Carbon and Water Cycles in Rainforests*. They will then go through the interactive resource, "From rainforest to cupboard: the real story of palm oil," from The Guardian. Students will answer comprehension questions about the video and the interactive website.

Assignment 2: For one day, students will look at the ingredient labels of products they eat and use such as soaps and shampoos. They will write down the products that contain palm oil. They will reflect on the following: whether they were surprised by the number of products with palm oil or not, whether being aware of palm oil will make a difference in their purchasing habits (why or why not), and whether they think the public should be more aware of palm oil production.

Assignment 3: Students will then research an organization dedicated to restoring the damage done by the palm oil industry, choosing from the following: Roundtable on Sustainable Palm Oil, Palm Oil Innovation Group, Rainforest Rescue, Rainforest Action Network, World Wildlife Fund, Orangutan Conservancy, Rainforest Trust, Palm Oil Action, Sumatran Orangutan Society, or Say No to Palm Oil. Students will create an infographic about one potential solution described by the organization they chose to research. In their infographic, they will assess how this solution will aid in restoring the impacts of the palm oil industry and the feasibility of the solution.

Follow-up Assignment and Assessment: Students will complete the questions about the video and interactive website. They will submit the list of palm oil products that they use along with their reflection about this assignment. Their reflections will be discussed in-class or on a discussion board for online courses.

Students will also submit the infographic of the environmental organization and solution they researched. Infographics can be created in PowerPoint and a video tutorial will be provided. Infographics will be graded based on the content, including the organization they researched, the solution described by the organization, and an assessment of how this solution will work and its feasibility. Infographics will also be graded for the use of graphics, professionalism, and citations.

Students will share their infographics with the class, and we will discuss the proposed solutions either in-class or through a discussion board.

Resources:

Carbon and water cycles in rainforests. (2018). In *Films On Demand*. Films Media Group. https://fod.infobase.com/PortalPlaylists.aspx?wID=104913&xtid=190165

How to Canvas. (2021, Feb 21). Creating an Infographic in PowerPoint [Video]. YouTube. https://www.youtube.com/watch?v=WkSYjZRgtqI&t=14s

Paddison, L., Purt, J., Moulds, J., Balch, O., Riadi, Y & Ifansasti, U. (2014, November 10). From rainforest to your cupboard: The real story of palm oil – interactive. The Guardian. https://www.theguardian.com/sustainable-business/ng-interactive/2014/nov/10/palm-oil-rainforest-cupboard-interactive

Global Learning Activity 2:
Title: Adapting to Extreme Environments

Objective: Design organisms adapted to Asian ecosystems using the high-altitude environment of the Himalayans as an example.

Procedure:

Assignment 1: Students will watch a video about climbing Mount Everest, *The Death Zone*, and then answer questions about the physiological effects of high altitude. Students will then be given data about acute mountain sickness, arterial oxygen saturation, and heart rate for individuals from Tibet versus mainland China. They will be asked to come up with a hypothesis to explain the differences in the data.

Assignment 2: Students will be given background information on the EPAS1 gene and data on the distribution of genotypes for the EPAS1 gene in samples taken from populations at different altitudes. Students will answer questions about the patterns they observe and how they think these gene variations allow for high altitude adaptations. They will then watch the segment about Tibetans in the documentary *First peoples: Asia*.

Assignment 3: Students will design an organism adapted to an Asian ecosystem. They will choose an ecosystem from Global Forest Resources Assessment. They will provide detailed information about the chemical, geological and physical features of the environment such as sunlight/energy, temperature, precipitation, biotic factors, abiotic factors, and other physical features of the system. Students will then decide what five traits are most important for an organism to survive in the ecosystem and explain why

these traits are important for survival. Students will design an organism uniquely adapted to the ecosystem, designing both internal and external body parts. They will sketch their organism in its natural environment, including all parts of the body design that are key to survival.

Follow-up Assignment and Assessment: Students will complete questions about the physiological effects of high altitude and their hypothesis about adaptations among different populations. They will submit their assessment of the patterns they observe in the EPAS1 gene among populations and how they think these gene variations allow for high altitude adaptations.

Students will then submit the organism they designed. This assignment will be graded based on having a thorough description of their chosen ecosystem, an explanation of why the five traits they chose are important for survival in the ecosystem, and the sketch of their organism exhibiting the traits needed for survival. Students will share and discuss their organisms in-class or through a discussion board for online courses.

Resources:

First peoples: Asia. (2015). In *Films On Demand*. Films Media Group. https://fod.infobase.com/PortalPlaylists.aspx?wID=104913&xtid=129846

Gonggalanzi, Labasangzhu, Bjertness, E., Wu, T., Stigum, H., & Nafstad, P. (2017). Acute mountain sickness, arterial oxygen saturation and heart rate among Tibetan students who reascend to Lhasa after 7 years at low altitude: A prospective cohort study. BMJ Open, 7(7). https://doi.org/10.1136/bmjopen-2017-016460

National Science Teaching Association. (n.d.). High Altitude Living. https://www.nsta.org/storyline/high-altitude-living

Peng, Y., Yang, Z., Zhang, H., Cui, C., Qi, X., Luo, X., Tao, X., Wu, T., Ouzhuluobu, Basang, Ciwangsangbu, Danzengduojie, Chen, H., Shi, H., & Su, B. (2010). Genetic variations in Tibetan populations and high-altitude adaptation in the Himalayas. Molecular Biology and Evolution, 28(2), 1075–1081. https://doi.org/10.1093/molbev/msq290

Space, J. (2020). Asia: ecological zones. Global Forest Resources Assessment 2000. https://www.fao.org/3/Y1997E/y1997e0p.htm

The death zone. (2007). In *Films On Demand*. Films Media Group. https://fod.infobase.com/PortalPlaylists.aspx?wID=104913&xtid=47617

Global Learning Activity #3

Title: Income and Food Consumption Patterns

Objective: Students will compare food consumption patterns and nutrition in low-, middle-, and high-income Asian countries.

Procedure:

Assignment 1: In class we will have a demonstration about how food is distributed among low-, middle-, and high-income countries.   The demonstration will be record for online courses. A loaf of bread will represent the world's food supply. The class will be divided into three groups. Seventeen percent of the class will represent the high-income countries, they will get 16 slices of bread which is 81% of the food supply. Twenty five percent of the class will represent the middle-income countries, they will get 3 slices of bread which is 17% of the food supply. The remaining 58 % of the class will represent the low-income countries and they will get one slice of bread, representing 2% of the food supply. We will then discuss food distribution and what students think about the other income countries either in-class or through on online discussion board.

Assignment 2: Students will investigate food consumption in different income countries across Asia. They will be assigned a country: Myanmar (Burma), Bangladesh, India, China, Japan or Singapore. These countries represent low-, middle-, and high-income countries. The students will research how much food costs out of total household spending for their country, prevalence of undernourishment (%), prevalence of moderate and severe food insecurity (%), average protein supply (g/capita/day), average dietary energy supply adequacy (%) using data from the Food and Agriculture Organization of the United Nations and USDA. They will research typical meals and make a food log for one day for someone living in their country. They will calculate the total calories along with percent of calories from fat, protein, carbohydrates for their food log.

Follow-up Assignment and Assessment: Students will submit their country's data along with the food log and nutrition data (total calories along with percent of calories from fat, protein, carbohydrates). They will also submit a PDF or PowerPoint slide showing images of the meals they included for the food log. In class or on a discussion board, students will discuss the meals and nutrition data. We will then watch the Ted talk: *Ending Hunger Now* by Josette Sheeran and discuss solutions for food insecurity.

Resources:

Bread for the World. (2015). *An Unbalance World: A Distribution Exercise*. Bread for the World. https://www.bread.org/

FAO, IFAD, UNICEF, WFP and WHO. (2023). *The State of Food Security and Nutrition in the World 2023*. Food and Agriculture Organization of the United Nations. https://www.fao.org/documents/card/en/c/cc3017en

Food and Agriculture Organization of the United Nations. (2024). FAOSTAT. https://www.fao.org/faostat/en/#country

Sheeran, J. (2011, July). *Ending hunger now* [Video]. TED Conferences. https://www.ted.com/talks/josette_sheeran_ending_hunger_now

Syed Mahfuz, A. H., Saulam, J., Kanda, K., Murakami, A., Yamadori, Y., Mashima, Y., Nlandu, R. N., & Hirao, T. (2020). Temporal Trends in Apparent Energy and Macronutrient Intakes in the Diet in Bangladesh: A Joinpoint Regression Analysis of the FAO's Food Balance Sheet Data from 1961 to 2017. Nutrients, 12(8), 2319. https://doi.org/10.3390/nu12082319

USDA. (2022). Lower income countries spend much higher share of expenditures on food than higher income countries. https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=107494

Resources and References Used in the Creation of the Module
See above.