

Scholar of Global Distinction Program

Course

General Biology BIO 112

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Course Description

This course is a continuation of BIO 111. Emphasis is placed on organisms, evolution, biodiversity, plant and animal systems, ecology, and other related topics. Upon completion, students should be able to demonstrate comprehension of life at the organismal and ecological levels.

Number of Students Enrolled in Course:

25 per section

Module Description

Biodiversity is a large portion of the curriculum for Biology 112 with each unit diving into the diversity of species from viruses to plants, invertebrates to vertebrates. For each unit, students will complete a study plan on each group of organisms and continue with a global learning activity. In order to enhance our lessons throughout the semester, students will begin learning about the global diversity of viruses and continue with plants. The final activity will focus on conservation biology and the role of human impact on our planet.

Student Global Learning Outcomes:

1. Discuss how different cultures in the Middle East and N. Africa react to a viral epidemic/pandemic including how they view infected people and medically treat the sick
2. Explore how different cultures in the Middle East and N. Africa use plants for medicinal purposes including the active ingredients, the way it is prepared and what ailment it treats.
3. View the biodiversity of animals from the Middle East and N. Africa, evaluate how humans have changed the landscape, impacted animals who live there, and how to promote biodiversity and animal conservation.

Global Learning Activities:

Activity 1

Basic Description:

Students will conduct research on a virus that has caused an epidemic or pandemic and describe how the different cultures of the Middle East and N. Africa react to and treat the diseases.

Objective:

The purpose of this activity is to allow students to understand the different ways Middle Eastern and African cultures can have an impact on the response of society to an epidemic or pandemic.

Procedure:

This activity will be conducted during Unit 1: Introduction to Biology and Viruses. Students will learn viral evolution, classification, infections and hosts, as well as the

prevention and treatment of viral infections. This material is provided from an open educational resource built with custom learning tools.

The global activity will include a short oral presentation accompanied by a PowerPoint presentation and a written (typed) summary with at least 4 credible sources in APA format.

1. Students will be assigned to groups of 3 and each group will be given a specific virus to research.
2. Students will research the virus itself in terms of scientific name, classification, morphology and how it infects a host.
3. Students will then research how economics, resources, and the political stability of different countries impact pandemic recovery.

Assessment:

Instructor will grade summary paper by rubric. Paper should contain grammatically correct sentences with observations made from research.

Peer grading on presentation based on the following rubric.

Category	Full points (11)	Partial points (6)	0 points
Scientific name			
Classification			
Morphology			
Mode of transmission/how it infects a host			
How are infected people viewed?			
How are infected people treated?			
How did the country/world recover?			
Group members equally present			
Well organized and visually appealing			

Follow up:

Class discussion on the diversity of viruses and the ways different cultures observe and react to viral infections. Discuss possible reasons for that diversity including societal and governmental pressures. Also include how the regions or country are able to recover from epidemics or pandemics given the tools they are allowed from the government.

Resources:

World Health Organization

- <https://www.who.int/en/>

CDC global health protection and security

- <https://www.cdc.gov/globalhealth/healthprotection/>

Center for Disease Control

- <https://www.cdc.gov/>

UNC Institute for Global Health and Infectious Disease

- <https://globalhealth.unc.edu/>

International Society for Infectious Diseases

- <https://isid.org/>

Middle East respiratory syndrome

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7155742/>

Deadly MERS outbreak

- <https://www.nature.com/articles/d42473-019-00422-y>

Tropical Diseases of the Middle East

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3289601/>

Epidemic and pandemic-prone diseases in the Middle East

- <http://www.emro.who.int/pandemic-epidemic-diseases/news/emerging-infectious-disease-outbreaks-reported-in-the-eastern-mediterranean-region-in-2017.html>

African CDC Disease Information

- <https://africacdc.org/disease/>

Systematic Review of Important Viral Diseases in Africa

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7238228/>

Preparing Africa for the next pandemic

- <https://www.nature.com/articles/d41586-021-02864-1>

Cholera:

- Afkhami, Amir Arsalan. 2019. *A modern contagion: imperialism and public health in Iran's age of cholera*. <https://press.prod.jhu.mindgrb.io/books/title/9055/modern-contagion>
- Stewart, Ashleigh. "What quarantine was like in 1947: the fascinating story of the Middle East's cholera outbreak." *The National*. <https://www.thenationalnews.com/arts/what-quarantine-was-like-in-1947-the-fascinating-story-of-the-middle-east-s-cholera-outbreak-1.1026271>
- Leong, Amanda. "How Iranian Princess Taj al-Saltana Saw a 19th Century Global Pandemic." *Ajam Media Collective* <https://ajammc.com/2020/11/15/taj-al-saltana-global-pandemic/>

- Leong, Amanda. "How to Quarantine: Lessons from a 19th century Qajar Iranian Prince." *Ajam Media Collective* <https://ajammc.com/2021/07/05/how-to-quarantine-qajar-prince/>

Plague (Yersinia Pestis):

- Varlık, Nükhet. "Tracing Plague in the Ottoman Empire." *Ottoman History Podcast*. <https://www.ottomanhistorypodcast.com/2016/07/plague.html>
- Green, Monics. "Rewriting the Black Death." *Ottoman History Podcast*. <https://www.ottomanhistorypodcast.com/2021/08/green.html>
- Dols, Michael Walters. 2019. *Black Death in the Middle East*. Princeton University Press. <https://press.princeton.edu/books/hardcover/9780691657042/the-black-death-in-the-middle-east>
- Seay, Nicholas. "Ibn Sina as Corona Meme: The Internet Afterlife of a 1950s Soviet Film." *Ajam Media Collective*. <https://ajammc.com/2020/04/16/ibn-sina-corona-meme//>

Spanish Flu (Influenza):

- Yolun, Murat and Metin Kopar. "The Impact of the Spanish Influenza on the Ottoman Empire." *Bellefen* 79, 286 (2015). pp. 1099 – 1120. <https://belleten.gov.tr/tam-metin/249/eng>
- Afkhami, Amir. "Compromised Constitutions: The Iranian Experience with the 1918 Influenza Pandemic." *Bulletin of the History of Medicine* 77, 2. (2003). pp. 367-392. <https://www.jstor.org/stable/44447742>

Malaria:

- Gratien, Chris and Sam Dolbee. "Malaria: Global Themes and Ottoman Connections." *Ottoman History Podcast*. <https://www.ottomanhistorypodcast.com/2013/01/malaria-disease-treatment-world.html>

Global Learning Activity 2

Activity Basic Description:

Students will explore plant biodiversity of Middle Eastern and N. African countries how and why different cultures in the Middle East and N. Africa use plants as medicine.

Objective:

The purpose of this activity is to allow students to view the biodiversity of plants from other regions such as the Middle East and N. Africa and explore how those cultures use plants to make medicine to heal the sick or injured. Students will also learn why some Middle Eastern and N. African cultures prefer homeopathic medicine to western medicine by reviewing humoral theory and ancient beliefs.

Procedure:

This activity will be conducted during Unit 3: Plants, form and function. Students will learn about the different types of plants, plant structure, function and reproduction. This material is provided from an open educational resource built with custom learning tools.

The global activity will include designing a Pinterest board containing relevant information and pictures based on research. Students will have 5 or more credible resources in APA format.

1. Students will research which plants in N. Africa or the Middle East that can be used as medicines or in healing processes.
2. Students will write (typed) a paragraph for each "pin" to describe, in detail, either the procedure on making the medicine, the active ingredient or what ailment it treats. Paragraphs will include the resource(s) in APA format.

Assessment:

Medicinal Rubric (100 points)

	Plant 1 (50 points)	Plant 2 (50 points)
Procedure 2 pins (9 points each)		
Active Ingredient 2 pins (8 points each)		
Ailment 2 pins (8 points each)		

Follow up:

Students will pick a plant from another student's Pinterest board and compare the efficacy of that plant to western medicine in terms of treating the same illness. This will be in the form of a 1-2 paragraph paper with at least 2 credible sources in APA format.

Resources:

Aramco World

- <https://www.aramcoworld.com/Search?searchtext=spice+medicine&searchmode=anyword>

Pinterest

- <https://www.pinterest.com/>

Medicinal Plants: Historical and Cross-Cultural Usage Patterns

- <https://www.sciencedirect.com/science/article/abs/pii/S1047279705000578>

Traditional uses of medicinal plants practiced by the indigenous communities at Mohmand Agency, FATA, Pakistan

- <https://ethnobiomed.biomedcentral.com/articles/10.1186/s13002-017-0204-5>

A review of the medicinal plant of the Middle East and North Africa

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7451596/>

The State of the Art of Traditional Arab Herbal Medicine

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1475945/>

Medicinal Plants of the Middle East

- https://www.researchgate.net/publication/330484061_Medicinal_plants_of_the_middle_east

Medicinal Botany

- <https://www.fs.fed.us/wildflowers/ethnobotany/medicinal/index.shtml>

Traditional Medicines in Africa: An Appraisal of Ten Potent African Medicinal Plants

- <https://www.hindawi.com/journals/ecam/2013/617459/>

11 Plants in African Forests That Are Curing Diseases

- <https://theculturetrip.com/africa/ghana/articles/11-plants-in-african-forests-that-are-curing-diseases/>

A review of commercially important African medicinal plants

- <https://www.sciencedirect.com/science/article/abs/pii/S0378874115301896>

African Herbal Medicines: Adverse Effects and Cytotoxic Potentials with Different Therapeutic Applications

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8199769/>

The Traditional Medicine and Modern Medicine from Natural Products

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6273146/>

Herbal versus Synthetic Medicines

- <https://www.news-medical.net/health/Herbal-versus-Synthetic-Medicines.aspx>

Integrating modern and traditional medicine: facts and figures

- <https://www.scidev.net/global/features/integrating-modern-and-traditional-medicine-facts-and-figures/>

Healing herbs: Seven ancient plant remedies from the Arab world

- <https://www.middleeasteye.net/discover/home-remedies-cold-seven-traditional-arab-world>

Humoral Theory (Akhlat) & Temperament (Mizaj):

- *Canon of Medicine* by Avicenna (Ibn Sina):
https://data.nur.nu/Kutub/English/Avicenna_Canon-of-Medicine_text.pdf

- Ormos, Istvan. "The Theory of the Humours in Islam (Avicenna)." *Quaderni di Studi Arabi* 5/6 (1987-88). pp. 601-607. <https://www.jstor.org/stable/25802633>

Miasma Theory & Urbanism:

- Fahmy, Khalid "An Olfactory Tale of One City: Cairo in Khedival Times" in *In Quest of Justice Islamic Law and Forensic Medicine in Modern Egypt*. University of California Press (2018). <https://www.ucpress.edu/book/9780520279032/in-quest-of-justice>

Medicine and Medical Institutions

- Ragab, Ahmed. "Islamic Hospitals in Medieval Egypt and the Levant." *Ottoman History Podcast*. <https://www.ottomanhistorypodcast.com/2015/07/islamic-hospitals-in-medieval-egypt-and.html>
- Mossensohn, Miri Shefer. 2010. *Ottoman medicine: healing and medical institutions, 1500-1700*. Albany, N.Y.: SUNY Press. <https://www.sunypress.edu/p-4768-ottoman-medicine.aspx>

Global Learning Activity 3

Activity Basic Description:

Students will explore the ecosystem around a Middle Eastern or N. African country of their choice. They will analyze how humans have changed biodiversity over time by gathering data on the changing landscapes from 1700 to present time. They will then evaluate a specific species that occurs on the IUCN list at a level of vulnerable, endangered or critically endangered and create a Species Profile and Global Status Review.

Objective:

The purpose of this activity is to allow students to view the biodiversity of animals from the Middle East and N. Africa and evaluate how humans have had an impact on the evolution of a species. Students will become aware of the behaviors that cause negative consequences on the land as well as to the animals that live within it. By creating a species profile and global status review, students will gain insight into how to conserve and promote a species to maintain the regions' biodiversity.

Procedure:

1. This activity will be conducted during Units 4 and 5: Vertebrates and Conservation. Students will learn animal diversity, ecology of living things and the environment. This material is provided from an open educational resource built with custom learning tools.

2. Students will begin by opening [Biome Viewer](#), a virtual tool by HHMI Biointeractive. In the search box, the students will enter the country of their choice either from the Middle East or N. Africa. A pop-up box will appear, click "save" to put a star on the map. Click "more" to view the information for the area. To return to the main screen click the white 'x' in the upper right hand corner.
3. The information on the left side of the screen will allow the student to scroll through Biomes, Anthromes, Temperature, Precipitation and Terrain. The focus will be on Anthromes in which exploration of what happens to the land use in country during the changes of centuries will be observed.

Part 1: Students will complete the information tables and questions listed below on how land development affects species richness.

Anthrome Observation

Year	Anthrome	Changes
1700		
1800		
1900		
2000		

1. Define species richness.
2. Define species abundance.
3. What is the species richness of your country in the 2000 century?
4. How many species are listed as "least concern" on the IUCN list? This number give the idea of species abundance in that region.
5. Make a claim founded by evidence on how human interaction could have made an impact on the biodiversity of that region of the Middle East or N. Africa.

Description of species richness, abundance and IUCN status within (your country's name)	
Claim	
Evidence	

Part 2: Students will pick an animal of their choice by using the biome viewer. This animal must be on the vulnerable, endangered or critically endangered IUCN list. Click "more" then "wildlife". Using the information on this app, the *Encyclopedia of Life* located in the description section of the animal, or other



credible resources students will build a Species Profile and a Global Status Review.

Species Profile and Status Review will include the following and will be written as an article that may appear in a biological conservation newspaper, magazine or textbook. The purpose of the article will be to educate the public on a declining species, the human impact on biodiversity and how we can promote species richness and abundance. Students can also include any social movements towards ending climate change and how they may help educate and involve the general public.

Current conservation status

- a. IUCN red list.

Species description

- a. Identified by scientific name and common names.
- b. Include a photograph or drawing.
- c. Morphological, behavioral, genetic and ecological aspects of the species biology. (Emphasis on what makes the species prone to threats).

Species function and values

- a. Current cultural, socio-economic, legal and religious significance the species has to people.
- b. Ecosystems described such as predator-prey relationships, competition, mutualisms, and species role in creating or changing ecosystems.

Historical account of species

- a. Historical distribution including maps.
- b. How did the species come to be of a concern?

Current distribution

- a. Maps of recent surveys of the species.
- b. Population size estimates including mortality data and reproductive data.

Habitat and resource assessment

- a. Requirements of the species including food, water, shelter and any key resources such as prey types.
- b. Map of ecological setting of species including a review of land type and land use. Research some of the ecosystem types in this region. Have any habitats been taken away due to influence of agriculture, religion or government?
- c. Description of gains and losses of species habitat.

Threat analysis

- a. Identify primary threats to species such as exploitation, habitat destruction/modification, and competition for resources including people or domestic animals, diseases, climate change. Use of tables in Part 1 will be helpful.

- b. It is important to determine natural threats that limit population size from other threats listed above. For example, lions keep cheetah population levels in check by predation.
- c. Categorize into most serious to least serious.

Ongoing conservation and management actions

- a. Identify current measures, including social movements, which are in place to contribute to the conservation of the species at a specific site or world-wide.

Possible add on: Have students present their news report in the format of a biological reporter such as on the National Geographic Channel. Students can make a short video report using all of the above information and deliver this news to the general public (classroom).

Assessment

This review or profile should be based on hard data including well conducted surveys on population growth, reproductive rates, causes of mortality and rates of change in habitat as well as rates of exploitation by humans. Be sure to include any current events such as social movements and government involvement within the region that influence habitat change or destruction.

Fellow students will perform a critique of classmates' written report and or video report.

Key citations in APA format from scientific literature must be included.

Resources:

HHMI Biome Viewer

- <https://www.biointeractive.org/classroom-resources/biomeviewer>

Ecology Project International Classroom

- <https://www.ecologyproject.org/epi-classroom>

Encyclopedia of Life

- <https://eol.org/>

International Union for Conservation of Nature

- <https://www.iucn.org/>
- <https://www.iucn.org/resources/conservation-tools/iucn-red-list-threatened-species>
- <https://www.iucn.org/species/about/species-survival-commission>
- <https://www.iucnredlist.org/>

Summary of conservation evidence for the effectiveness of conservation actions

- <https://www.conservationevidence.com/>

Habitat loss in MENA

- <https://www.ecomena.org/habitat-loss-in-mena/>

Middle Eastern Biodiversity Network

- https://www.researchgate.net/figure/Terrestrial-biodiversity-in-the-Middle-East-is-strongly-infl-uenced-by-seasonality_fig1_40846142

Assessing national human footprint and implications for biodiversity conservation in Iran

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7320097/>

Biodiversity in a changing Middle East

- <https://www.sciencedaily.com/releases/2011/06/110624083519.htm>

Predicting climate change impact on Afro-Arabian biodiversity

- <https://www.natureasia.com/en/nmiddleeast/article/10.1038/nmiddleeast.2019.18>

How biodiversity conservation supports human well-being

- <https://www.awf.org/news/how-biodiversity-conservation-supports-human-well-being>
- [eBird: Bird distributions, habitats, etc.](#)
- <https://ebird.org/explore>

Fishbase: Fish taxonomy, life history, uses and historical data

- <https://www.fishbase.in/home.htm>

Global Biodiversity Information Facility: funded by governments to provide open access to data

- <https://www.gbif.org>

Ocean Biogeography Information System: marine organism distribution, abundance and diversity

- <https://mapper.obis.org>

Biodiversity, Environmentalism, and Conservation

Socotra (Red Sea)

- <https://whc.unesco.org/en/list/1263/>

Persian Gulf Coral Reefs

- https://link.springer.com/referenceworkentry/10.1007%2F978-90-481-2639-2_123

Caspian Sea

- <https://www.worldwildlife.org/ecoregions/pa1308>

Lebanon Cedar Forest

- <https://www.forest-monitor.com/en/the-complex-adaptive-ecosystem-of-tannourine-cedar-reserve-in-lebanon/>

Ecosystems

- Oasis, Desert, Semi Desert Ecosystem
 - Rub al-Khali
 - Arabian Peninsula coastal fog desert
 - Sahara Desert
- Salt Flats
 - Dasht-i Kavir, Iran
 - Dasht-I Lut, Iran
 - Sabkhat al-Jabbul, Syria
- Indian Ocean / Monsoon Ecosystem
 - Dhofar, Oman
 - Mangrove Forests in the Persian Gulf
- Rain Shadow plains and Woodlands
 - Caspian Temperate Forests in Iran
 - Cilician plain in Turkey
- Alpine Ecosystem
 - Zagros Mountains
 - Taurus Mountains
 - Caucasus Mountains
- Endoreic Basins
 - Caspian Sea
 - Aral Sea
 - Urmia Lake
 - Lake Van
 - Dead Sea
- Alluvial Ecosystem
 - Nile River and Delta
 - Tigris and Euphrates

Climate Change and Conservation

- Desertification: UAE, Egypt, Saudi Arabia
- Deforestation: Lebanon, Turkey.
- Urbanization: Everywhere
- Damming and Water Stress
 - Egypt: Aswan High Dam
 - Iraq and Turkey: Dams on the Tigris and Euphrates
- Sea Level Rise
 - UAE
 - Egypt

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- Lake Water Loss and Diversion
 - Urmia Lake
 - Caspian Sea
 - Wetlands Destruction
 - Mesopotamian Marshes
 - <https://www.wetlands.org/publications/directory-of-wetlands-in-the-middle-east/>