**Course Title:** Environmental Science

**Course Number:** BIOL 1103

**Course Hours:** 3 class hours, lecture (3 Credits)

**Prerequisites:** none

**Course description:** Introduction to the basic characteristics and dynamics of the ecosystems. The effects of the increasing and changing human demands on our environment are explored. Includes an environmentally based lab-like experience. An optional 1-credit lab is also offered.

**Course Context**: BIOL 1103 is an introductory course for non-science majors, although it is also a core required course for our A.S. in Environmental Science degree.

**Course Topics:**

1. Ecosystem structure and function, including:

a. the process of energy flow

b. the process of material cycling

c. population dynamics

2. Nature of biological communities, including:

a. the types of significance of species interactions

b. the nature of ecological succession

c. the concept of biomes

3. Application of evaluative thinking in classroom studies, including:

a. hypothesis formation and the objective collection and evaluation of information

b. objective means of evaluating claims and positions

4. Economically and ecologically important resources, including:

a. renewable resources

b. nonrenewable resources

c. intangible resources

5. Evaluate and describe significant environmental dilemmas associated with activities of human societies, including:

a. the consequences of continued exponential growth of human populations

b. the potential for global climate change

c. ecosystem destruction

d. the loss of biological diversity

e. defining and defending a reasoned personal position on how to contend with the above problems

6. Describe the concept of sustainability, including:

a. identification of both sustainable and non-sustainable practices

b. the economic, ecological, and social dimensions of sustainability

c. creating a model of sustainable future

7. Describe the options for effecting change in our society, including:

a. those options open to individuals and groups

b. the role of government and the political system

8. Explain the concept of environmental ethics, including:

a. contrasting the world views of native peoples with the dominant world view of society today

b. the concepts of racial and intergenerational justice

c. identifying values and precepts that would be compatible with an ethic that upheld environmental integrity

**Materials Used:** Climate of Change, Unit 5: Systems@Play

**Introductory Statement:** I taught two sections of online Environmental Science, and two sections of seated, traditional delivery Environmental Science. The classes I used this module with was the two sections of traditional/seated students. In one section, there were approximately 50 students, and in the other section, there were approximately 30 students of various backgrounds and academic preparation. I introduced this module as an active learning opportunity after I had introduced the primary concepts of atmospheric science and greenhouse gases/greenhouse effect. We did the activity as a jigsaw, where we first assembled into teams representing the climate forcing factors and talked through the model iterations, and then subsequently reassembled into groups with one forcing factor represented in each group, and then walked through as many rounds/iterations of the climate model as time allowed. The students were receptive to the exercise, and very engaged in discussion of the often conflicting effects of the forcing effects.

**Inspirational Quote:**

“Students were very engaged and actively discussed the interactions of multiple climate forcing factors in the role of global warming. I heard students comment more than once that they had never before considered how so many things were connected to climate and climate change.”

**My Experience:** I adapted this module to provide an active learning opportunity about climate models and climate change in lieu of either lectures or videos that I have shown previously on the topics.

**Module Relationship to Course:** The course is on a semester schedule and we met three times a week for fifty minutes each class meeting. I used the modules during all instructional time during the two weeks allotted for atmospheric science and climate change, or approximately 10% of the semester. All introductory course material concerning these topics had been introduced prior to beginning this module which allowed students to understand the basic concepts and refer to the appropriate sections of the textbook when and if necessary.

**Unit by Unit:**

Week 1: Unit 5 – Lecture Instruction, Preparatory Reading and Discussion

* Class Period 1: Preparatory Reading and Discussion
  + Students completed the Unit 5 Reading: Your Climate Family before coming to class.
  + Students used this class period to talk through new vocabulary and conceptual questions provided at the end of the reading.
  + My role was to facilitate their small group discussions, answer questions, clear up ambiguities, and ask pointed questions to ensure their discussions were on topic and they were getting the background information needed.
* Class Period 2: Lecture
  + I used the Unit 5 lecture slides and notes provided, and integrated them with my course materials and lecture (based on materials from Withgott and Laposata Essential Environment, 5th edition).
  + We made sure to address any remaining questions or muddy points from the new vocabulary and conceptual questions from the previous day.

Week 2: Case Studies and Climate Model Activity

* Class Period 1: Case Study 5.1 – Interactions: Climate’s Tangled Web
  + Students received Case Study 5.1 Assignment at end of previous class, and were expected to read through it in preparation.
  + We began by breaking students into groups representing the climate forcing factors (outlined at the top of the 2nd page of the Case Study 5.1 handout and also provided as row on the Climate Response Sheet). We omitted the “Tectonics” group.
  + We walked through two rounds of the model, having students in “climate forcing factors” groups, so that they could get a good understanding of how to fill out their climate scenarios sheet.
  + Then, we rearranged and reassembled into mixed groups so that each student group was comprised of 6 students, each representing a different climate forcing factor. We then continued through as many rounds of the interactive climate model as time allowed during class.
* Class Period 2: Case Study 5.2 – Interpretations: Reading the Book of Earth
  + We didn’t finish all rounds on the Climate Scenario sheets in the previous class period, so we finished that up at the beginning of this class period.
  + I presented Case Study 5.2 intro/mini lecture using materials provided on the Integrate website.
  + Students were to complete Case Study 5.2 as an assignment outside of class. They had the option to work individually or with a partner.
    - Note: if doing this exercise as part of a homework I think the twelve suggested resources from the module will work but if in class three was difficult for some students.
    - Note: Students were able to complete the lesson but if you are thinking about expanding beyond one lesson it is probably ideal to try it with one first.

**Assessments:** There were no formal assessments of student progress for the module beyond student products from each activity. I did have questions based on the concepts in the model activity on the regular unit exam, as well as a data interpretation question on the exam for which students needed to read and interpret data from a graph they had seen during the activity.

**Outcomes:** My goals for the module were for students to learn core concepts about climate and data evaluation through interaction and engagement in problem solving. I think we were successful in achieving those goals, as students performed well on exam questions about climate change and data interpretation. I implemented this module pretty much as written and presented on the Integrate website, but in the future, I would make some minor modifications and adaptations to allow it to better fit into the time constraints of my classes, as well as add/edit some of the questions to make them consistent and align with the text materials students are also using in my course. At the end of semester evaluation, a few students specifically referenced this activity as enjoyable or beneficial when asked what they enjoyed about the course (choosing from activities and topics we had covered during the entire semester).