

Destination 2018: Sustainability Lesson Plan

NAME: RICARDO SILVA

CAMPUS: WEST

DISCIPLINE: BIOLOGY

The goal of this lesson plan is to help you decide why and where you will infuse sustainability to improve student learning. Remember that sustainability is not an "add-on" content area; rather, sustainability can be integrated into already existing lessons as in-class examples of concepts and as a context for activities and problem sets that promote critical thinking.

Week 1: Needs Assessment

This week you will write a needs assessment for your lesson, learn about SDG goals, and identify 3 goals that could align with your course and topic.

Needs Assessment

1. Write your Needs Assessment:

(examples)

General Biology I (BSC1010C): The topic that my students struggle with the most is the relationship between chemistry and biology, in particular, elements, and molecules!

2. Explain why you think infusing sustainability will help this need:

(examples)

I believe that infusing sustainability will help make a connection between the origin of elements, the composition of earth, the composition of life, the effects of certain elements on life, and the importance of water and it's conservation.

3. State where (course or area) you are infusing sustainability and the topic:

(examples)

General Biology I (BSC1010C): The topic is, the fundamentals of molecular structure and functions in biology

Research SDGs

Visit the [Sustainable Development Knowledge Platform](#) to research the Sustainable Development Goals.

4. Choose at least 3 of the SDGs of interest that could align with your topic and share why:

(examples)

Goal 6: Ensure access to water and sanitation for all. It is important to understand the relation between freshwater, food security, human health, and global inequalities. It is important to understand that our actions have consequences and how these actions and consequences are directly related to goals 12 and 15.

Goal 12: Ensure sustainable consumption and production patterns. If we understand the relation of freshwater and life, in particular human life, then we can educate on sustainable consumption and lifestyles. We can propose alternatives to be implemented in our neighborhoods.

Goal 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss. The video documentary on how Wolves change Rivers will be presented as an example of good environmental management practices and unforeseen consequences. We will discuss options that could be developed in our communities to mitigate the effects of water scarcity and compare them with possibilities available in countries with physical water scarcity, such as desalination, cloud harvesting, recycling, and other techniques.

Week 1 Reflection

5. Now that you have completed this week's portion of the template, reflect on the following:

- a. I'm excited about adding more value to my teaching.
- b. I have questions about how will students respond to all this information, in particular the severity of the situation.

Week 2: Learning Outcomes/Research

This week you will write the student learning outcome for your lesson, explore lesson plan examples, look at a variety of classroom assessment techniques, and consider how you could incorporate the 3 Pillars of sustainability with a learning activity.

Student Learning Outcome(s)

The Student Learning Outcome is a statement of what the student will learn or be able to do because of this lesson. For more information on how to write a measurable learning outcome, review the following resources:

[How to write a Student Learning Outcome \(Slides 1 to 5\)](#) | Bloom's Taxonomy Resources - [Bloom's Taxonomy Action Verbs](#), [Bloom's Interactive Graphic](#), [Bloom's Taxonomy of Learning Domains](#)

6. Write your Learning Outcome:
(*examples*)

- *Students will be able to classify elements in the periodic table according to their function in living systems. Specific categories: Essential, Supplementary, inert, toxic/poisonous, radioactive.*
- *Students will be able to analyze interconnectivity and water usage as they relate to sustainable consumption and production patterns.*

Sustainability Lesson Plan Samples

Explore the following resources for lesson plan ideas:

- [Sustainability teaching activities across the disciplines](#) (Repository developed by Carleton College)
- Lesson plans organized according to conceptual Sustainability Systems: [Water](#), [Energy](#), [Food](#), [Waste](#), [Landscape & Ecosystem](#), [Supply Chain](#), and [Quality of Life](#) (Developed by ASU faculty)
- [AASHE Curriculum Resources Hub](#) (requires login)

7. Of the lesson plans you've explored, pick 3 and share why you selected those:
([examples](#))

Activities presented by ASU are very good, however have two important limitation when related to my particular lesson plan schedule. The first limitation is that they are set up in a deserted area (Arizona); the second is that most of the lessons have activities for several days. In the case of General Biology, there are so many topics to cover every class that is very difficult to include an activity that could transition various class periods. I have selected lesson plans that are relevant for general biology, could be adapted for a one day session and to Floridian ecosystem and water cycle!

- *Loads of Work (Riparian Systems): This lesson plan covers the transition area between terrestrial and aquatic ecosystem. The lesson includes an outdoor activity simulation. This lesson was developed for Arizona, however it can be modified for the Floridian ecosystem and it could be accompanied by an outdoor activity at Lake Pamela. We can explore the effects of Floridian Riparian Systems in wetlands and swamps, and how this is affected by urbanization, and pollution.*
- *Break the Cycle: Water bottle life cycle: This lesson plan is very relevant and easy to follow, it can be directly inserted into my current lesson plan, when talking about the importance of water for life.*
- *Untangling the Food System: Again this lesson plan aligns well with my learning outcomes, especially the snicker bar activity. It covers two important subjects: interconnectivity and water usage. I could adapt it and insert it into my current lesson plan!*

Classroom Assessment Techniques

Explore the following resource for Classroom Assessment Techniques:

- [101 Strategies to Demonstrate the Essential Competencies](#) – a college of classroom assessment techniques aligned to the essential competencies of a Valencia educator prepared by Valencia faculty Donna Colwell and Kevin Colwell
- [50 CATs by Angelo and Cross](#)
- [Classroom Assessment Techniques](#) by Northwest Evaluation Association

8. Of the CATs you've explored, pick 3 and share why you selected those:
([examples](#))

I have selected three CATs that would be consistent with the lesson plan ideas previously selected and the proposed learning outcomes:

- *Debate or Opposing Viewpoints: In either case students could discuss their position regarding pros and cons of the activity. For example if we use the food system activity they could talk about advantages and disadvantages of GMO's with respect to Pesticides or water usage.*
- *Shared Viewpoints: Similar to the prior example, students could share their viewpoints, especially if they come from different cultural backgrounds.*
- *Quick Case Study. Any of the selected lesson plan activities are case studies, so this would be an appropriate way of assessing their learning outcomes!*

3 Pillars Activity Idea

Review the 3 Pillars Worksheet.

9. Describe an activity that incorporates the 3 pillars:
([examples](#))

I would adapt the “Loads of Work (Riparian Systems)” lesson plan for the Floridian ecosystem and water cycle! We can explore the effects of Floridian Riparian Systems in wetlands and swamps, and how this is affected by urbanization, and pollution. The Orlando Wetlands Park Cleans Our Water video available in YouTube would be a great example of sustainable use of wetland resources for water treatment based on the three pillars. We could try to add an outdoor activity at Lake Pamela.

Week 2 Reflection

10. Now that you have completed this week’s portion of the template, reflect on the following:

- a. I’m excited about... Connecting the idea of urban development with sustainability and environmental preservation.
- b. I have questions about... How we could actually take student proposals to decision makers for their study and discussion.

Week 3: Putting it All Together

The goal for this week is to create an activity that incorporates the SDG, CAT, and connection to the 3 Pillars of sustainability.

SDG Selection

11. Choose the SDG that aligns best with your Needs Assessment/Student Learning outcome and explain why:
([examples](#))

Goal 6: *Ensure access to water and sanitation for all. It is important to understand the relation between freshwater, food security, human health, and global inequalities. It is important to understand that our actions have consequences and how these actions and consequences are directly related to goals 12 and 15.*

CAT Selection

12. Choose the CAT that aligns best with your Needs Assessment/Student Learning outcome and explain why:
([examples](#))

Quick Case Study using the Jigsaw technique.

3 Pillars Activity

13. Describe how you will incorporate the 3 Pillars into your activity:
([examples](#))

Watch Fabulous Wetlands with Bill Nye The Science Guy (1989), and Orlando Wetlands Park Cleans Our Water videos, both available from YouTube.

After watching the videos, students will be separated into three “Expert teams”: People, Planet, and Profit. Each expert team will:

- *Review City of Orlando current Green Works Orlando initiatives <http://www.cityoforlando.net/greenworks/>*
- *How do the Green Works Orlando initiatives address the ENVIRONMENTAL concerns?*
- *How do the Green Works Orlando initiatives address the SOCIAL concerns?*
- *How do the Green Works Orlando initiatives address the ECONOMIC concerns?*
- *From your “Expert” position, how would you adapt the Cleveland Urban Design Opportunity Corridor for Orlando?*
- *Write an “Expert” position statement regarding an “Orlando Opportunity Corridor”*

Students will be regrouped in three new groups with members of each “Expert Team”. The integrated groups will review Cleveland Urban Design Opportunity Corridor,

https://www.cleveland.com/metro/index.ssf/2014/06/with_green_light_for_opportuni.html

- *Considering the Estimated Growth for Tampa-Orlando (2000-2050), each team will develop a proposal for Green Works Orlando that will mitigate wetland loss and permit the population expansion!*

Activity Draft

14. Create a draft of the activity using the SDG, CAT, and 3 Pillars:
([examples](#))

This lesson plan is based on the Constructivist learning theory, emphasizing individual and cooperative learning through the connection of their prior knowledge, with new ideas and experiences, to develop new and enhanced understanding.

The class is part of the global study track, so it includes an international component, in this case, the love story of Pierre and Marie Curie. It is also part of Valencia Sustainability, so it includes a relevant case study as closure to the in-class component. Class content is supported on chapters 2 and 3 of the book.

Most learning objectives will be met prior to the class, by watching three videos and answering the respective questions.

- *The Nucleus: Crash Course Chemistry #1*
- *Atomic Hook-Ups - Types of Chemical Bonds: Crash Course Chemistry #22*
- *Water - Liquid Awesome: Crash Course Biology #2*

Students will also read both chapters of the book and answer Mastering Biology chapter related questions.

In class, concepts will be assessed through Socratic Method questioning, and at the end of the class, students will connect all the information through a Quick Case Study using the Jigsaw technique and covering sustainability three pillars. See attached PowerPoint Presentation, and lesson plan template.

15. Explain how the activity aligns with your Needs Assessment/Student Learning Outcome
([examples](#))

As explained previously, I am teaching General Biology I (BSC1010C), and the topic that my students struggle with the most is the relationship between chemistry and biology, in particular, elements, and molecules! Modified Student Learning Outcomes for this particular section are:

- Students will be able to classify elements in the periodic table according to their function in living systems. Specific categories: Essential, Supplementary, inert, toxic/poisonous, radioactive.
- Students will be able to analyze interconnectivity and water usage as they relate to sustainable consumption and production patterns.

The activity allows students to make a connection between the origin of elements, the composition of earth, the composition of life, the effects of certain elements on life, and the importance of riparian systems in water purification and it's conservation. It is directly related to the City of Orlando so they should be able to appropriate the concepts as they relate to their immediate environment.

Week 3 Reflection

16. Now that you have completed this week's portion of the template, reflect on the following:

- a. I'm excited about the way my students are going to respond to this new jigsaw activity.
- b. I have questions about presenting alternative lifestyles to my students, they are too comfortable with "The American Way" and not very familiar with other city living standards!

Week 4: Lesson Plan Draft

This week you will finalize your activity and create directions for students.

17. Prepare a set of instructions on how to facilitate this activity.
([examples](#))

Answer the following questions:

What prior knowledge will students need to be successful with this activity?

This is only the second lesson in the course, so the only prior knowledge students will count with corresponds to the first lesson where the concepts of life and scientific method are introduced. Since this is a flipped classroom environment, students would have already read the corresponding chapter, watched the curated videos and answered the corresponding mastering biology questions. They will also bring their own experience regarding the importance of water and its preservation.

What needs to be setup prior to delivering the lesson?

Since this is a flipped classroom environment, a learning management system is required. In our case we are using Canvas. We are also utilizing Pearson's Mastering Biology resources.

What resources and materials will you need?

For the "in-class" component of the lesson, we require a video projector with access to the internet and to you-tube. Students also require internet capable devices to review the information that they are going to use for the jigsaw exercise.

How do you plan to introduce the topic?

It is a progressive introduction, starting with the nature of elements, how elements are formed in connection to universal evolution, the development of complexity and emergent properties. We introduce the essential elements for life and how these relate to those elements considered toxic and poisonous. From this stepping stones we move to the properties of water and carbon-based compounds and this opens the door for water conservation and sustainability. When they reach the jigsaw activity they already have a background to understand the situation.

How will you keep students engaged?

I like to flip between different pedagogical strategies, and multiple teaching aides. I use the PowerPoint, the white-board, guided student internet searches, videos, animations, etc. The best way to keep them engaged in my opinion is to switch focal points!

Step-by-step run of the activity

Now that you have addressed the questions above, include directions in the draft of your activity

Prior to class (Flipped Classroom component): Watch three videos and answer the respective questions in Canvas.

- *The Nucleus: Crash Course Chemistry #1*
- *Atomic Hook-Ups - Types of Chemical Bonds: Crash Course Chemistry #22*
- *Water - Liquid Awesome: Crash Course Biology #2*

Read chapters 2 and 3 of the book and answer Mastering Biology chapter related questions.

In class, use the PowerPoint presentation, discuss:

- *Organization of the Periodic Table*
- *Atomic Structure, including concept of isotopes*
- *The discovery and classification of elements as an international endeavor (Discuss the love story between Pierre and Marie Curie)*
- *Origin of the Universe and atomic evolution of the periodic table*
- *Nature of elements as they relate to living systems*
- *Water and it's properties*
- *Carbon and it's properties*
- *Hydrophilic versus hydrophobic molecules*
- *Importance of water for life*
- *Sustainable use of water*

Complete the lesson with a Quick Case Study (Florida Riparian Systems) using the Jigsaw technique.

Week 4 Reflection

18. Now that you have completed this week's portion of the template, reflect on the following:

- a. I'm excited about implementing this lesson plan during the fall semester.
- b. I have questions about the impact that this lesson plan could have within the students. Will they understand the importance of water ecosystems and their conservation for sustainable human existence?