Destination 2018: Sustainability Lesson Plan

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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)

Some students have difficulty understanding the scientific process and scientific reasoning. This need is also a critical part of the Science General Education Assessment. Scientific reasoning requires critical thinking…which is somewhat of a challenge to "teach."

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

To address scientific method in my non-majors Biology class (BSC1005), I usually try to find an article that students can connect to. Infusing sustainability into the curriculum will allow the students to apply and understand scientific reasoning in a topic that is relatable and applicable to their lives. In addition, it will increase their awareness of what is going on globally rather than just in their neighborhood, and that things that they do and decisions they make can have an unanticipated effect on others.

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

I plan to infuse sustainability in my BSC1005 (Biological Science) class. Students in this class tend to be nonmajors, and this is the only class they may have where the environment is addressed. The topic will be on Scientific Method/ Scientific Inquiry, which is covered in the first chapter.

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)*

    1. *Number 11: Sustainable Cities and Communities*
    2. *Number 3: Good Health and Well-being*
    3. *Number 12: Responsible Consumption and Production*

    The topic of interest is regarding overharvesting and how our decisions can have unanticipated effects. Therefore students will gain an understanding of our choices in food (and the sources of these foods).

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…providing means for students to do undergraduate research at Poinciana Campus.

    b. I have questions about…how to design the project so that it suits students with different interest or time available to invest in the project. Also, although it seems that the BSC1011C class and the PEaS club are separate, one provide the means for the other. However, I would like to know if to keep these separate, or if not, how to make sure that the balance is right.

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 Measurable Learning Outcomes | 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 demonstrate analytical skills and critical thinking. (This one is from course outline)

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*)

1. *https://serc.carleton.edu/sisl/2012workshop/activities/83569.html*
   Salt Marshes: estimation techniques using basic algebra and geometry: although this lesson plan was designed for a math class, the appeal is that I can apply it (with modifications) to a biology class to address the scientific method and reasoning. In this case the students do not have to do an experiment, but they can use data provided to draw and analyze graphs, identify/create hypotheses, make predictions and draw conclusions.
2. *https://serc.carleton.edu/sisl/2012workshop/activities/70659.html*
   A Monarchy Deposed: The Demise of the Monarch Butterfly: similar to the one above, this lesson plan was designed for a math class. However, the topic (Monarch butterfly as an endangered species) is one that I have begun my BSC1011C class for the past two semesters. Usually I provide a research article and they are required to identify key components of a scientific research article (e.g. hypothesis, results, etc.). However this lesson plan approaches the topic from a different angle providing opportunities to use critical thinking rather than just searching for answers within an article.
3. *https://static.sustainability.asu.edu/docs/sustainableschools/toolkit/Multi-Day-Lessons/CommonsLessonPlan.pdf*
   Sustainable science for sustainable schools: 5-day tragedy of The Commons and fishing game lessons → This lesson plan is an interactive classroom activity in which students act out the scenario of overfishing (there are real fish in this activity…well goldfish crackers). This activity would be suitable for my non-majors course (BSC1005), which is an alternative course in which I can address sustainability if the majors class (BSC1011C) does not work. If I do apply it to the majors class, I will most likely modify it to suit the class.

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)

*1. **Symposium:** I currently use this in my BSC1011C course in which they present a research article. In this case, they will present their own findings rather than the findings of others.*
*2. **Field research**: This aligns to my original idea of having the students conduct an experiment and write a report on their findings. In this case it would be accompanied by a rubric.*
*3. **Pro-and-Con Grid:** This is used to assess critical thinking and analytical skills, which is the aim of my SLO. In this CAT, students must identify advantages and disadvantages of the subject discussed. At the heart of sustainability is the concept of trade-offs…determining cost-benefits and whether the benefits outweigh the cost.*

3 Pillars Activity Idea

Review the 3 Pillars Worksheet.

9. Describe an activity that incorporates the 3 pillars:
(*examples*)

The activity mentioned previously about The Commons and overfishing would be a great way to integrate the 3 pillars. Students would be required to summarize the activity by determining the economic, social, and environmental cost/benefits of the scenario that they reenacted. Students can create a pro-and-con grid to identify both the benefits (if any) and disadvantages (if any) of overfishing.

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…creating/designing the activity for the class.

b. I have questions about…finding/creating one that is suitable for the students in the course; I am also concerned about how to intersperse it throughout the course in a manner that is smooth/non-intrusive. It would be best as an ongoing topic from the beginning to the end of class rather than an inserted activity at some point during the semester. I am also concerned that my focus is still too broad.

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)*

Number 12: Responsible Consumption and Production

The Commons focuses on the effects of overfishing. It ties in with taking responsibility on what we consume and how we obtain the things that we consume.

CAT Selection

12. Choose the CAT that aligns best with your Needs Assessment/Student Learning out come and explain why: (*examples*)

Students will create a pro-and-con grid of overfishing. This will allow them to identify the benefits and cost of overfishing that relates to economic, environmental, and social concerns.

I will also include a worksheet that addresses identifying components of the scientific method. This worksheet will be based on results obtained from the students "experiment" on overfishing. This would be as a summative assessment.

3 Pillars Activity

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

The pro-and-con grid will be designed to address the economic, environmental, and social tradeoffs of overfishing. This can occur in Day 3 when students are required to "brainstorm solutions" to go from unsustainable to a sustainable fishing.

Activity Draft

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

The Commons activity already has a five day step-by-step guidelines for the assignment. My goal is to follow the guidelines. However, for Day 3, I will include the pro-and-con grid as mentioned above. In addition, I would like to include a video either as in introduction to sustainability or as a summary/conclusion to the activity. (I have not found one yet.)

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

My needs assessment was regarding student skills in scientific reasoning and analytical/critical thinking. Having them create the graph from the data, interpret the results, and identify the potential concerns raised by the results ensures that use critical thinking and scientific reasoning through the activity. The pro-and-con grid on Day 3, the students' reflection on Day 5, and the worksheet on scientific method will assess student understanding.

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…(well…more concerned because I had to do a major overhaul of what I began with in Week 1)

b. I have questions about…the three pillars. Are these just Environmental, Economic and Social, or does it refer to the Steps 1 – 3 in the 3-pillars worksheet (Identify, Social, Economic and Environmental systems involved; Identify stakeholders; Design potential solutions)

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?

We will review the scientific method and graphing (both will be relevant to the graphing and analyzing of the graph). There will also be key terms that the students should know prior and during each portion of the activity. Most of these terms have already been addressed in parts of the activity under "Key Vocabulary."

What needs to be setup prior to delivering the lesson?

Besides the materials addressed in the next portion, I would need to ensure that the Excel spreadsheet is already set in place. I will also have to reserve a classroom that allows for the activity. For example, classroom with individual chairs (which is bountiful) would not be a good choice, compared to a classroom with tables (which is limited on our campus).

What resources and materials will you need?

Materials are required to simulate what occurred at The Commons. Students will need fishing poles (spoon), containers to hold the fish (napkins), the ocean (bowl), and fish (goldfish crackers).

Handouts/worksheets for each sub-activity will need to be printed; pre-set Excel spreadsheet

How do you plan to introduce the topic?

I would like to use a video to introduce the topic and sustainability in general. I am still trying to figure out at what point in the semester to include the activity. Most likely, I will do so towards the second half of the semester when we begin to cover interaction of organisms, etc.

How will you keep students engaged?

The fact that the activity covers a day-by-day format and that each builds on the other would in itself keep the students engaged. In addition, they are required to make decisions/predictions and observe what happens when these decisions/predictions are applied. They are not just reading about what happened, they are doing what happened.

Step-by-step run of the activity

Thankfully, the activity is already designed as a step-by-step process covering days 1 – 5.

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

Put your response here

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…finding an activity that meets my need. I think that because I began in Week 1 with too broad a goal, it was a challenging reigning in my ideas to one that was more concrete and doable. In addition, I was fixated on applying the activity to my BSC1011C class, and I believe that was part of the problem and the reason why I decided not to follow through with The Commons. However, I find that switching to my non-majors BSC1005 class, The Commons would be suitable and more doable.

b. I have questions about…how much should I introduce prior to the activity. Part of the appeal on the first round of fishing is that students may not necessary fish sustainably. When they graph their results, they will see the effects and make future adjustments for the next round of fishing. Basically, I don't want to give away the story on the first day or prior to the first day of the activity.