Destination 2018: Sustainability Lesson Plan

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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)

Put your response here
The topic my students struggle with the most is connecting how chemistry relates to biology. The students do not know how to make the connection of what they are learning in class to the outside world, therefore they are resistant to learning the material.

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

Organic chemistry is essential to life. I would like my students to see that everything biologically speaking was made of simple chemical components. They need to be able to visualize their structures to see how it is related to life.

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

I am going to infuse my topic into my General Biology course. We cover a substantial amount of material on how chemistry relates to pH level and organic structures for their first exam.

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)*

Climate Action- Greenhouse gas emissions can lead to increased temperatures on earth. I can relate this information to the properties of water.

Life Below Water-The world's oceans depend on the correct temperature and chemistry to remain habitable. I can explain about the effects of acid rain and other pollutants effects their ecology.

Sustainainble cities and Communities-Rapid urbanization takes away ecological niches for animals. Animals require organic nutrients, certain levels of pH in their habitat, and other natural sources. Housing development can take that away and lead to more pollution in the area.

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…Learning how to apply sustainability to my classroom in a relevant manner for students.

   b. I have questions about…What exactly the 20 PD for the Fall term entails.

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 analyze the connection between the formation of pollution and changes in pH levels in the environment effecting ecological habitats.

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)

http://www.bbc.co.uk/sn/hottopics/climatechange/climate_challenge/
a. Students will learn how pollution levels in the environment due to human or industrial activities may lead to increased global climate temperatures.

b. https://serc.carleton.edu/integrate/teaching_materials/sustain_ocean/activity2.html
Students will learn how from 1850-until present day the carbon dioxide levels in the atmosphere have effects on the pH level of the ocean.

c. https://serc.carleton.edu/integrate/teaching_materials/sustain_ocean/activity4.html
Students will be presented a real-life example of climate change causing a change in the ecosystem of the gray whale behavior.

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)

a. Muddiest Point-Students can clear up any uncertainties they have on topic of pH, climate change, environmental pollution or water properties.

b. Concept Map-Students can link the connections between release of pollution in the environment, to increasing carbon dioxide levels forming acid rain, to the acid rain falling back down into the ocean and eventually effecting different ecosystems in the water.

c. Pro/Con grid- Students can compare and contrast the pros and cons of students and the industry trying to control pollution levels.

3 Pillars Activity Idea

Review the 3 Pillars Worksheet.

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

Students will pick a species and describe how the social, environmental and economic factors effects their ecosystem due to industry standards of practice. For example, a chemical plant near bodies of water would release pollution of carbon dioxide. The emissions would therefore cause acid rain, and change the temperature too of the water surrounding the plants. Wildlife that lived near the plant therefore then either die or migrate to different areas.

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…Application of this into the classroom.

    b. I have questions about…None.

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)

https://serc.carleton.edu/integrate/teaching_materials/sustain_ocean/activity4.html
Students will be presented a real-life example of climate change causing a change in the ecosystem of the gray whale behavior.

Students will be able to make a real-life connection with the gray whale. They can study the gray whale in a particular habitat that is near industries that produce increased carbon dioxide emission. The release of carbon dioxide into the environment creates acidic rain, can lead to global climate change, and in turn effect the migration pattern of the gray whale.

CAT Selection

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

Concept Map-Students can link the connections between release of pollution in the environment, to increasing carbon dioxide levels forming acid rain, to the acid rain falling back down into the ocean and eventually effecting different ecosystems in the water.

Students can make a drawing of emission from the industry near the ocean causing gray whales to migrate.

3 Pillars Activity

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

Students will study the gray whale and describe how the social, environmental and economic factors effects their ecosystem due to industry standards of practice. For example, a chemical plant near bodies of water would release pollution of carbon dioxide. The emissions would therefore cause acid rain, and change the temperature too of the water surrounding the plants. Wildlife that lived near the plant therefore then either die or migrate to different areas.

I am incorporating the 3 pillars activity by students reflecting on videos and PowerPoint presentations of the industry on the gray whale migration patterns.

Activity Draft

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

1. Students will be directed to the following website.

https://serc.carleton.edu/integrate/teaching_materials/sustain_ocean/activity4.html

2. Within the website, they will find a homework assignment which contains an article they will need to read, and then complete a chart that is a part of the article. All students will have to complete the homework assignment prior to coming to class. The students will also view a video and PowerPoint presentation on the topic prior to completing the homework on their own.

2. The next class meeting the class will be divided into 4 groups. They will have poster board paper where they will have a prompt question that they will need to answer based upon the article. The students will rotate to different groups to help to add onto the posters.

3. The students will need to visit all of the 4 poster stations.

4. The students will be graded upon their write-up of the activities and participation.

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

Student Learning Outcome:

Students will be able to analyze the connection between the formation of pollution and changes in pH levels in the environment effecting ecological habitats.

The students will see a real-life example of how the gray whales have their migration pattern effected by pollution, which changes the pH levels of the water.

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…If the exercise actually works.

b. I have questions about…None

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?

Students will need to understand the basics of the pH scale, water properties, some background knowledge of grey whales, and what happens when carbon dioxide is released in the environment.

What needs to be setup prior to delivering the lesson?

A clear deadline of the coverage of chemistry from the textbook, when students will complete their homework assignment on reading over grey whales and pollution, and when I will split them into groups in the class to discuss the information.

What resources and materials will you need?

I will need four large poster size papers where students can write on in the classroom.

How do you plan to introduce the topic?

I will introduce the topic during lecture, after I cover the pH scale and waters properties.

How will you keep students engaged?

The students will be required what they uncovered as a group in class, and present the information. They will be individually responsible for what they have learned.

Step-by-step run of the activity

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

1. I will cover in class the topic of the pH scale and water's properties in class.

2. After covering the topics, I will tell the students they have a homework assignment to read over grey whales, and they are affected due to pollution.

3. The next class meeting students will be broken into 4 groups. Each group will have to answer a question in relation to the homework assignment. Each group will have a poster board paper to write their responses on. The groups will have to rotate around the room until they have covered all 4 questions.

4. After all the students in the class has answer every question, then a representative will have to present the information for each group.

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…Not there yet....

b. I have questions about…I'm still unsure of execution.