

Photosynthesis and Cellular Respiration Lesson Plan

Context (InTASC 1,2,3)

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Lesson Topic: Botany (Photosynthesis and Respiration)

Grade Level: Grades 9-12

Duration: Two 55 minute lessons

Kit Contents: http://odin-primo.hosted.exlibrisgroup.com/nmy:NMY_ALEPH:ODIN_ALEPH007820431

Desired Results (InTASC 4)

Purpose: The students will understand the two fundamental cellular processes – cellular respiration and photosynthesis and how they cycle carbon through ecosystems to meet the energy needs of all organisms.

North Dakota Science Content Standards (April 2014 Draft)

- From Molecules to Organisms: Structures and Processes
 - HS-LS1-4: Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

Objectives:

1. The students will investigate the reactions of photosynthesis and cellular respiration by organizing a series of images and statements
2. The students will discuss the role of photosynthesis in an ecosystem
3. The students will connect the role of photosynthesis to the carbon cycle
4. The students will discuss the role of cellular respiration in an ecosystem
5. The students will discuss the role of cellular respiration to the carbon cycle
6. The students will be able to name the three stages of the Krebs cycle
7. The students will be able to describe the reactions of both light-dependent and the light-independent photosynthesis

Assessment Evidence (InTASC 6)

Evidence of meeting desired results: The students will be able to organize the images and statements correctly in regard to Photosynthesis and cellular respiration & provide correct responses on the Student Worksheet and Guide.

Learning Plan (InTASC 4,5,7,8)

Instructional Strategy: (Check all that apply)

Direct Indirect Independent Experiential Interactive

Technology Use(s): (Check all that apply)

Student Interaction Align Goals Differentiate Instruction Enhance Lesson

Collect Data N/A

Hook and Hold:

- Show the virtual video of the kelp forest food web

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- California Academy of Sciences. (2015, Aug 28) Take a virtual dive in a kelp forest [Video file]. Retrieved from <https://www.youtube.com/watch?v=HGMvPqfcDOk&feature=youtu.be>

Materials:**Ahead of time:**

- Make copies of (one per student) of the Student Worksheet and Guide included in the kit: "Photosynthesis and cellular Respiration"
- Make copies of the strips from the kit for each team: make a set of "photosynthesis & cellular Respiration strips; 1 set of Category cards; 1 set of photosynthesis & cellular Respiration cards & laminate them so they can be used more than one class.
- Make groups of four to work together for Day 1; Make paired groups to work together for Day 2

Blue and red transparency pens (or make a copy of the transparency and use blue and red colored pencils with the document camera)

Procedures:**Day 1**

1. After showing the You Tube video in the "hook and hold, put the Kelp forest transparency on the overhead projector
2. Tell students that this transparency is actually an example of how energy flows through a Kelp forest. Point out that this is just one way to demonstrate a food web and that there are many different kinds of food webs.
3. On the board write: Cellular respiration: The process of cells releasing stored energy from sugars (example: glucose)
4. Write on board: Photosynthesis: producer cells use carbon dioxide, water, and nutrients to produce glucose and oxygen.
5. Write on board: Carbon Cycle: moves essential molecules through ecosystems and is made of photosynthesis and cellular respiration.
6. Pass out the students' copies of the "student worksheet and guides" and have the students turn to page two and examine the "Carbon Cycle". Discuss with the students where producers and consumers play a role.
7. Display the picture of the photosynthesis and cellular respiration from the front page of the student worksheet and demonstrate (using a document camera) how the process works. Point out the Challenge question: "How do cellular respiration and photosynthesis cycle carbon through ecosystems to meet the energy needs of all organisms?"
8. Show the Kelp forest transparency again and ask the students to predict where photosynthesis would occur in the kelp forest ecosystem. Mark those areas with a blue erasable transparency marker. Then ask the students to tell you where cellular respiration would occur. Mark those areas with a red erasable marker pen. (you could photocopy this transparency and then use the document camera to demonstrate the student responses on the photocopied version if you don't have transparency pens)
9. Tell students to use a pencil as they begin work on step 1. Of the procedure. (They are to complete the Photosynthesis and Cellular Respiration Diagram on page 2 by drawing in and

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labeling the paths they think that oxygen, glucose, carbon dioxide and water take through the ecosystem. (give them about 10 minutes)

10. Break the students into groups of three or four. Give each group a set of 8 photosynthesis and cellular respiration cards and one set of 2 category cards
11. Instruct the teams to spread out the two category cards.
12. Tell the teams that they are going to sort the Photosynthesis & cellular Respiration cards into two sets based on what you already know about the processes of cellular respiration and photosynthesis. One set should go under each of the category cards
13. Give each group a set of 12 photosynthesis and cellular respiration strips and instruct them to lay them all out on the table and read each one aloud within your group
14. Instruct the groups to sort the strips into two stacks, one for cellular respiration and one for photosynthesis. (If they don't know where a particular strip belongs, they should lay it by where they are working so they can see it as they work.)
15. Choose one stack to begin work. As a group, put the strips in the order that you think the processes are happening
16. Do the same for the second stack of strips
17. Decide where you are going to put the strips that you could not decide on placement for before. (Give it your best guess)
18. Look at the strips once you have them in order and compare your strips to the cards you sorted earlier. (There are more strips than cards so more than one strip may fit with a single card.)
19. Now turn to page three of your student workbook and look at the two areas at the bottom of the page. In YOUR OWN WORDS write a short paragraph describing cellular respiration and a paragraph describing photosynthesis. You can use the information you learned from working with the cards and strips, but do not use the same words – use your own words.
20. (The correct order for the Photosynthesis cards: 2,1,3,4)
21. The correct order for the Cellular respiration cards are: 5,8,6,7)
22. (The correct order for the Photosynthesis strips are: K,G,J,D,B, L(K & G can be reversed)
23. The correct order for the cellular respiration strips are: E,A,F,C,L,H (steps C, L, H are interchangeable)
24. Show the Kelp Forest Food Web again and have the students look at their own diagram. Have them look at their initial predictions and make changes or add to them as is appropriate.
25. Have the students put the cards and slips together again and collect them.
26. Have the students do the analysis questions 1-7 for the remainder of class and for homework if it is not completed in class.

Day 2

1. Discuss the analysis questions from yesterday in class.
2. Display page 5, 6, 7,8 & 9 respectively on the document camera, doing a Quaker reading for the materials and stopping to point out various diagrams and answer any questions that may come up. (Quaker reading is based on the Quaker way of practicing their religion. They read aloud as they feel comfortable doing so. In a classroom it works best if the teacher explains the process and then begins it. Then waits patiently for the next student to read for as long as they are comfortable. They must complete a sentence however when they are done. If two start reading at the same time, that is okay too. It helps other students to follow along and to practice in their mind what they plan to read ahead of time. Be sure to tell students that you

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will help them with pronunciations as you go along so not to worry about words they might not know. This really does work well to keep students engaged and to cover material)

3. When reading material is covered, have the students paired to do the analysis questions on pages 10-12. If completed before the end of class, begin the discussion of the questions.

Summary: By participating in these lessons, students will discuss and connect the role of cellular respiration and the carbon cycle as well as the ecosystem. Students will be able to name the three stages of the KREBS Cycle as well as differentiate between dependent and independent light reactions. Students will use the materials in the kit to help them discover the important points of the lesson. Have students write about the importance of the Photosynthesis process after reading the following quote: Plants do photosynthesis, a complicated process, and without plants, we'd all be dead. (*Pamela Ronald*)

Reflection (InTASC 9)

Reflect On:

- *Preparation*
- *Planning*
- *Teaching*
- *Student Engagement and Participation*

Evidence of Student Learning

Standards

Council of Chief School Officers. (2011, April) *Interstate Teacher Assessment and Support Consortium (InTASC) model core teaching standards: a resource for state dialogue*. Washington DC. Retrieved from http://www.ccsso.org/documents/2011/intasc_model_core_teaching_standards_2011.pdf

North Dakota Department of Public Instruction. (2014) *North Dakota science content standards-DRAFT*. Bismarck, ND. Retrieved from https://www.nd.gov/dpi/uploads/132/NDScienceStandardsDraftFormat1_03APR14.pdf

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