## Cellular Respiration and Photosynthesis

### Identifying Information:
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**Title:** Photosynthesis and Cellular Respiration

**Length:** 2-55 minute classes

**Level:** Grade 8

### Motivation:

**Day 1:** Teacher will present the standards and content limits for this lesson on the SMART board. Teacher will pose the question “Do plants need to eat and breathe?” No discussion will take place at this time. (3 minutes)

Students will then take a paper pencil Pre-Test Assessment. (15 minutes)

Upon the completion of the assessment, the teacher will present to students the following video, [https://www.youtube.com/watch?v=QMgCziQgrus](https://www.youtube.com/watch?v=QMgCziQgrus) (3 minutes)  
This discussion will lead into the lesson for today. (5 minutes)

**Day 2:** The teacher will use a straw to blow in a flask of BTB solution to produce a color change. The teacher will ask the students to recall the question from yesterday, “Do plants need to eat and breathe?” No discussion at this time. The teacher will instruct the students to open science lab journals and review observations and data from yesterday. The lesson will proceed as indicated in Presentation and Participation section.
**Needed Materials & Set-Up:**

**Day 1**

- Standards and content limits
- Copy of pre-test for each student *(attached)*
- SMART board
- Pencil
- Whiteboard
- Dry erase markers
- Teacher computer
- Classroom seating layout *(attached)*
- Observation Lab Graphic organizer *(attached)*
- Safety goggles
- 3 test tubes with caps and rack per group
- 1 beaker per group
- 1 graduated cylinder per group
- 1 6” cm piece of elodea per group
- Bromothymmol Blue solution
- Water
- Straw
- Foil
- Lamp or light source

**Set Up:**

- Students will be seated working in groups of 4. *(see seating chart attached)*
  Four desks can be moved together forming a pod or students can be grouped together in 4’s at their table. (Make groups fit your class size a group of three will also work.) This will help struggling students to follow instructions and quickly ask clarifications and help from group mates while completing BTB/Elodea group lab. Table set-up can vary as long as each member in each group will have access to the materials. *(attached)*
Virtual and Book community resource:

- As a community resource the students will be using teacher selected book:
  - Dr. Seuss: Oh Say Can You Seed
  - Photosynthesis and Respiration Cute Angry Seed
  - YouTube Video by drviabla
http://www.youtube.com/watch?v=QMgCziQgrus

Day 2

- Flask of BTB solution (35 mL)
- Safety goggles
- 1 straw
- Paper for foldable 3 sheets per student
- Pencil
- Scissors
- Color Markers or color pencils
- Whiteboard
- Dry erase markers
- Classroom Seating chart (attached) same as day 1
- Teacher computer
- 1 flask of BTB solution
- 1 straw
- SMART Board to show how to set up foldable. (attached)
- Copy of post-test for each student (attached)
- Teacher created scale of foldable (attached)

Set Up:

- Students will remain in same seating groups see day 1 to complete the Ziploc individual lab. The teacher will be circulating among groups assisting. (attached)
Transition Methods:

- **Focus-Eyes on Me method** - Teacher raises arm and hand in the air and says “Focus on Me” aloud to capture the students attention.

Outcomes

Next Generation Sunshine State Standards:

SC.8.L.18.1 Describe and investigate the process of photosynthesis, such as the roles of light, carbon dioxide, water and chlorophyll; production of food; release of oxygen.

SC.8.N.1.1 Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.8.N.1.3 Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim.

Dimensions of K-12 Science Education Standards:

Dimension 1
Scientific & Engineering Practices
1. Asking questions and defining problems
3. Constructing explanations and designing solutions

Dimension 2
Crosscutting Concepts:
1. Patterns. Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them.

Dimension 3- Life Sciences

Crosscutting Concepts
1. Cause & effect: Mechanism and explanation
2. Structure & Function
3. Stability and change
Content Literacy Standards
Reading Standards: Science & Technical Subjects - Integration of Knowledge & Ideas
Speaking & Listening Standards: Comprehension & Collaboration

Florida Common Core:
LACC.8.L.2.3 Use knowledge of language and its conventions when writing, speaking, reading, or listening.
LACC.8.SL.2.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
LACC.8.L.3.6 Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Specific Learning Outcomes:
- After the completion of the lesson, 90% of students will increase content knowledge as determined by pre-test/post-test scores. (knowledge, comprehension, application, synthesis, and evaluation)
- After the conclusion of the lesson, 90% of students will successfully complete the culminating activity. (synthesis)
- At the conclusion of Day 2, 70% of students will correctly respond to a randomly selected exit slip question. (Exit Slip questions listed in Question section of lesson plan) (evaluation, analysis, and synthesis)

Presentation and Participation:

Behavior: Modeling, Cooperative Learning, Vocabulary Learning
Cognitive: Summarizing and Note taking, Conversations, Brainstorming
Application/Process: Advance Organizers, seeking out answers to questions
**Other**: Identifying similarities and differences, Cooperative Learning, providing feedback

**Day 1- 50 minutes:**

After completing the Pre-Test assessment and the motivation activity the lesson will continue as follows: (application, behavior) (15 min)

The students will complete the *Photosynthesis and CO₂ Elodea and BTB* Lab (see attachment). (application, cognitive) (35 minutes)

**Day 2- 50 minutes**

Teacher will demonstrate how exhaling into the flask of BTB solution results in a color change. (refer to Motivation)

Teacher leads discussion reviewing the lab from yesterday. (behavior, cognitive) (5 minutes)

Students continue Elodea lab from previous class. (see attachment) (application, cognitive) (15 minutes)

Students will use the science textbook to complete a foldable to compare and contrast Photosynthesis and Cellular Respiration. Teacher will model on whiteboard or SMART board. (see attachment) (behavior, cognitive) (25 minutes)

Students will take the Post Test. (see attachment) (application) (10 minutes)

Students will complete an exit ticket after the Post Test. (Each ticket has one of the questions from Questions section.) (other) Exit tickets are returned to teacher.

**Questions:**

1. What is energy? Why do living things need energy? (Analysis)

2. Explain and justify how the structure of ATP is used to store energy for work. (Analysis and Evaluate)
3. Explain and justify how living things obtain energy the energy they use in day to day activities? (Analysis and Evaluate)

4. Do plants need to eat and breathe to stay alive like humans do? If so, justify your answer by explaining why they need to eat and breathe? (Synthesis and Evaluate)

5. Explain why photosynthesis and cellular respiration are essential for all ecosystems? Justify your answer with specific examples of how both photosynthesis and cellular respiration are used in an ecosystem. (Analysis, Evaluate and Synthesis)

6. Explain and justify how the processes of cellular respiration and photosynthesis are linked and interdependent (Synthesis and Evaluate)

**Reflection:**

- Formative Post-Test assessment is attached. The teacher will conference individually with students regarding Pre-test/Post-test scores.
- Teacher will consider students’ prior knowledge and scores on the pre-test when deciding level of assistance and teacher-centered instruction in the lesson when students are creating the foldable.
- Teacher will use pre-test scores to pull small groups of students to assist in the creation of the foldable in order to ensure mastery of the standards being taught to all students.
- Students will receive feedback on their Elodea Lab via student worksheets/lab reports produced during the lab activity.
- Students will be able to ask for clarification of misconceptions during the process of creating the graphic organizer – foldable. The teacher will circulate to provide assistance and/or work with small groups.
- The five questions in the section “Questions” will be distributed on exit slips to evaluate student progress. Exit slip information will be evaluated and returned to students.
- Teacher will provide remediation after conferencing with students individually (within 48 hours) to discuss the post-test, problems missed and
areas of weakness.

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<tr>
<th>Safety:</th>
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<td>Before the whole class activities begin, reiterate to the students the importance of observing the “Laboratory Safety Rules”. Remind the students of the general safety rules and procedure that were discussed at the beginning of the school year and during the execution of previous labs. Specifically, remind the students of the following:</td>
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<tr>
<td>a. Never eat or drink while working in the laboratory.</td>
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<td>b. Read and follow instructions and procedures carefully.</td>
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<td>c. Keep the work area clear of all materials except those needed for your work.</td>
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<td>d. Return all supplies to their appropriate containers. Discard waste materials as instructed by your teacher.</td>
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<td>e. Clean up your work area before leaving.</td>
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<th>Transformative:</th>
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<td><strong>ESOL</strong></td>
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<tr>
<td>• Teach content specific vocabulary using flash cards or personal glossary</td>
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<tr>
<td>• Native language translation dictionary</td>
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<tr>
<td>• Monitor comprehension</td>
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<tr>
<td>• Extended time to complete assignments</td>
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<tr>
<td>• Peer assistance with instructional activities (foldable)</td>
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<td>• Modified written instructional materials inserting native language</td>
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<td>• Limit number of problems/questions according to proficiency</td>
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<td>• Visual images to complete charts-Teacher created example</td>
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<td>• Flexible setting</td>
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<td>• Preferential seating or seating close to the teacher</td>
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<table>
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<tr>
<th>A. ESE students</th>
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<tr>
<td>• Monitor comprehension</td>
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<td>• Extra time to complete assignments</td>
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<tr>
<td>• Assistive technology-if needed</td>
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• Ask higher level questions and use thinking skills strategies frequently
• Assistance with instruction activities using kinesthetic activities with manipulates (i.e., foldable construction, color pencil)
• Promote cooperation with small groups
• Encourage use of graphic organizers, KWL, drawings
• Teach with visuals-charts, videos, interactive power point etc.

B. High Functioning Autism students
• Monitor comprehension with teacher proximity
• Use simple vocabulary in directions and instructions (i.e. find highlighted terms)
• Extended time to complete assignments and assessments
• Use kinesthetic activities with manipulates (i.e.; computer, poster board, symbiotic foldable construction, color pencils)
• Encourage use graphic organizers, KWL, drawings
• Assistance with instructional activities
• Teach with visuals-charts, videos, etc.
• Reduce steps in directions and have student check back frequently
• Verbal encouragement and motivation to remain on task
• Quiet area in the classroom or headphones (ear plugs) for students who need to take a break

Utilize:
Strengths:

Using motivational video will help students practice media literacy and critical viewing skills. This will serve as springboard for student action and interaction.

Students will be working in small group. This will help struggling students to follow instructions and quickly ask clarifications and help from group mates while completing BTB/Elodea group lab.

Using foldable will help the students to organize, remember, review, and learn many kinds of information. They encourage students to use their creativity in a kinesthetic learning environment while reinforcing important thinking and communication skills.
The Smart Board Presentation and the Video are effective tools for students’ engagement.

Powerful strategy, Focus-Eyes on Me Method is used to capture and redirect the students’ attention.

Teacher demonstration will allow the students to have clear understanding of the topic and to potentially conceptualize class materials more effectively.

BTB/Elodea Group Lab will provide hands on minds on learning environment which is a great opportunity for the students to be successful.

Rubrics are provided to define expected answer on PRE/POST TEST short answer part. They help students more clearly understand what Superior, Sufficient, Below Expectation and Far Below Expectation work looks like and thus, allows them to visualize proficiency targets to strive for.

Challenges:
Challenges presented in this lesson are based on teacher observation throughout the review activities and student assessment data from the pre-test and post-test.
- Time is a big challenge. Some students will spend more time than others, specifically when they are doing group activity. The teacher must be conscious of the time and facilitate the activities accordingly.

-Classroom Management- Science is interactive. Noise is expected. When students are excited and engaged they tend to create organized chaos especially during actual experiments. The teacher needs to make sure control is maintained and the purpose of the lesson remains evident.

Reteaching – Remediation and reteaching opportunities will be incorporated into future lessons if 80% of the students are unable to obtain at least an 80% average on Post Test. A review on the topics Photosynthesis and Cellular Respiration would be suggested if Post Test results are not optimal. The teacher may use educational videos such as Brain Pop, Khan Academy, Crash Biology, You Tube and Educational Portal to assist students master the benchmark. Reteaching can take place through the use of Bell Work/Bell Ringer or by using remediation stations when doing group directed instruction for other lesson. The teacher should encourage students to ask questions and receive clarification during class time and after school. Seek the support of the parents.