

RESPIRATION AND PHOTOSYNTHESIS LESSON PLAN



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SCHOOL: Williamsburg Middle School

SUBJECT: Life Science

CITY AND STATE: Arlington, Virginia

GRADE LEVEL(S): 9th Grade

CCSS:

- CCSS.ELA-Literacy.RST.11-12.1
- CCSS.Math.Content.HSN.QA.1
- CCSS.ELA-Literacy.WHST.9-12.2
- CCSS.Math.Content.HSN.QA.2
- CCSS.ELA-Literacy.WHST.9-12.5
- CCSS.Math.Content.HSN.QA.3
- CCSS.ELA-Literacy.WHST.9-12.9
- CCSS.Math.Content.MP.2
- CCSS.ELA-Literacy.SL.11-12.5
- CCSS.Math.Content.7.MP.4
- CCSS.Math.Content.7.EE.A.2
- CCSS.Math.Content.7.RPA.2.C

INSTRUCTIONAL AND LEARNING MATERIALS NEEDED:

- Student guided notes
- Photosynthesis and respiration foldable instructions
- Photosynthesis and respiration card sort and graphic organiser
- Photosynthesis and respiration story guide (comic, iMovie, children's book, song)
- Individualised learning technology (iPad, computer, etc.).

LEARNING OBJECTIVES:

By the end of the lesson the students will be able to differentiate the processes of photosynthesis and respiration, and identify and follow the movement of molecules through cells during energy transformations.

LESSON DURATION:

Two 45-minute periods



TEACHING AND LEARNING

Time Spent on the Activity	Targeted Activity	Purpose of Activity
5 min/day	<p>ORIENTATING STUDENTS TO LESSON</p> <p>Day 1 – Teacher leads a discussion on the differences between the plant and animal cell and why these differences are significant.</p> <p>Day 2 – Teacher ask students to sort the organisms into autotrophs and heterotrophs. The teacher monitors students' learning by asking questions (e.g. What clues did you use to sort the organisms? Which organisms use photosynthesis?)</p>	<p>Day 1 – To help students connect prior knowledge from earlier lessons in the unit to the processes related to the structure of a cell.</p> <p>Day 2 – To assist students in connecting prior and spiraling knowledge to the cellular processes and to bring to awareness to the common misconception that only heterotrophs use cellular respiration.</p>
6 min. (4 for video + 2 for discussion)	<p>MOTIVATION</p> <p>The teacher captures students' interest by displaying TedEd Photosynthesis video (https://youtu.be/eo5XndJaz-Y). Students' prior knowledge and prerequisites are activated by teacher asking them to identify differences between plant and animal cells, connecting cellular structure to processes, and identifying autotrophs from heterotrophs. After the video, the teacher gives students apple slices as a way to connect the learning objectives to their daily lives.</p>	<p>To capture students' motivation and attention with the video and apple slices. The video helps stimulate students' prior knowledge and break down photosynthesis into simpler parts. The apple slices motivate students to better understand the world around them through the use of a familiar plant.</p>

64 min.
(Day 1 = 29 min, Day 2 = 35 min)



SMALL GROUP INSTRUCTION

Teacher sets up six stations for students to rotate in small groups. The students are grouped as: Group 1 – weak background knowledge and needs guidance to build content; Group 2 – weak background knowledge but able to assemble content knowledge from various sources; Group 3 – some background knowledge and able to assemble knowledge with little guidance.

The teacher explains the stations and then directs student small groups to start at designated stations. One group will start with the teacher at station 1 while other groups will start and progress through stations 2-5 at their own pace. The teacher directs specific groups when to attend station 1.

Station 1 – Teacher Directed Notes. Teacher gives notes through direct instruction to small groups based on pre-assessment. Questions are scaffolded to assess and activate student knowledge of photosynthesis and respiration. After all groups have completed station 1, the teacher moves around the room monitoring students' progress on other stations.

Station 2 – Foldable Model. Students model photosynthesis and respiration making a foldable using the instructions and models provided.

Station 3 – Equation Sort. Students complete a card sort to organise information about photosynthesis/respiration processes; they also complete a graphic organiser comparing and contrasting these two processes.

Station 4 – Leveled Guided Readings. Students use leveled readings and other materials to create a story/comic strip/iMovie/song about photosynthesis and respiration.

Stations 5 – Leveled Virtual Labs. Students conduct a virtual lab in leveled groups based on their background knowledge demonstrated on the pre-assessment.

Station 6 – Virtual Game. Students use virtual game to connect the processes of photosynthesis and respiration.

The purpose of each activity is to build students' understanding of the molecules involved in photosynthesis and cellular respiration, and how the molecules are exchanged in the processes. Some activities build basic competency of the content, while other activities extend the basic concepts and demonstrate the interrelated processes.

The purpose of station 1 is for the teacher to introduce the concepts and build foundational knowledge for students (whole class instruction).

The purpose of station 2 is for students to develop a 3D model to visualise the movement of molecules (guided practice).

The purpose of station 3 is for students to have kinesthetic interactions with the equations (guided practice).

The purpose of station 4 is for students to use deeper learning competencies to explain the processes in their understanding (independent practice).

The purpose of station 5 is for students to conduct and observe photosynthesis at a molecular level (guided practice).

The purpose of station 6 is for students to apply their knowledge about the processes of photosynthesis (independent practice): <http://www.bioanbio.com/GamesandLabs/PhotoRespgames/phorespgame.html>

a. Group 1 – <http://www.scholastic.com/magicschoolbus/Games/sciencenews/index.htm>

b. Group 2. <http://www.pbs.org/wgbh/nova/nature/photosynthesis.html>

c. Group 3 – <http://www.wonderville.ca/asset/photosynthesis>

64 min.
(Day 1 = 29 min, Day 2 = 35 min)

GUIDED PRACTICE/PROVIDING FEEDBACK

Teacher assigns different groups of students to start at stations 2 through 5, to provide students with multiple opportunities to practise the key concepts and to demonstrate learning in various ways. Although students work independently at each station, peer collaboration is encouraged. That is, each station builds on the prior stations and students are expected to apply knowledge learned from one station to the next. There is no timed rotation of the groups. However, the teacher monitors and encourage students to continue progressing through all stations.

To help student build knowledge with continuous feedback regarding the knowledge they have acquired and to address misconceptions that students often exhibit. Students also have opportunities to self-assess their knowledge. Students will work with other students at stations to check their understanding and direct their learning through comparing their work with others at stations 2 through 6.

15 min.	<p>INDEPENDENT PRACTICE</p> <p>Station 2 – Foldable Model. The teacher provides materials for students to independently create a model. The foldable is limited in the number of ways the components are assembled to guide students and provide a means of feedback.</p> <p>Station 3 – Equations Sort. The teacher assigns students to assemble the chemical equations explaining the processes of photosynthesis and cellular respiration, and then make observations to understand the reciprocal nature of the processes.</p> <p>Station 4 – Leveled Guided Readings. The teacher provides reading and guides for students to assemble the content knowledge independently.</p> <p>Station 5 – Leveled Virtual Labs. The teacher provides labs with direct observations that students use to explain the process of photosynthesis and cellular respiration.</p> <p>Station 6 – Virtual Game. The teacher assigns students to conduct a virtual game requiring synthesis content learned in prior stations.</p>	Each station provides students with independent practice to assemble the content knowledge. The students practise the content through a variety of means, which allows them to interact and wrestle with the content.
Ongoing during lessons	<p>EVALUATION OF LEARNING AND ASSESSMENTS</p> <p>The teacher directly assesses student learning during station 1 with checks for understanding. The teacher provides students feedback and checks for understanding as he/she circulates the room. The teacher will guide students to use the self-evaluation to focus their learning at stations 2, 3 and 5.</p>	<p>The purpose of formative questions is to address misconceptions and evaluate student mastery of content.</p> <p>To help refine students' skill in self-assessing and monitoring their learning and understanding. The self-assessments are designed to emphasise the content assessed in the formative assessment. The application of the knowledge to the prelab demonstrates the students' ability to apply the learning concepts in a different context.</p>
5 min/day	<p>CLOSING ACTIVITIES</p> <p>Day 1 – Students will contribute responses to a Padlet. The responses will be assembled and grouped to provide context to a group discussion of the learning objectives.</p> <p>Day 2 – Students will take a short quiz, which will include questions regarding their strategies for content acquisition from the activities.</p>	<p>Day 1 – To allow students to express their understanding of the main content objectives for the day and to learn about how other students assimilate the information.</p> <p>Day 2 – The activity provides feedback on how individual students understand the material, and how they are able to assess their own learning.</p>

Specific strategies used to address exceptional students and/or students for whom English is a second language

Attempts are made to strategically adapt the stations to the students' needs and thus are differentiated by either learning style preference or student ability level.

Station 1 – Teacher Directed Notes - At station 1, the notes provided through direct instruction are differentiated to meet the needs of groups of students. Students who need very direct instruction will receive the content in small chunks, which will be scaffolded for student understanding. Students with more content knowledge will be provided the opportunity to extend the learning and delve deeper into the content.

Station 4 – Leveled Guided Readings - At station 4, the readings will be leveled by lexile scores to provide appropriate reading comprehension based on students' fall lexile tests.

Station 5 – Leveled Virtual Labs - At station 5, the students will conduct the virtual lab based on the preassessment placement.

Collectively, across the stations, students are provided with materials that match their achievement levels or reading skills so that all students can be actively engaged.

1. Tiered notes provide more direct interaction to evaluate student learning, and to direct student questions and facilitate learning for a smaller group of students. This engages more students in the content by challenging students ready to delve deeper while providing a small environment for students needing more direct instruction.
2. Level readings – The purpose of this activity is to provide students with an opportunity to engage with the material from a different explanation, but at an appropriate level for the students.
3. Leveled virtual lab and reading allow students to access the content independently at a level they are able to access.

