

*SCIENCE MATTERS

Grade 5 Life Science

Transport Systems in Animals and Plants

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Grade 5
Life Science: Transport Systems in Animals and Plants
Introduction and Conceptual Flow Narrative

Introduction: The *Grade 5 Life Science Unit* focuses on transport systems in animals (respiratory, circulatory, digestive and excretory) and plants (roots, stems-xylem and phloem, leaves) and addresses the California Science Standards for 5th grade Life Science. By the end of the unit students will know the main idea that structure and function are related in living organisms. Specifically students will know that: living things are organized structurally from microscopic cells to tissues, organs, and organ systems; within each of these levels, living things demonstrate a structure function relationship in which the way something is designed and built contributes to its ability to perform specific functions; four systems in animals function to transport materials; those systems are the respiratory, circulatory, digestive and excretory systems; each of these systems is made of smaller parts called organs, each with their own function; in addition to a specific function (e.g., digest food), these systems are inter-related (e.g., circulatory and respiratory) to provide nutrients to the body and remove wastes; plant structures also provide transport of nutrients and the removal of waste; roots, stems (xylem and phloem), and leaves are actively involved in the transport; photosynthesis enables plants to make food from carbon dioxide and water in the presence of chlorophyll and sunlight; photosynthesis produces oxygen, which is used by animals and plants in the process of cellular respiration; cellular respiration produces carbon dioxide used by plants creating the photosynthesis/respiration cycle. The *Grade 5 Life Science Unit* is presented to students through a series of investigations, experiments, active learning experiences, questions, and assessments. Assessments include: pre-, post- and 6 formative assessments.

Conceptual Flow Narrative: The *Grade 5 Conceptual Flow Narrative for Life Science: Transport Systems in Animals and Plants* builds on the concepts presented on conceptual flow graphic by describing the concept(s) addressed in each lesson and the links that connect each lesson to the next. Lessons are linked to the previous lesson and the lesson that follows via a conceptual storyline to enable the development of student understanding as they progress from one concept to the next.

After students have completed the **Pre-Assessment**, they begin their exploration of life science with **Lesson 1, “Hierarchy.”** In this lesson students learn that living things demonstrate a hierarchy of structure from cells to tissues to organs to organ systems to organism. They use a “Lego-man” as an analogy.

In the previous lesson students learned levels of organization. In **Lesson 2, “Structure-Function,”** students learn that parts of organisms have specific structures that enable the parts to do specific functions. Students use sport balls (e.g., footballs, tennis balls) as common items that show a structure-function relationship as a

connection into the animal and plant transport systems in which the emphasis is on structures and their related functions.

Formative Assessment #1 is aligned to the concepts in Lessons 1-2. As a formative assessment, student answers provide feedback to the teacher and student for any adjustments in the learning. In Formative Assessment #1 students demonstrate their understanding of the organizational levels of living things and share their understanding of structure and function by answering five open-ended prompts.

The next set of lessons (3-11) addresses the structure and function of four different transport systems (respiration, circulation, digestion, excretion) found in animals. *Note: the systems the students learn are human systems, but they can be generalized to many animal types.* With each new system, students are first asked to draw what they know about the system, and then in the course of the lessons about the system, they compare their new learning with their original thoughts.

In **Lesson 3, “Just Breathe,”** students begin their study with the respiratory system and through drawings and puzzles, learn that this system enables organisms to breathe, exchanging oxygen for carbon dioxide.

In **Lesson 4, “Under Pressure,”** students build a model of the lungs using bottles and balloons to simulate what happens when one inhales and exhales. They learn the structure and function of the lungs and how changes in air pressure allow air to enter and leave the lungs.

Lesson 5, “You Gotta Have Heart,” introduces students to the circulatory system. Using diagrams and discussion, students learn about the structure of the heart (including the parts) and the related functions. In **Lesson 6, “Heart to Heart,”** students continue their investigation by participating in several learning stations, including a dissection of a heart. They are able to compare their drawings from Lesson 5 with a real heart in Lesson 6.

Formative Assessment #2 is aligned to the concepts in Lessons 5 and 6. As a formative assessment, student answers provide feedback to the teacher and student for any adjustments in the learning. In Formative Assessment #2 students participate in a performance assessment to determine the effect of various activities on their heart rate. Students take their pulse after sitting, walking, jogging and doing jumping jacks. They record their data in a chart, graph the data, and create summary statements about the data.

In **Lesson 7, “The Body’s Highways,”** students learn about the structure and function of arteries, veins and capillaries and relate their function (nutrients, water and oxygen are transported to the body’s cells through arteries to capillaries; waste and carbon dioxide are removed from the body’s cells from capillaries to veins) to a highway

system. Students play a simulation game moving blood from the heart, around the body and back to the heart.

Lesson 8, “Let’s Get Connected,” helps students to understand the link between the circulatory and respiratory system. Using diagrams and discussion, students trace the conversion of oxygen-rich blood into blood that carries carbon dioxide, which is then expelled through the lungs.

Students are introduced to the digestive system in **Lesson 9, “Digestion: Chew on That!”** In this lesson, students experiment with chewing crackers and learn that digestion begins in the mouth through mechanical digestion (breaking the food with the teeth and tongue) and chemical digestion (as the starch in the cracker is converted to sugar).

In the previous lesson, students learned about how digestions begin in the mouth. In **Lesson 10, “ Digestive System Simulation,”** students learn the structure and function of the other organs of the digestive system. Students build a digestive system using baggies, tubes, nylons and cups, and “digest” bananas and crackers. Be prepared for a memorable event!

Formative Assessment #3 is given after Lessons 9 and 10 as a creative writing prompt for students to show their understanding of the digestive system. As a formative assessment, student answers provide feedback to the teacher and student for any adjustments in the learning.

In **Lesson 11, “The Excretory System,”** students complete their study of the four animal transport systems. In this lesson, students build a model of the excretory system and explain its structure and function.

Formative Assessment #4 is given after Lesson 11 as an indicator of student understanding from Lessons 3-11 that the body has four major systems (respiration, circulation, digestion and excretory) for transporting nutrients and waste. Each system is made of specific organs that perform specific functions. The functions of the systems are inter-related. As a formative assessment, student answers provide feedback to the teacher and student for any adjustments in the learning. In this assessment, students demonstrate their knowledge by placing organs on their body outline to show the location of each system (and its organs) and then explain how each system works in relationship to another system.

Lessons 12-15 address transport in plants. In **Lesson 12, “Plant Macro Transport,”** students reconnect (from primary grades) with their basic understanding of transport in plants that involves roots and stems. In this lesson, students focus on root types. In **Lesson 13, “Celery Lab,”** students conduct an experiment with a split celery stalk and food color to better understand the stem-xylem and phloem-as a transport structure.

In the previous lessons, the students studied roots and stems as structures for transport. In **Lesson 14, “Leave it to the Leaves,”** students continue to understand transport into the leaf structure. Students make leaf rubbings to identify stalk and veins. Through discussion with powerpoint slides, students also indentify microscopic components of the leaf that are necessary for photosynthesis: somate (stomata plural), and chloroplasts.

Formative Assessment #5 is given after Lesson 14 as an indicator of student understanding from Lessons 12-14 about the structure and function of plant transport. Students are given plant structures for which they must supply the function in transporting nutrients/materials around the plant. As a formative assessment, student answers provide feedback to the teacher and student for any adjustments in the learning.

The unit concludes with two lessons that introduce the concept of photosynthesis and cellular respiration and the relationship between the two. In a two-part **Lesson 15, “Photosynthesis Play,”** students first discuss the difference between how plants and animals get energy and the basics of photosynthesis. In the second part of the lesson, students “perform” how photosynthesis uses the nutrients from the soil (water) and carbon dioxide and sunlight from the air to make sugar (food) and release oxygen.

In Lesson 16, “Photosynthesis-Cellular Respiration Cycle,” students learn that photosynthesis and cellular respiration are reverse processes. Plants use photosynthesis to make food and release oxygen and plants and animals use cellular respiration to break down food (sugars) and release carbon dioxide. Using an experiment with their breath, an indicator, and elodea (a plant), students observe as carbon dioxide is converted to oxygen. Through discussion, students understand that photosynthesis occurs in plants, while cellular respiration occurs in animals and plants. Therefore, plants need oxygen too! This is the last lesson in this unit.

Formative Assessment #6 is given after Lesson 16 to help prepare students for the photosynthesis/cellular respiration questions on the Post Assessment. Students label each reaction and write about their relationship.

Upon completion of the 16 lessons, students take a **Post-Assessment** to determine their overall understanding of the concepts presented in the unit.



