

Plants: Misconceptions

What some pupils think	Notes....
Soil is inert and it just holds the plant in its place	The soil contains the minerals that plants need for healthy growth. The soil also contains many other organisms that live inside the soil
Plants get all they need from "plant food"	Plant food provides nitrates that help plants make the proteins they need to grow. Soil also contains these nitrates and the decaying remains of plants and animals is what puts the nitrates into the soil. Plants do not have a digestive system so it's important not to refer to the nutrients/ minerals as food to avoid misconceptions later on. "Plant food" is often sold in garden centres or attached to a bunch of flowers but if you look at the labels you can see the usual minerals (NPK- Nitrogen, Phosphorus and Potassium) that plants need for healthy growth.
Plants obtain their energy directly from the sun	Pupils often think that the sunlight is directly linked to the plant growing. Photosynthesis requires sunlight- this process releases glucose for the plant to use as an energy store/ resource. In order for a plant to grow they need to make proteins (more complex molecules) They combine the glucose with other molecules in order to make proteins. It is the protein that makes the plants grow, they need the sunlight to produce the glucose initially to make the proteins. This misconception often continues throughout KS3 and KS4
Leaves are mainly to catch and take in water	As pupils link water collecting and running off leaves they sometimes relate it to their function. The main function of a leaf is to carry out photosynthesis. Water is lost via the leaves in transpiration but water doesn't enter the leaves. Leaves have a waxy cuticle on the surface of the leaf which actually prevents water loss and most of the water is lost from the unde-side of the leaf. Leaves have many different sizes and shapes. The shapes of the leaves can help water to run off the leaves and fall directly or near to the base- thus providing water that can be absorbed into the soil then taken up by the roots into the plant/ tree. <i>Tillandsia</i> plant species (epiphytes or air plants), which do not require soil to grow. Water and nutrients are absorbed through their leaves and roots are used to anchor the plants. You can grow plants in clear containers in order for children to see the roots. Sometimes as the grow under/ within the soil it can be difficult for children to visualise and therefore identify that they are an essential part of the plant.
Plants breathe in Carbon Dioxide and breathe out oxygen	This is a popular misconception as pupils are sometimes taught that humans breathe oxygen and plants carbon dioxide. Teachers should avoid the word breathing at all times when discussing plants and need to be careful when comparing plants and animals in that way. Plants do not have lungs and therefore do not breathe. Humans and other animals breath to get oxygen into their body for respiration. In a plant this enters through the leaves, they do not need lungs and therefore do not breathe.
Plants are not alive	Pupils often think of animals only as living organisms rather than plants and animals. This knowledge can be strengthened when teaching about the 7 life processes.
Plants take everything they need in from the roots	Plants can in water and mineral ions from the roots, but photosynthesis releases glucose for the plant- This glucose is required to make up lots of more complex molecules as well as being required for respiration. Without respiration the plants can not release energy in order to carry out the 7 processes (and would die!)
Plants get their energy from the soil	See above note
Sunlight helps plants grow by keeping them warm	Plants do not need excessive warmth in order to grow. Some plants are well adapted to hot conditions but these plants usually have smaller leaves/ spikes to help reduce water loss. In warm conditions plants lose water. In a plant enzymes responsible for photosynthesis would denature at a high temperature and the reaction would not occur. All plants

	tolerate temperatures in different ways but cold “snaps” of weather can damage plants as the water inside them can freeze causing issues with the transport of water. Enzyme activity decreases. Water in the soil can freeze and therefore limit water entering the plant.
People need to help plants grow	Pupils often relate to plants growing as a result of a person watering them or putting plant food into the water. If pupils are able to access an area where wild plants grow, this can help them understand that plants get all the nutrients they need without the intervention from people.
Plants eat plant food	See above note about plants and “plant food”
Breathing is the same as respiration	<p>Breathing is a process of drawing air into and out of the lungs and involves your diaphragm, ribs and intercostal muscles. Respiration is an exothermic chemical reaction. It occurs in all cells and transfers energy from a glucose chemical energy store to an ‘energy currency’ molecule called ATP. The ATP can be used for all other processes.</p> <p>Plants do not have lungs, so they cannot “breathe”. Instead they obtain oxygen from their stomata or from photosynthesis. But plants do respire (as all living organisms do). Plants respire all the time, not just at night when they have finished photosynthesising.</p>
There is only one type of plant cell (KS3/ GCSE)	When students are first introduced to cells they learn the “general” plant and animal cell but when differentiation of cells occur and they become specialised you get many different types of plant cells each with a specific function
Cells do not carry out the life processes for themselves (KS3/ GCSE)	Cells take in nutrients and excrete waste. Processes such as respiration and the majority of all enzymatic reactions take place within the cytoplasm of the cell within organelles found in the cytoplasm
Misconceived ideas about exchange in the xylem and phloem due to comparisons with animal circulation (KS3/ GCSE)	Take care when explaining the roles of xylem and phloem in a plant. When comparisons are made between plants and the circulatory system in an animal, this is where confusion can occur. As plants have vascular tissue and veins this can lead to pupils making direct links to animals. Plants do not contain blood but like animals they need a method of transporting nutrients and waste and water. It may be an idea not to refer to animal circulation since plants don’t contain blood it is impossible to make a direct comparison. Higher ability students may be able to compare and contrast but it is a model that needs to be approached with care.
The xylem only carries water (KS3/ GCSE)	<p>Pupils think the xylem carries water and the phloem carries everything else.</p> <p>Xylem and Phloem both contain water but the concentration of sugars and salts in xylem is much lower than in phloem. Xylem tissue/ tubes run from the roots to the leaves and therefore mineral ions absorbed at root level are also contained in the xylem. Substances in phloem are generally transported from leaves to the rest of the plant and so carry the products of photosynthesis along with other substances..</p>
Transpiration alone is responsible for supplying water for all plant cells (KS3/ GCSE)	Although the majority of water is absorbed via the roots, plants also get water from the metabolic processes (chemical reactions) that occur in the cells, A by-product of respiration for example is water. This is then available for the plant to use. Condensation reactions also release water as a by-product.
Photosynthesis and respiration stop at night (KS3/ GCSE)	Photosynthesis requires sunlight for the reaction to occur so stops when the light intensity is too low. Respiration however, is a chemical reaction required in all cells to release energy. This occurs all of the time, just like in animal cells.