

HOW DOES YOUR GARDEN GROW? EXPLAIN PHASE

For Middle Schoolers

Now that students have a general understanding of soil health, transition them into developing concepts about soil nutrients specifically. Students should work together to complete the *How Does Your Garden Grow? Breakout*. They should summarize the information they learn during the breakout in the *Nutrient Cycles Window Note* box and make additional notes in the other "windows" as necessary.

Ask students to use the 3-Post It Notes strategy in their small groups or individually. At this point only have them complete the Word = ___ and Phrase = ___ notes. Repeat the process you used for the previous anchor charts to develop one for *Nutrient Cycles*. Ask students to share out their Words and Phrases as part of the summary conversation. If necessary, add any new information students discovered to the other three charts as well.

MISCONCEPTIONS, VOCABULARY, NOTES

If the entire class is struggling with content details or missed important information during their Explore activities, this is an appropriate place for direct instruction. To fill gaps or misconceptions, this could include providing a brief lecture, having students take notes over specific concepts, or developing content-specific vocabulary.

Help students synthesize the conceptual pieces for themselves. As part of this process, they should complete the *Sentence* part of the 3-Post It Notes activity. Their sentence should emphasize the connections among the information they've gathered during the Explore and Explain activities and discussions. There are other ways to direct students' knowledge construction, but they should at least work out the following connections:

- the relationship between nutrient cycles and soil health (e.g., how cycles support healthy soil, how unhealthy soil might disrupt cycles)
- how soil management practices support or supplement natural nutrient cycles
- the impact of soil management practices on soil health

Several alternatives to class discussion or a written assignment for this portion of the Explain are suggested below.

CONCEPT (CARD) MAPPING

This strategy can be done physically or digitally. Students can create hand-drawn or digital (e.g., MindMeister, Cmaps) concept maps. They can also use physical cards, either pre-made or class-generated, that they glue/tape down and draw lines to connect ideas. As a whole class, you might consider using string to physically connect concepts found on the four anchor charts.

METAPHORICAL THINKING

Students create metaphors based on their personal experiences to help explain the connections they are making.

COGNITIVE COMICS

Using either a predetermined structure (e.g., three panels) or letting students choose their own, students draw their conceptual understanding as a comic. These could be shared using gallery walks or brief class presentations.

For High Schoolers

Have groups present a rough draft of their plans. As each group presents, ask the others to make one suggestion for improvement and ask one question for peer feedback. This feedback will be used to refine their final presentations.

After students have given peer feedback, provide students with a brief overview of nutrient cycles related to agriculture:

- <http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-5685/E-1003.pdf>
- http://www.envirothon.org/pdf/CG/nutrient_cycles.pdf
- <http://biology.about.com/od/ecology/ss/nutrient-cycle.htm>
- http://www.soil-net.com/dev/page.cfm?pageid=secondary_cycles_nutrient&loginas=anon_secondary

Have students incorporate this information into their presentations.