**Supplementary Resources for Teachers**

The following resources provide support for teachers seeking guidance with the use of KWL charts and other graphic organizers

**Designing a KWL for use in the classroom**

KWL charts are useful because the charts provide guidelines for students to begin an investigation. The chart consists of three columns represented by the letters K, W, and L. The K represents what students already know about the topic or content. The W represents the goals for the lesson/investigation or what students want to learn about the topic or content. Finally, the L represents what students have learned about the topic or content. The first two columns are completed by the students before the investigation begins and serve to identify the knowledge held by the student and the learning goals for the activity. The final column asks students to reflect on what they learned during the activity. The KWL chart provides guidance for students as they begin an investigation by identifying what is already known about the topic and the learning goals for the investigation. Use the sites below to access KWL charts.

* + <https://www.eduplace.com/graphicorganizer/pdf/kwl.pdf>
	+ <http://www.readwritethink.org/files/resources/printouts/KWL%20Chart.pdf>

**Graphic organizers**

* Compare and Contrast: When asking students to make comparisons, these graphic organizers can be very helpful. You well find multiple examples at the following sites.
	+ <https://notebookingfairy.com/comparison-contrast/>
* Identifying Sources: This KWS chart is very similar to the KWL chart except that the final column (the S column) asks students to identify sources for what they want to learn,.
	+ <https://www.eduplace.com/graphicorganizer/pdf/kws.pdf>
		- The KWS chart is found at this site and asks students to identify the sources for what they want to learn.
* Problem Solving: This graphic organizer asks students to identify specific problems encountered in their investigation and potential solutions.
	+ <https://www.eduplace.com/graphicorganizer/pdf/probsol.pdf>
* Flow Chart: This graphic organizer provides an easy what for students to identify the step and the sequence of steps in their investigation.
	+ <https://www.eduplace.com/graphicorganizer/pdf/flow.pdf>

The following resources may be useful for teachers seeking alternate/extension activities to help students explore topographic maps, soil characteristics, permeability, and plant growth.

**Reading topographic maps - 1**

This site provides an introduction to topographic maps as well as guided practice for reading topographic maps for grades 4 and 5. Students are quizzed with immediate feedback to enhance map reading skills. Students could be placed into teams to investigate topographic maps. The students are shown pictures and next asked to respond to a multiple choice question. The accurate response is shown immediately. The site is designed for 5th grade students but could easily be applicable for lower grades as well.

* <https://www.ixl.com/science/grade-5/read-a-topographic-map>
* <https://www.ixl.com/science/grade-4/read-a-topographic-map>

**Reading topographic maps – 2**

This site provides activities to support student learning in terms of reading topographic maps. Free access includes a student worksheet and a vocabulary page. Please note that the student worksheet can be adapted for specific applications. Other materials are available only when one subscribes to the Gizmo site.

* <https://www.explorelearning.com/index.cfm?ResourceID=471&method=cResource.dspDetail>

**Virtual Labs: Soil types, runoff, permeability to water**

The first two sites allow students to explore the rate at which water will percolate through different soil types (e.g., gravel, sand, and silt) in terms of the porosity of the soil. Students can be paired to explore the different soil types to determine the nature of the soil, and the size of the particles that make up the soil, and the resulting porosity of the soil type. The third site is a water-balance simulator which allows students to change the amount of rainfall, the soil type, and ground cover to note changes in the infiltration of water into the soil as well as the potential for flooding.

* <https://www.explorelearning.com/index.cfm?method=cResource.dspDetail&ResourceID=431>
* <http://www.glencoe.com/sites/common_assets/science/virtual_labs/CT02/CT02.html>
* <https://runoff.app.wikiwatershed.org/>

**Virtual Lab: Light and plant growth simulation**

This Glencoe McGraw Hill simulation explores the varying wavelength of sunlight and the resulting plant growth when exposed to specific wavelengths. This activity may be beyond the level of knowledge held by young students, however, the site would be a good review for teachers and might also be a way to involve the entire class with an exploration of the make-up of sunlight and the impact of light energy on plant growth.

* <http://www.glencoe.com/sites/common_assets/science/virtual_labs/LS12/LS12.html>

This site provides additional information concerning plant growth and light for the teacher. Reviewing the online simulation and reviewing the explanation provided at the site shown above would be an extensive review of photosynthesis and wavelengths of light.

* <http://blog.canacad.ac.jp/wpmu/16fernse/2015/01/22/photosynthesis-virtual-lab-1-chromatography-separation-of-photosynthetic-pigments/>