# Strategies to Support Students with LDs 'Reading to Learn' in Science

| Strategy | Activity | Example |
|---|---|---|
| **Prior Knowledge** | | |
| **Develop Background Knowledge** (Mason & Hedin, 2011) | In addition to reading about science, facilitate hands-on activities that stimulate and challenge preconceptions in science and support students' co-construction of knowledge. | To challenge the preconceptions of floating and density of fresh and salt water, have students observe what happens when they place a fresh egg in a bowl of fresh water and then in a bowl of salt water. What will happen to the egg if salt is added to the bowl of fresh water? |
| **Guided Text Inquiry** (Scruggs Mastropieri, & Okolo, 2008) | Provide structured and guided inquiry questions to prompt students to generate explanations for scientific facts and coach students through inductive reasoning. | Read informational text (e.g., *National Geographic Kids*, n.d.): Raccoons are active-at-night, or nocturnal, mammals that live from North and South America to Asia, in wooded areas and cities. The raccoon's favourite foods on land are: fruits, seeds, nuts, birds' eggs and plants. In cities, raccoons scavenge around garbage bins and will eat scraps of food and other trash. Raccoons are excellent swimmers, hunting fish, frogs, and crayfish.<br><br>Ask and provide cognitive guidance to questions such as: What do you think raccoons do at night? How do raccoons access fruits, nuts and birds' eggs? What might raccoons eat during the winter months? |
| **Transfer** | | |
| **Guided Scientific Inquiry** (Cavagnetto, 2010) | Deconstruct scientific argumentation in science text by first engaging in science inquiry and applying this to a scientific argumentation framework. Students develop an understanding about scientific reasoning if they are able to *transfer* learning from a first-hand experience to build knowledge – in this way, the 'doing' of science supports reading comprehension in science. | Beginning with the inquiry, "What causes condensation on a window?" students read to find evidence and engage in a hands-on activity. They construct an argument using a series of guided questions that prompt observations (e.g., "I observed…."), evidence (e.g., The data shows….") and conclusions (e.g., "Therefore, I think that…. .") |
| **Student-Generated Explanations** (Villanueva et al., 2012) | After reading in science, students develop their own explanations of 'why' a scientific concept is plausible. Scaffolded by a teacher, they then critically think about how the explanations *transfer* into statements for a two-sided debate. Students generate the lines for discussion while the teacher guides the debate process, referencing connections to their reading in science – in this way, oral communication supports reading comprehension in science. | After reading about gravity, students develop their explanations of why objects fall to the ground at different rates of speed. The dominant explanations (e.g., weight and resistance) are divided into two groups and then students prepare to discuss based on their explanations. |

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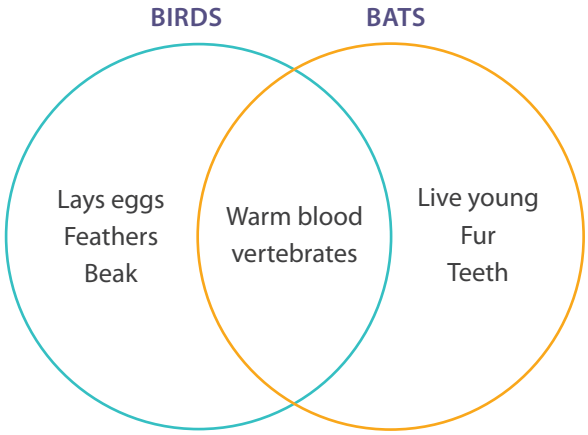
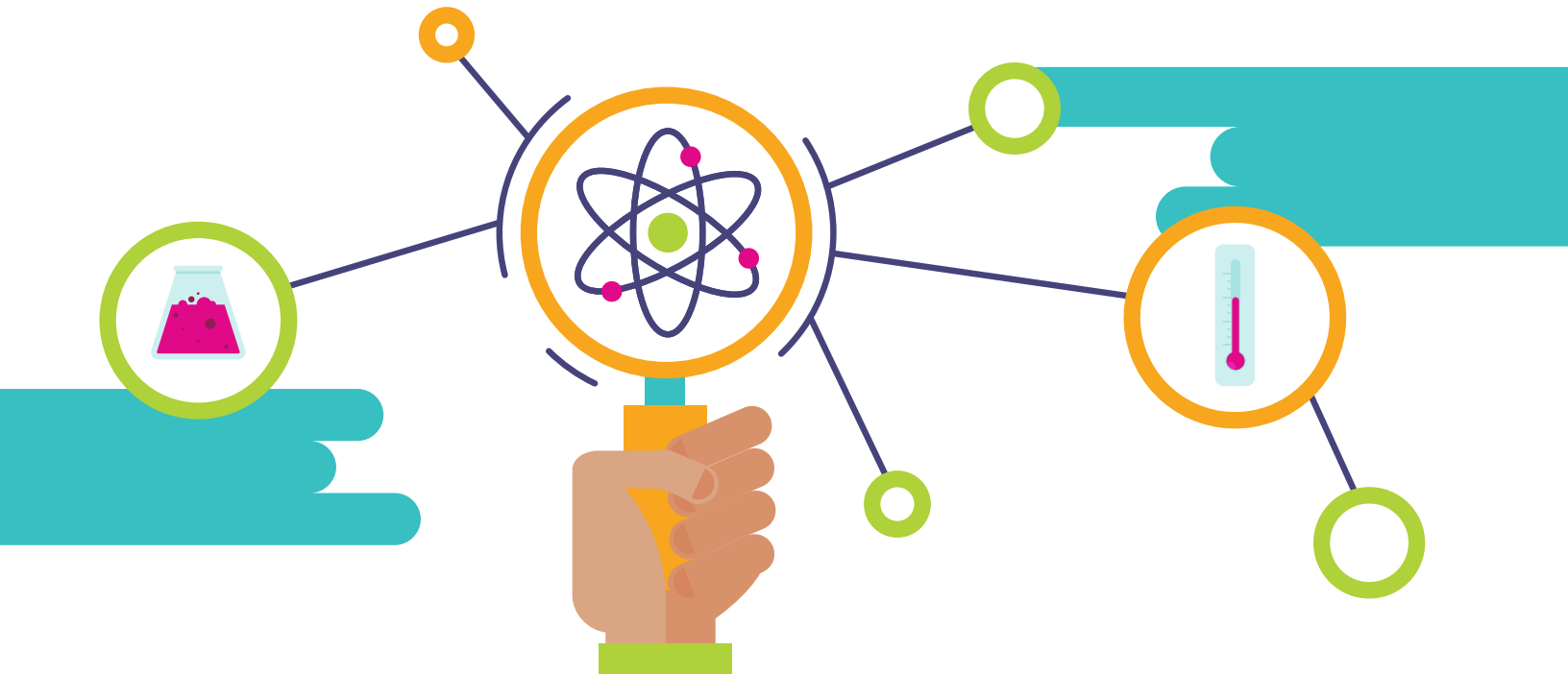
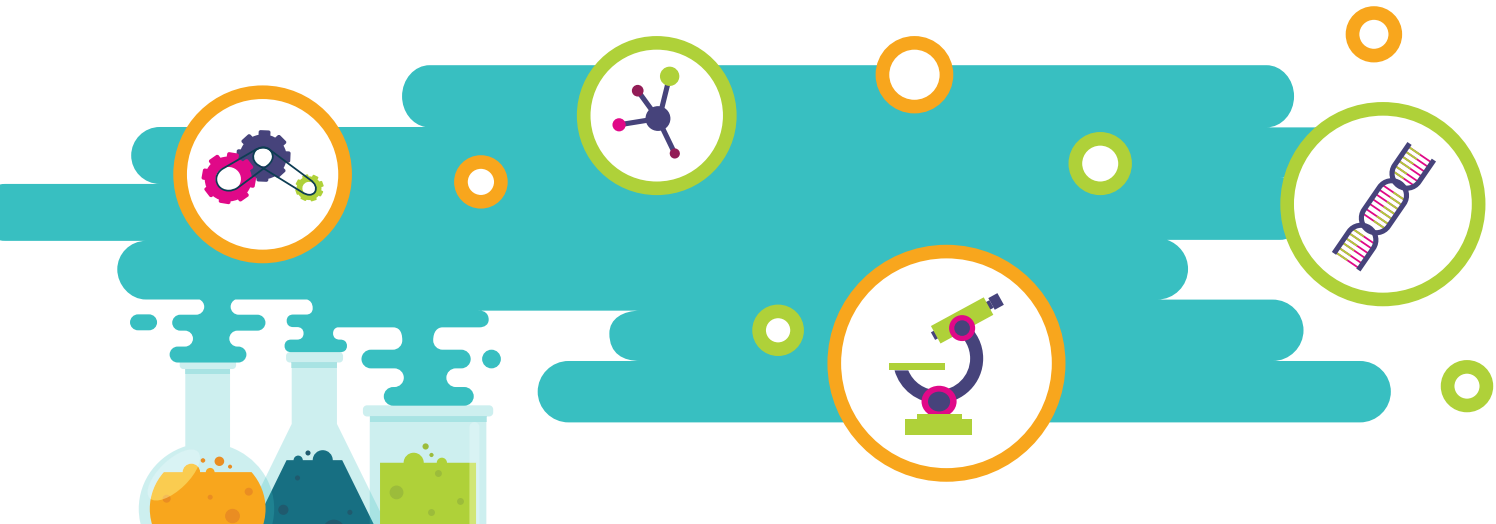
| **Working Memory** | | |
| **Graphic Organizers** (Dexter, Park, & Hughes, 2011) | Before reading, introduce a graphic organizer that visually displays how concepts are grouped and connected to minimize memory load. During and after reading science text, fill in the graphic organizer to concretize relationships among abstract concepts. | Venn Diagram<br>  <br><br>**Click here to access the LD@school article on Graphic Organizers (http://www.ldatschool.ca/executive-function/graphic-organizers/).** |
| **Memory Mnemonics** (Scruggs, Mastropieri, Berkeley, & Marshak, 2010) | Teach an acronym to aid in the retention of factual information. | Teach an acronym to aid in the recall of the: Watercycle<br><br>(**R**unoff, **E**vaporation, **C**ondensation, **P**recipitation)<br>**R**=Really<br>**E**=Excellent<br>**C**=Cream<br>**P**=Pie<br><br>**Click here to access the LD@school article on Mnemonics (http://www.ldatschool.ca/executive-function/mnemonics/).** |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| **Vocabulary** | | |
| **Vocabulary Pre-Exposure** (Gallagher, Fazio, & Ciampa, 2017) | Assess and pre-teach science terms and vocabulary with examples and non-examples. | Before teaching a unit on types of rocks (sedimentary, metamorphic, igneous), pre-teach vocabulary comparing and contrasting: magma & lava; sediment & particles; compacted & pressure. |
| **Morphology Lessons** (Fazio & Gallagher, 2014) | Word study activities focused on science word origins, identifying word bases, generating derivations. | Explicitly teach students:<br>The rock type, metamorphic, gets its name from the Latin word, metamorphosis meaning "transformation" with the prefix, "meta" (change) and base "morphe" (shape, form). Generate other words with the prefix, "meta" and base, "morphe." |
| **Text Complexity** | | |
| **Graphic text enhancements** (Mason & Hedin, 2011) | Provide explicit instruction on how to create representational illustrations and use mental imagery to support understanding of densely worded text. | During reading, think aloud to describe a mental picture of what has been read (*National Audubon Society,* n.d.) then draw an illustration:<br>The Eastern Whip-poor-will's habitat is in leafy woodlands. It breeds in rich moist woodlands, either deciduous or mixed and seems to avoid purely coniferous forest. By day, the bird sleeps on the forest floor, or on a horizontal log or branch. It forages at night, especially at dusk and dawn and on moonlit nights. It forages by flying out from a perch in a tree, or in low, continuous flight along the edges of woods and clearings; sometimes by fluttering up from the ground. It captures insects in its wide, gaping mouth and swallows them whole. |
| **Text Structures** (Ministry of Education, 2016) | For procedural text in science, explicitly teach the text structures, highlighting important words such as prediction, hypothesis, materials, procedure, results, and conclusion. | When preparing for an investigation, engage students prior to hands-on activity by following along and reading a sample template that outlines the structure of the investigation. Students could highlight in different colours and read aloud the text structures using the template. |