



Reading Strategies

Enhance Comprehension in the Science Classroom

By Cindy McCloud

Teaching science presents a special challenge. Science teachers must help students perceive scientific concepts as more than memorized facts and lists. Students must conceptualize science as a dynamic content area of processes, analysis, and investigation.

In his 1998 article, *Cooperative Learning that Really Works in Biology Teaching*, Dr. Thomas R. Lord states, “We need to teach not just the body of knowledge, but also the way of thinking and analysis that characterizes science.” Johnson and Martin-Hansen (2005) concur. They contend that in contrast to reading literature—mainly for pleasure and information—when reading science content, students also must read to solve problems, evaluate material to decipher steps and procedures, and utilize inquiry skills.

Science lends itself to analytical thinking, and Project CRISS is a natural fit for science teachers who seek research-based practices to aid them in teaching students to think analytically and to be metacognitive in their learning. Evidence of such instruction in science classrooms emerges as science teachers adapt CRISS strategies for use specifically with the science curriculum. Hersherber, Zembal-Saul, and Starr (2006) have developed a comprehension strategy specifically geared to the science classroom. Using K-W-L as a basis, these educators developed KLEW, which aligns K-W-L with the National Science Education Standards.

Similar to the K-W-L strategy, which supports the CRISS Principles of background knowledge, purpose setting, active learning, writing, and metacognition through the use of three guiding questions about a topic:

- What do I *know*?
- What do I *want* to know?
- What did I *learn*?

the KLEW chart encourages students to list:

- What they think they *know*.
- What they are *learning*.
- *Evidence* to support what they are learning.
- What they *wonder* based on the new information they have learned.

Initially, students make a list of **what they think they know (K)**. The addition of the word *think* is important, according to Hersherber, Zembal-Saul, and Starr. In science, students need to realize that what they think they know to be true may change based on observation and experimentation.

Next, students list **what they are learning (L)** as they proceed through the scientific process, as opposed to the K-W-L chart where students list what they learned as the last step. In the scientific process, learning occurs as students conduct experiments and investigations. Listing what students learn early in the chart makes the learning process dynamic, which is imperative in the science classroom.

The E in the KLEW chart denotes the **evidence students gather** while they are conducting experiments and investigations. For every entry in the learning column, students must record this evidence as support. The evidence component of KLEW denotes a significant difference between the K-W-L and KLEW and makes KLEW especially appropriate for use in the science classroom. Notice that the L/E columns are similar to two other CRISS organizers: Conclusion—Support and Hypothesis—Evidence Notes.

The final step in the KLEW strategy is the W, which stands for **wonderings**. This is in contrast to the W (what students

want to know) in K-W-L, which comes near the beginning of the learning process. In the science classroom, the investigations that students perform lead the students to new questions and new areas of investigation. The wonderings column is the final step in KLEW, leading students to continue in the dynamic process of learning in the science classroom. Scientific inquiry and metacognition are intertwined as students utilize KLEW.

A foundational element of Project CRISS is that good readers are actively involved in their learning. The KLEW strategy provides a marvelous avenue for students to actively chart learning and to write as a means of understanding what they learn! Project CRISS also presents research to support the organization of information to promote retention. KLEW provides a framework for organization of material that students gather from reading, writing, discussion, and experimentation.

Crowther and Cannon (2004) also provide an adaptation of the K-W-L for the science classroom. Their strategy, T-H-C, entices students to explore the questions:

- What do you *think*?
- *How* can we find out?
- What do we *conclude*?

As with K-W-L and KLEW, students are asked to think about what they already know about the topic as a means of building background knowledge and providing a pre-assessment of the students' knowledge on the topic. The students are then asked to delve into creative ways to find information that will support or refute the information they think they know. Finally, students are asked to draw conclusions, through writing or illustration, about the things they have investigated. The CRISS RAFT and Picture Notes strategies align nicely with this portion of the T-H-C! The T-H-C strategy provides the organizational framework, as supported in CRISS Principles and Philosophy, for students to apply the scientific process in their learning.

Engaging strategies such as KLEW and T-H-C are evident in science classrooms as more teachers discover that teaching reading in the content areas and utilization of comprehension strategies helps students learn and retain subject-area material. Johnson and Martin-Hansen (2005) concur with the use of comprehension strategies, such as those found in Project CRISS, to aid struggling readers in the science classroom. "The reading tasks going on in science classrooms today are quite extensive and do complement efforts being made in schools to improve reading achievement. However, science teachers need to support struggling readers with strategies that will enhance their comprehension of science reading materials."

Project CRISS provides a research-based avenue for science teachers to incorporate reading strategies in their classrooms and helps readers of all levels delve into content material and improve their comprehension. The development of the KLEW and T-H-C strategies provides evidence that science teachers have embraced reading strategies in their content area classrooms.

References

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About the Author-Cindy McCloud is a doctoral student at Argosy University in Atlanta, Georgia, pursuing a degree in Curriculum and Instruction. She has a Specialist and Masters in Administration and Supervision and an undergraduate degree in Speech and Theatre, with an emphasis in Mass Communication. Cindy taught high school English and has been an administrator at the high school and elementary school levels. She is currently an assistant principal in the Coweta County School System at Jefferson Parkway Elementary School. Cindy is an avid reader, who actually enjoys reading research on reading and learning, as well as Biblical studies. Cindy, a District Trainer, tells us she particularly loves spreading the word about research-based learning through Project CRISS trainings!

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