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## Literature Circles and Reading in Science

**Subject:** Biology  
**Topic:** Literature Circles and Reading in Science  
**Grade:** 9  
**Teacher:** Jody Bird

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### ***Introduction:***

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At the University Park Campus School, we have a program of literacy across the curriculum, where students read, write, and engage with texts in every class. This means that an activity like Literature Circles is not used only by English teachers. It is also a technique that I use in my biology class to scaffold students' reading of primary source documents and other challenging scientific texts. In the lesson described below, at the beginning of the unit on evolution, students read excerpts from seminal works on evolutionary theory by Darwin and Wallace and a recent article from *National Geographic* by David Quammen.

When our students enter the school in 7<sup>th</sup> grade, they are not typically strong readers and writers. Many do not speak English at home and others simply enter the school behind in these critical skills. To help students catch up, teachers in every class assume responsibility for helping students to become strong readers and writers. In addition, reading and writing activities help students improve their understanding of science. Reading well is a critical skill to acquiring knowledge in all areas. In class, we create opportunities for students to grapple with a text, helping them read for deep understanding. My colleague, Jim McDermott, is fond of saying "writing is thinking." When students write, they challenge themselves to understand the material in new ways; they learn as they do it. Writing is the best tool we have as teachers to assess the full scope of students' knowledge.

When I entered the school as a new science teacher, I did not have a background in literacy instruction. Through collaboration with other teachers at UPCS, I have learned to use literature circles and other literacy-based instructional techniques from the English teachers on the staff. One year, I co-taught a unit on science writing with June Eressy, who was then the middle school English teacher and is now the principal at UPCS. This was in response to an analysis of standardized test scores which showed that our students were struggling in science open response questions, where they needed to explain their scientific thinking through writing.

The unit we taught was a great success. I brought the science content knowledge and June brought strategies to teach writing. Together, we helped students improve as science writers and their scores in the open response sections of the state science tests improved dramatically. It was a great pairing, and in the seven years I've been at UPCS, I've developed my own set of techniques to incorporate reading and writing into my science classes.

### ***Reading in Science:***

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In general, students don't read very much non-fiction. There is tons of really good, engaging science writing out there that they will enjoy. In my biology class, students have reading logs, where they must read and write a journal entry about four articles each term. This counts for one test grade.

The articles are typically from *Science News*, *National Geographic*, or other publications that students can choose.

In their journals, students write a straightforward, three paragraph response. The first paragraph summarizes the article they read. In the second paragraph, they write down the exciting things they learned from the article—what made them say “WOW!”, and in the third they record any further questions that the article spurred them to ask.

The structure of this response allows me first to check that students understand the article, and then to see how they engage with the content as scientists. I get to see what they are excited about and what they are curious about. These two qualities, excitement and curiosity, are what drive the very best scientists in the world in their journeys of discovery, and I want create opportunities that drive my students in the same way.

### **Building Excitement through Primary Sources:**

I love science. That goes without saying, but a big part of my goal as a science teacher is to instill in my students the same passion for the wonders of the natural world that I have. I want them to discover things that they think are cool, grapple with big ideas, and ask big questions. I want them to understand the scientific process and imagine themselves as scientists. Textbooks typically gloss over the fantastic process of discovery too much for my taste. I want students to enter the mind of the scientist, trying to organize often confusing data to make sense of the world.

To do that, I ask them to read primary sources, and in our evolution unit they enter the mind and journeys of Darwin and his lesser known contemporary, Alfred Wallace. Students follow Darwin’s voyage on the Beagle, read selections of from his journal, and evaluate the evidence that Darwin collected in his research.

### **Using Literature Circles to Approach Challenging Texts:**

During my evolution unit, I use literature circles to help students to understand complex texts from Darwin and Wallace and an overview of the recent controversy around the “theory of evolution” from *National Geographic*. The specific texts are:

- Darwin, Charles. 1859. *On the Origin of Species by Means of Natural Selection*, London. (Excerpts from Introduction)
- Quammen, David. November, 2004. “Was Darwin Wrong?” *National Geographic*, 3-31.
- Wallace, Alfred Russel. August, 1858. “On the Tendency of Varieties to Depart Indefinitely from the Original Type,” *Journal of the Proceeding of the Linnean Society*, London. (Excerpts)

These texts are too challenging for most of the students in the class without additional support. Literature circles provide the scaffolding that students need to comprehend these texts.

Quite simply, literature circles offer a structure for promoting student-led discussions about a reading. English teachers have been using them for years to help students engage with literature, but

the structure works just as well with the non-fiction that we read in science class. Each student is assigned a specific role outlining the contribution that he or she is expected to add to the conversation.

I split the class into groups of five and assign each student a role. The roles I use are:

- The **Discussion Director** leads the discussion, keeps the group on task, and makes sure that everyone is participating.
- The **Summarizer** summarizes the main ideas of the article.
- The **Connector** makes connections between the text and students' own lives.
- The **Investigator** looks up background material related to the article.
- The **Literary Luminary** looks up vocabulary words that are unfamiliar.

I hand out a role sheet to each student explaining his or her job in the discussion. I found the role descriptions that I used online. There are tons of good websites out there on literature circles and many other roles that you can use if it makes sense for your students and the reading you are using.

I use the varied roles as a way of differentiating instruction. I can assign simpler roles such as Literary Luminary or Investigator to students who are struggling readers, and the more complex roles such as Discussion Director and Connector to students who are more advanced.

For this assignment, students read the text for homework. Then in class, I gave them a chance to look it over again. After multiple passes through the text, I assembled them into their literature circles where they would continue to refer back to it throughout their discussion.

I gave the discussion directors sample questions to help them get the discussion started. For example in the Quammen article, Discussion Directors could begin with "How does the author explain the meaning of the word "theory" in a scientific context?" or "What are the types of evidence that the author uses to support the theory of evolution?"

With these texts, the Connectors initially struggled to draw connections between the scientists and their own lives. Eventually the connections they made were excellent, and not what I expected. Among others, they noted that Darwin was observant of the world around him, and it is important for them to be similarly attentive in their own lives. And they also empathized with his nervousness he had about the possible public scorn or dismissal he would face when he published his groundbreaking ideas in *Origin of Species*. I was excited about these responses; they were connecting with the process of science and discovery, not just the results.

The Literary Luminaries flagged many of the technical terms in the articles. In the Quammen piece some of the words they noted were: morphology, biogeography, paleontology and embryology, four branches of science which offer evidence to support evolution. Many students internalized these words and were able to use them again, in context, in a later assignment where they wrote a letter to the principal justifying why evolution should remain in the biology curriculum "even though it is 'just a theory.'"

## **Conclusion:**

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As adults, we know that scientists read all the time. In fact, scientific journals are the major way the scientific knowledge is spread. It is important for students to learn to read and interpret scientific knowledge as well. Literature circles are one relatively simple way to help students learn to read challenging articles and advance their scientific knowledge and excitement about the topic. There are countless other reading strategies that can easily be adapted for use in science classes as well. The resource list on the next page has some books that may be helpful.

## **Resources:**

Barton, Mary Lee and Jordan, Deborah L. (2001). *Teaching Reading in Science: A Supplement to the Second Edition of Teaching Reading in the Content Areas Teacher's Manual*. Aurora, CO: Mid-continent Research for Education and Learning.

Billmeyer, Rachel and Barton, Mary Lee. (1998). *Teaching Reading in the Content Areas: If Not Me, Then Who?* Alexandria, VA: Association for Supervision and Curriculum Development.

Daniels, Harvey. (2002). *Literature circles: Voice and Choice in Book Clubs and Reading Groups*. Portland, ME: Stenhouse Publishers.

Harvey, Stephanie. (1998). *Nonfiction Matters*. Portland, ME: Stenhouse Publishers.