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ABSTRACT

As a science teacher, I regularly use outside reading assignments (e.g., news articles) to help develop my students' understanding of topics addressed in my anatomy class. However, I have found that in simply reading texts, students often fail to (1) understand the context of the science discussed, (2) make the connections between ideas represented in the reading and those presented in class, and (3) appreciate the science that is being discussed. To better support my students' reading, I needed to structure their reading to direct them toward key ideas and prompt them to process the information deeply, to make connections between their readings and the concepts learned in class, and to understand the science content in context. To address these needs, and to help increase my students' science comprehension and encourage their thinking while reading, I turned to a language arts strategy called Literature Circles. Here, I describe my use of this successful strategy and provide resources to support other teachers who want to employ outside readings and/or Literature Circles in their own teaching.

Key Words: Literature Circles; selected readings; developing roles; structuring assignments.

○ Literature Circles Overview

Literature Circles (LC) are discussion groups of students who have chosen to read the same text. To direct their attention in reading and ensure greater participation during group discussions, students are provided with prompts, called "roles" (Daniels, 2002). To begin the LC process, instructional objectives and readings that may help produce the desired outcomes must be identified. Topics covered in the reading should parallel those taught in class. Once readings are identified, roles can be developed to guide students to consider particular concepts within the text and take written notes as they read; these are used later to support small-group discussion.

Discussions are of critical importance because they provide a context for relating in a more meaningful way to the science concepts being taught. Insights developed through the completion of roles

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should enrich conversations; group meetings should be open, natural conversations in which personal connections, digressions, and open-ended questions are welcome (Daniels, 2002).

○ Literature Circles in Anatomy

There are three main considerations that guide my use of Literature Circles: selecting readings, developing roles, and structuring assignments. Each of these is detailed below.

Selecting Readings

At the beginning of the school year or semester, to help scaffold the LC experience, I select the articles for my students to read. I post a number of options online, and reading groups are responsible for choosing a single article to read. When I'm selecting articles for my students, I consider four important criteria. (Later in the school year or semester, when students need to find their own articles, I share these criteria with them.)

(1) *The source.* I use online sources only – this allows ready access for students in and out of class. (Hard copies of articles should be made available. Depending on your students and school community, it may not be safe to assume that all students have Internet access.) A priority for me is that students read accurate science information that requires them to apply the concepts they have learned in class (via lecture, discussion, lab, and/or textbook) to a real context. We avoid sources written for the general public (such as Yahoo News), because these are often watered down and fail to provide challenging opportunities for students to apply and expand their science understanding. Table 1 lists many useful online sources.

(2) *Connection to content.* In Anatomy, we cover all major body systems. To aid students' understanding and comprehension, I use outside readings that connect the content to students' lives.

Table 1. Names and descriptions of the Literature Circle roles used in my anatomy class.

Role	Description
Discussion Director	Identifies key aspects of reading, generates discussion questions that are focused on the “Big Ideas” of the selected reading, facilitates the discussion
Connector	Responsible for identifying the connections in daily life, news, politics, or trends; also makes the connections to the textbook and class lectures
Word Watcher	Identifies words and phrases that are important to the understanding of the “Big Idea” of the article and overall science
Illustrator	Responsible for drawing out the article for the group (I usually have this person draw the experimental design and identify the variables); helps group understand the experimental process of the article
Summarizer	Prepares a summary of article and discussion, keeps track of questions discussed, and organizes the group’s thoughts into a single narrative

Table 2. Outline of three different ways to structure the Literature Circles assignment.

	Day 1	Day 2	Day 3	Day 4
Start of semester	Select article	Read article	Complete worksheet	Discussion
Second third of semester	Select article	Read article*	Complete worksheet*	Discussion
Final third of semester	Find articles and write synopses*	Share articles – select one	Read article and Complete worksheet*	Discussion

*Designates tasks accomplished as homework; all other activities occur in class.

For each system, we address a range of topics; the science of most topics is described in the textbook. However, I have found that students are more engaged and learn more when we discuss “real” topics that interest them. For example, in the integumentary unit, although the textbook tells us important information about the integumentary system, it’s when we read articles about nails, hair, and pimples (topics with relevance for students) that information is applied and student learning comes to life (see Table 2 for additional examples).

- (3) *Length and readability.* I select readings that are roughly two pages for easy printing, but also because this length ensures that the students have enough time to read and discuss the article in class. The shorter length also helps ensure readability. I give the students a set time to read the article, with their groups, to make sure that they (1) underline key words, (2) make notations on important points, and (3) figure out which body system is being discussed. The websites I select articles from are all written in the same format and have content related to our course. The selected articles are all high school–level readings. To maintain a constructivist environment, I encourage better readers to assist lower-level readers. This way, everyone can collectively master the science content and enhance their literacy.
- (4) *Interest and relevance.* Sex, drugs, diseases, and things that are gross – these topics are proven winners for capturing student interest. Sex includes topics related to reproduction, contraception, puberty, and hormones. These topics are relevant in our discussion of a number of systems, including the reproductive and the endocrine. Drugs, from caffeine to alcohol to methamphetamine, are popular topics, and, because many drugs have wide-ranging effects in the body, articles about the effects of drugs on all body systems are available. Articles about diseases are also fairly easy to find; there are diseases that affect

Table 3. Online sources of appropriate science articles.

Name	Website
New Scientist	http://www.newscientist.com/
Science News	http://www.sciencenews.org/
Medpage today	http://www.medpagetoday.com/
Scientific American	http://www.scientificamerican.com/
Science Daily	http://www.sciencedaily.com/

all body systems. The final topics of interest are things that are disgusting. Fortunately, to the 16-year-old mind, so many things are “gross.”

Developing Roles

There are many roles to choose from, and the roles provided by Daniels (2002) and Straits (2007) can serve as a strong starting point. I use several roles developed by these authors, including “Discussion Director” and “Summarizer” (see Table 1). However, it’s important to note that you can develop and structure roles to best guide your students to meet the specific objectives while reading the assigned text. An important modification that I made for my students was to the format of the role sheets. Our school uses Cornell Notes (Pauk & Owen, 2010), a note-taking strategy that requires students to divide their papers into two columns – the right for recording information from the source (i.e., text or lecture) and the left for recording questions and ideas they have about the information. In alignment with this, LC role sheets ask students to record “notes for discussion” on the right and “critical-thinking questions” on the left (for an example role sheet, see Tables 3 and 4). The teacher initially assigns roles to students, so that each student gets practice completing each task. As the

Table 4. List of systems included in my Anatomy & Physiology class and the potential topics that each class will explore to gain context for the material that is covered in their textbook.

System	Reading Topics	Example
Integumentary	Skin color and causes, tattoos, healthy skin, skin ailments, cancer, nail/hair	"Skin Cancer Reaching Epidemic Levels" from a web article
Skeletal	Bone strength, osteoporosis, bone breaks	"Vigorous Exercise Linked with Better Grades" from NYTimes.com
Muscular	Steroid use, muscle disorders	"What Causes Nocturnal Leg Cramps?" from a web article
Nervous	Brain pathologies and disorders, drug effects, behavior disorders	"Headache" from US News and World Report
Endocrine	Metabolism, puberty, growth, reproduction	"Are Steroids Worth the Risk?" from kidshealth.org
Digestive	Health, nutrition, diabetes	"Obesity Linked to Mental Decline" from Discovery News
Cardiovascular	Heart disease, blood disorders, health	"Sorting Out the Cholesterols" from a web article
Lymphatic	Diseases, immunity, infections, parasites, etc.	"Evolution of the Immune System" from a web article
Reproductive	Puberty, pregnancy, development, STIs	"Breast Milk Sugars Give Infants a Protective Coat" from NY Times.com
Respiratory	Smoking, cancers, asthma, respiratory disorders	"Asthma" from a web article

Literature Circles mature, students assign themselves roles for their group. Upon completion of each role, students have a greater understanding of the reading and much to share during discussions.

Structuring Assignments

To help establish meaningful, small-group discussion, group size and class time need to be considered. In determining group sizes, try to balance the goals of providing multiple perspectives and having opportunities for all group members to participate; groups of three to five students seem best. The amount of time allotted depends greatly on how familiar students are with the LC process, as well as the length of the reading selected and the importance of the LC goals in relation to other instructional aims. In the beginning of the year, our LC assignment is primarily an in-class activity. The LC activity has worksheets that I constructed, based on those used by the English teacher in my school. An Internet search will yield a plethora of editable documents that can be modified for each individual teacher's classroom (try key words "literature circles worksheets" or "literature circles roles"). We use part of four consecutive class meetings, 20–30 minutes each. The tasks for each day are described below.

Day 1. I give students several related readings to choose from; they peruse the articles and must agree as a group on which to read. My role is to help groups understand the articles; I provide clarifications and encourage students to use their textbooks as resources.

Day 2. Sitting with their discussion groups, students read the article; they may take notes and begin their LC worksheet. While reading, students should keep the focus of their role in mind; for example, the "Word Watcher" can look for vocabulary that is important, and the "Discussion Director" can look for the big ideas to discuss with the group. As on the previous day, my role here is to help students understand the content in their articles. I give students about 30 minutes to read and annotate their articles.

Day 3. Students complete their LC worksheets. Meanwhile, I walk around and guide students or clarify items; I also help struggling groups with probing questions to help them write their "critical-thinking questions." Worksheet completion is

important because it requires students to express their understanding of the article in their own words and later enriches groups' discussions and learning.

Day 4. At this time, the students are ready to discuss their critical questions from their respective roles. During group discussions, students share questions and insights and use textual evidence (from the article and textbooks) to explain their responses to others' questions; they clarify meanings, draw parallels to other situations, articulate related personal experience, offer additional information, critique and analyze the text, and connect the text to the content and skills learned in class. I require them to write their connections to share with the class. One of the jobs of the "Connector" is to link the article topic to an issue in their life or from movies or television. I take this time to visit groups, checking for student understanding to determine how much is learned from the readings. I have a few focus questions prepared to share, either as examples or as ways to help students find the points from the article they may have missed.

At the end of their discussion, students submit their completed LC worksheets; these are assessed for an initial grade. Later, in the end-of-unit exam, the depth of student knowledge is further assessed as students are asked to relate their conceptual understanding of the body system to the real-world context discussed in their later assignments. Within the unit exam, there are questions that are free-response that relate to the assigned system. These questions are related to the articles that were originally available for student selection and require higher-level thinking, helping me assess the depth of student understanding.

As the semester advances, students take more and more responsibility for their LC assignments – and less and less class time. Students still spend 20 minutes in class selecting an article to read. The reading of this article and the completion of their worksheets are accomplished outside of class as homework. After a day or two to complete the assignments, groups meet in class to have their discussions and share their findings with their group. Table 2 summarizes the different formats of the LC assignment throughout the semester.

During the last third of the school semester, students are given even greater responsibility for this assignment. Now, rather than me providing possible articles for them, they must find their own articles that are related to the current body system of study. We engage in a conversation about selecting articles. By this point in the semester, students have seen several articles that I have selected for them, so they're able to tell me the components of appropriate articles. I share with the students the criteria described earlier, and we brainstorm possible topics related to our upcoming unit. Each student then finds an article as homework and writes a brief synopsis and a justification for why the group should select this article. (This is new for them, so the first time, we spend additional time in class discussing how to write a synopsis; I share examples, with the corresponding articles, from last year; and I collect the first few synopses they write and provide feedback.) In class, the groups meet and discuss the articles that they have found and choose one to read together. The LC assignment then progresses as before. My students work hard to find the most interesting articles. (Of course, it doesn't hurt that if their article is selected, their homework is easier – they've already read the article, so their synopsis can help them complete their LC role sheet.)

○ Conclusion

Supplemental readings paired with group discussions, organized and structured with Literature Circles, provide a means for students to understand the science we learn in class and apply it to real-world contexts. In addition to learning science content, with the LC format students also learn how to critically analyze and discuss science text, helping them become better consumers of science information – an important scientific literacy goal for all students.

○ Sample Resources

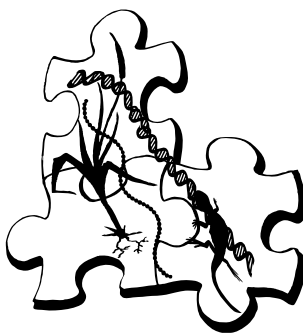
Integumentary: <http://www.urmc.rochester.edu/referring-physicians/urmc-connection/summer-2012/facilities-and-programs/skin-cancer.cfm>

Skeletal: <http://well.blogs.nytimes.com/2010/06/03/vigorous-exercise-linked-with-better-grades/>
 Muscular: <http://www.wisegeek.com/what-causes-nocturnal-leg-cramps.htm>
 Nervous: <http://health.usnews.com/health-conditions/brain-health/headache>
 Endocrine: http://kidshealth.org/teen/food_fitness/sports/steroids.html
 Digestive: <http://health.usnews.com/health-news/articles/2012/08/21/health-buzz-obesity-linked-with-cognitive-decline>
 Cardiovascular: http://www.schools.manatee.k12.fl.us/sollenberger/healthscience2/cardiac_articles.html
 Lymphatic: http://www.nescent.org/documents/NABT2007/Evo_Imm_Sys_Weintraub.pdf
 Reproduction: <http://www.nytimes.com/2010/08/03/science/03milk.html?ref=nicholaswade>
 Respiratory: http://www.schools.manatee.k12.fl.us/sollenberger/healthscience2/respiratory_articles.html

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