COMMENTARY

Disciplinary Literacy

ADAPT NOT ADOPT

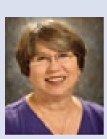
Victoria Gillis

This article argues that all teachers are NOT reading teachers, nor should they be. Adapt rather than adopt is the approach suggested, with examples of adaptations provided.

Recently, I was reading online and came across an item titled “All teachers are literacy teachers under common core” (ASCD, April 17, 2013). My first thought was, “Oh, no – not again. We can’t go back there!” The “back there” to which I refer is the *quicksand* of “every teacher a teacher of reading.” This notion, dating from the early part of the previous century, has hobbled our efforts to improve adolescent literacy for more than 75 years. Every teacher is *not* a teacher of reading. This may seem like anathema to readers of *JAAL*, but if we are to make a difference in adolescent literacy, we have to approach the problem in a different way (Moje, 2008). Albert Einstein said, “The definition of insanity is doing the same thing over and over again and expecting a different result,” which, it seems to me, is what we’ve been doing in adolescent literacy for far too long.

Secondary teachers are experts in specific disciplines, and as such have no desire, let alone sufficient knowledge, to teach literacy (Moje, 2008; Ridgeway, 2004). Although literacy professionals may not mean to turn science or history or mathematics teachers into reading teachers, this is what secondary teachers hear when we say, “every teacher a teacher of reading.” This sort of pronouncement just turns secondary teachers against ideas that, when implemented, can improve student learning and their literacy simultaneously. I know whereof I speak because 40 years ago, I was one of those content area teachers forced against my will to attend a “reading meeting.” I wrote about this in a First Person piece several years ago (Ridgeway, 2004); suffice it to say, I was opposed to being told by a reading person how to teach science. It was in my attempt to show the reading supervisor that she could not tell me how to teach science that I discovered the power in *appropriate* disciplinary literacy practices in science, such as explicitly linking data (evidence) to inferences and conclusions, focusing on multimodal reading, and attending to vocabulary. These practices turned my unmotivated junior high students into engaged learners and solved classroom management problems at the same time. The key, as in many parts of life, was in how I envisioned literacy instruction in my classroom.

Initially, literacy never crossed my mind; instead, I was trying ideas that might improve students’ learning in science. I did “think alouds” as I read diagrams and text before they were assigned; I did not assign every page because some passages were so poorly written that I directed my students to skip them and read the diagrams instead; I assigned



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reading *after* students had engaged in a lab and discussion so that they had constructed sufficient prior knowledge to comprehend the text; and I focused on vocabulary, emphasizing morphology. I envisioned literacy instruction as science instruction – they were the same thing for me. Perhaps this is the difference between conceptions of *content area reading* and *disciplinary literacy*. Often, content area reading seems to impose generic reading strategies on content-specific text whereas disciplinary literacy considers content first and asks, "How would a scientist (or historian, mathematician, or writer) approach this task?" For many content teachers, "adding" literacy to their curriculum means adding something separate and divorced from their content. It is like having a Mercedes sitting in the garage and looking at it as something extra you have to drive once a week or so because you are forced to do so, rather than appreciating that the vehicle will take you someplace. Content area teachers do not see the seamless integration of appropriate literacy practices as an option because most don't think like that. They are focused on content, and these days of high-stakes testing only reinforce that focus. Content area instruction integrated with discipline-appropriate literacy practices was powerful, effective, and more efficient than instruction in my classroom prior to my exposure to content area reading. I did not select a general strategy, such as KWL or Directed Reading-Thinking Activity, to implement in my classroom. Instead, I chose strategies that accomplished my *content* objectives and *adapted* them to fit my teaching style, context, and content. In my classroom, *content determined process* (Herber, 1970), and as I read the current dialogue among secondary literacy scholars, it seems we have come full circle.

In 2008, Moje suggested that perhaps it was time for those in secondary literacy to put content first, rather than literacy. She noted that the general approach in content area reading had been to promote inclusion of literacy instruction in content area classes, and this approach had not worked (see also Bean & O'Brien, 2012/13; O'Brien, Stewart, & Moje, 1995). Moje suggested that the goal of secondary literacy should be "teaching students what the privileged discourses are, when and why such discourses are useful and how these discourses and practices came to be valued" (2008, p. 100). In a response to Moje (2008), Heller (2010/11) suggested that secondary schools should focus on general education and aim to have students communicate about civic, political, and personal issues of importance to them in ordinary language. This seems to me a call for teaching generic reading and writing in content area classes – the status quo. However, students must understand the ideas and content associated with these civic, political, and personal issues and must understand how assertions are made and supported in the various disciplines from which the issues are drawn in order to communicate their ideas clearly and effectively. Additionally, students need to understand the technical language (vocabulary) they use to communicate about these issues. These understandings are the focus that Moje (2008, 2010/11) suggests. Heller's stance is that secondary students are not capable of reaching the goals set by Moje (2008) and that perhaps secondary teachers are unprepared to help them do so. Brozo, Moorman, Meyer, and Stewart (2013) agreed with Heller that Moje's (2008) call for students to be apprenticed in disciplinary ways of thinking was perhaps overreaching.

However, Juel, Hebard, Haubner, and Moran (2010) described first graders learning about how scientists and historians think, and Cervetti and Pearson described research in which elementary students were engaged in *doing* science and were simultaneously learning about reading and writing practices in science. Cervetti and Pearson's stance that it does not make sense to teach comprehension of scientific text isolated from engaged exploration and scientific inquiry strikes a chord with me as a science teacher. If primary and elementary students can learn discipline-appropriate ways of thinking, why do we assume secondary students cannot do so?

Brozo et al. (2013) call for a "middle ground." Their position is that content area teachers can be approached in such a way that they are less resistant to content area literacy instruction. I agree, but I have two issues with Brozo et al.'s argument. First, Hal Herber's (1970) seminal book did call for literacy instruction in content area classrooms, but his mantra was *content determines process*. This crucial element seems to have disappeared from the discussion. Herber was the consultant on the content reading project in Central Florida in which I was a participant. My work with Joy Monahan and Herber in 1973/4 instilled in me the idea that first you look at the content you want to teach. Then you determine the sorts of strategies that will help students learn the content. Content first. It was an idea I could agree with as a science teacher, and one my content area reading students can relate to as well. Second, Moje's (2008) call for students to be apprenticed into the various disciplines was not a call to make high school students experts in any field (Moje, 2010/11). Brozo et al. called for a blending of the two approaches, and noted that some struggling adolescent readers may need the generic reading strategies of content area reading. Faggella-Luby, Graner, Deschler, and Drew (2012) make this argument and provide an example to illustrate their point drawn from history. They compare a discipline-specific strategy that teaches students historical reasoning practices in order to reconcile differences in primary sources with a generic compare and contrast strategy, and claim that the latter is more appropriate for struggling readers because it can be generalized to any content. But it cannot. Not at the high school level, where history students are expected to compare sources and note when each source was generated, who generated it, any biases involved in the author(s) of the source, and to consider other events and sources that are related, to note any language that might provide clues to biases. The sorts of analysis expected of high school students cannot be addressed by generic literacy strategies that simply have students compare and contrast two sources. I think the problem identified by Faggella-Luby et al. (2012) of struggling readers incapable of handling discipline-specific thinking strategies can be mitigated by increased scaffolding for these struggling readers. For example, in the historical reasoning illustration, a history teacher might provide students with an Inquiry Chart that helps support their comparison of the sources in question and simultaneously develop historical thinking as seen in Figure 1.

This provides scaffolding for students' historical thinking, enabling struggling adolescent readers to accomplish the task of comparing the sources. Having struggling readers work collaboratively provides additional support as well as opportunities for students to discuss their emerging understandings.

The current discussion, in a nutshell, is one of general literacy strategies vs. discipline specific strategies (Fang & Coatoam, 2013). As a former science teacher, my experience is that strategies **adapted** (rather than adopted) to fit the content (discipline specific strategies) are more effective than general literacy strategies. Here is an example of what I mean by ***adapt rather than adopt***. In the following discussion, I hope to show how Response Heuristic (Bleich cited in Tierney, Readence, & Dishner, 2000; Alvermann, Gillis, & Phelps, 2013), a strategy that originated in English, can be adapted for other content areas. Response Heuristic was designed to foster readers' inferences about an author's meaning and create space for the reader's personal interpretation of literature. In English, students need to understand what the "experts" say about the meaning of a piece of poetry or literature, but it is also important to allow students to personalize their understanding of the literature. Response Heuristic accomplishes these seemingly opposing tasks. Essentially, Response Heuristic is a three-column graphic organizer in which the first column targets literal information, the second column targets inferential/interpretive thinking, and the third column targets application level thinking. However, the strategy must be adapted for use in different content areas (Alvermann et al., 2013).

In an English class that is reading Hurston *Their Eyes Were Watching God* (1998), and focusing on figurative language, Response Heuristic might be completed as in Figure 2 on page 618.

In a history class studying 20th century history, students might be asked to read from their textbook, identify one to three significant events described in the assignment, the immediate effect(s) and perhaps long-term effects or unintended consequences, and provide evidence for their assertions (see Figure 3). Students need to be able to make these connections and be able to provide supporting evidence for them. Response Heuristic provides an appropriate frame to support students' historical thinking.

In science, Response Heuristic can be adapted to help students make connections between data/observations, inferences, and conclusions. The example shown in Figure 4 relates to a class activity in which students view a video of sodium, then calcium, reacting with water (this must be presented as a video because solid sodium is no longer allowed to be kept in science labs, although as a young science teacher 45 years ago, the demonstration is one I used with students to great effect).

In mathematics, Response Heuristic can help students focus on the process of problem-solving (Polya, 1973), and might have four (rather than three) columns. I must thank my math colleague, Dr. Linda Hutchison, for the adaptation in Figure 5 and Leigh Haltiwanger,

FIGURE 1 Historical Thinking: Inquiry Chart Topic: Civil Rights Movement: Rosa Parks

Resource	**Sourcing** • **When written?** • **Who wrote it?** • **Biases?**	**Close Reading** • **Images prompted?** • **Words/phrases used?** • **How do these impact your understanding?** • **Key ideas?**	**Corroboration** **Compared with related documents:** • **Similarities?** • **Differences?** • **Contradictions?**	**Contextualization** • **Prior related events?** • **Concurrent related events?** • **Resources available to participants?**	**Additional questions / information**
Textbook excerpt	2005 Kohl; summarized from history textbooks	"she was tired" gives an image of someone acting on the spur of the moment, because she was tired	Contradicted by letter from Parks to Mayor and by evidence of her training in civil rights activism	The African American community had organized for a boycott before Rosa Park's arrest	Why do textbooks seem so simplistic? This was very complicated!
Court Affidavit and bus sketch	1957 – by arresting officers who wrote this in late 1956	Diagram shows she was sitting in the assigned black section and asked to move to accommodate more white bus riders	Contradicts the textbook account of her being "tired"	Based on the video, the African American community was waiting for an opportunity to challenge the laws in Alabama	
Robinson letter to Mayor	1954 - Jo Ann Robinson to Mayor of Montgomery	Respectfully written, thanks Mayor for some changes but asks for more	Similar to other documents (Durr letter) indicating that there had been a long-standing request for better treatment of African American bus riders	Based on the video and Durr's letter, it shows the African American community trying to go through "legal" or appropriate channels to get changes made	Why did this all take so long? Two years between the letter asking for better treatment to the date of Parks' arrest?
Durr letter to the Highland Folk School	1956 – Virginia Durr wrote to Highland Folk School people about Rosa Parks' training experience	It paints a different picture of Parks – a woman who had experienced being treated like a human being at Highland	Sheds a different light (from the textbook) on Parks' refusal to move when asked to on the bus – agrees with other documents in the group	Shows evidence for Parks' training as a civil rights activist, gives more context for why she might have refused to move	I never knew there were places where African Americans went to be trained in civil rights activism -

FIGURE 2 Response Heuristic in English Class

Passage quote	Author's meaning	Personal connection
"Women are the mules of the world."	Hurston means although women work hard, they don't get credit for it, and that men think women are "dumb and stubborn" as mules are often described.	As a young wife, I taught school and did all the housework and yard work – including mowing the lawn. My Saturdays were spent working – my husband's were spent hunting and fishing.

FIGURE 3 Response Heuristic in History

Event	Effect	Unintended consequences
After the Soviet Union invaded Afghanistan in the late 1970s, US funded the Taliban in the 80s in order to prohibit the Soviets from taking over Afghanistan	Soviets withdrew in late 1980s - the Taliban won Soviet Union collapsed – in part because of economic costs related to the war in Afghanistan	We are now fighting the Taliban, even though we armed and trained them initially

doctoral student, for the problem illustrated. Leigh commented that the heuristic forces students to generate a plan, something they frequently skip, and that it helps students identify their prior knowledge and forces reflection on the process (personal communication, December 2, 2013). As a science/literacy person, I needed disciplinary experts to help me adapt this strategy for a discipline with which I am not as familiar.

Note how in these examples, a strategy is adapted to reflect the kinds of thinking found in the different content areas. As a content area teacher, this is the kind of "secondary literacy" that was helpful to my students – scaffolding that helped them acquire the habits of mind in science. This is the kind of scaffolding found in Juel et al.'s work with first graders (2010) as well as the work reviewed by Cervetti and Pearson (2012).

Secondary teachers need to understand how literacy can be used as a tool for learning so that students improve their literacy and content knowledge simultaneously. When presented in this light, content area teachers are more willing to consider ideas presented in content area literacy courses. I must tell you, however, that as a science teacher I cared little about students' literacy. I wasn't opposed to students improving their literacy, but my focus was on their learning science, and appropriately so. It took many years before I realized what I was doing; initially, I was just thankful the strategies worked. But once I perceived the literacy principles operating in science literacy, I was able to be more focused and purposeful in my instruction, which increased my effectiveness as well as instructional efficiency. Even then, however, I did not fully appreciate the complexity of literacy in science.

A number of researchers have noted differences in literacy practices across the disciplines

FIGURE 4 Response Heuristic in Science

Observation	Inference	Conclusion
• Initially, the water is neutral (litmus paper does not change color) • The solid sodium fizzes – lots of bubbles around the piece of sodium as soon as you put it in water • Sodium catches on fire briefly • After the sodium is “dissolved” (completely reacts), the water is basic, it turns litmus blue • Water is neutral before putting the calcium in it • Calcium bubbles slowly in water – takes much longer than the sodium • After 5 minutes, there is still some solid calcium left • After five minutes, litmus paper turns blue in the “water” with the calcium	Sodium reacts violently with water and produces a base Calcium reacts with water to produce a base, but more slowly Sodium and calcium have different atomic structures – different numbers of electrons in their outer shells	Na outer electrons are loosely held by Na atoms Ca outer electrons are more tightly held by Ca atoms than are Na electrons Therefore, single outer electrons are more available for reactions than paired outer electrons.

FIGURE 5 Response Heuristic in Mathematics

Problem: The American History Club is taking a field trip to Philadelphia and Boston. The club has raised enough money to provide transportation and lodging for everyone. However, each student must take enough money to cover meals and extras. You plan to take $425.00 and spend $30.00 each day. Your friend is taking $550.00 and is planning to spend $45.00 each day. On which day will you and your friend have exactly the same amount of money remaining?

<table>
<tr><th>What? (What are you asked to find?]</th><th>Plan</th><th>Execute: work the problem</th><th>Check and reflect</th></tr>
<tr>
<td>What is the unknown?
How many days will pass until my friend and I will have the same amount of money?

What are the data?
I start with $425 and spend $30 per day; my friend starts with more money, $550, and spends more money per day, $45

What is the condition?
My friend starts with more money and spends more money per day</td>
<td>Find the connection between the data and the unknown
I want to know when we will have the same amount of money. So, I could look at the amount of money we each have remaining at the end of each day by creating a table. I could also write an equation for me and my friend and see if the lines cross (I know these will be linear equations because we are both spending a set amount of money each day). Or I could set the two equations I write equal to one another to determine when we will have the same amount of money. I think that the third option will give me a more precise answer.</td>
<td>Here students work the problem, showing all their work, including any necessary units
1. Me = m; Friend = f; # of days = x
2. My equation is m = 425 – 30x.
3. My friend's equation is f = 550 – 45x.
4. Since we want to know when we'll have the same amount of money, we have to see when the equations will be equal to each other.
5. Write 425 – 30x = 550 – 45x
6. Add 45x to both sides to get 425 +15x =550
7. Subtract 425 from both sides and get 15x=125
8. Divide both sides by 15 and get 8.333
9. This means that sometime during the 8th day, we will have the same amount of money.</td>
<td>Did your solution work?
Well, I think so, but I might check my solution by using one of the other methods.
1. Make a table showing how much money we will have after each day.
2. In my column, start with 425 and take away 30 dollars each day.
3. In my friend's column, start with 550 and take away 45 dollars each day.
4. The table should look like this:
<table>
<tr><th>Days</th><th>My money</th><th>My friend's money</th></tr>
<tr><td>0</td><td>425</td><td>550</td></tr>
<tr><td>1</td><td>395</td><td>505</td></tr>
<tr><td>2</td><td>365</td><td>460</td></tr>
<tr><td>3</td><td>335</td><td>415</td></tr>
<tr><td>4</td><td>305</td><td>370</td></tr>
<tr><td>5</td><td>275</td><td>325</td></tr>
<tr><td>6</td><td>245</td><td>280</td></tr>
<tr><td>7</td><td>215</td><td>235</td></tr>
<tr><td>8</td><td>185</td><td>190</td></tr>
<tr><td>9</td><td>155</td><td>145</td></tr>
</table>
5. On the 8th day, my friend still has more money than me.
6. On the 9th day, I have more money than my friend.
7. Sometime on the 8th day, we must have the same amount of money.
So, it looks like my first method worked. I would also think about the reasonableness of my solution: does it make sense that we would have the same amount of money sometime on the 8th day? I think so because my friend started with $125 more than me and spent $15 more per day than me; that is, my friend spent $120 more than me during those eight days, and that is almost equal to the $125 more than me that my friend had.</td>
</tr>
</table>

(Johnson, Watson, Delahunty, McSwiggen, & Smith, 2011; Moje, 2006, 2007, 2008; Shanahan & Shanahan, 2008; Wilson, 2011). In the following discussion, I focus on literacy in science to illustrate the complexity involved in reading secondary texts, because this is the discipline that I still consider my academic home with respect to teaching in secondary schools, but use examples from other disciplines to illustrate major points.

In science, reading is multimodal and readers must read diagrams, experimental results, graphs, and prose alternating among these semiotic systems as they think about what they are learning (Shanahan, 2009; Shanahan & Shanahan, 2008; Wilson, 2011). Diagrams, photographs, and graphs each present important information in science textbooks in contrast to social studies texts that use photographs less in support of the prose and more for graphic design purposes. Diagrams are not read left to right, top to bottom; it depends on the structure of the conceptual representation. Some concepts are processes (for example, photosynthesis or how a bill becomes a law) and are best represented as flow charts. Other concepts are structured as part-to-whole (the structure of a leaf, a lever, an atom, or a map of the United States) and are best represented as labeled diagrams. Concepts such as the classification of animals, plants, elements, lenses, or parts of the government are hierarchical taxonomies that are best represented as branching tree diagrams. The structure of the content determines the kind of graphic that best represents the concept (Alvermann et al., 2013). But the multimodal nature of science involves more than diagrams and prose.

In science, text may very well be a graduated cylinder. Reading might involve reading the volume of a liquid in it and knowing to read from the *bottom* of the meniscus. Text might be a wet mount slide of pond water, and in order to read it, one must know how to move the slide as you examine it (if you need to see the top portion of the slide, you have to move the slide down toward you in the opposite direction). Or text might be a chemical reaction that changes color, produces a gas, or gives off or absorbs heat. In chemistry, text includes symbols (Al, H_2, CO_2), numbers, diagrams, and prose. Text, in its broadest sense, can take many forms (Draper, Broomhead, Jensen, Nokes, & Siebert, 2005), and teachers and students need to understand this important feature of scientific text and understand that to read science text, you have to move between the various semiotic systems as you work in order to comprehend the text. In contrast, history text might be a video of an historical event, photographs, journals, diaries, or maps. Students must learn to read these artifacts, including primary documents that might contain archaic language and vocabulary (Draper et al., 2005; Nokes, 2013). Clearly reading science and history texts require different complex cognitive processes. Neither reading nor English teachers possess the requisite prior knowledge necessary to teach students how to read or write in science, social studies, or mathematics.

Being a "teacher of secondary literacy" is more accurately being a teacher of *discipline appropriate literacy practices*, and this cannot be divorced from sufficient content knowledge to understand the epistemology and philosophy of the field from which the text is drawn. One difference between science and math is the idea of proving something. In science, one can *dis*prove but cannot prove anything beyond a shadow of a doubt (thus, all those "scientifically proven" reading programs are oxymorons); but in mathematics, proving something is the name of the game. This difference in philosophy is important for science and mathematics teachers (and students) to understand.

As you can see, literacy at the secondary level is much more complicated than selecting a strategy to use with a particular text passage. We truly don't want every teacher teaching reading. Frankly, they are not prepared to do so. What we DO want is for teachers to teach ***discipline appropriate*** **literacy practices**, which vary according to the content area - not to produce disciplinary experts, but to produce students capable of critical thinking about the issues important to them. In order to accomplish this goal, it is incumbent on adolescent literacy professionals to collaborate with their colleagues teaching discipline-specific courses, including those housed in Arts and Sciences and those in education methods. Johnson et al. (2011) working in mathematics and geography exemplify a team approach to understanding these disciplines and exploring similarities and differences between them, as viewed by content area experts. As a result of their discussions and explorations, they discovered two strategies that are particularly well-suited for mathematics; these strategies are think aloud and math circles (adapted from literature circles). They also discovered that although Cornell notes were spurned by the geographers, Inquiry Charts were enthusiastically taken up as suitable graphic organizers in geography.

This is a case of perfect symbiosis – agriculture, art, dance, English, mathematics, music, physical education, science, social studies, and theater education professors possess the deep content knowledge necessary for successful navigation and creation of texts in these disciplines while literacy professionals bring knowledge of text, comprehension, and composing processes. Together, we can find common ground.

Take Action

STEPS FOR IMMEDIATE IMPLEMENTATION

- Select a concept to be taught in a discipline such as math, science, or social studies.
- Determine what students should *know and be able to do* as a result of instruction.
- Select a literacy strategy that supports students' learning of the identified content.
- Adapt the strategy to promote *disciplinary appropriate thinking* and *processes*.
- Use the adapted strategy, and reflect on its effectiveness in order to refine the strategy for the next time you use it.

Example: In science, the content targeted might be the kinetic molecular theory of matter (*matter is made up of molecules that move continuously, depending on the amount of kinetic energy they have*). Targeted scientific processes might include observing and drawing inferences, and then making connections among the inferences to develop conclusions. These scientific processes are essential in science. A good strategy to help students make these connections might be an *adaptation* of Herber's (1970) Three Level Reading Guide. Rather than using the Three Level Reading Guide as it is described for text (see Alvermann et al. 2013, pp. 222-224), adapt the strategy so that Level 1 has observations, Level 2 has inferences, and Level 3 has conclusions. As students complete the guide (now a thinking guide), they might be required to identify the observations that support each inference, and the inferences that are connected to each conclusion.

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More to Explore

CONNECTED CONTENT-BASED RESOURCES

- ✓ For an article describing an adaptation of the Three Level Guide to a Thinking Guide, see Ridgeway, V.G., & Padilla, M.J. (1998, November). Guided Thinking. *The Science Teacher*, 65(8), 18–21.
- ✓ See http://www.voiceofliteracy.org/posts/45157 for a podcast by Dr. Cynthia Shanahan on how professionals think in a variety of disciplines: Baker, E.A. & Shanahan, C. (2012, January 16). Gleaning insights from historians, mathematicians, and chemists about how they read within their disciplines. Voice of Literacy. Podcast retrieved from http://www.voiceofliteracy.org
- ✓ See www.thinkfinity.org for lesson plans and other instructional resources. Thinkfinity.org links to lessons and resources from National Geographic, the Smithsonian Institute, the International Reading Association (ReadWriteThink), and the International Society for Technical Education, among others.
- ✓ See www.pbslearningmedia.org and search for teachersdomain.org for videos, interactive web-based activities, and more. A video, *frozen frogs,* is an excellent introductory activity when teaching about adaptation or metabolism in science. [Teachersdomain.org was a stand-alone site until recently when it was acquired by Public Broadcasting.]