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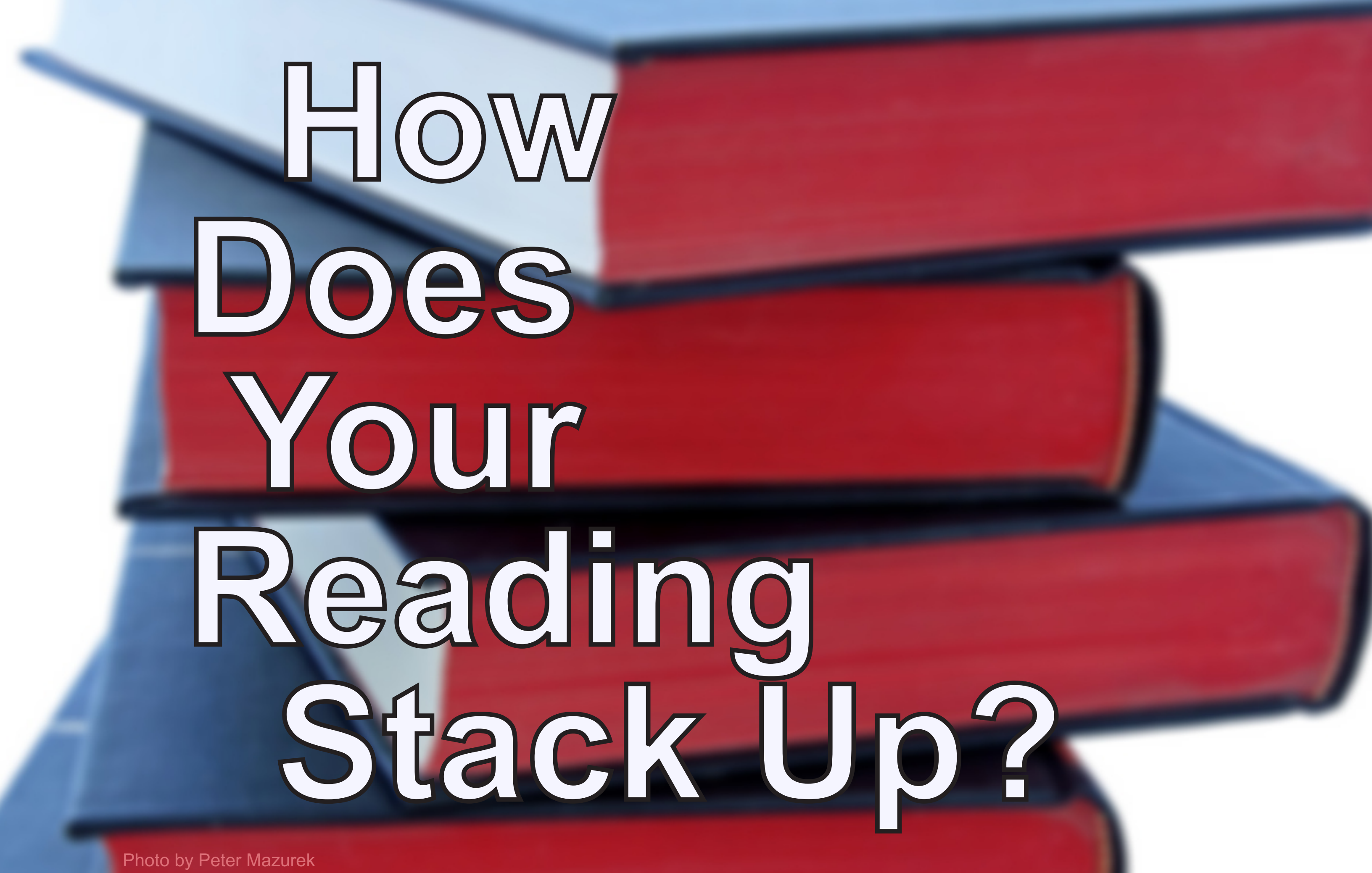
Jennifer A. R. Smith
Iowa State University

Lori Marie Ihrig
Iowa State University



How Does Your Reading Stack Up?

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EFFECTIVE TEACHING PRACTICES MAKE FOR SUCCESSFUL READING EXPERIENCES IN THE CLASSROOM

Jennifer A. R. Smith, Iowa State University
Lori Marie Ihrig, Iowa State University

ABSTRACT: This article provides teachers concrete strategies for applying knowledge of how people learn and effective teaching practices to decisions about classroom implementation of science content area readings. *This article promotes Iowa Teaching Standards 1, 3, 4, 5, and 6.*

With the current emphasis on inquiry science teaching, many people wrongly believe all instruction should be hands-on and reading should be avoided in science instruction. However, reading can contribute in many ways to an engaging, cognitively demanding, and inquiry-based science classroom. Readings may serve many purposes in the science classroom, including:

(1) capturing students' interest in the content,
(2) providing information sources to draw from during concept development and extend upon during application,
(3) humanizing science,
(4) illustrating how science knowledge is developed,
(5) providing new scenarios for students to analyze by applying their content knowledge,
(6) raising questions for investigation, and
(7) developing effective communication skills by reading and reviewing peers' written work.

Unfortunately, the low reading abilities and poor attitudes towards reading many students demonstrate are lamented by teachers and used to justify removing reading from science classroom instruction. However, if science teachers continue to avoid utilizing readings in their classes, students are unlikely to improve their attitudes and capabilities with respect to reading science related materials. While science teachers may not believe their job is to teach students how to read effectively, students will suffer if we permit students' reading abilities and attitudes to prevent the inclusion of reading in our classrooms. All teachers, regardless of content discipline, have the responsibility to help students learn to successfully read material relevant to their content area. Effective science teaching practices can be used to overcome these hurdles and make science readings engaging and meaningful for our students.

Considerations when Choosing a Reading

Even before implementing a reading activity in the classroom, you must carefully consider the type of reading materials you select. Rather than textbooks, choose more engaging or authentic reading sources that promote understanding and application of science content or the processes of science. Appropriate sources of readings may include:

(1) historical and contemporary short stories about the development of science ideas,

(2) science magazine articles,

(3) newspaper articles,

(4) science journal articles, and

(5) information sources addressing questions students develop.

Additionally, you must consider the age and development of students when choosing reading materials. The content, length, and structure of readings need to be developmentally appropriate. If the science content in the article is too abstract, students will not be able to make sense of the reading regardless of how much cognitive effort they put forth.

Considerations When Structuring a Reading Activity

Effective teaching practices are the key to successfully using readings in the classroom. To most effectively use readings in your classroom, you must consider:

(1) your students and how people learn,

(2) supporting your students with before, during, and after reading strategies, and

(3) your own teacher behaviors.

Each of these considerations are discussed below.

How Students Learn and Implications for Structuring a Reading Activity

To effectively implement readings in your science classroom, decisions about how to select readings, where to place readings during instruction, and how to successfully support students before, during, and after reading should reflect how students learn. Consider the implications of each of these aspects of how students learn:

- Students interpret knowledge in light of their prior experiences and conceptions. Productive learning occurs when students attempt to make sense of their experiences by wrestling with ideas that do not fit their prior conceptions. Thus, teachers cannot just transmit their knowledge and understanding intact to students; students may interpret information and experiences provided by teachers very differently than intended (Saunders, 1992). *Students must have opportunities to repeatedly explore and wrestle with new experiences and ideas*.

- Students become increasingly able to comprehend abstractions as they age (Karplus, 1977). However, although we may handle more abstractions as we age, all learners more easily understand concepts when they are represented concretely (Olson, 2008). Text is a very abstract representation type for science concepts—little more than black lines on a white paper we use to represent and transmit ideas. *Thus, exposing learners to concrete representations of science ideas prior to reading about them will promote better comprehension of the reading and understanding of science content.*

- Students learn through using language, interaction, and communication with others (Dixon-Krauss, 1996). *Reading should be considered a collaborative process where students have opportunities to read, discuss, and make sense of readings together.*

Considering how students learn will guide your decisions about how to most successfully implement readings in your classroom. The following implications for implementing readings draw upon an understanding of how people learn:

(1) Be sure the content, vocabulary, and format of reading materials are developmentally appropriate. If the content is too abstract for students, they are unlikely to understand the reading.

(2) Provide concrete experiences prior to having students engage in reading. Just as we would expect to need concrete experience before abstract explanations of science content (Olson, 2008), we need to utilize concrete experiences prior to having students engage in the abstract process of reading.

(3) Use readings following exploration and laboratory activities. Such activities may serve as concrete experiences students can refer to when they are reading. Providing concrete experiences first will aid students in making sense of what they are reading.

(4) Use readings in the later portions of the content development or application phases of the learning cycle when students have already developed some understanding of the content being discussed.

(5) Utilizing pair, small group, and large group discussion of questions relevant to the reading can help students clarify and extend their understanding of readings.

This also provides you with opportunities to monitor students' thinking and understanding of the reading and science concepts.

(6) Break up reading time with social interaction by having students work with small groups or pairs to discuss key ideas or questions at different points in the reading.

(7) If some students have limited reading ability, have them work in small groups in which another student reads the material aloud.

The Importance of using Appropriate Reading Strategies Before, During, and After Reading

Effective decisions about strategies for teaching science content are rooted in what we know about how people learn and are selected to promote student actions in line with our goals for students (Clough, Berg, & Olson, 2009). The same is true concerning effective decisions about strategies for content area readings. Before, during, and after reading strategies serve different purposes and should be used consecutively for any reading provided to students. Before-reading strategies serve to help engage students in the reading and prepare students to understand and make sense of the readings. Strategies used during the readings help students make sense of what they are reading and promote active mental engagement while reading. Strategies used after a reading may serve to:

(1) further students' understanding of the reading by requiring students to explain, apply, or integrate knowledge with prior understandings or new situations,

(2) hold students accountable for what they read, and

(3) enable teachers to assess students' thinking about the reading content and science ideas.

When used together, before, during, and after-reading strategies help make implementation of science readings in your class successful and effective. Examples of each are found below.

<u>*Before Reading Strategies:*</u>

- Use concrete experiences prior to reading. Before reading, students should explore the science concept or natural phenomenon by using direct observation, simulation and laboratory activities, models, pictures, illustrations, or diagrams.
- Utilize pre-reading questions to draw students' attention to relevant prior experiences, their current understandings of the content, and the intent of the reading.
- Set the stage for the reading using pictures, illustrations, or other visual graphics to introduce the people or setting of the reading.
- Introduce complex vocabulary that may be essential to understanding the reading.

<u>*During Reading Strategies:*</u>

- Embed questions (verbal or written) within and at the end of the reading to break up the reading and draw students' attention to key ideas or relate ideas from the reading to prior knowledge.
- Break up long readings into discrete sections and minimize how much time students spend reading at one time.
- Have students work individually or in groups to identify key ideas in each section of the reading.
- Stop students at key points in the reading to introduce more concrete representations such as models, pictures, illustrations, diagrams, or video clips.

<u>*After Reading Strategies:*</u>

- Discuss questions from the reading in small groups or as a whole class.
- Lead whole class discussion using questions previously discussed in small groups.
- Ask students to apply information from the reading to new scenarios.
- Ask students how information from the readings relates to science content previously learned.
- Have students create concept maps, Venn diagrams, or other graphic organizers to display their understanding of the reading material and relationships to other science concepts.

Considerations of Teacher Behaviors When Implementing a Reading Activity

Choosing appropriate readings and implementing effective reading strategies are not enough to successfully incorporate reading into your science instruction. As with any highly effective science lesson, effective teacher behaviors are essential for implementing a successful content area reading lesson. Your verbal and non-verbal behaviors should always be carefully chosen to promote students' engagement and participation.

Highly effective teachers always find ways to promote student engagement while revealing and monitoring students' thinking. Monitoring student engagement and understanding is especially important during reading activities because students may find the content difficult, or even dislike reading. Therefore, you must be certain that students do not simply skim the material without actually reading for meaning. Additionally, students often misinterpret concepts from the reading because they interpret what they read in light of their prior knowledge and experiences.

Often, students will force the ideas they read to match what they already know – whether or not these ideas are accurate. Hence, you must be continually revealing students' ideas and assessing their thinking about concepts from the reading. Then, use students' ideas to help them scaffold their thinking toward accurate science ideas. For example, you might ask

- "How does ______ compare to ______?" followed by,
- "If that were the case, then what would you expect to happen if _______?"

However, poor teacher behaviors often inadvertently inhibit students from participating in class discussions and activities, and thus reduce your ability to assess students' thinking and interpretation of the text.

Questions to Ask Yourself if You Struggle with Student Participation

1. What do my body language, facial expressions, and positioning communicate about me?

- How consistently do I appear friendly, caring, and interested?
- In what ways do I unintentionally appear bored, angry, or intimidating?
- What physical barriers are separating me from the students?

2. How might I be inadvertently intimidating my students?

- What facial expressions do I use that look angry, annoyed, or bored?
- How often does my voice sound angry, frustrated, annoyed, or disinterested?
- In what ways might I seem judgmental rather than accepting of student answers?

3. How do my questions, responses, and use of wait-time communicate I am interested and want to hear students' ideas?

- How consistently am I asking thought-provoking questions?
- How frequently do I inhibit student thinking by asking short answer or yes/no questions?
- How often do I cut off students or interrupt when they answer?
- How consistently do I ask students to elaborate or justify their answers so I can better understand their thinking?
- How frequently do I use students' ideas in class?

4. How does my use of wait-time communicate I am interested in students' ideas and expect participation?

- How consistently do I use 3-4 second wait-time after asking a question to induce student responses?
- How frequently do I undermine student thinking by giving students the answer if no one responds?
- How consistently do I use 3-4 second wait-time after a student response to promote additional student participation?

Effective questioning, wait-time, and responding patterns require students to mentally engage in your discussions, promote critical thinking and communication skills, and reveal students' thinking about content. Utilizing thought provoking extended-answer questions rather than yes/no and short answer questions provides opportunities for students to express themselves and explain their thinking (Penick, et. al., 1996). By waiting a minimum of three to five seconds after asking a question, wait-time I provides an opportunity for students to think of an appropriate response and induces pressure on students to participate in the discussion. Using an additional three to five second pause after a student responds, wait-time II, increases the likelihood that additional students will respond to the question (Rowe, 1986), thus revealing the thinking of more students.

In addition to wait-time, our responses to students also impact their participation in discussions. Student-centered responses communicate to students that you are thoughtfully listening to what they say and interested in developing their ideas (e.g., What do you mean by _______? How does what Maria said compare to what Marcus mentioned? If that were the case, how might it explain ______?) Using student-centered responses increases students' mental engagement, critical thinking, and participation. Thus, you have a more clear idea of what students are thinking and why.

Facial expressions, body language, classroom positioning, and intonation also play a key role in promoting student participation and discussion. Unfortunately, teachers often inadvertently communicate that they are angry, bored, frustrated, or uninterested in student ideas; thus inhibiting discussion before it even begins. Open and inviting body language (e.g., leaning forward and opening your arms) and expectant facial expressions (e.g., smiling and raising your eyebrows) coupled with a friendly and interested voice intonation communicate to students that you care about and are interested in their ideas (Bavelas, et. al., 1995; Clough, et. al., 2009).

Moving among your students is also essential for monitoring both students' behavior and thinking during reading activities. Simply sitting behind a desk while students read invites students to be off task and indicates you are unconcerned about whether or not they take the assignment seriously. By removing barriers between yourself and the students and continually monitoring students, you communicate that you take the assignment seriously and care about their learning.

Concluding Thoughts

Effective science instruction and successful incorporation of content area readings both require informed decision making by thoughtful teachers. Effective science teachers consider the background of their students, how students learn, and their own teaching behaviors when designing a learning environment conducive to both reading and learning science content. Ultimately, thoughtful teachers make informed decisions to successfully promote the goals they have for students. Inclusion of content area readings is essential for creating a classroom environment designed to develop our students into individuals capable of applying science knowledge to new situations, thinking critically, effectively solving problems and communicating, being creative, and successful citizenship.

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***Jennifer A. R. Smith** is pursuing a doctoral degree in Curriculum and Instruction at Iowa State University. She previously taught biology and chemistry at Norwalk High School in Norwalk, Iowa. Jennifer wrote an article for the Iowa Science Teachers Journal called* DNA: Modeling Structure and Function*. Contact Jennifer at jarsmith@iastate.edu.*

***Lori Marie Ihrig** is pursuing her doctoral degree in Curriculum and Instruction at Iowa State University. She has several years of teaching experience including seven years of teaching at Williamsburg Community School District in Williamsburg, Iowa. Lori has written three additional articles for ISTJ, including Wiggling Worms: Using the Learning Cycle in an Elementary Classroom to Study Variation, Growing Minds: Planting a Lasting Seed Using the Learning Cycle, and Days of Our Spineless Lives: A Never Ending Saga. Contact Lori at lihrig@iastate.edu.*