



**S<sup>2</sup>TEM Centers SC**

Solutions in Science, Technology, Engineering & Mathematics Education

## Creating a Literate Workforce

### *Reading, Writing, and Speaking in Technical Subjects*

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*S<sup>2</sup>TEM Centers SC (Solutions in Science, Technology, Engineering, and Mathematics Education) is a public/private/fee-for-service not-for-profit organization focused on economic development through improvement in K-12 STEM education. S<sup>2</sup>TEM Centers SC are an initiative of South Carolina's Coalition for Mathematics and Science ([www.sccoalition.org](http://www.sccoalition.org)).*

## Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, and Language

The descriptions that follow are not standards themselves but instead offer a portrait of students who meet the standards set out in this document. As students advance through the grades and master the standards in reading, writing, speaking, listening, and language, they are able to exhibit with increasing fullness and regularity these capacities of the literate individual.

### They demonstrate independence.

Students can, without significant scaffolding, comprehend and evaluate complex texts across a range of types and disciplines, and they can construct effective arguments and convey intricate or multifaceted information. Likewise, students are able independently to discern a speaker's key points, request clarification, and ask relevant questions. They build on others' ideas, articulate their own ideas, and confirm they have been understood. Without prompting, they demonstrate command of standard English and acquire and use a wide-ranging vocabulary. More broadly, they become self-directed learners, effectively seeking out and using resources to assist them, including teachers, peers, and print and digital reference materials.

### They build strong content knowledge.

Students establish a base of knowledge across a wide range of subject matter by engaging with works of quality and substance. They become proficient in new areas through research and study. They read purposefully and listen attentively to gain both general knowledge and discipline-specific expertise. They refine and share their knowledge through writing and speaking.

### They respond to the varying demands of audience, task, purpose, and discipline.

Students adapt their communication in relation to audience, task, purpose, and discipline. They set and adjust purpose for reading, writing, speaking, listening, and language use as warranted by the task. They appreciate nuances, such as how the composition of an audience should affect tone when speaking and how the connotations of words affect meaning. They also know that different disciplines call for different types of evidence (e.g., documentary evidence in history, experimental evidence in science).

### They comprehend as well as critique.

Students are engaged and open-minded—but discerning—readers and listeners. They work diligently to understand precisely what an author or speaker is saying, but they also question an author's or speaker's assumptions and premises and assess the veracity of claims and the soundness of reasoning.

### They value evidence.

Students cite specific evidence when offering an oral or written interpretation of a text. They use relevant evidence when supporting their own points in writing and speaking, making their reasoning clear to the reader or listener, and they constructively evaluate others' use of evidence.

### They use technology and digital media strategically and capably.

Students employ technology thoughtfully to enhance their reading, writing, speaking, listening, and language use. They tailor their searches online to acquire useful information efficiently, and they integrate what they learn using technology with what they learn offline. They are familiar with the strengths and limitations of various technological tools and mediums and can select and use those best suited to their communication goals.

### They come to understand other perspectives and cultures.

Students appreciate that the twenty-first-century classroom and workplace are settings in which people from often widely divergent cultures and who represent diverse experiences and perspectives must learn and work together. Students actively seek to understand other perspectives and cultures through reading and listening, and they are able to communicate effectively with people of varied backgrounds. They evaluate other points of view critically and constructively. Through reading great classic and contemporary works of literature representative of a variety of periods, cultures, and worldviews, students can vicariously inhabit worlds and have experiences much different than their own.

## STRATEGIES FOR READING, WRITING, AND SPEAKING IN TECHNICAL SUBJECTS

### PAIRED-VERBAL-FLUENCY

**WHAT:** Paired Dialogue Strategy

**WHY:** To activate (beginning of lesson) or summarize (end of lesson) knowledge

**How:**

1. Identify pairs of students. Have pairs designate Student A and Student B.
2. On the signal, Student A will begin speaking on the given topic or question. When time is called, Student B will begin speaking on the same topic or question. Student B can not repeat anything Student A said. This pattern continues for up to three rounds.
3. Depending on the purpose, the time either increases or decreases each round. When used at the beginning of the lesson (to activate), time increases (Round 1: 15 seconds, Round 2: 30 seconds, Round 3: 45 seconds.) When used at the end of the lesson, time decreases (Round 1: 45 seconds, Round 2: 30 seconds, Round 3: 15 seconds.)

**SOURCE:** Lipton, L. and Wellman, B. (1998). *Pathways to understanding: Patterns and practices in the learning-focused classroom*. Sherman, CT: MiraVia LLC.

### FOCUSED READING

**WHAT:** Individual Reading Strategy

**WHY:** To promote active engagement with text and encourage students to compare their current knowledge with the information in the text

**How:**

1. Introduce students to the focused reading symbols.
  - ✓ = Got it. I know or understand this.
  - ! = This is really important or interesting.
  - ? = I don't understand this or this does not make sense.
2. Assign a text passage for reading and marking with the symbols. Use photocopied text while students are learning the strategy. Later they can use a table in their notebooks to record.
3. After reading, student teams of three to four students compare their responses.
4. Teams select sample items from each category to share with the class.

**SOURCE:** Lipton, L. and Wellman, B. (1998). *Pathways to understanding: Patterns and practices in the learning-focused classroom*. Sherman, CT: MiraVia LLC.

## STRATEGIES FOR READING, WRITING, AND SPEAKING IN TECHNICAL SUBJECTS

### FIRST TURN-LAST TURN

**WHAT:** Group Dialogue Strategy

**WHY:** To ensure active participation by all students as they dialogue about a text selection

**How:**

1. When the group is ready, a volunteer identifies and reads aloud the part of the text s/he found most significant. This person says nothing about why s/he chose that particular passage.
2. The group should pause for a moment to consider the passage and make notes before moving to the next step.
3. The other participants each have 2 minutes to respond to the passage – saying what they think the author is trying to achieve and is achieving in the passage.
4. The first participant then has 3 minutes to state why s/he chose that part of the article and to respond to – or build on – what s/he heard from colleagues.

**SOURCE:** Garmston, R. and Wellman, B.. (2009). *The adaptive school: A sourcebook for developing collaborative groups* (2nd Ed.). Norwood, MA: Christopher-Gordon Publishers, Inc.

### TWO-MINUTE PAPER

**WHAT:** Individual Writing Strategy

**WHY:** To provide student opportunity to synthesize their learning and to assess student understanding of the lesson

**How:**

1. Provide a half-sheet of paper to students during the last three-to-five minutes of a class.
2. Write two questions on the board or on a chart to which you want students to respond.

#### Sample Questions:

- What was the most important thing you learned today?
  - What did you learn today that you didn't know before class?
  - What important question remains unanswered for you?
  - What would help you learn better tomorrow?
3. Give students two minutes to respond then collect their papers. Read, sort and analyze the responses to make adjustments for the next day's lesson.

**SOURCE:** Keeley, P. (2008) *Science Formative Assessment: 75 Practical Strategies for Linking Assessment, Instruction, and Learning*. Thousand Oaks, CA: Corwin Press.

## STRATEGIES FOR READING, WRITING, AND SPEAKING IN TECHNICAL SUBJECTS

<b><u>RERUN</u></b>	<b><u>TWO OR THREE BEFORE ME</u></b>
<p><b>WHAT:</b> Individual Writing Strategy</p> <p><b>WHY:</b> To provide a structured opportunity for students to write about what they did, how they did it, and what they learned from it</p> <p><b>How:</b></p>	<p><b><u>VOLLEYBALL, NOT PING PONG</u></b></p> <p><b>WHAT:</b> Group Dialogue Strategies</p> <p><b>WHY:</b> To provide opportunities for more students to share their ideas during class by setting classroom norms for dialogue</p>
<p><b><u>RERUN:</u></b></p> <p><u>Recall:</u> Summarize what you did in the lab/activity. <u>Explain:</u> Explain the purpose of the lab/activity. <u>Results:</u> Describe the results of the lab/activity and what they mean. <u>Uncertainties:</u> Describe what you are still unsure about. <u>New Learning:</u> Write at least two new things you learned from this lab/activity.</p>	<p><b>How:</b></p> <p><u>Two or Three Before Me:</u> Two or three others must have an opportunity to speak before the same person speaks again</p> <p><u>Volleyball, Not Ping Pong:</u> Classroom dialogue should be like volleyball—students build on the ideas of others and “set” up the conversation for others in the room.</p>
<ol style="list-style-type: none"><li>1. Post a RERUN chart in the classroom.</li><li>2. After a lab or activity, students use the RERUN chart as a guide for a written summary of their learning. They should write one or two sentences for each letter.</li><li>3. RERUN can also be done as a collaborative group activity to summarize group learning.</li></ol> <p><b>SOURCE:</b> Keeley, P. (2008) <i>Science Formative Assessment: 75 Practical Strategies for Linking Assessment, Instruction, and Learning</i>. Thousand Oaks, CA: Corwin Press.</p>	<ol style="list-style-type: none"><li>1. Explain the classroom expectations regarding small group and whole group dialogue.</li><li>2. Monitor students as they practice the strategy in group dialogue or in whole class dialogue.</li><li>3. The teacher should also follow these norms during class dialogue to encourage more students to speak.</li></ol> <p><b>SOURCE:</b> Keeley, P. (2008) <i>Science Formative Assessment: 75 Practical Strategies for Linking Assessment, Instruction, and Learning</i>. Thousand Oaks, CA: Corwin Press.</p>

**STRATEGIES FOR READING, WRITING, AND SPEAKING IN TECHNICAL SUBJECTS**

**Graphic Organizer: Analyzing Text – Citing Evidence and Inferences**

<p>What does the Author <b>claim</b> is the problem?</p>	<p>What <b>inferences/counterclaims/opposing claims</b> am I making as I read and think about the text?</p>
<p>What <b>relevant evidence</b> does the author give to support the claim(s)? Circle any evidence from credible sources.</p>	<p>What <b>relevant evidence</b> from the text supports my <b>inferences/counterclaims/opposing claims</b>? Circle any evidence from credible sources.</p>
<p>What do I <b>conclude</b> as a result of <b>analyzing</b> the text and weighing the <b>evidence</b>? What <b>supports</b> my decision?</p>	