Supporting Rigorous Science Teaching and Learning

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Welcome to: Hamilton County District-Wide Professional Development Day January 7, 2014

Tennessee Department of Education
Science
Grades 6-8

Supporting Rigorous Science Teaching and Learning

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Module 1 to 3: Review

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Module 1: Analysis of a Science Research Simulation Task

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Portrait of Students Who Meet the Standards

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- They demonstrate independence.
- They build strong content knowledge.
- They respond to the varying demands of audience, task, purpose, and discipline.
- They comprehend as well as critique.
- They value evidence.
- They use technology and digital media strategically and capably.
- They come to understand other perspectives and cultures.

Common Core State Standards (CCSS) Key Shifts for ELA & Literacy

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1. **Complexity:** Regular practice with complex text and its academic language
2. **Evidence:** Reading, writing, and speaking grounded in evidence from text, both literary and informational
3. **Knowledge:** Building knowledge through content rich nonfiction

What questions do you have about the key shifts?

*Excerpted from A Strong State Role in Common Core State Standards Implementation: Rubric and Self-Assessment Tool, p. 6, Table 1, Key Instructional Shifts of the Common Core State Standards, by the Partnership of Readiness for College and Careers Transition & Implementation Institute, 2012, Washington, DC: Achieve.

Common Core State Standards (CCSS) for English Language Arts (ELA) & Literacy in History/Social Studies, Science, and Technical Subjects

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CCSS for ELA consist of
- Reading
  - Literature
  - Informational Text
  - Foundational Skills
- Writing
  - Arguments
  - Explanatory Text
  - Narratives
- Speaking & Listening
- Language

CCSS for Literacy in Science consist of
- Reading
  - Informational Text
- Writing
  - Arguments
  - Explanatory Text

Science **content** still comes from science standards.

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Module 2: Engaging in Rigorous Science Lessons

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Task Sheet 1
Seed to Tree

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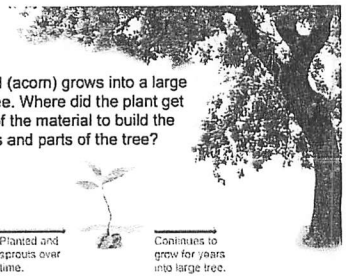

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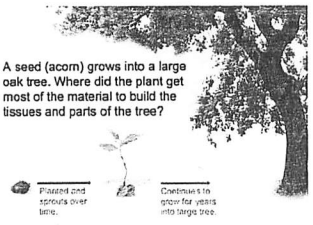

Which claim can **you** best support?

1. Most of the matter in plants comes from the soil.
2. Most of the matter in plants comes from water.
3. Most of the matter in plants comes from the air.

Takeaways

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An understanding of

- the implications of the Common Core State Standards (CCSS) shifts on science instruction, in particular the role of reading, writing, and talk; and
- the interplay among reading, writing, talking, and learning science, recognizing the importance of text, task, and talk.

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Module 3: Text Complexity

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Key Requirement for Reading

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All students must be able to **independently** read and comprehend texts of **steadily increasing complexity** as they progress through school.

Student Reading Across The Grades*

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Grade	Literary	Informational**
4	50%	50%
8	45%	55%
12	30%	70%

*The percentages on the table reflect the sum of student reading across the school day (Page 5 of CCSS Introduction).

**Informational texts in ELA include literary non-fiction.

Why Text Complexity Matters

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- Reading demands in college, workforce, and life have increased while complexity of K-12 texts have declined.
- Clearest differentiator on ACT was students' ability to answer questions on complex texts.
- "A high school graduate who is a poor reader is a post-secondary student who must struggle mightily to succeed."
- "The consequences of insufficiently high text demands…in K-12 school are severe for everyone."

A Three-Part Model for Measuring Text Complexity

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1. **Qualitative dimensions**—levels of meaning, structure, language conventionality and clarity, and knowledge demands (human reader).
2. **Quantitative dimensions**—readability and other scores of text complexity (computer scored).
3. **Reader and task considerations**—background knowledge of reader, motivation, interests, and complexity generated by tasks assigned (educators employing professional judgment).

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Share Time!!!

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Module 4: Academically Productive Talk

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Course of Study

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1. Analysis of a Science Research Simulation Task
2. Engaging in Rigorous Science Lessons
3. Text Complexity
4. **Academically Productive Talk**
5. Arguments and Explanatory Writing

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Goals

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- Deepen understanding of academically productive talk by
  - using Accountable Talk® norms and practices;
  - designing questions that ask students to engage in intellectual work to meet Common Core State Standards (CCSS); and
  - experiencing and analyzing intentionally structured discussions that apprentice talk in science.
- Reflect on your learning.

Norms for Working Together

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- Be respectful of other's time – Begin and end on time
- Maintain and open and safe atmosphere for communication and collaboration
- Remain positive, task/purpose-focused, respectful, and courteous
- Actively participate and bring requested materials
- Share a sense of responsibility for student learning
- Be professional at all times
- Be the student you want in your class
- **Keep students at the center**

Review of Module 3

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1. What are the three facets to assessing text complexity?
2. Why is analyzing texts useful?

Packet 1: Science6-8 Materials, page 73

Task Sheet
Questions, Tasks, and Talk

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Part I—Publishers' Criteria

1. Individually read *Revised Publishers' Criteria for the Common Core State Standards in English Language Arts and Literacy, Grades 3-12* sections II and III.
2. Discuss with a partner what the authors mean by
   a. high-quality text-dependent questions and tasks and
   b. academic (and domain-specific) vocabulary.
3. Be prepared to share your thoughts with the whole group.

Task Sheet
Questions, Tasks, and Talk

TNCore

Part II—Speaking and Listening: The Key Role of Evidence

1. Watch the video. As you watch, listen for insights that Susan Pimentel shares about speaking and listening.
2. With a partner, discuss benefits of speaking and listening in science. Compare and discuss your analysis of each text.

Task Sheet
Questions, Tasks, and Talk

TNCore

Part III—Preparing for Talk

1. Take a few minutes to collect your thoughts and note (from the text and video) what the authors say about the role of questions, tasks, and talk in learning.
2. Be prepared to cite evidence as you engage in the upcoming discussion.

Task Sheet
Questions, Tasks, and Talk

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Part IV—Whole Group Discussion

1. Engage in a discussion around what the authors say about the role of questions, tasks, and talk in learning.
2. Cite evidence as you engage in the discussion.

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Learning About *Accountable Talk* Practices

Task Sheet
Learning About *Accountable Talk* Practices

TNCore

Part I—Three *Accountable Talk* Focus Features

1. Take the next **three minutes** to individually read/skim An Overview of *Accountable Talk* Practices.
2. Focus on Section 3 and the three features the authors identify as areas we should be accountable to for academically productive talk (pages 5-9).
3. Be prepared to share the three features we should be accountable to for academically productive talk.

Task Sheet
Learning About *Accountable Talk* Practices

TNCore

Part II—Whole Group Discussion

1. What are the three areas we should be accountable to for academically productive talk:
   a. Accountability to _____
   b. Accountability to _____
   c. Accountability to _____

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Task Sheet
Learning About *Accountable Talk* Practices

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Part II—Whole Group Discussion (continued)

2. What talk format was modeled during this "whole group discussion"? (pages 3-5 to understand more about this talk format)
3. Please read An Overview of *Accountable Talk* Practices outside of this session for more detailed information about *Accountable Talk* practices.

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Task Sheet
Learning About *Accountable Talk* Practices

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Part III—What do *Accountable Talk* practices look and sound like?

1. As you watch the video clips, look for evidence of student learning and what promoted it (Accountability to the Learning Community, Knowledge, and Rigorous Thinking).
2. Take notes in the left-hand column as you watch the video.

Science 6-8 Materials, page 78

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Task Sheet
Learning About *Accountable Talk* Practices

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Part IV—Preparing for Talk

1. Take five minutes to reflect on the three features of *Accountable Talk* Practices.
2. Record your thoughts in the right-hand column.
3. Be prepared to discuss the three features and how they contribute to academically productive talk as well as how they are different from current practices.

Task Sheet
Learning About *Accountable Talk* Practices

TNCore

Part V—Whole Group Discussion

- How do the three features of *Accountable Talk* Practices contribute to academically productive talk?
- How is academically productive talk different from common current practices?

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Setting the Stage for Academically Productive Talk

Task Sheet
Setting the Stage for Academically Productive Talk

TNCore

Part I—Norms for Equitable and Respectful Participation

1. Take 10 minutes to individually read and reflect on Setting the Stage for *Accountable Talk* Practices: Norms for Equitable and Respectful Participation (Packet 2, gray pages) focusing on the three questions on page 81.
2. Be prepared to engage in a learning conversation to share your understanding as well as your questions.

Task Sheet
Setting the Stage for Academically Productive Talk

TNCore

Part II—Preparing for Talk

1. Take 10 minutes to reflect on your responses to the three questions (on page 81) with a partner.
2. Be prepared to engage in a whole group discussion about the questions.

Task Sheet
Setting the Stage for Academically Productive Talk

TNCore

Part III—Whole Group Discussion

- How do these practices aid in setting the stage for a classroom culture and interactions that promote rich discussions and deeper understandings?
- Be sure to consider the evidence (descriptions and research) you read in the text around establishing and maintaining norms, ground rules, and wait time.

Norms for Discussion

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You have the **right** to...	You are **obligated** to...
• Make a contribution to an attentive, responsive audience. • Ask questions that clarify and advance your understanding. • Be treated civilly. • Have your ideas discussed.	• Speak so that everyone can hear. • Speak one at a time. • Listen for understanding. • Agree or disagree (and explain why) in response to other people's ideas. • Critique ideas, not people.

Science 6-8 Materials, page 83

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Questions for Text Study

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- Take a few minutes to look at the Common Core reading and writing standards (pages 62 and 64-66).
- Then read the definitions and examples for both Interpretive (Readlike) and Analytic (WriteLike) Questions.
- Consider...
  - How are they different?
  - How will they support the standards?

Science 6-8 Materials, page 85
Pages 62 and 64-66

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Text-based Questions

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How is the intellectual work required of learners different between the "moving from" and "moving to" questions?

Moving From...	Moving To...
What are the two common elements of successful establishment of ground rules?	What evidence do the authors provide for establishing and maintaining norms and ground rules?
What are the three types of wait time?	Which of the three types of wait time seems most powerful? Why?
How long should wait time be?	How did the authors' inclusion of research effects of wait time strengthen the argument for paying attention to wait time?

Science 6-8 Materials, page 86

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Key *Accountable Talk* Teacher Moves

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- Read the Key *Accountable Talk* Teacher Moves.
- Keep these six key moves in your mind as we move into the remainder of the session.
- Note when the facilitator uses one of the moves. What impact does the move have on the group's learning?

Science 6-8 Materials, page 87

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Planning for Academically Productive Talk Around Complex Texts Within a Lesson

Task Sheet
Planning for Academically Productive Talk

TNCore

Part I—Reviewing Text and Text Complexity Analysis Sheet

1. Locate Connected by the Light: Photosynthesis and the Text Complexity Analysis form for that text.
2. Take 10 minutes to discuss with a partner the purposes for reading the text (knowledge that students should gain by reading the text) as well as challenges that the text poses according to your previous analysis.

Task Sheet
Planning for Academically Productive Talk

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Part II—Identifying and Charting Questions

1. Identify three to four text-based questions (interpretive and/or analytic) you might pose to help students read closely to gain the identified purposes for reading this text.
2. Chart your questions on chart paper.
3. What types of questions will help socialize the intelligence of your classroom learning community?

Science 6-8 Materials, pages 89 and 90

Task Sheet
Planning for Academically Productive Talk

TNCore

Part III—Gallery Walk

1. Visit four to six other groups' charts.
2. Look for examples of thought-provoking, text-based questions that would help students be able to read closely and achieve the purposes for reading the text.
3. Be prepared to share your examples and reasoning with the whole group.

Science 6-8 Materials, page 90

Task Sheet
Planning for Academically Productive Talk

TNCore

Part IV—Whole Group Discussion

- Which text-based questions did you find the most thought provoking?
- What made them thought-provoking questions?
- How did they help students read the text more closely?
- How did they help to achieve the purpose for reading the text?

Thinking About Talking...

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- Take some time to reflect as a **learner** and as a **teacher** about your experiences across the entire day.
- Be prepared to share your thoughts.

Thinking About Talking... Reflecting as Learners

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1. Reflect on your experiences as a **learner** across the entire day.
   a. How did establishing norms and being accountable to the learning community contribute to your learning?
   b. How did asking questions and staying accountable to knowledge push your thinking?
   c. How did staying accountable to rigorous thinking expose thinking and advance your learning?
   d. How did the use of key *Accountable Talk* moves build community and advance learning?

Thinking About Talking... Reflecting as Teachers

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2. Reflect on your experiences as a **teacher**. What will you do differently based on your experience?
   a. How will you establish norms and hold students accountable to the community?
   b. How will you increase the intellectual work required of learners through your questions?
   c. How will you structure talk?

Takeaways

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An understanding that

- creating a culture that supports academically productive talk requires trust and respect;
- discussions are intentionally structured to build on each other;
- different kinds of questions ask for different kinds of mental work;
- reading, writing, talk, and learning are interrelated; and
- academically productive talk apprentices students to the discourse of the discipline.

Gots and Needs

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- Think about the module takeaways and your current level of understanding for each takeaway.
- What messages are clear (you got it)? Use a "sticky" note to share your "Gots." Write one "Got" per sticky note.
- What questions do you still have? Use a "sticky" note to share your "Needs." Write one "Need" per sticky note.
- Post your "Gots" and "Needs" on the appropriate chart.

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Module 5: Arguments and Explanatory Writing

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Grades 6-8

Course of Study

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1. Analysis of a Science Research Simulation Task
2. Engaging in Rigorous Science Lessons
3. Text Complexity
4. Academically Productive Talk
5. **Arguments and Explanatory Writing**

Goals

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- Deepen understanding of scientific argument and informational/explanatory writing by
  - analyzing the similarities and differences in the two types of writing;
  - engaging in a short research project writing task; and
  - considering writing tasks and strategies to support your students as they write in both styles.
- Reflect on your learning.

Norms for Working Together

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- Be respectful of other's time – Begin and end on time
- Maintain and open and safe atmosphere for communication and collaboration
- Remain positive, task/purpose-focused, respectful, and courteous
- Actively participate and bring requested materials
- Share a sense of responsibility for student learning
- Be professional at all times
- Be the student you want in your class
- **Keep students at the center**

Review of Module 4

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1. What is academically productive talk?
2. How do you prepare for academically productive talk?

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Writing: Understanding Text Types

Task Sheet
Understanding Text Types

TNCore

Part I—Writing to Inform and Make Arguments

1. As you watch the Writing to Inform and Make Arguments video clip, think about these two questions:
   a. What are the Common Core State Standards (CCSS) expectations for student writing?
   b. How can we support student writing in our science classrooms?
2. Following the video clip, write a response to the two questions.

Packet 1: Science 6-8 Materials, page 101

Task Sheet
Understanding Text Types

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Part II—Understanding the Writing Standards

1. Please take about 10 minutes to individually
   a. review the writing standards (pages 64-66) for your grade band and
   b. Read Writing: Definition of the Standards' Three Text Types (pages 23-25).

Pages 64-66 and pages 23-25

Task Sheet
Understanding Text Types

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Part II—Understanding the Writing Standards (continued)

2. In pairs, discuss (about 10 minutes) the following questions:
   a. What are the differences between argument and explanatory writing according to the Common Core State Standards (CCSS)?
   b. What does CCSS see as differences in argument among the content areas ELA, history/social studies, science, and technical subjects?
3. Be prepared to share your thinking with our whole group.

Task Sheet
Understanding Text Types

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Part III—Whole Group Discussion

- What is distinctive about these two different types of writing?
- Why are they both important to being literate?
- Why are they both important to science education?

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Short Research Project Writing Task

Task Sheet
Short Research Project Writing Task

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Part I—Reading and Writing to Inform or Make Arguments

A. Count off by twos; then read the directions for your assigned task.
   1. = Argument (green, page 105)
   2. = Explanatory (blue, page 107)

Either 105 or 107

Task Sheet
Short Research Project Writing Task

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Part I—Reading and Writing to Inform or Make Arguments (continued)

B. Locate and read your texts.
   1. Connected by the Light
   2. Exchange Cycles
C. Write your response. Take 30 minutes (this will probably not be enough time to finish the task) to individually write the essay as an adult.
D. Use the appropriate **rubric** to guide your writing.
   1. Argument Rubric
   2. Explanatory Rubric

Task Sheet
Short Research Project Writing Task

TNCore

Part II—Unpacking Your Task

A. Partner with someone who completed the same writing project and "unpack" the task.
   1. What would students have **to know** and be able **to do** to successfully complete the task?
   2. What instructional supports might scaffold students to successfully complete this task?
B. Chart and post your thoughts.
C. Be prepared to share your thinking with another group.

Task Sheet
Short Research Project Writing Task

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Part III—Pairs Share

A. Team up with another pair (different task).
B. Discuss the two types of writing.
   1. How is the intellectual work similar? How is it different?
   2. How are the supports similar? How are they different?
C. Be prepared to engage in a discussion with the whole group.

Task Sheet
Short Research Project Writing Task

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Part IV—Whole Group Discussion

- What insights did you gain or questions do you have related to short research project writing tasks
  - about the two types of writing?
  - about being a learner in the task?
- What do you see as implications for your teaching?

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Planning for Engaging Your Students in Scientific Writing

Task Sheet
Understanding Text Types

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Part IV—Writing to Inform and Make Arguments (Revisited)

1. Revisit your response to the Common Core State Standards (CCSS) video clip (Part I).
2. As you watch this video clip a second time, think about these two questions:
   a. What are the CCSS expectations for student writing?
   b. How can we support student writing in our science classrooms?
3. Following the video clip, revise and/or add to your original response.

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Task Sheet
Planning for Short Research Projects

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Part I—What might a short research project look like in your classroom?

1. Read Part IV of the Publisher's Criteria. How were you engaged in writing to sources and research?
2. Consider the topics you will teach next year. How might you structure a short research task that requires students to write an **argument** based on scientific data and evidence[1]?
3. How about opportunities to write an **informational/explanatory text?**

[1]Evidence includes facts, extended definitions, concrete details, quotations, or other information and examples as appropriate to the task and the stimuli (sources).

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Task Sheet
Planning for Short Research Projects

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Part II—Pair and Share

1. Partner with someone else and share your thinking.
2. Be prepared to share your ideas with the whole group.

Takeaways

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An understanding that

- tasks can be structured/designed to influence the type of writing produced;
- scientific arguments make a claim about a scientific question and support the claim with logical evidence and reasoning; alternative or opposing claims are addressed;
- informational/explanatory science texts are designed to inform the reader about a topic; and
- cohesion, clarity, and formal style are expected in both types of writing.

Gots and Needs

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- Think about the module takeaways and your current level of understanding for each takeaway.
- What messages are clear (you got it)? Use a "sticky" note to share your "Gots." Write one "Got" per sticky note.
- What questions do you still have? Use a "sticky" note to share your "Needs." Write one "Need" per sticky note.
- Post your "Gots" and "Needs" on the appropriate chart.