

Read. Write. Science!
Real Science, Real
Literacy

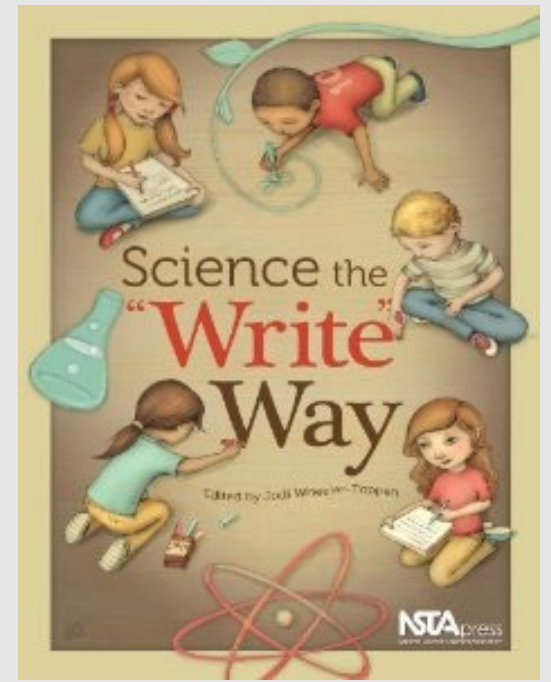
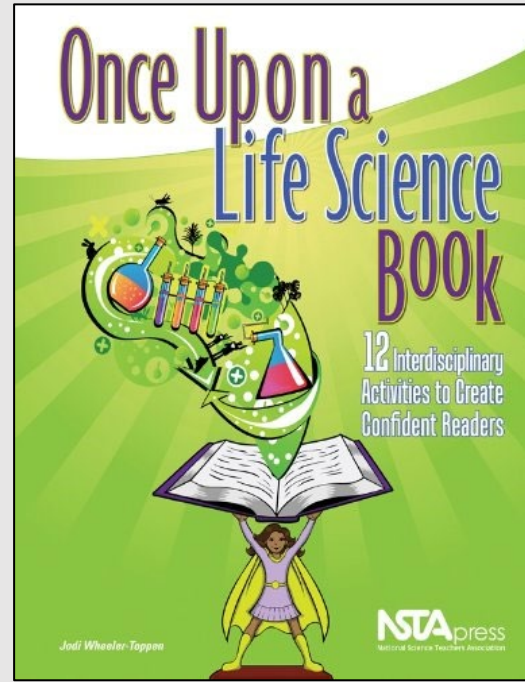
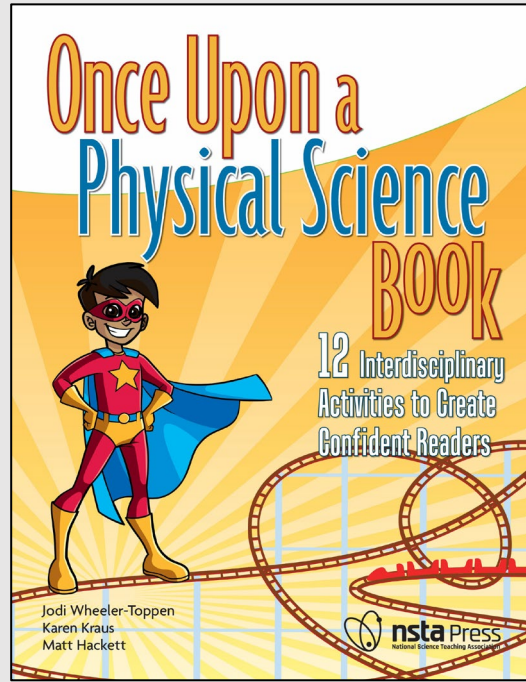
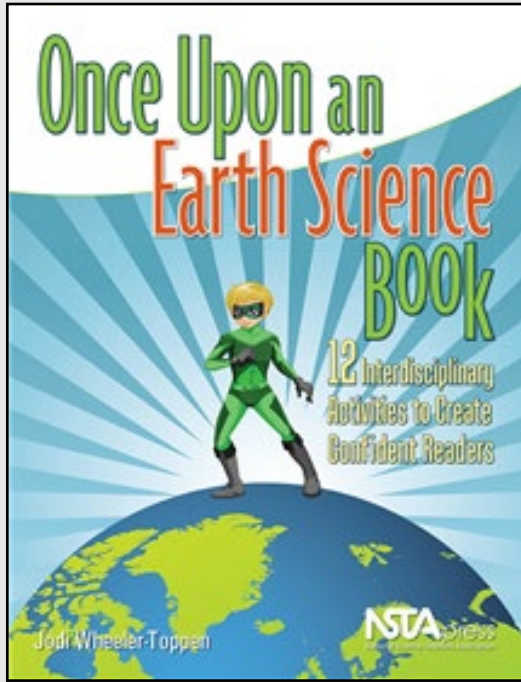
Jodi Wheeler-Toppen, Ph.D.



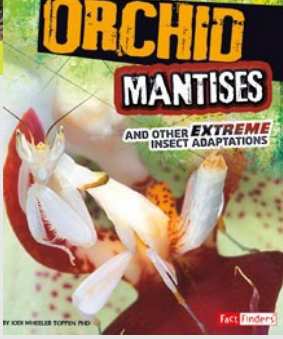
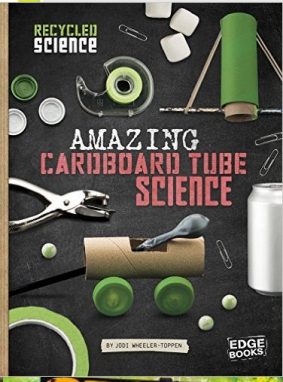
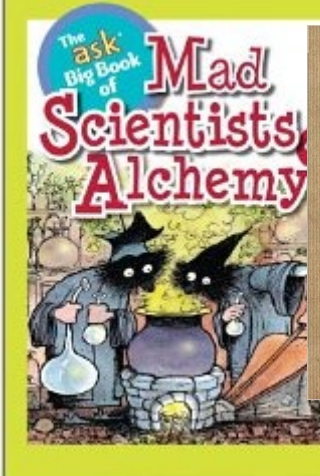
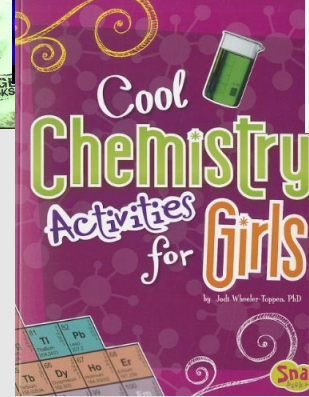
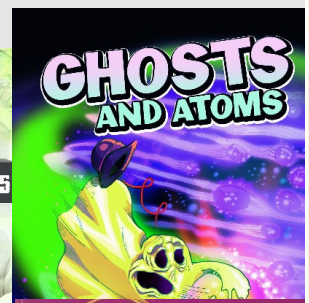
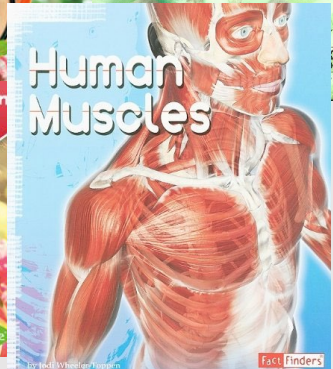
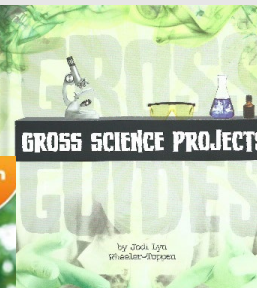
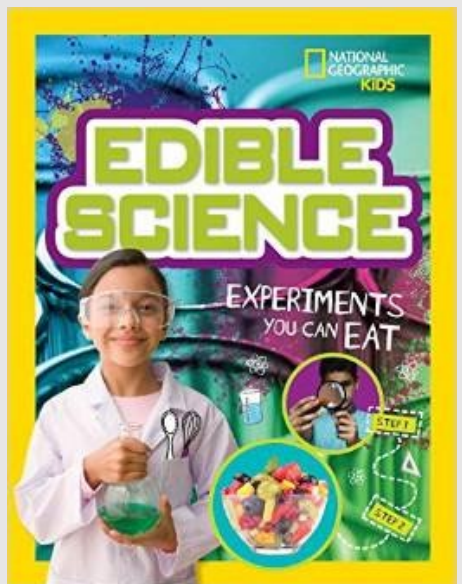
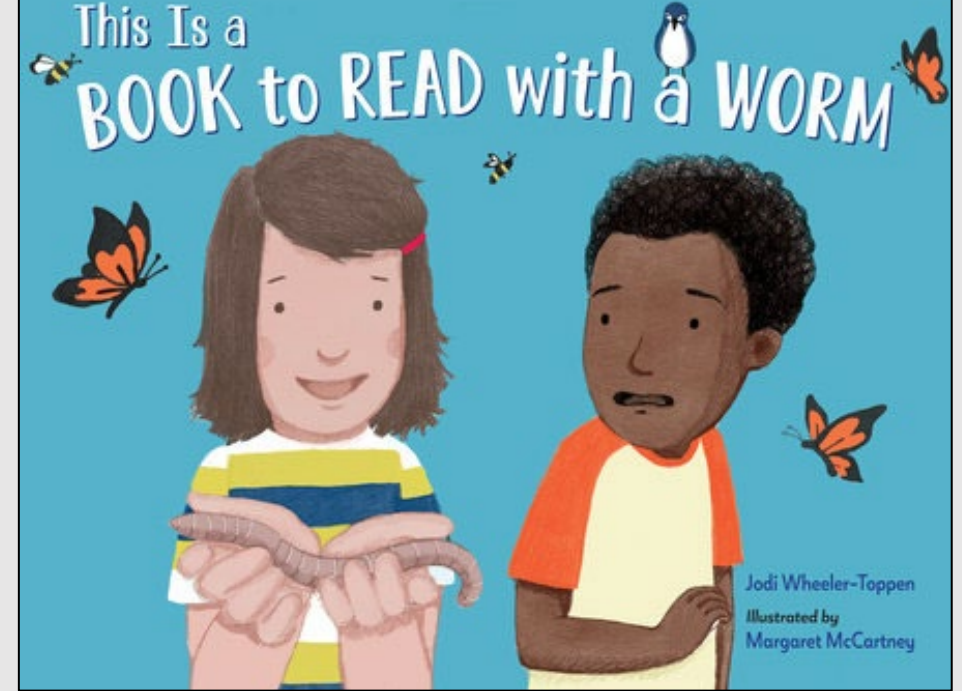
Read. Write. Science!

Welcome Message

<https://stream.meet.google.com/livestream/47412469-f706-4cb3-8668-d4b675972642?pli=1>



Who I am and
How I ended up here



Literacy Challenges in Your Classroom

- What challenges do you see with your students?
- What expectations from others are hard to meet in your classroom?



Agenda

- Henry County Introduction
- Try a “Literacy Learning Cycle”
- Talk about how this type of lesson is structured (and why!)
- Dig in on reading challenges
- A few writing tips
- Find out about available resources to support this style of teaching

Agenda

HENRY COUNTY SCHOOLS
and our COMMUNITY share
A VISION TO
ensure a **high-quality, world-class** education for **every student.**
and a singular
MISSION TO
empower all students with **exceptional opportunities and access** that lead to **success** in a global society.

Unified Governance

A COMPASS FOR THE FUTURE

CORE BELIEFS | We believe
Each student can learn at or above grade level and will have an equal opportunity to do so.
Family and community involvement is critical to student success.
All learning environments should be supportive, safe, and secure.
Effective teachers, leaders, and staff, produce excellent results.

CORE POLICIES | We will...
An Aligned System of Teaching & Learning
A System of Accountability
A Framework for Continuous Improvement
A Plan to Advance Opportunities, Access, and Outcomes

STRATEGIC ACTIONS | To advance
And accelerate learning opportunities and experiences for students.
And support effective school leaders and teachers.
Community and stakeholder engagement so that all students, families and employees feel welcomed and valued.
Student and employee health, wellness, and support structures.
A high-performing operational culture.

PRIORITY OUTCOMES | Every student will be
Ready for kindergarten.
Ready to read and write at or above grade level each year with a curriculum-rich literature and world language.
Ready for success in advanced coursework at every grade level.
Ready for life with strong soft skills, personal health, and well-being.
Ready for college, career and post-secondary successes with industry certifications, competitive test scores and scholarship awards.

Community-Inspired 2021-2026 Strategic Plan
Developed by the Henry County Board of Education

In Pursuit of *Exceptional*

1. Literacy Learning Cycle: Inertia: It's a Drag

Chapter 7: Once Upon a Physical Science Book

Science Reading Writing

2. Literacy Learning Cycles How this type of lesson is structured (and why!)

3 Impediments to Learning from Text

Impediment 1:
Students do not expect what they are reading to make sense.

A Few Tips on Writing



“Blank Pages”: Provide sentence or even paragraph frames

When the hotcup bottle is moving, the hotcup inside _____
_____ The hotcup has inertia,
which means _____ When the
bottle stops _____



“Speed Demons”: Tell them the task is part “show that you know it” and part “show that you can explain it”

4. Helpful Resources for Literacy Learning Cycles



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An system for educating, led by the Henry County Board of Education



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Each student can learn at or above grade level and will have an equal opportunity to do so

Family and community involvement is critical to student success

All learning environments should be supportive, safe, and secure

Effective teachers, leaders, and staff, produce excellent results

CORE POLICIES | BAB, IAB, and IB, call for

An Aligned System of Teaching & Learning

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Community and stakeholder engagement so that all students, families and employees feel welcomed and valued

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PRIORITY OUTCOMES | Every student will be

Ready for kindergarten

Ready to read and write at or above grade level each year with a curriculum rich literature and world languages

Ready for success in advanced coursework at every grade level

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Community-Inspired **2021-2026 Strategic Plan**
Developed by the Henry County Board of Education

In Pursuit of *Exceptional*

BALANCED INSTRUCTION **IN SCIENCE**

Science instruction balances core knowledge with crosscutting concepts and science and engineering practices. Through obtaining, evaluating and communicating information, students are actively engaged in a range of learning experiences that foster a comprehensive knowledge of science.

Embedded Practices

- Students engage in meaningful and challenging learning activities that address their unique characteristics and needs.
- Students engage in learning experiences that foster communication, collaboration, creativity, and critical thinking.
- Students leverage a variety of digital and print resources to learn content and demonstrate what they know.

Investigate & Connect

- Students gather information and evaluate claims.
- Students solve real-world problems.
- Students ask questions to plan and carry out investigations.
- Students apply mathematics and computational thinking to make sense of data.

Evaluate Information

- Students evaluate claims, methods, and designs.
- Students analyze and interpret data.
- Students apply mathematical and computational thinking to evaluate quantitative relationships.
- Students develop conclusions and solutions supported by evidence.
- Students read technical text and evaluate claims, methods, and designs.

Communicate Findings

- Students communicate ideas and methods they generate.
- Students use argumentation supported by evidence to validate claims.
- Students construct models to communicate ideas.
- Students share ideas and methods they generate through technical writing.

Students apply crosscutting concepts across all disciplines throughout the K-12 science experiences. These include: Patterns, Cause and Effect; Scale, Proportion and Quantity; System and System Models, Energy and Matter, Structure and Function, and Stability and Change. Progression of crosscutting concepts from grade to grade ensures students demonstrate mastery of core knowledge and skills.

Crosscutting Concepts

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Disciplinary
Core Ideas
(Content)



Core Knowledge & Skills

Students engage in core scientific knowledge integrated with science and engineering practices to build a foundation to think and act as a scientist. By developing skills and strategies to investigate and solve problems, students build knowledge. This knowledge, paired with curiosity, provides students opportunities to observe, interpret and make scientific connections to the outside world.



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Science & Engineering Practices



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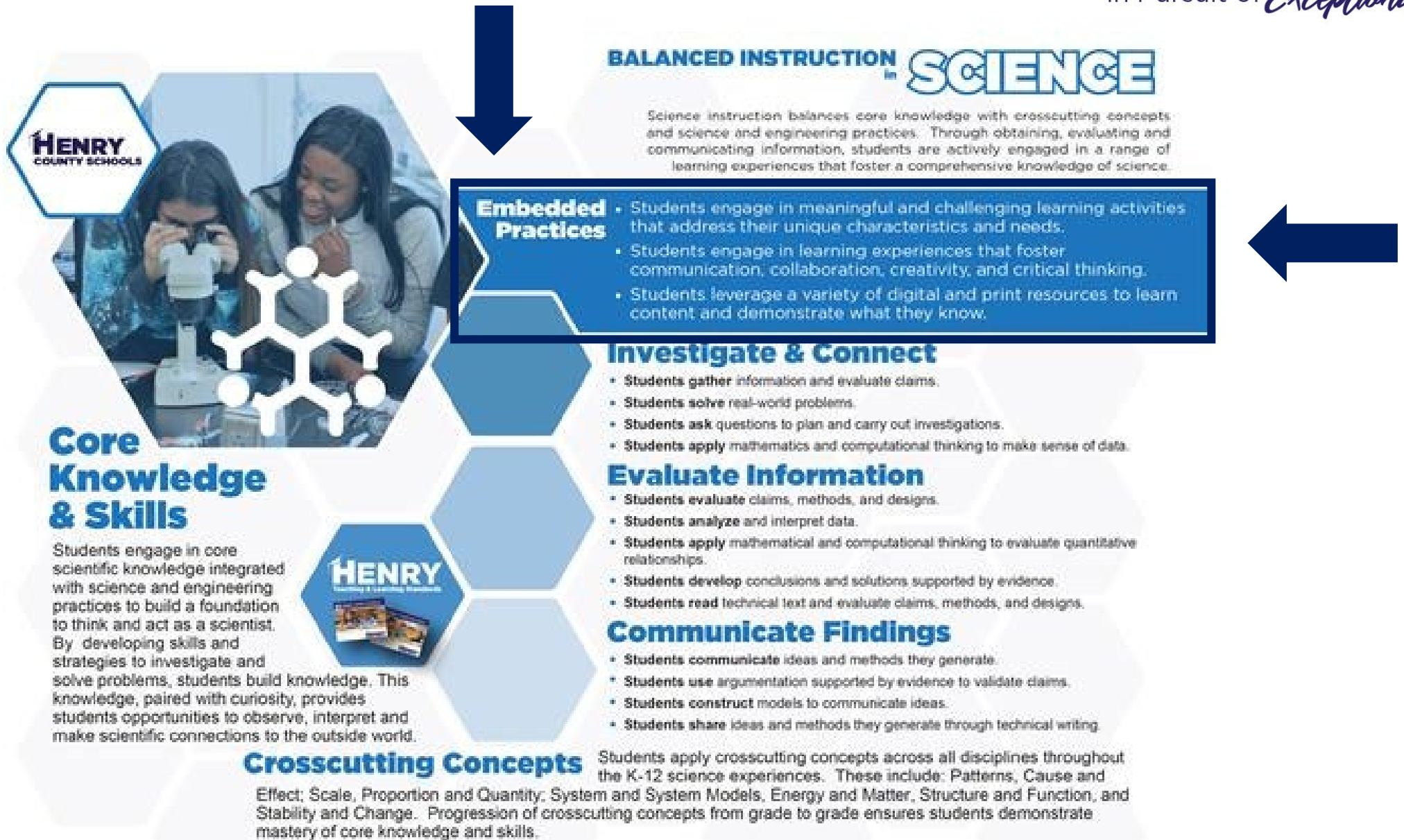
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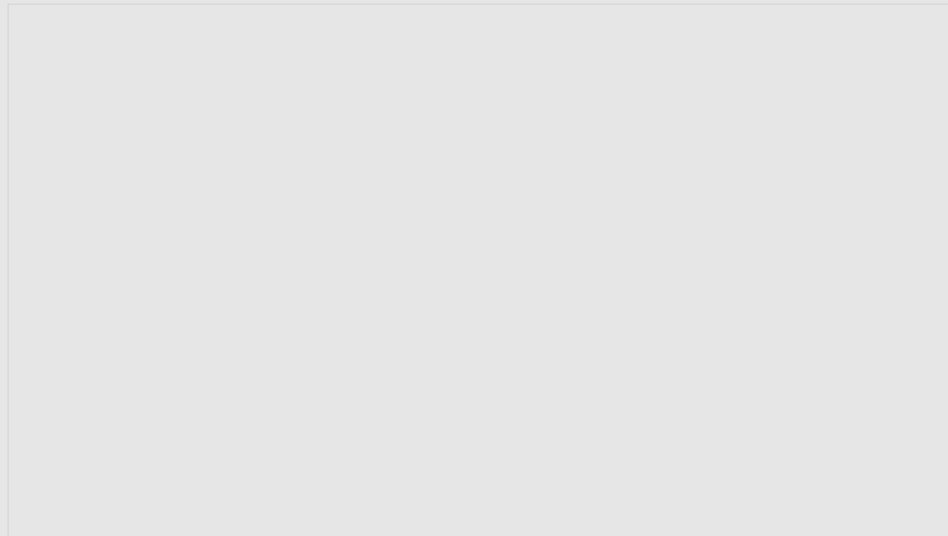
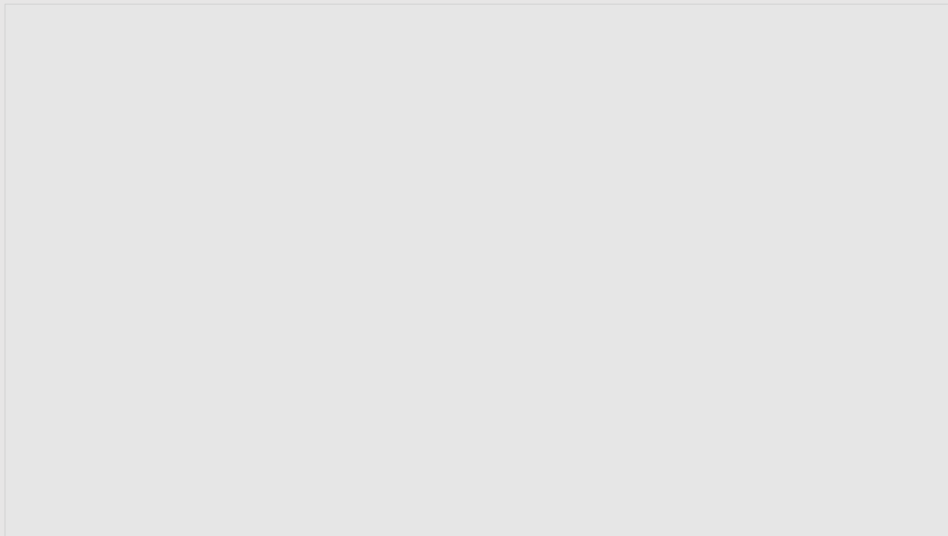
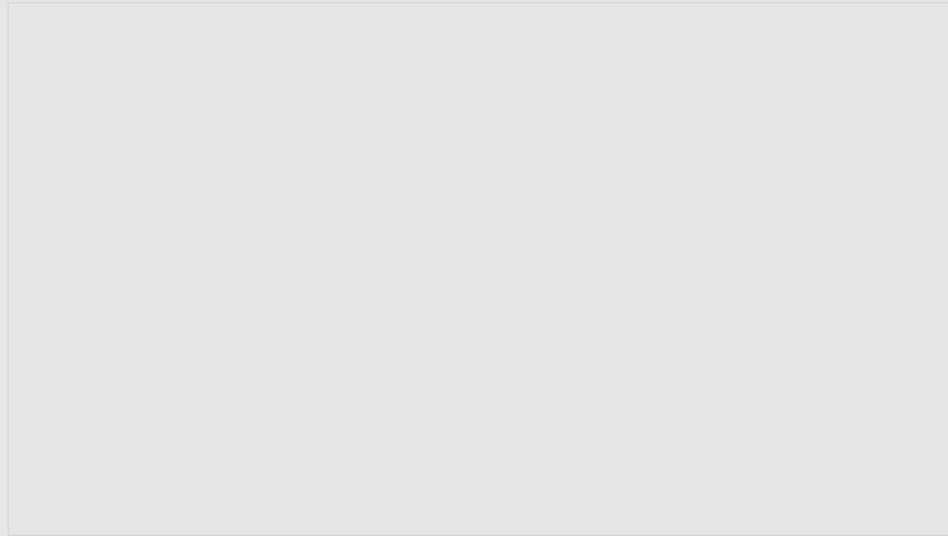
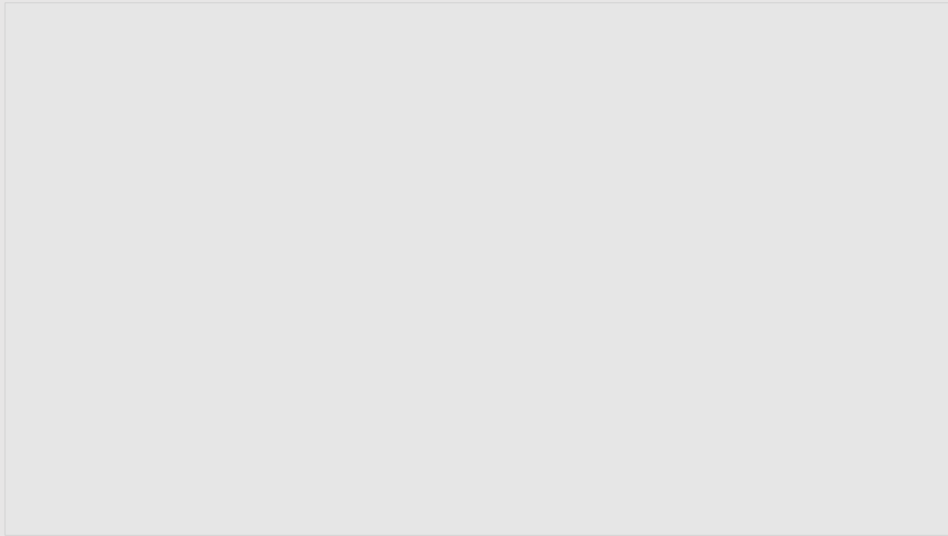
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Agenda



1. Literacy Learning Cycle: Inertia: It's a Drag

Chapter 7: Once Upon a Physical Science Book

Phenomenon:

Have you ever been riding in a car or bus and felt yourself leaning in some direction? Having a hard time sitting upright?

Today we're going to explore some ideas to help us explain why that happens.



Part 1: Explore

Take your marble on a magic carpet ride...

- Put your marble in the middle of the card. Pull the card as quickly as you can in a straight line while keeping the ball in the middle. See how quickly you can pull it to the end of your table.

What happened to the ball if you pulled the platform too fast?

- Get the card and ball moving again in a straight line. Change the direction that the card is moving as quickly as you can without losing the ball. You can choose to turn right or left.

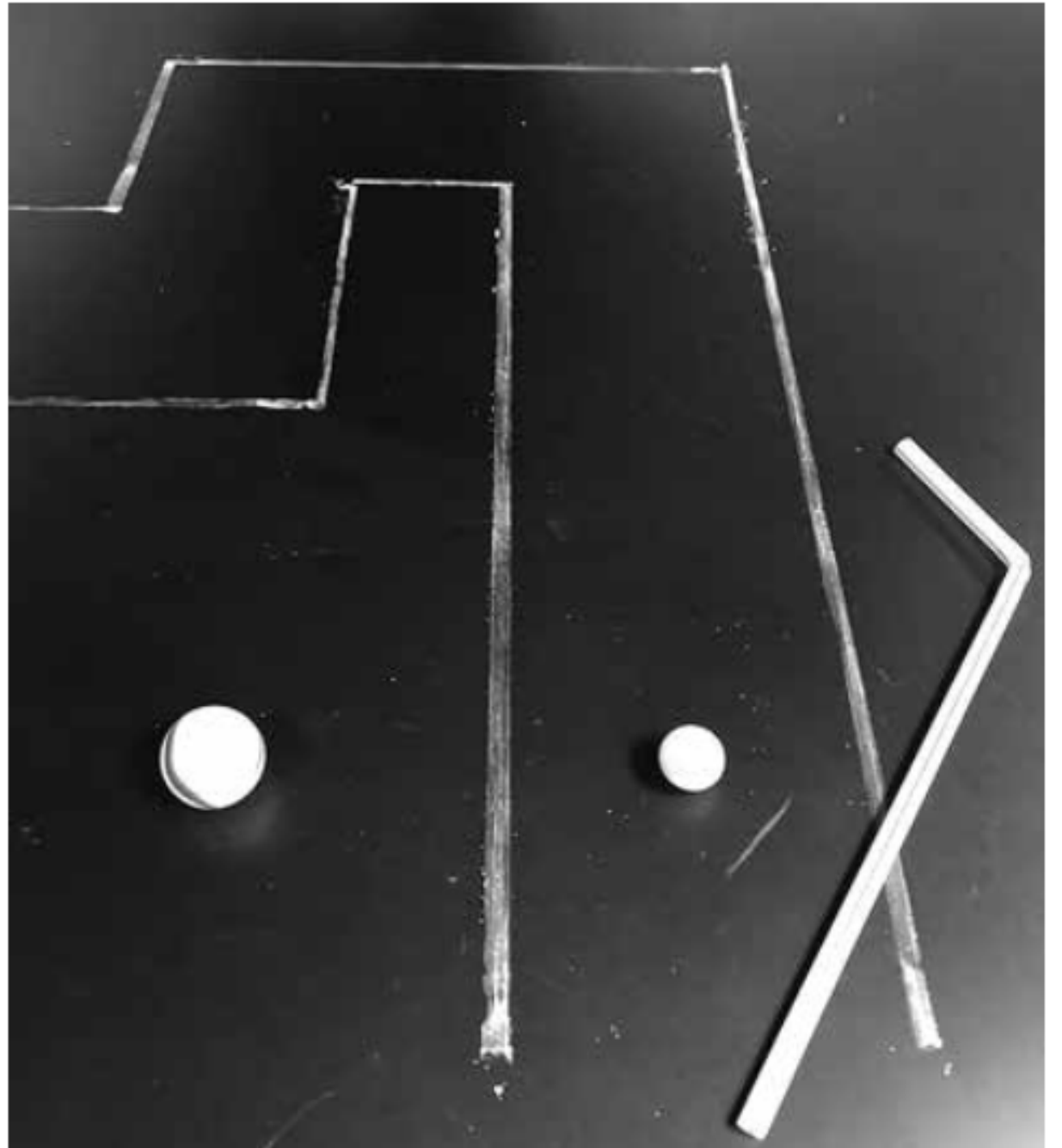
What did the ball do if the turn was too fast?

- Get the platform and ball moving as fast as you can and stop it as quickly as you can.

What did the ball do if you stopped the platform too quickly?

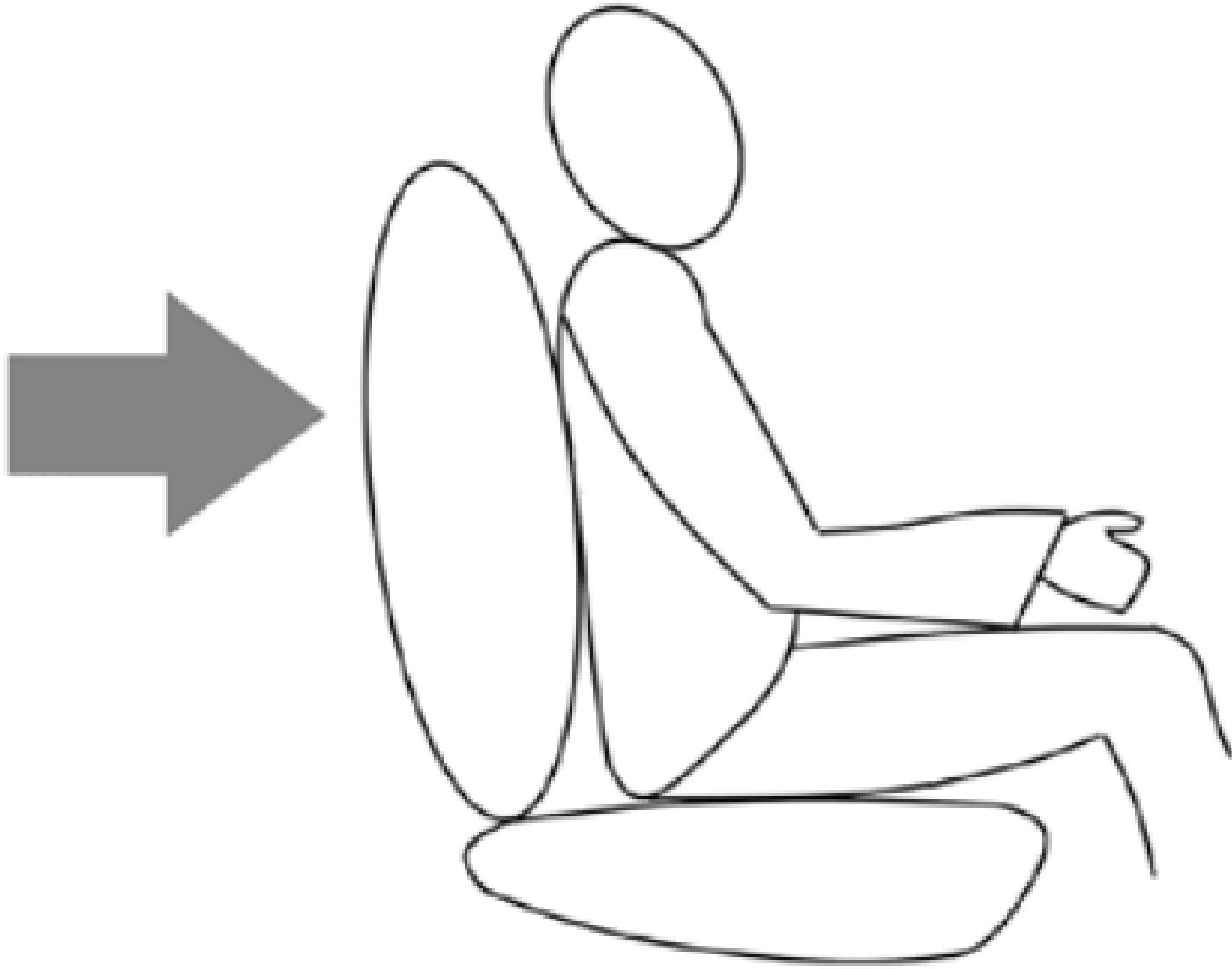
Marble Maze

- Work with your team to move the marble through the maze.
- Try again with the heavier marble. How do you have to adjust your strategies?



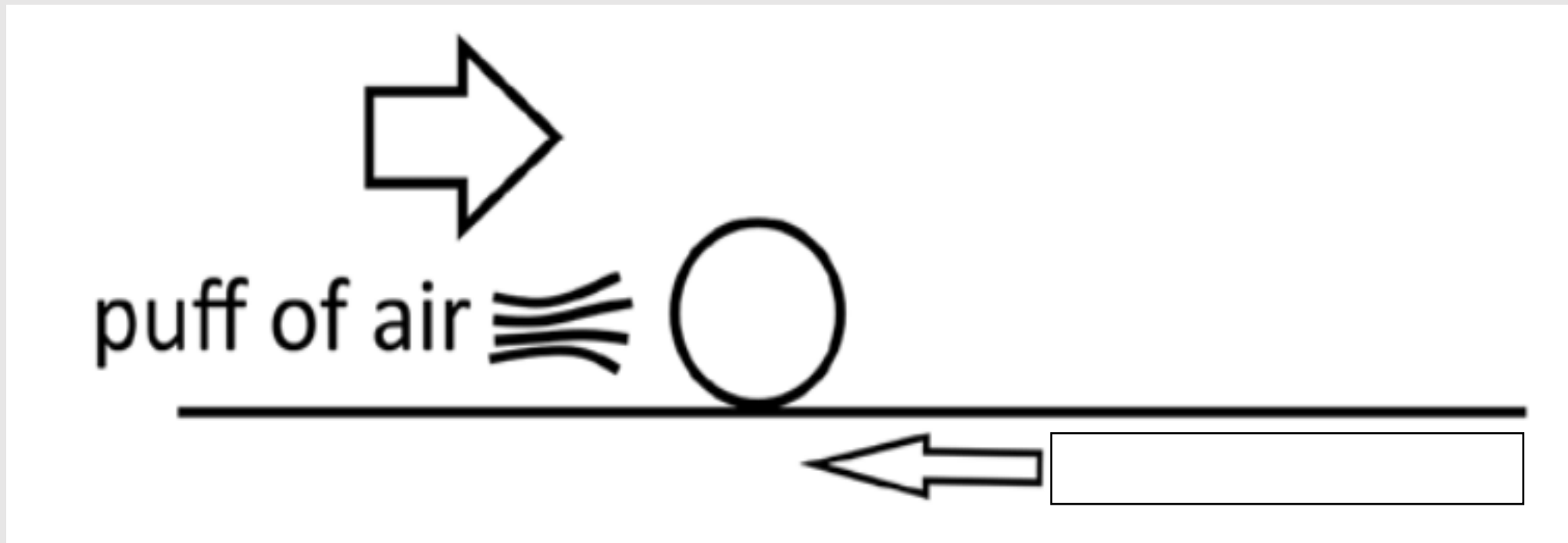
Part 2: Read!

- We are going to read an article that will talk about what happens as you ride in a vehicle.
- Before we read, let's preview some of the diagrams from this text.
(reading strategy)
- Grab a partner. Decide who is going to be Partner 1 and who will be Partner 2.



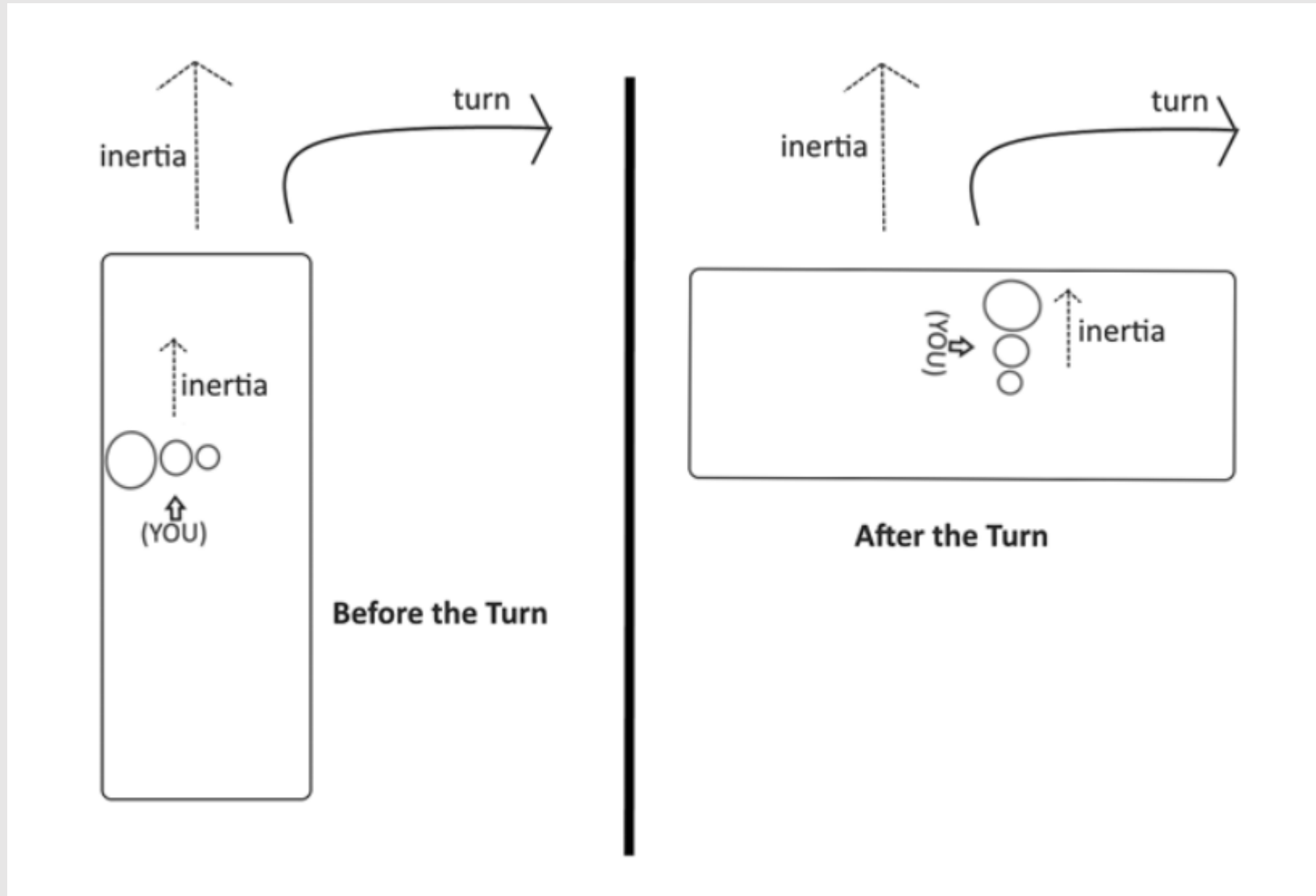
Partner 1: Describe what you see in this diagram.

Partner 2: Make a prediction. What do you think this has to do with the activity we just did?



- Partner 2: Describe what you see in the diagram.
- Partner 1: Make a prediction. What do you think the label under the rectangle says?

- Partner 1: Describe what you see in the diagram.
- Partner 2: Make a prediction. What idea do you think this diagram is trying to show?



One Long Bus Ride

Field trip to the science museum! You load onto the school bus, packed three to a seat. You find yourself wedged between Football Fred, the biggest student in your class, and Tiny Tiana, the smallest. Ms. Wheeler is driving. You groan. Ms. Wheeler has only been driving buses for a few weeks, and she's not exactly smooth at the wheel.

"Hang on!" she cries as she hits the gas. The bus leaps out of its parking spot. As the bus plows forward, you lean back hard, feeling as though you were being pressed to the back of your seat. The bus races for the end of the parking lot, then—*screech!*—Ms. Wheeler hits the brakes. You barely stop yourself from banging your face on the back of the seat in front of you.

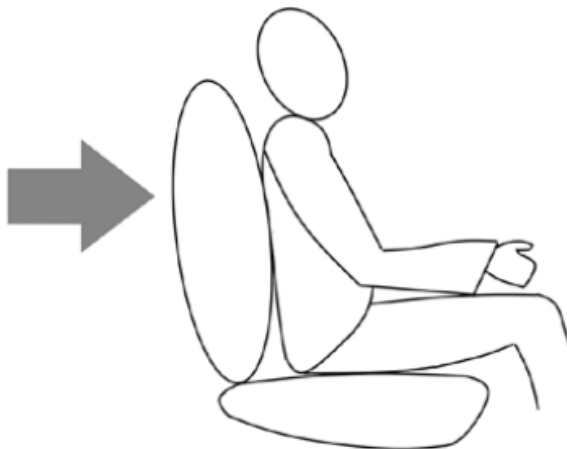
Things Keep Doing What They Are Doing

Why all the lurching back and forth? You can thank inertia. Inertia describes how objects resist changing speed or direction. Before the bus started, you were sitting still in your seat. The bus moved forward, but your body resisted getting moving. That's inertia. The back of your seat had to push you forward to help you get with the program, as seen in Figure S7.2. Once your body was moving along with the bus, it was ready to continue moving forward. When the bus stopped suddenly, your body kept going, propelling your face toward the seat in front of you. That's also inertia.

REMEMBER YOUR CODES

- ! This is important.
- ✓ I knew that.
- X This is different from what I thought.
- ? I don't understand.

Figure S7.2. Inertia as the Bus Speeds Up

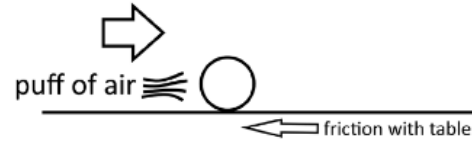


The bus pushes against you as it starts forward.

Isaac Newton, an early physicist, described inertia this way in his first law of motion: An object in motion remains in motion, and an object at rest remains at rest, unless acted upon by an external force. Imagine that you set a marble on a smooth table. As long as you don't touch it or blow on it or tilt the table, it is going to sit in that same spot. It is "at rest," and it is going to stay that way. But say you take a deep breath and blow on the marble. Now you have applied an outside force that is strong enough to overcome the marble's inertia. The marble starts rolling forward, and it will keep rolling forward, even if you don't puff on it again. This time, its inertia keeps it moving.

If you have a long enough table, the marble will eventually stop—not because of some failure of inertia, but because there is a small force still acting on the marble. That force is friction, as shown in Figure S7.3. Friction between the marble and the table gradually slows the marble.

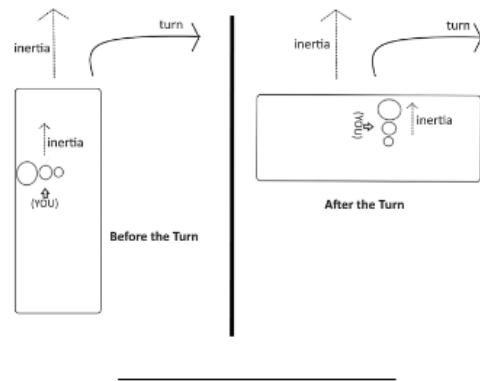
Figure S7.3. Friction Gradually Slows the Marble

**Taking Inertia for a Spin**

Back on the bus, you're bracing yourself to try to limit the effects of inertia. "Oh! I almost missed my turn," shouts Ms. Wheeler, as she wrenches the bus to the right. You find yourself leaning left against Football Fred, who leans against the window. At the same time, Tiny Tiana falls over onto you. Why, when the bus turned *right*, did you and your seatmates fall *left*?

Once again, the answer is inertia. See Figure S7.4. Before the turn, you and Tiana were moving steadily forward. When the bus turned, you kept moving in that same direction. But because of the turn, Football Fred was sitting where "forward" used to be!

Figure S7.4. Inertia as the Bus Turns



Get the complete article here:
<https://wheelertoppen.files.wordpress.com/2023/03/one-long-bus-ride.pdf>





Part 3: Writing Prompt

Dear Physics Whiz,

The other day, my friend had a bottle of ketchup with only a little left in it. He turned it upside down and gave the bottle a hard shake, and then stopped the bottle suddenly to get the ketchup out. He said it helps get it out, but I wondered if it was just a coincidence.

Does this really work? If so, why?

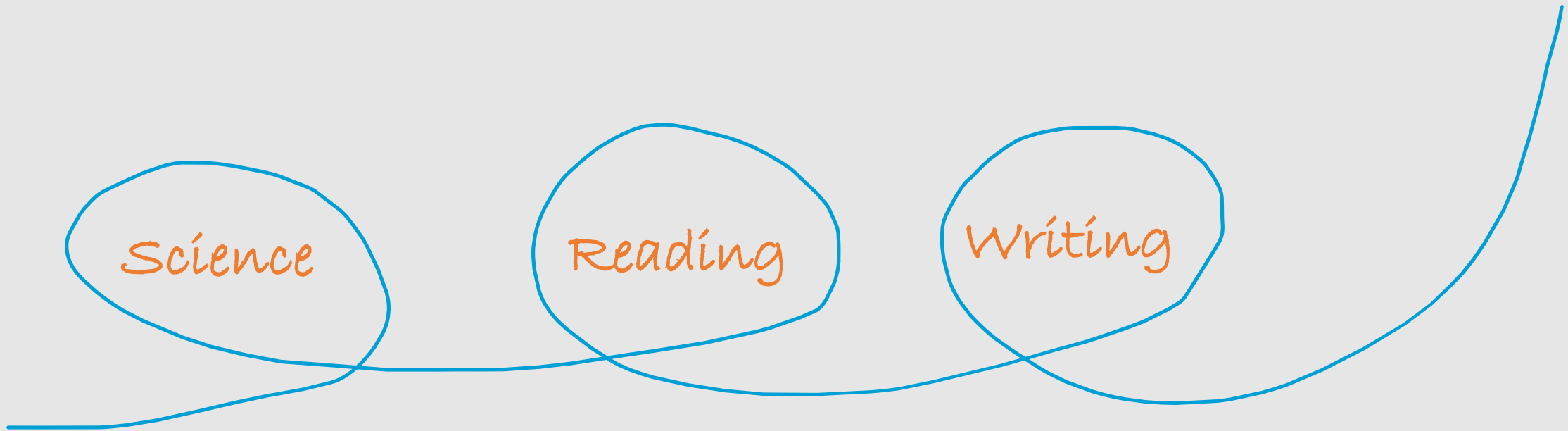
Sincerely,

Ketchup-Less

Pre-writing Questions

- Which step in the marble/card activity was most like this situation? (Think about this as you work on your response).
- What science words do you think you should include in your response?
- A diagram often makes an explanation clearer. Think about a diagram you could draw to add to your explanation. How would you direct your reader to refer to it?





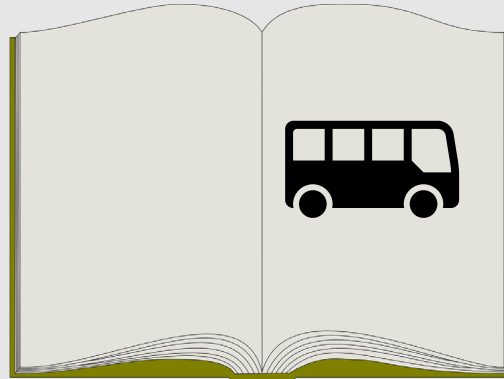
2. Literacy Learning Cycles

How this type of lesson is structured (and why!)

Lesson Structure



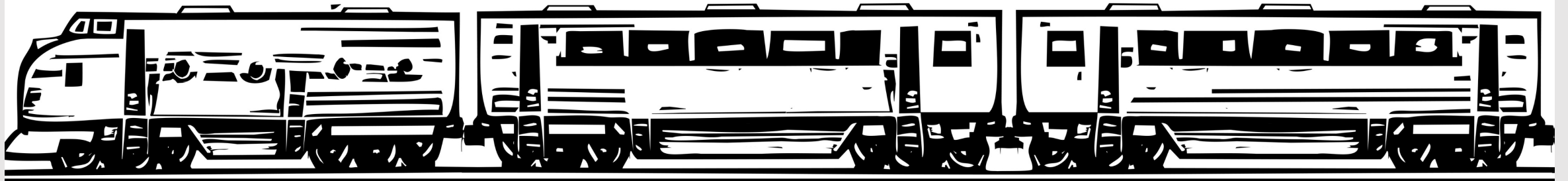
Real Science



Analytical Reading



Academic Writing



(Engage)

Exploration

Explanation

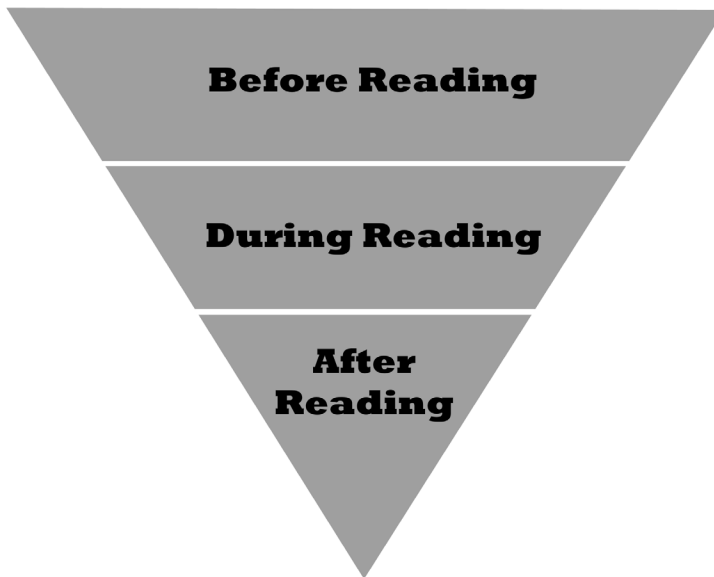
Concept Application

(Evaluate)

+

+

+



=

=

=

Investigate the science concepts and build knowledge needed for the text

Read for clues to what they saw while exploring and for more information

Write to integrate ideas from observations and text

Science Learning Cycle

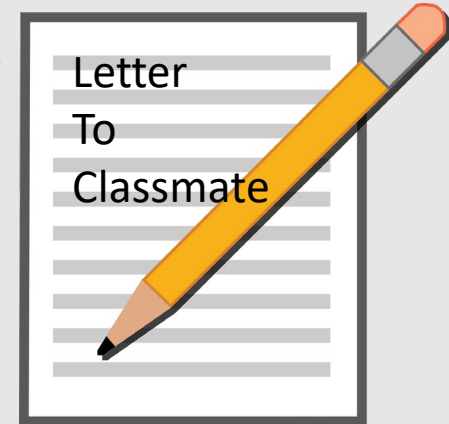
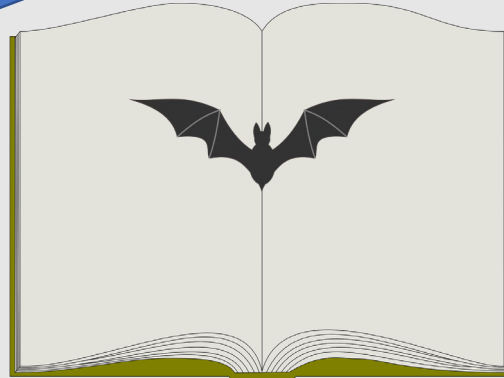
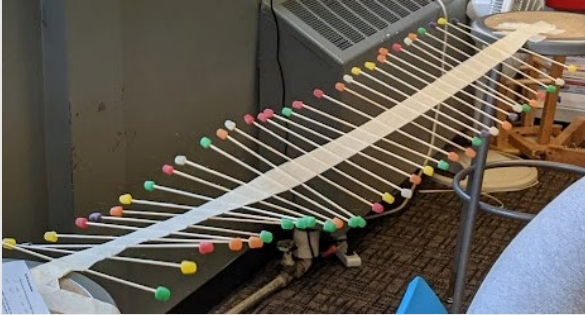
Reading Lesson
(after Berkeley and Barber 2015)

Literacy Learning Cycle

More Complex
Literacy Learning
Cycle

Specific Reading
Strategy

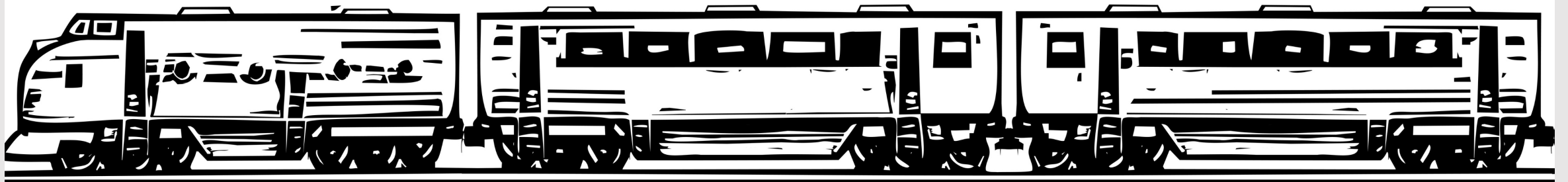
Specific Writing
Strategy



Real Science

Analytical Reading

Academic Writing





3 Impediments to Learning from Text

Impediment 1:
Students do not expect what they are reading to make sense.

Response: start a conversation

- Talk about needing to “figure out” as a normal part of reading science.
- Encourage students to pay attention to what they are thinking as they read.
- Model the kind of thinking that successful readers use through Thinking Aloud

Thinking Aloud

Ms. Wheeler pulls another wild turn, this time to the left. Everyone in your seat flies right, and Football Fred slams into you. Whoa! It was awkward when Tiny Tiana was snuggling your shoulder, but with Football Fred, you feel like you've been hit by a boulder.

What caused this unintentional tackle? You guessed it—inertia! The more mass an object has, the greater its inertia. Football Fred has more mass than Tiny Tiana, so Football Fred also has more inertia. It is going to take an even greater outside force to get Fred to turn with the bus. And where is he getting that outside force? From your poor, bruised shoulder.

Somerset Draw with Durham Hands Notts the Title

After bowling the home side out for 320, Somerset were left needing 181 from 17 overs to guarantee the title. But, at 48-3, the chase was abandoned at Chester-le-Street and a draw agreed.

Fired-up Notts then took the three Lancashire wickets they required at Old Trafford to pick up a sixth bonus point and break Somerset hearts.

Eventually, Trego had Scott Rushworth caught behind and Benkenstein was caught at slip by skipper Marcus Trescothick off Charl Willoughby to set up the Somerset chase.

They went to the crease not knowing if a draw would be good enough to hold off Notts and immediately lost Kieswetter, promoted up the order, when he was bowled by Somerset old boy Blackwell.

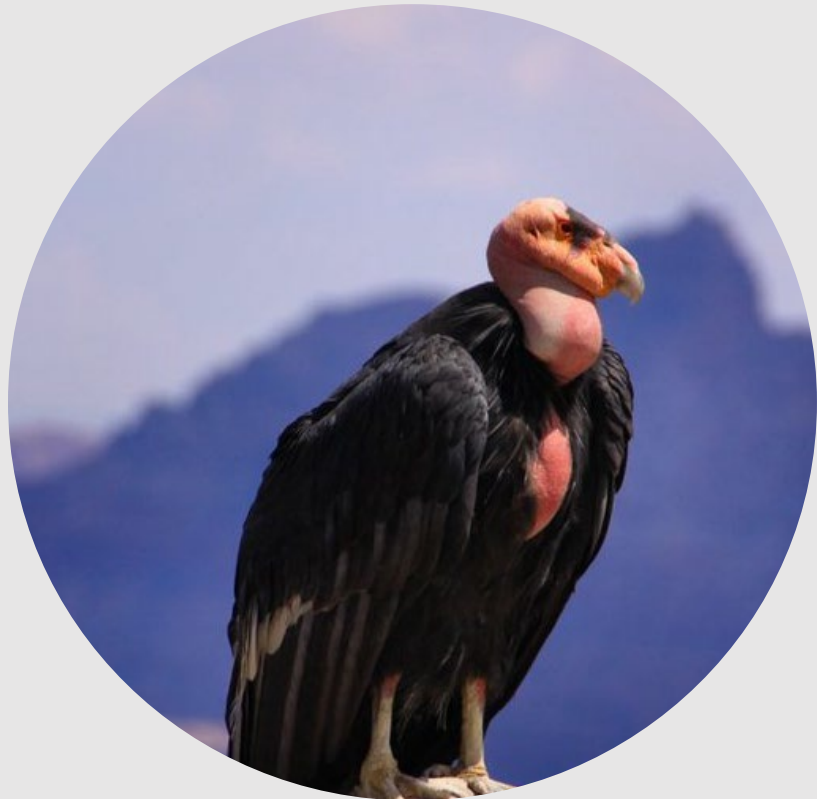


3 Impediments to Learning from Text

Impediment 2:
Students lack background knowledge assumed by the text.

Lack of Background Knowledge

“Some people were afraid the condor would soon be gone.”



Background knowledge: non-science vocabulary

Adequate

Contradict

Tentative

Characteristic

Substance

Offspring

Deposit

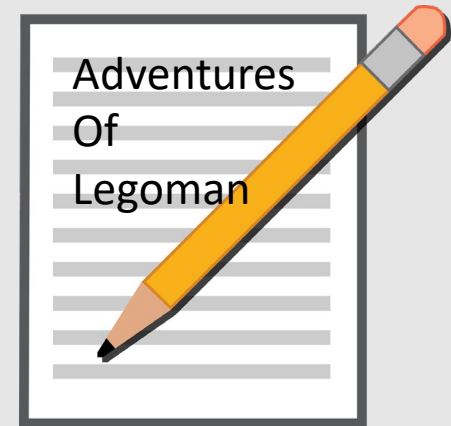
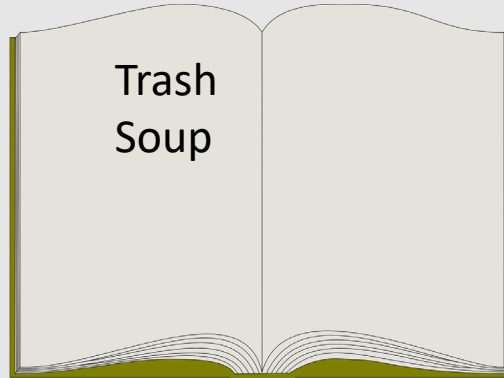
Gradual

(All words used in academic writing, but
not very often in speech)

Responses:

- Have students explore before reading!
- Read the text, looking for background they'll need.
- Listen, listen to what they say about the text.
- Consider reading groups or having students think aloud to each other.

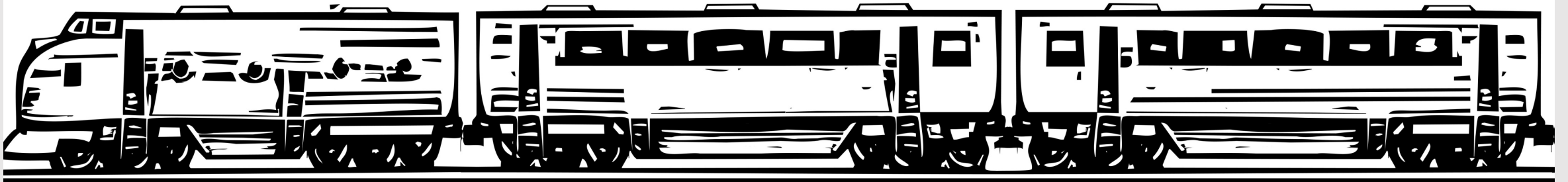
Lesson Structure




Real Science

Analytical Reading

Academic Writing





Ferdie and Niddle gabbled on the plag,
plag wert. “Pling,” Ferdie twaddled,
“pling apie plee.” Niddle peedled and
vang rue sot.

Comprehension Questions:

1. Where did Ferdie and Niddle gabble?
2. What did Ferdie twaddle?
3. What did Niddle do after he peedled?

*Critical Thinking:

4. Where else might Ferdie and Niddle gabble?



3 Impediments to Learning from Text

Impediment 3:
They don't
have to read
to do their
school tasks.

Response:

- Give them better tasks!
(That is, ask questions and give assignments that they cannot complete by just copying sentences.)

Questions? Comments?

A Few Tips on Writing



“Blank Pagers”: Provide sentence or even paragraph frames

When the ketchup bottle is moving, the ketchup inside _____
_____. The ketchup has inertia,
which means _____. When the
bottle stops _____.



“Speed Demons”: Tell them the task is part “show that you know it” and part “show that you can explain it”

Cause and Effect Writing Words

Writing Words

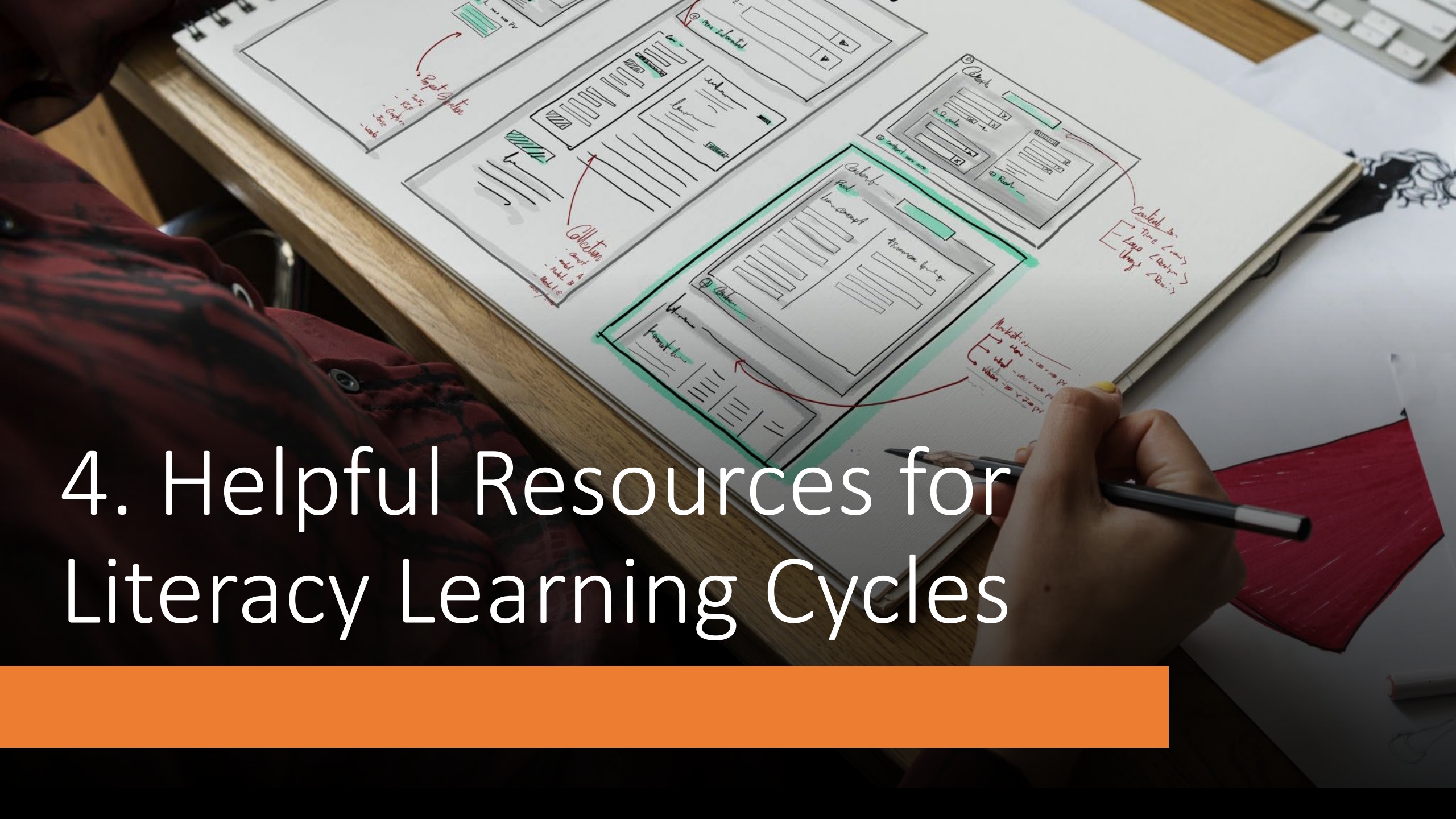
- because
- causes/caused
- consequently
- as a result
- therefore
- for this reason

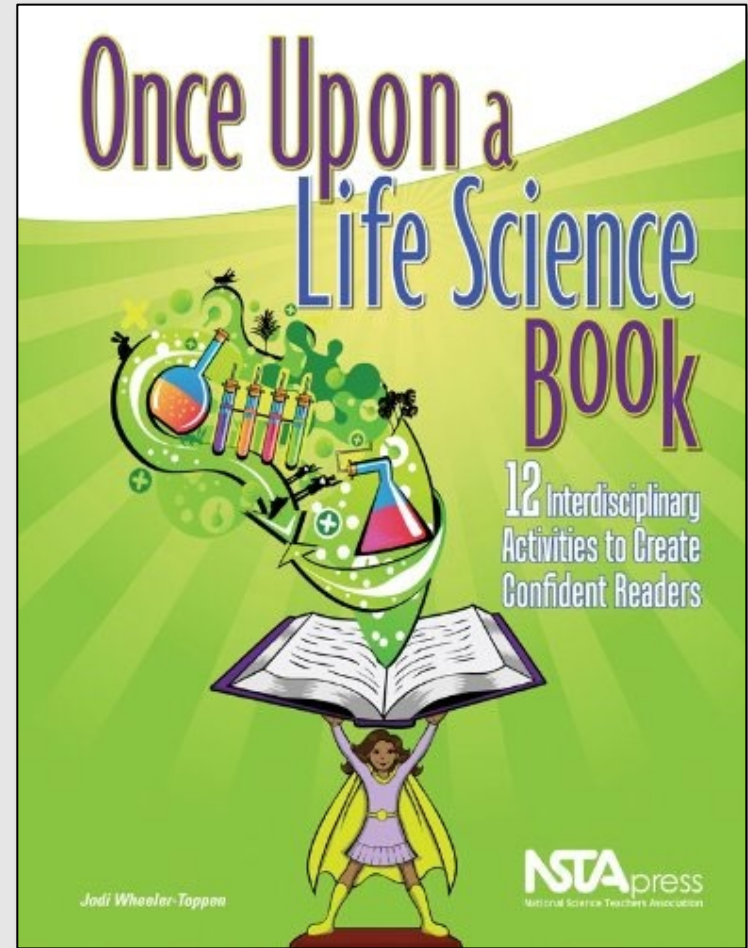
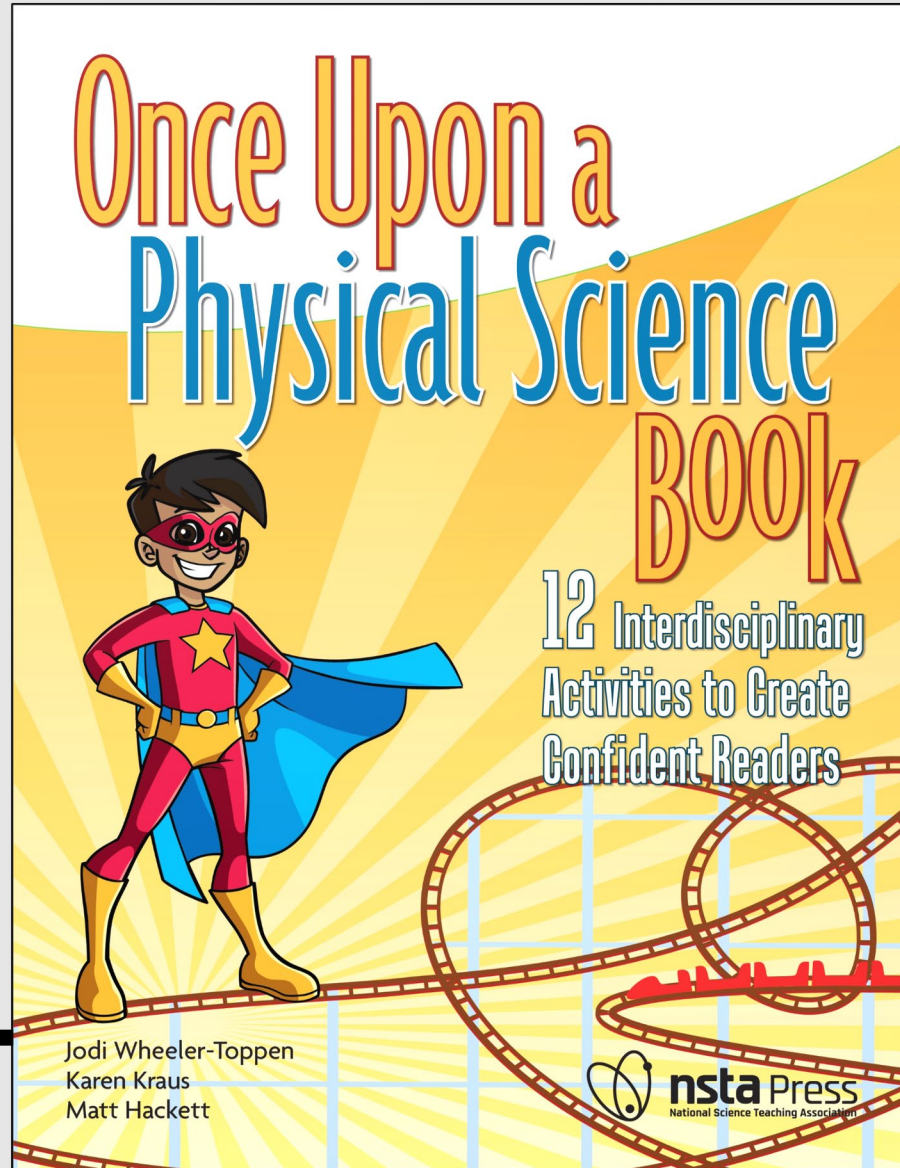
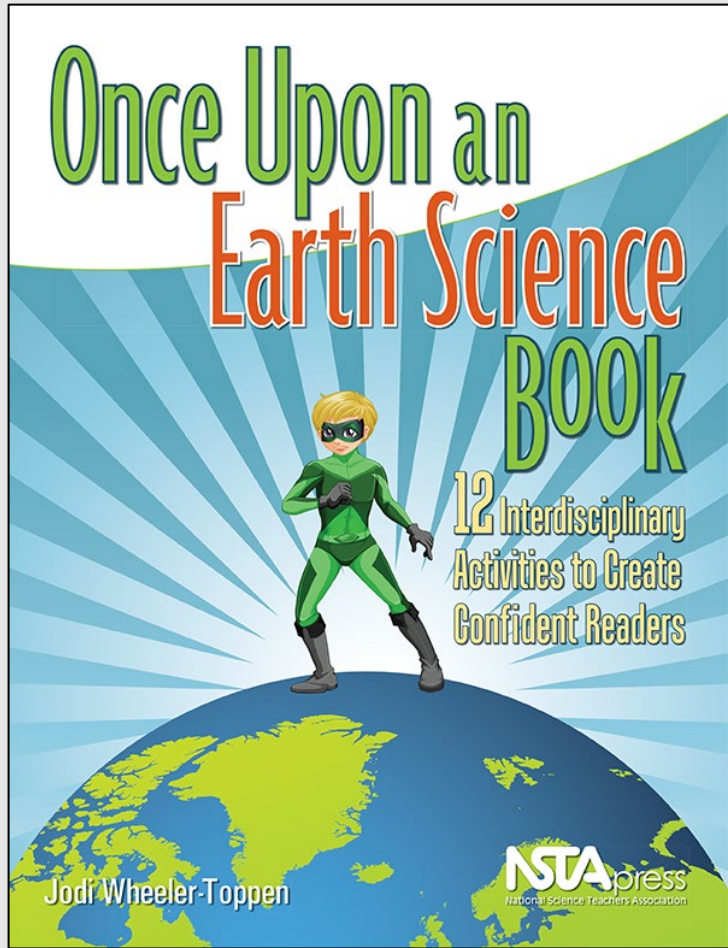
- thus
- hence
- in response to
- since
- due to

E-X--P---A----N-----D

- Add a “because” to your response.
- Add a “for example” to your response.
- Add a picture or diagram to your response. (Be sure to refer to it in words, with something like, “As you can see in the diagram...”)

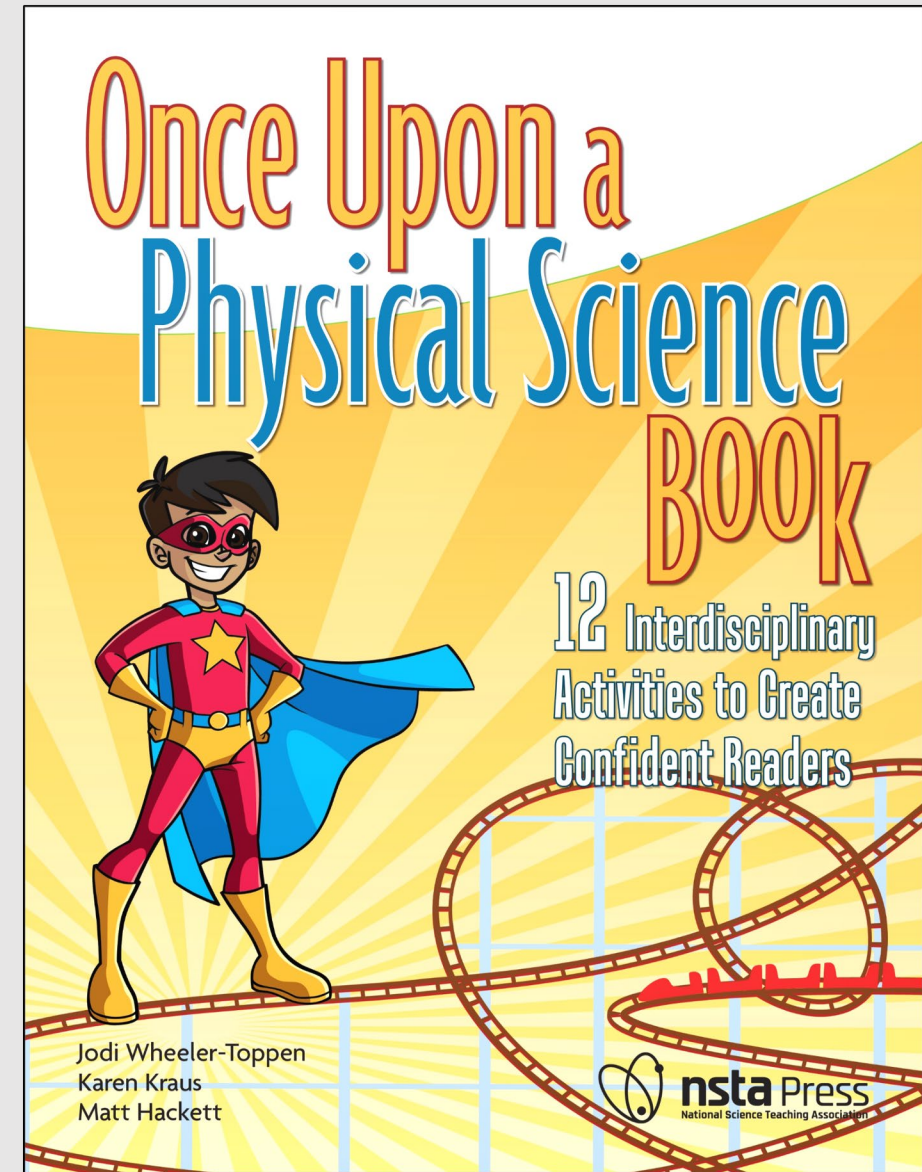
4. Helpful Resources for Literacy Learning Cycles





Each chapter includes:

- A hands-on exploration
- An engaging article to read, paired with
 - An appropriate reading strategy and instructions for introducing it
 - A short journal question about the strategy
- A writing prompt that draws from the exploration and the reading
- A “Thinking Mathematically” or “Thinking Visually” activity



Related Resources for the Books

- <https://onceuponasciencebook.com/for-educators/resources-for-teaching-online-with-the-once-upon-books/>
- <https://wheelertoppen.files.wordpress.com/2017/03/georgia-standards-of-excellence-correlations-life-science.pdf>
- <https://wheelertoppen.files.wordpress.com/2017/03/georgia-standards-of-excellence-correlations-earth-science.pdf>

Georgia
DOE
Literacy
Learning
Cycles

- 6th Grade Science Literacy Task: Tornadoes
- 7th Grade Science Literacy Task: Cells
- 8th Grade Science Literacy Task: Mixtures

Short Videos



Elementary:

- [Integrating Writing and Science](#)
- [Integrating Reading and Science](#)
- [Writing about Claims, Evidence, and Reasoning](#)
- [Sentence Frames for Reading, Writing, and Forming Science Knowledge](#)

Middle/High:

- [Integrating Writing and Science:](#)
- [Integrating Reading and Science:](#)
- [Signal Words for Reading, Writing, and Forming Science Knowledge](#)
- [Writing about Claims, Evidence, and Reasoning:](#)

K-12:

- [Reading Strategies Part 1: Make it Make Sense: For Teachers in Grades K-12](#)
- [Reading Strategies Part 2: Problem-Solving Tools](#)
- [Knowing Enough to Read: How Background Influences Science Comprehension](#)
- [Before and After Writing: Prewriting and Evaluation](#)
- [Integrating Reading, Writing, and Science in the K-8 Classroom: A Call to Action for Administrators](#)

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