Cross-Curricular Connections: Inquiry with Math, Science, and Language Arts (4-12)

Mrs. Amanda Bray Cody, M.Ed.
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Incorporating Math and Science into the Language Arts Classroom

- Teach problem-solving skills
- More effectively implement inquiry-based learning
- Show cross-curricular connections
- Activate prior knowledge
- Correct misconceptions
- Increase student and teacher confidence & comfort by doing small daily tasks
- Create and implement inquiry projects
Common Core Focus Areas

(Middle School Language Arts)

- Informational Texts
- Complex Texts
- Close Reading & Citing Text Evidence
- Writing Arguments
- Research

Common Core & Content Areas

“Common Core emphasizes an integrated model of literacy that includes cross-subject collaboration among teachers...”

~ Susan Ryan & Dana Frazee

Common Core Standards for Middle School English Language Arts
Incorporate Math, Science, & Inquiry into the Language Arts Classroom Using...

- Daily Data
- Paired Texts
- Research & Argumentative Writing
- Debate & Discussion
Daily Data

• *Daily Data* is the idea of setting aside time each day to have students participate in collecting, analyzing, interpreting, and representing data that is meaningful to the student.

• The goal of daily data is to provide math practice through problem solving, reinforce mathematical vocabulary, and provide opportunities for students to communicate mathematically – speaking, listening, and writing.


Daily Data Outcomes

- Increase vocabulary
- Record and analyze data
- Discuss data
- Analyze similarities and differences
- Reinforce previously learned skills
- Give students a purpose
- Review past skills
<table>
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**Monday:** Pose a question. Students indicate their answer. Discuss the answers.

**Tuesday:** Students will write about the data results from Monday.

**Wednesday:** Draw a graphic representation of the data.

**Thursday:** Write a story problem or number sequence to express the data.

**Friday:** Show the data in a different form.
Do you think that Atticus Finch was a good father figure for Scout?

**YES**
- Ann
- Sidney
- Sarah
- Brittany
- Chris
- John
- Kelly
- Nick
- Matt
- Lauren

**BOTH**
- Carrie
- Carlos
- Jennifer
- Bill
- Nathan

**NO**
- Jonathan
- Colin
- Robin
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General Statement:
• I think that Atticus was a good father for Scout. Most of my classmates agreed with my opinion. I think the reason for this is because there are a lot of clear examples of Atticus being a good father in the book.

Evidence:
• Atticus valued education.
• He spent time reading with Scout.
• He ensured that Scout had mother figures in her life.
• He let Scout learn lessons on her own.
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The table outlines the activities for each day of the week, starting with posing a question on Monday, and concluding with discussing the answers on Friday. Each day builds upon the previous day’s activity, ensuring a comprehensive understanding of the data.
Graphic Representation
# Daily Data

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- **Monday**: Pose a question. Students will write about the data results from Monday. Discuss the answers.
- **Tuesday**: Students will write about the data results from Monday.
- **Wednesday**: Draw a graphic representation of the data.
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- **Friday**: Show the data in a different form.
Fifty-six percent of the class said that Atticus was a good father for Scout.

If you were to ask 100 students, how many would you expect to say yes?

See how the answers to a question change over a period of time

Answers from boys vs. girls
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Was Atticus a good father for Scout?

- Yes: 56%
- Both: 28%
- No: 17%

17%
Extending the Task...

- How might this same topic look if we surveyed students in another grade, school, state, or community?
- Who in the "real world" would be interested in the data on our graph this week?
- Work with a partner to interpret this week's data in a different way.
Paired Texts

- Combating “I’m done.”
- Reading the same text multiple times for different purposes
- “two texts that are conceptually related in some way, e.g., by topic, theme, genre, etc.”
- Reading “Rime of the Ancient Mariner” from a scientific perspective or a navigational/mathematical perspective

“Rime of the Ancient Mariner”

Water, water, every where,
And all the boards did shrink;
Water, water, every where,
Nor any drop to drink.

• What questions might students have about this passage?
• What information might help them understand better?
• How could this be connected with science?
“Rime of the Ancient Mariner”

The Sun came up upon the left,
Out of the sea came he!
And he shone bright, and on the right
Went down into the sea.

Without a breeze, without a tide,
She steadies with upright keel!

- What else could students discuss or research that relates to these passages?
- Text to world connections
Resources for selecting high-quality literature for paired texts

- National Council of Teachers of English
  - www.ncte.org
- National Council for the Social Studies
  - www.ncss.org
- National Science Teachers Association
  - www.nsta.org
- National Council of Teachers of Mathematics
  - www.nctm.org
- American Library Association
  - www.ala.org
Research & Argumentative Writing

- Evidence
- Reasoning
- Real world applications
  - Government
  - Law
  - Policy-making
  - Science

## Teaching the Argumentative Standard

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<table>
<thead>
<tr>
<th></th>
<th>Opinion Writing</th>
<th>Persuasive Writing</th>
<th>Argumentative Writing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose</strong></td>
<td>The writer aims to share his opinion or preference.</td>
<td>The writer aims to get the reader to agree with him/his perspective.</td>
<td>The writer aims to get the reader to accept his perspective/his side as truth.</td>
</tr>
<tr>
<td><strong>General Technique</strong></td>
<td>The writer states what he thinks and why he thinks it.</td>
<td>Opinions are blended with facts, all in an attempt to convince the reader that the writer is &quot;right.&quot;</td>
<td>Relevant reasons and credible data are blended to demonstrate the writer's argument as valid.</td>
</tr>
<tr>
<td><strong>Audience</strong></td>
<td>The writer seeks to be heard and wants to share his ideas/opinions. He is not concerned with getting something; he wants to voice his thoughts.</td>
<td>The writer needs an intended audience to address his request or need to. Who can give him what he wants?</td>
<td>To write an argument, the writer doesn't need an intended audience. The writer is satisfied with simply &quot;putting the truth out there.&quot;</td>
</tr>
<tr>
<td><strong>Point of View</strong></td>
<td>Because the writer is predominantly concerned with stating his opinion, first-person (i.e., I) is always used.</td>
<td>Since the writer is communicating directly to a person, group, or organization, it's common to use first-person (i.e., I) and second-person (i.e., you) point of view.</td>
<td>With no specific audience in mind, this more formal writing addresses the multiple sides of an issue using the more objective third-person point of view.</td>
</tr>
<tr>
<td><strong>Attitude</strong></td>
<td>Opinion writers are excited about their own ideas and eager to share them with whomever will listen.</td>
<td>Persuasive writers &quot;go after&quot; their readers more aggressively. They consider the emotional strategy that will work best on their audience (e.g., manipulation, motivation, inspiration, etc.). Persuasive writing is personal, passionate, and emotional.</td>
<td>Argumentative writers maintain a tone of fairness and reasonableness. Their attitude is respectful, tactful, and formal.</td>
</tr>
<tr>
<td><strong>Perspectives Presented</strong></td>
<td>Opinion has a single-minded goal—Tell the reader what you think. (See the one-sided scale above.)</td>
<td>Persuasion has a single-minded goal—Get what the writer wants. It is based on the writer's personal conviction that his way of thinking is the best. Consequently, the writer's viewpoint is typically the only one presented. (See the lopsided scales above.)</td>
<td>Argumentative writing acknowledges opposing views within a pro/con piece. (See the more balanced scales above.) This demonstrates the writer as a fair-minded person and gives him the opportunity to counter these perspectives with more logic, reasoning, and proof.</td>
</tr>
<tr>
<td><strong>Starting Point</strong></td>
<td>1. Pick a topic. 2. Decide what you think. 3. Write, draw, or talk about it.</td>
<td>1. Pick a topic of interest. (What do you want?) 2. Choose a side to &quot;fight&quot; for. 3. Start writing.</td>
<td>1. Conduct initial research on a debatable topic. 2. Align with the strongest side. 3. Continue gathering facts and research.</td>
</tr>
<tr>
<td><strong>Support</strong></td>
<td>Opinion pieces rely solely on opinion and feelings.</td>
<td>Persuasive pieces rely almost solely on opinions and feelings. The writer uses his own passion and/or plays off reader emotions to get what he wants. The audience agrees with the writer because of strong emotional appeals.</td>
<td>Arguments rely on logical reasons that are all substantiated by facts, data, expert quotes, and evidence. The audience agrees with the writer because of the strong logical appeals.</td>
</tr>
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</table>
Inquiry-Based Lessons

- Incorporate math skills into language arts inquiry-based projects.
- **Project starters** guide teachers and students.
  - Student interest
  - Student ability
  - Teacher choice
  - Curriculum
Math & Science Connections

- Students are able to clearly communicate ideas
- Create arguments
- Critique reasoning
- Real-world applications
- Explain multiple strategies

Project Starter Examples

- Your school has just received a $1,000 donation. What class project would you choose to complete?
  - Class Aquarium
  - School Garden
  - Reading Nook
  - Other

- Graphic organizers
  - Critical thinking on paper
  - Formative assessment
## School Donation

<table>
<thead>
<tr>
<th>Math Component</th>
<th>Language Arts Component</th>
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<tbody>
<tr>
<td>Calculate costs</td>
<td>Research costs and instructions</td>
</tr>
<tr>
<td>Stay within a budget</td>
<td>Create an argumentative essay / speech</td>
</tr>
<tr>
<td>Determine the amount(s) of supplies needed</td>
<td>Incorporate finances into an essay / speech</td>
</tr>
<tr>
<td>Long-term financial planning</td>
<td></td>
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</thead>
<tbody>
<tr>
<td><strong>What I know</strong></td>
<td><strong>What I want to know</strong></td>
<td><strong>How will I find information?</strong></td>
<td><strong>What I learned</strong></td>
</tr>
<tr>
<td>Need 1-year supply of food</td>
<td>Cost calculations</td>
<td>Internet research</td>
<td>Goldfish .25</td>
</tr>
<tr>
<td>Aquarium Fish Decorations</td>
<td>What kinds of fish?</td>
<td>Visit pet stores for prices</td>
<td>Tetras $2.25</td>
</tr>
<tr>
<td>Can’t mix certain kinds of fish</td>
<td>Calculate Labels &amp; store workers tell about fish</td>
<td>Betta fish – alone</td>
<td>Don’t mix goldfish w/ other fish</td>
</tr>
</tbody>
</table>
What’s next?

- After using the graphic organizer...
  - Develop a budget plan
  - Create speech, essay, or other presentation
  - Present to class or panel
- Instructions, rubric(s), and graphic organizers
  - Keep students on track
  - Hold students accountable
  - Enable teachers and peers to monitor work and progress
Project Resources

- Argumentative Writing vs. Persuasive Writing
  - Argumentative vs. Persuasive Chart
- ReadWriteThink.org Lesson – Food Waste in the Cafeteria
  - Cafeteria Waste Research and Argument Project
  - Adjust for your own students needs
- Create your own.
## Sports reporter

<table>
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<th>Math Component</th>
<th>Language Arts Component</th>
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<tbody>
<tr>
<td>Analyze statistics</td>
<td>Simulated sports report newscast</td>
</tr>
<tr>
<td>Calculate probability</td>
<td>Journalism article</td>
</tr>
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<td>Math Component</td>
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</tr>
<tr>
<td>------------------------------------</td>
<td>-------------------------------------------------------------------</td>
</tr>
<tr>
<td>Survey food preferences</td>
<td>Write a business letter format invitation to the dinner</td>
</tr>
<tr>
<td>Calculate serving sizes</td>
<td>Create a welcome speech and / or a keynote speech</td>
</tr>
<tr>
<td>Calculate cost</td>
<td>Write thank-you letters for attendees</td>
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# Statistics, Propaganda, & Persuasive Techniques

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<td>Survey class or school</td>
<td>Create an ad campaign for an important issue</td>
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<tr>
<td>Graph survey results</td>
<td>Use persuasive techniques to sway voters</td>
</tr>
<tr>
<td>Use statistics to predict voter choice</td>
<td>Create persuasive essays, speeches, or graphic ads</td>
</tr>
<tr>
<td>Calculate election results</td>
<td>Simulate voting process</td>
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In-class debates make students into active learners instead of passive ones, making them responsible for their own comprehension and application of skills. (Snider & Schnurer, 2002).

Debates cause students to think critically about previously held ideas and beliefs.

Kennedy (2009) argued that in today’s world, teachers should focus less on teaching information and more on how to use information.

In study by Kennedy (2009), 37.3% of students changed their minds about an issue after participating in a debate (students were assigned roles and sides of the argument).
Debating in the Classroom

• Formal debates

• 4 corners debate

• Scholastic Scope debates

• Fishbowl discussion
Methods to Promote Inquiry and Use Formative Assessment

- Anticipation Guides
- Webquests
- Student-Generated Questions
- Work Guide / Graphic Organizers
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- Daily Data
- Paired Texts
- Research & Argumentative Writing
- Debate & Discussion
Contact Information

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