The Quantitative Literacy Demands of Nonfiction Texts Used in English Language Arts (ELA) Classrooms: A Pilot Study

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**Common Core State Standards** (2009) proposed major shifts in ELA teaching:

Add more "**nonfiction text**" so that students are reading it 70% of the time by senior year.

(National Governors Association Center for Best Practices, & Council of Chief State School Officers, 2010).
But what is “Nonfiction Text?”

CCSS offers no definition: Instead, interchangeably uses:

- “Literary nonfiction”
- “Informational text”
- “Expository text”

Differ in structure, features, and cognitive demands but lead teachers to think they are the same.
Rising before them stood a castle tree house—two stories high with an open turret and stairs that wound through a trap door that led to a tiny chamber at its highest point. The castle included a sky bridge, a tower prison, a tunnel, and a library—perfect for a girl with a bright imagination and a hunger for stories.

In the castle Avery could be anybody she wanted to be. On sunny days, she pretended to be queen and made Henry one of her loyal subjects. She painted watercolor castles and wrote poetry while sending Henry to collect blackberries or fetch water from the nearby stream for their snack. At night, when the sky was as black as ink, Avery would lie on the roof and imagine the stars were diamonds in her crown.

This castle held many secrets—among them, it supposedly sat atop an intricate system of tunnels—but whether any of them were true, Avery had no idea. Most importantly, it was the last place Avery saw her mother before she left and never came back.

Today it would be a hiding place.

Avery decided she and Henry would stay in the tree house until night fell, and then they would sneak home where Avery would explain everything to their father. He would be angry at first but would eventually soften. He might even loan her the money to buy a replacement dress since she had saved her brother’s life.

Avery was just about to lead Henry into the arched doorway of the thick tree trunk when he yanked free of her grasp and raced into the open.
Why is this a problem?

1. **The Teachers**
   - Have autonomy, might lack the knowledge and guidance to make informed decisions (Stotsky, 2012).
   - Little is known about nonfiction texts taught

2. **The Texts**
   - Are inherently mathematical, containing mathematical ideas and representations.
   - Need to be read differently than verbal items even when embedded in a verbal context (Chapman & Lee, 1990).

3. **The Readers**
   - Need to move flexibly between registers, construct meaning, and transform it.
   - Read embedded mathematical representations non-mathematically or not at all (Chapman & Lee, 1990).

*Types: Complexity, Demands*

*Literacy depends on numeracy.*

*Requires ‘mathematical thinking’* (Burton, 1982).
The purpose of this study was to explore the nonfiction texts ELA teachers assign and the Quantitative Literacy demands that these texts pose on student readers.

**Research Questions:**

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<td><strong>Which nonfiction texts are secondary ELA teachers assigning to their students?</strong></td>
<td><strong>What are the Quantitative Literacy demands of these texts?</strong></td>
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Sample and Data Collection

- Sent emails to Connecticut high school ELA department heads asking them to invite their teachers to participate in the study.
- Collected nonfiction texts that participating teachers assign.
  - *Only the informational texts were analyzed.*
- All participating teachers use online nonfiction text collections.
- Cited 10 online resources.
- All participants use Newsela.com

Collected 41 texts:
  - 16 = narrative nonfiction
  - 25 = informational

Collected 35 Newsela texts

*Total: 60 texts*
A manifest content analysis (Potter & Levine-Donnerstein, 1999) was conducted to determine the quantity of **numeracy events**, or “occasions in which a numeracy activity is integral to the nature of the participants’ interactions and their interpretive processes” (Street & Baker, 2006, p. 201).

**Criteria:**
1. Words, mathematical symbols, visuals (graphs, tables) or a combination thereof (O’Halloran, 2005)
2. Readers must apply numeracy skills/knowledge to make inferences
3. Inferences are essential to fully comprehend the text.
About 20% of more than 4,400 11–18-year-olds surveyed by the Cyberbullying Research Center in 2010 reported having been cyberbullied at some point in their lives.

- %
- 20/100
- 1/5
- Less than half
- Less than a quarter
- Is this a lot or a little in the context?

- 4,401 or any number greater
- 4,400/5 = 880
- At least 880
- Is this a large sample size?

- Subtraction or range?
- How old are the respondents? 11, 12, 13, 14, 15, 16, 17, and 18.
Other examples

Publishers were quickly figuring out that young people and women made up the majority of the film audiences.

Nearly 70 percent of marriages, involving those under 18 end in divorce. For those who marry at 16 or younger, which is permitted in nearly 40 states, almost 80 percent of their marriages will end in divorce, Hamilton says.
# Findings

## Articles Collected from Teachers

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<tr>
<th># Articles</th>
<th># Numeracy Events</th>
<th>Average/Article</th>
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</thead>
<tbody>
<tr>
<td>25</td>
<td>310</td>
<td>12.40</td>
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## Articles Collected from Newsela.com

<table>
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<th># Articles</th>
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</tr>
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<tr>
<td>35</td>
<td>445</td>
<td>12.71</td>
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Nonfiction texts taught in secondary ELA classrooms contain numeracy events.
Successful comprehension depends on application of mathematical thinking
Explicit teaching of numeracy in the context of nonfiction text reading.

CCSS provides little pedagogical guidance:
- Nonfiction text selection
- Text complexity
- Teaching nonfiction texts

ELA teachers need to be aware of different nonfiction text types:
- Differing text features
- Differing cognitive demands

This could inform professional development

26 informational text exemplars for ELA are all narrative nonfiction.
Next Steps

For the current study:

• **Inter-rater reliability**: Have at least two additional raters analyze the texts for numeracy events.

• **Latent content analysis**: Deductively code numeracy events to determine patterns in mode of representation and levels of complexity.

Related studies for the future:

• **Explore teacher motivations for nonfiction text selection**: Awareness of numeracy events and intentions of explicitly teaching them.

• **Explore text simplification software**: What happens to numeracy events when Newsela.com simplifies nonfiction texts containing them?