

# Measuring Habits of Mind: Toward a Prompt-less Instrument for Assessing Quantitative Literacy

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# Quantitative Literacy is:

- *“the **habit of mind** to consider both the power and limitations of quantitative evidence in the evaluation, construction, and communication of arguments in public, professional, and personal life” (Grawe 2011).*
- *“a **predisposition** to look at the world through mathematical eyes, to see the benefits (and risks) of thinking quantitatively about commonplace issues, and to approach complex problems with confidence in the value of careful reasoning” (Steen 2001).*
- *the **power and habit of mind** to search out quantitative information, critique it, reflect upon it, and apply it in their public, personal and professional lives” from the vision of the National Numeracy Network as cited by Madison and Steen (2008).*
- Etc...

# Goal:

- Design a *reasonable (small scale, manageable)* assessment instrument to capture the idea that quantitative literacy encompasses more than just the ability to respond capably to specific prompts.
- Instead of measuring “*can* my students ...”, measure “*do* my students ...”
- Administered within an authentic context.

# Measure whether our students have the inclination to:

- glean, identify and report quantitative information in direct support of a thesis statement;
- invoke quantitative reasoning to critique a statement or opinion;
- check numerical information presented in text with any accompanying graphics; and
- critically evaluate information presented graphically.

# Design: Context

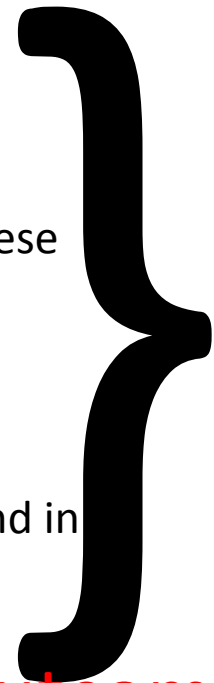
<500 word newspaper article containing:

- content of interest to college students.
- a variety of quantitative statements (including relative and absolute quantitative comparisons).
- An argument supported by quantitative comparisons.
- A graph which exhibits some discrepancies between the numerical information presented in the article.
- Quantitative strengths and weaknesses.

# Design: Prompts

- Open-ended and not multiple choice.
- Do not explicitly refer to any quantitative or mathematical calculation.
- Short amount of space for student responses.

1. Did you understand the article? If not, what did you find confusing?
2. What was the main point(s) of the article?
3. What facts did the author use to support the main point(s)?
4. Were there any particular strengths or weaknesses in how these facts were reported?
5. Does the graph help interpret the numerical information found in the text? Explain your thoughts.



Used to assess our outcomes.

# Scoring: Language and Reading

“1. Did you understand the Article?”

Used to help identify those students who may have difficulty with the language encountered in the reading.

“2. What was the main point(s) of the article?”

Measures a student’s ability to identify the main point of a lengthy article.



# Scoring: Habit of Mind to Seek out and Report Quantitative Information

- 0: “No quantitative information given or alluded to.”
- 1: Some relevant quantitative information is identified (or alluded to), but none is correct (or specific enough to be judged correct or incorrect). Students could glean, identify, and report all the relevant quantitative information used in direct support of the main point.
- 2: Some relevant and correct information is identified, but not all.
- 3: All relevant quantitative information is correctly identified.

# Scoring: Habit of Mind to Seek out and Report Quantitative Information

0: No strength or weakness identified or, if identified, not supported with quantitative reasoning.

“4. Were there any particular strengths or weaknesses in how these facts were reported?”

1: A strength or weakness is identified but is supported with incorrect quantitative reasoning (or the reasoning is not specific enough to be able to judge correctness).

2: A strength or weakness is identified and is supported with quantitative reasoning, but the reasoning is incomplete (e.g. it contains unsubstantiated claims).

3: A strength or weakness is identified and supported with correct and complete quantitative reasoning.

# Scoring: Habit of Mind to Seek out and Report Quantitative Information

“5. Does the graph help interpret the numerical information found in the text? Explain your thoughts.”

Was used to measure 1) a student’s habit of mind to check the numerical information in the text with the numerical information being presented graphically and 2) a student’s habit of mind to critically evaluate graphical information within an authentic context.

# QLAR

- Rubric based on the Quantitative Literacy Assessment Rubric (QLAR) [Madison, Boersma, Diefenderfer, Dingman], *Numeracy*, Volume 4, Issue 2, Article 8.

# Uses

- Administered as a pre/post QL assessment for a single general education mathematics class. (three classes, two instructors, two academic level of students)
- Pre/post assessment problematic [different articles, single course, etc.]

# Results

No statistically significant gains in habits of mind  
[as measured by each question]

2. What was the main point(s) of the article?

**Cohort G**

**Cohort H**

*However*

4. Were there any particular strengths or weaknesses in how these facts were reported?

**Question**

**Pre Post**

**Pre Post**

	3	4	5.1	5.2	Question	Question	<i>n</i>
	1.52	0.33	0.81	0.05	1.21	1.53	
		0.162	0.840	-0.53 <sup>1</sup>	0.60	1.95	
					1.42	1.08	50
					0.47	0.3	65

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<b>Question</b>	<b>Cohort G</b>		<b>Cohort H</b>	
	<b>Pre</b>	<b>Post</b>	<b>Pre</b>	<b>Post</b>
<b>3</b>	1.52	1.21	1.53	1.95
<b>4</b>	0.33	0.16	1.29	1.08
<b>5.1</b>	0.81	0.84	1.42	1.49
<b>5.2</b>	0.05	0.53	0.47	0.3

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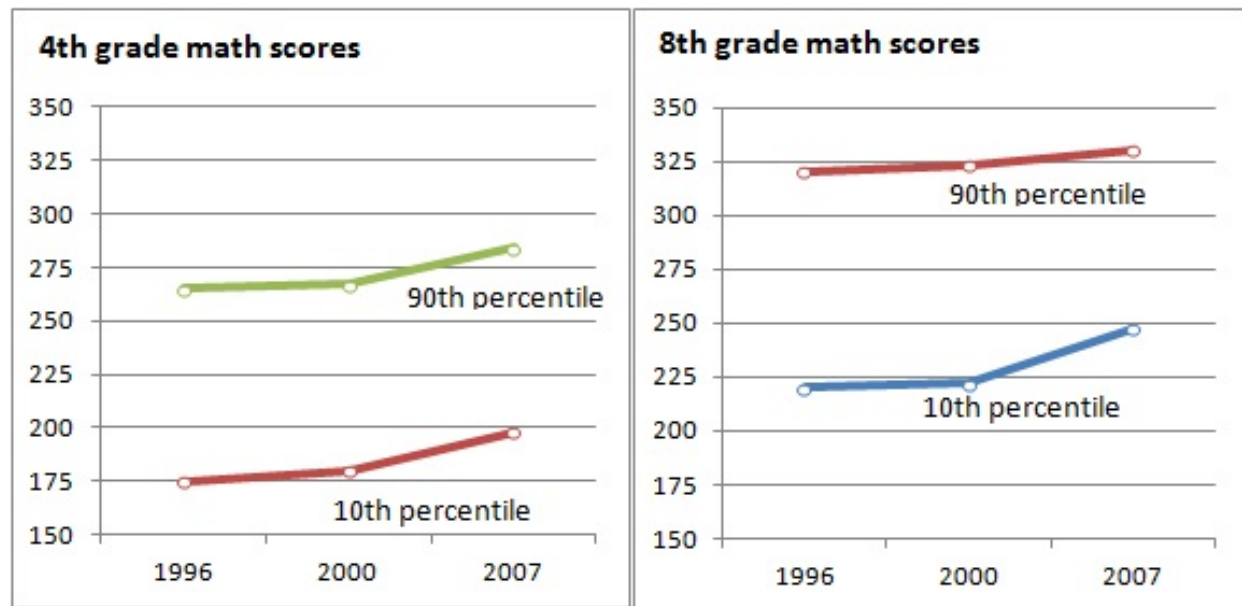
# References

- Boersma, S., C. Diefenderfer, S. Dingman, and B. Madison. 2011. Quantitative Reasoning in the Contemporary World, 3: Assessing Student Learning. *Numeracy* 4 (2).
- Grawe, N. 2011. Beyond Math Skills: Measuring Quantitative Reasoning in Context. *New Directions for Institutional Research* 149: 41-52.
- Madison, B. and L. Steen. 2008. Evolution of Numeracy and the National Numeracy Network, *Numeracy*, 1 (2).
- Steen, L.A. ed. 2001. *Mathematics and Democracy: The Case for Quantitative Literacy*. Princeton, NJ: The National Council on Education and the Disciplines.



# Newspaper Articles

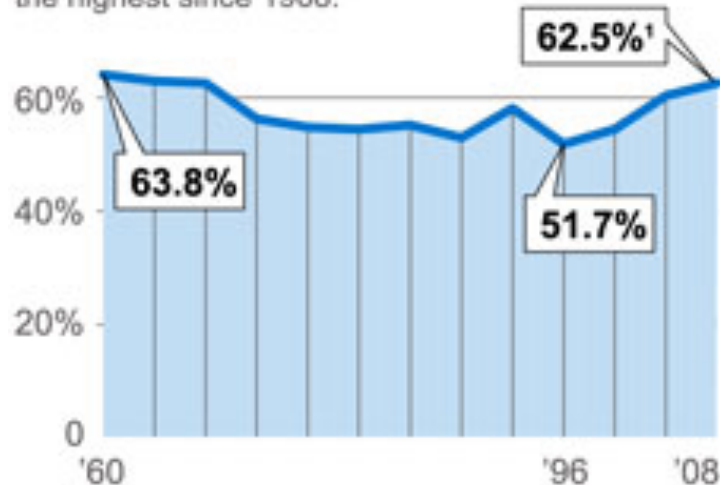
- [Pre](#): Top students show little gain from 'No Child' efforts, *Baltimore Sun*, June 18, 2008.



# Newspaper Articles

- [Post](#): Tally high for Americans at polls this year. *USA Today*, November 6, 2008

The percentage of Americans eligible to vote who cast ballots in this year's presidential election was the highest since 1968:



1 – Unofficial estimate

Sources: Vital Statistics on American Politics,  
United States Election Project

By Julie Snider, USA TODAY

