

Fostering the Development of Quantitative Life Skills through AST101

Can it be done?

Kate Brutlag Follette

Dr. Don McCarthy

January 10, 2012



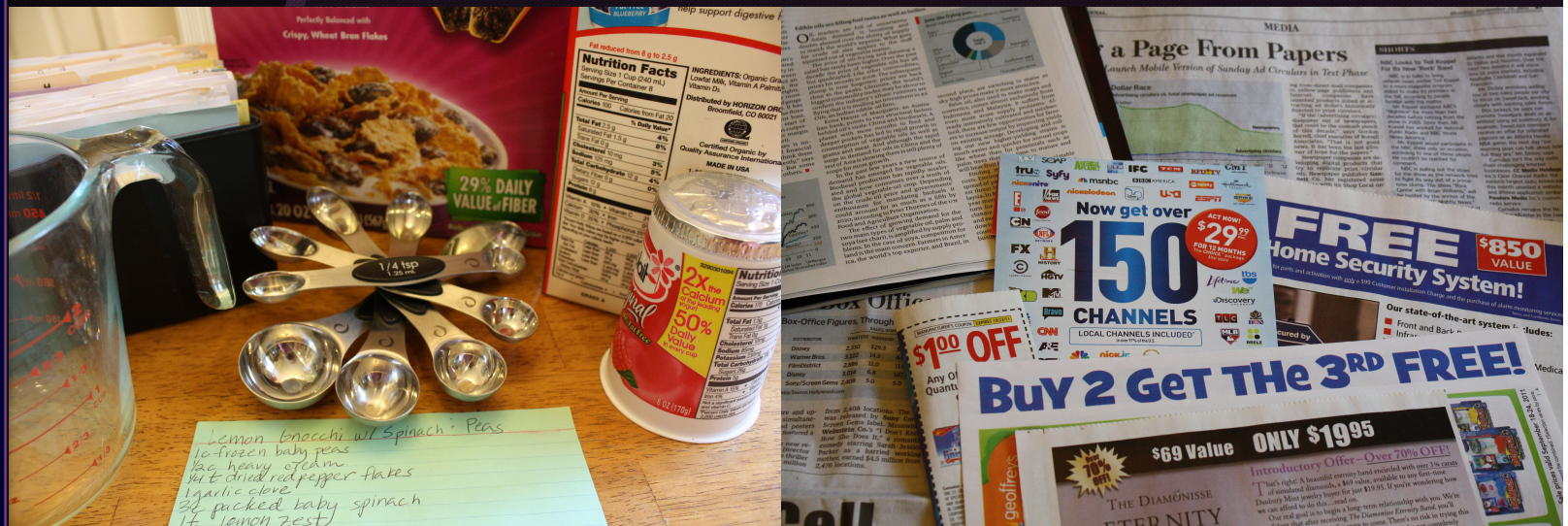
THE UNIVERSITY
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Innumeracy/Quantitative Illiteracy

Table 1. Common mathematical misconceptions encountered frequently in our classrooms.

Operation	Common Incorrect Answer
$1 \div 5$	0.5
$0.5 =$	5%
How many seconds in an hour?	$60\text{sec}/\text{min} + 60\text{min}/\text{hr} = 120\text{sec}$
$10^2 =$	20
$4.3 \times 10^6 =$	4.3000000

- ❖ Motivation
- ❖ Study Basics
- ❖ Preliminary Results
- ❖ Implications and Future Plans



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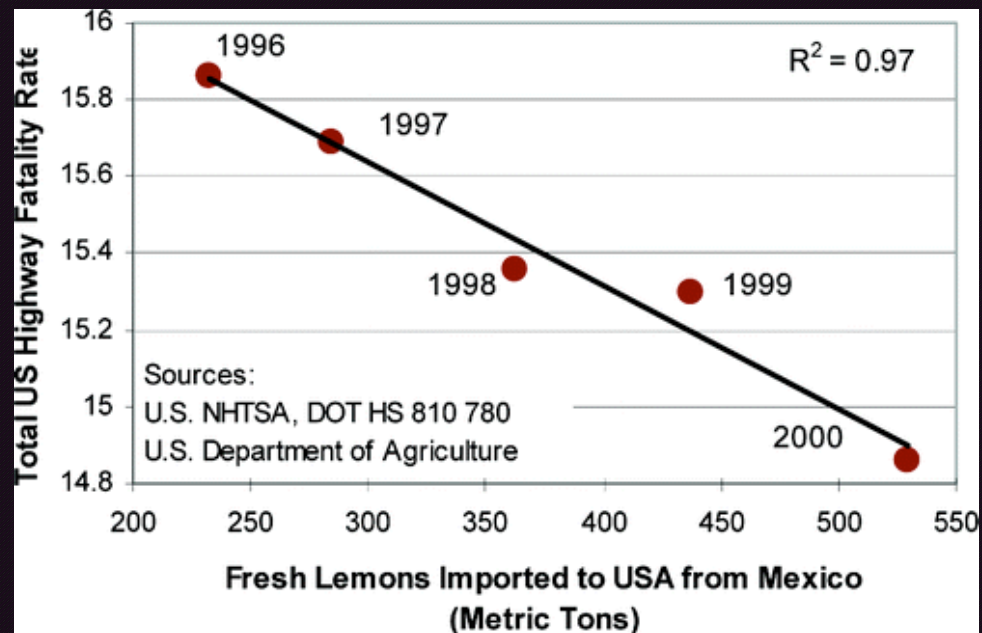
Pseudoscience

- ◇ Motivation
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“I have here in my hand a list of 205, a list of names that were made known to the Secretary of State as being members of the Communist party and who nevertheless are still working and shaping policy in the State Department”

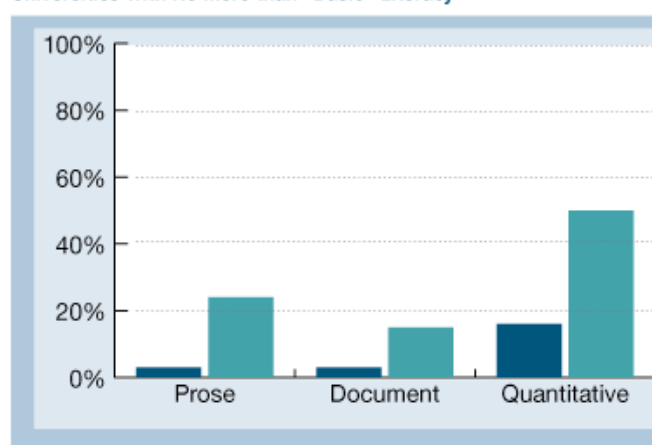
Joseph McCarthy February 9, 1950



NAALS

- ❖ Motivation
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- ❖ Implications and Future Plans

Percent of Graduating Students at 4-Year Colleges and Universities with No More than "Basic" Literacy



Prose: Comprehending and using information from texts such as news stories and editorials.

Document: Comprehending and using information from documents such as job applications and maps.

Quantitative: Identifying and performing computations using numbers embedded in printed materials such as an interest rate schedule.

■ White ■ Black

Source: J.D. Baer, A.L. Cook, S. Baldi, *The Literacy of America's College Students*, American Institutes for Research, 2006.

National Assessment of Adult Literacy (2003) Conclusions

1. **More than 45%** of American adults fell into the lowest two proficiency categories
2. Quantitative proficiency rates declined with age, suggesting that the **numerical proficiency of the US population is declining with time.**
3. Individuals with the highest numerical proficiencies reported **weekly wages 2-3 times higher** and were **more likely to be employed.**
4. **Minorities, women and the disabled** were more likely to perform in the lowest two levels.

Additional Conclusions from Studies in the Literature

1. Women are more susceptible to math anxiety (Betz 1978)
2. Minorities are more likely to leave college with deficits in numeracy (Raudenbush and Kasim, 2009, Ogbu 1990)
3. Students with learning difficulties are particularly likely to struggle with applied mathematics (Chan and Dally 2001, Rousselle and Noel 2007).

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Can you do Division? Divide a loaf by a knife - what's the answer to *that*?
Through the Looking Glass

Part I: Skill Set

- ◇ Motivation
- ◇ **Study Basics**
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Numerical Skills

- ◇ Percentages and Fractions
- ◇ Multiplication and Division
- ◇ Simple Unit Conversions
 - ◇ Powers and Area
 - ◇ Estimation
 - ◇ Error
- ◇ Graph Reading and Interpretation

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Sample Questions

- ◇ Motivation
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You get a letter from your cable company saying that they will be raising your monthly rate by \$5. Assuming that the rate does not change again, how much **additional** money will you be paying to the cable company over the course of the next **three** years?

- (a) \$60
- (b) \$100
- (c) \$130
- (d) \$180

How confident are you in the answer you just selected?

- (a) very confident
- (b) Confident
- (c) not very confident
- (d) I guessed

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Sample Questions

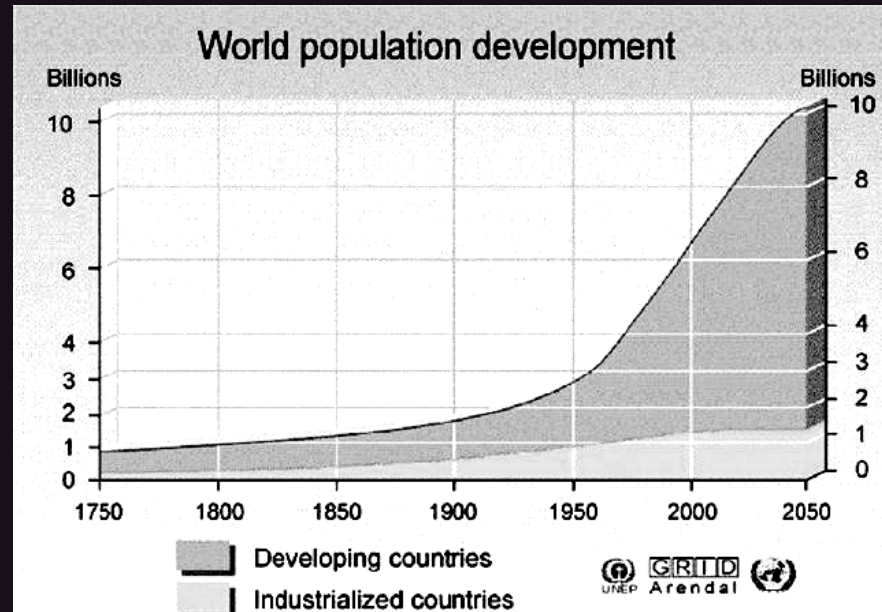
You begin by measuring out the peanut butter in a 2 cup glass measuring cup like that shown above. You fill it to the $\frac{3}{4}$ cup line. If you are to add the shortening to the same measuring cup on top of the peanut butter, which line should you fill it to?

- (a) the 1 cup line
- (b) the $1 \frac{1}{4}$ cup line
- (c) the $1 \frac{1}{3}$ cup line
- (d) none of the above

Sample Questions

- ◇ Motivation
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In 2050, how many people will be living in industrialized countries?

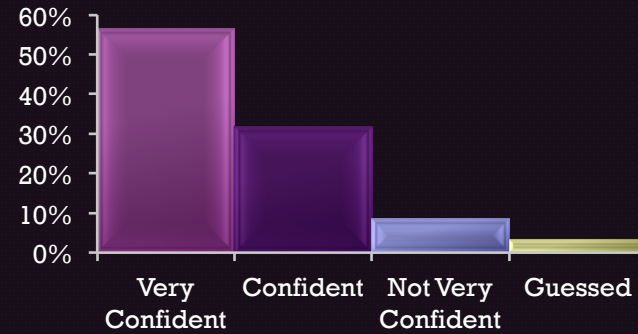
- (a) fewer than 1 in 5
- (b) fewer than 1 in 10
- (c) more than 1 in 5
- (d) about 1 in 6

Preliminary Survey

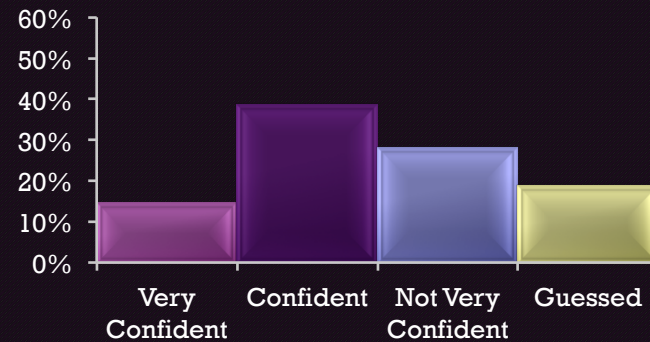
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Confidence in Correct Answers



Confidence in Incorrect Answers



Actual Score ~10% lower than Predicted Score

Fall, 2011

- ◇ Motivation
- ◇ Study Basics
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- ◇ 2 classes
 - ◇ 1 large (188 students)
 - ◇ 1 small (26 students)

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- ✧ Motivation
- ✧ Study Basics
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Inclusion Criteria

- ✧ Completed both
- ✧ 18+ years
- ✧ Spent ≥ 10 min on both

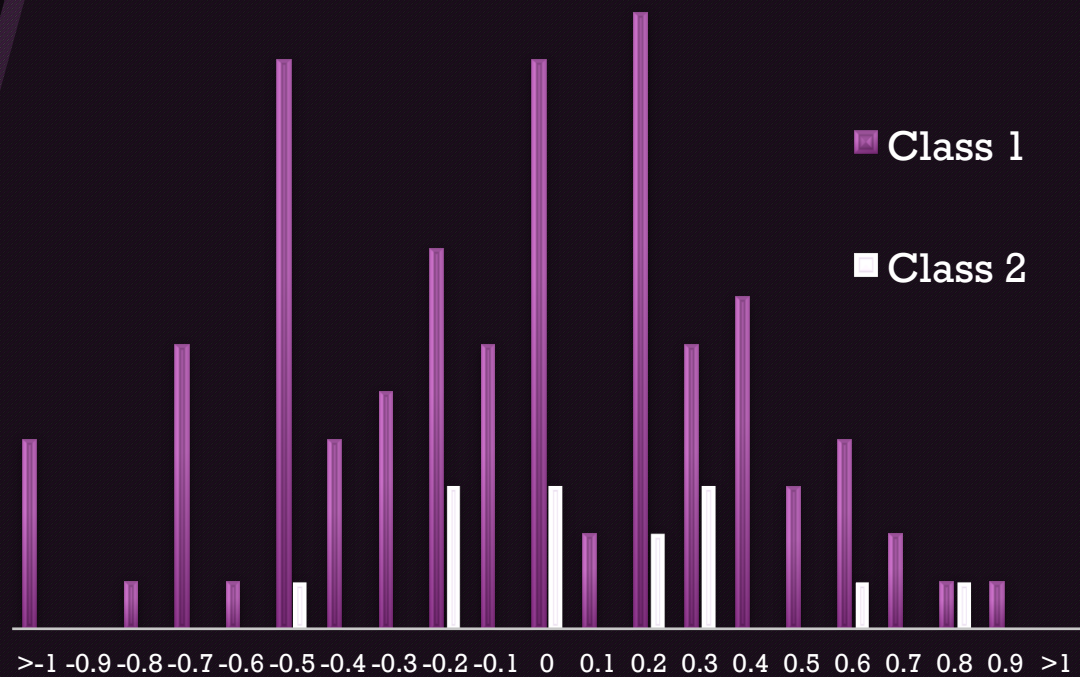
- ✧ Leaves ~55%:
 - ✧ 102 in class 1
 - ✧ 14 in class 2

Preliminary Results

- ◇ Motivation
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Normalized Gain Scores

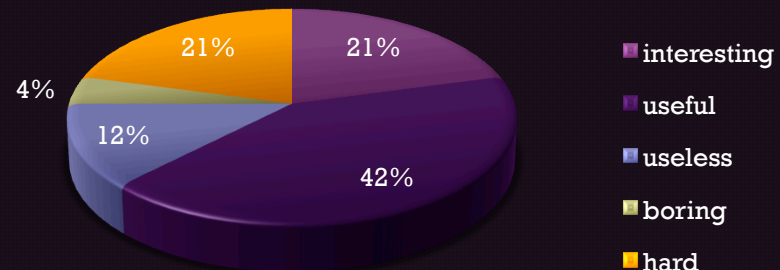


Math is....

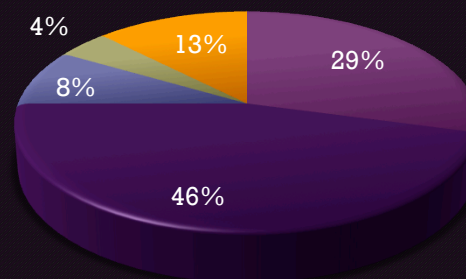
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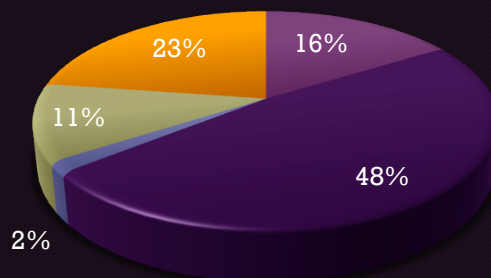
Class 2 Pre



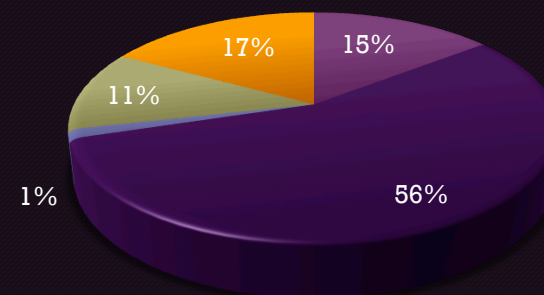
Class 2 Post



Class 1 Pre



Class 1 Post



Summary

- ✧ Motivation
- ✧ Study Basics
- ✧ Preliminary Results
- ✧ Implications and Future Plans

- ✧ Innumeracy is a **serious problem**, with implications for science literacy
- ✧ We as a community need to do more to mitigate this problem in our classrooms

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THANK YOU!

- ✧ Motivation
- ✧ Study Basics
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