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Analyzing Numbers in News Stories

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One vs. Many
Formulaic versus Unique

Natural tension between repeatability and freshness.

Lynn Steen. Many quantitative literacy courses remained localized because their choice of goals and topics was idiosyncratic or required considerable effort to present because it was unrepeatable.

Bernie Madison: Quantitative literacy based on analyzing news stories must be fresh. It can not be programmatic or it becomes stale.

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Joel Best Challenge:
Social Construction

Joel Best:
All numbers are socially constructed.

How do we get students to appreciate:
1. that this is fact?
2. that this fact is important?

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Social Construction
of Counts: #1

Which definition gives the larger number?
A "**dividend-paying stock**" is any stock that has paid a dividend
a. during the past year.
b. during ANY of the past three years
c. during EACH of the past five years
    ANSWER: B (80%)

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Social Construction
of Counts: #2

Who has more children: Rich or Poor moms?
Poor < 35K < Rich.
ANSWER: Rich moms

<10K	10-20K	20-25K	25-30K	30-35K	35-50K	50-75K	>75K
4.2M	6.2M	3.4M	3.8M	3.6M	8.9M	10.6M	12.5

Poor < 25K; Middle-class: 25-50K. Rich > 50K
ANSWER: Poor Moms

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Social Construction
of Ratios: #1

Which definition of "**bullying**" gives the higher *percentage of children who are bullied*?
a.physical force or the threat of physical force
b.Above and malicious gossip, spreading rumors
ANSWER: B   less restrictive in number

Social Construction of Ratios: #2

Which definition of "**children**" gives the higher *percentage of children who are bullies*?

a. Any person who is between 6 and 18

b. Any person who is between 13 and 18

ANSWER: B (71%)   More restrictive in number

Social Construction of Ratios: #3

Which definition of "**senior**" gives the higher *accidental death rate due to falls among seniors*?

a. Any person who is 65 or older

b. Any person who is 55 or older

ANSWER: A (79%)   More restrictive in number

Social Construction of "Percent Attributable"

In 2002, the percentage of US newborns who have low birth-weight is about 12% among moms who smoke (8% among moms who don't).

Among moms who smoke, what **percentage** of their low-weight births **are attributable to** the mother smoking?   Pick the closest answer.

 a. 25%   b. 33%   c. 67%   d. 80%

ANSWER: B 80%

Social Construction of "# Attributable"

In 2002, there were 4.02 million US births. 10% of these births were to mothers who smoked.

Q. How many of their low-weight births are **attributable to** their mother being a smoker?
    Pick the closest number.

a. 16,000   b. 24,000   c. 133,000   d. 400,000

ANSWER: A 42%

Analyzing News Stories 10-Step Analysis

Goal: To give a structured approach in evaluating articles that use numbers as evidence.

Argument based – where the point of the argument is not typically a number.

Argument is typically inductive – not deductive.

Step 1 CRITICAL THINKING

a. What kind of article is it?
    Inferential: Argument or Generalization
    Non-Inferential: Factual (sports, weather)

b. Does the title assert or imply causation?
        (E.g., action words like 'cut')

c. What is the point of the article?

d. Is the point explicit or implicit?

e. Does point assert prediction or causation?

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Step 2
NUMERICAL EVIDENCE

a. What numbers or numerical association gives the strongest support?

b. Is the association qualitative (more/less) or quantitative (% more/less)?

c. Does data refer to past (percentage/rate) or to the future (chance/probability/likely)?

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Step 3
STUDY DESIGN

a. Is association longitudinal or cross-sectional? If longitudinal, are the subjects a cohort?

b. Is association experimental or observational? Experiment: Researcher is in charge. Observational study: subjects in charge.

c. Does data refer to past (percentage/rate) or to the future (chance/probability/likely)?

d. Is study single or double-blind?

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Step 4
CAUSATION

a. How could association be causal?

b. What 3rd factor mechanism may be involved?

c. Could association involve reverse causation?

d. What factors are already taken into account?

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Step 5
RATIOS, MODELING

a. What kinds of ratios does the study involve?

b. Any confusion of the inverse?

c. Are counts used in place of ratios?

d. Are the numbers based on a model?

e. Does model involve regression?

f. Does model involve extrapolation?

g. Does model involve "attributable"

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Step 6
CONFOUNDING

Confounder: an associated factor not controlled for in the study.

a. What confounders does study design resist?

b. What are some plausible confounders?

c. Is X a plausible confounder?

Note: this involves hypothetical thinking about what might be. The answer is not in the article.

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Step 7
ASSEMBLY

a. What opportunities for assembly involve definitions of groups, conditions or events?

b. What opportunities for assembly involve choice in type of comparison?

c. What opportunities for assembly involve choice of basis for a comparison?

d. If X had been redefined from X1 to X2, what would happen to statistic S?

Step 8
RANDOMNESS

a. Does the study involve a sample?
b. Are subjects homogeneous or heterogeneous in relation to the factors of interest?
c. Was sample randomly selected?
d. Is margin of error presented?
e. Is the association "statistically significant"?
f. Is sample size given?

Step 9
ERROR/BIAS

What are plausible sources of
a. subject bias? (
b. measurement bias? (questions, researcher awareness of subjects in treatment group)
c. sampling bias? (differences between the treatment and control group due to the sampling methodology)

Step 10
SUMMARY EVALUATION

a. How readily can numerical evidence (association) be influenced by other factors?
b. Could the researchers have improved the quality of the study?
c. How much support does the numerical evidence give to the point of the essay?

Analyzing News Stories
Conclusion #1

Children need training wheels before they learn how to ride a bike. They need patterns they can practice on and master.

Students need a structured approach to help them master the complexity of unstructured reality.

Analyzing News Stories
Conclusion #2

But, in the end students must master the complexity of unstructured reality. They must be able to do this without prompts or structured assistance.

They must be able to analyze and evaluate what is **most important** in a news story – any news story involving numbers – and they must be able to do this entirely on their own. There is no formula for identifying what is most important.

Analyzing News Stories
Conclusion #3

There is no substitute for practice. Learning to thing critically is like learning to play the piano. It requires practice, repeated practice.

It must be repeated after the course is over if it is going to stick. It must become a way of life – a way of seeing the world.