Numeracy Assessment—Challenges and Considerations

October 17, 2016

1:45-2:45pm

Santa Fe Room

2016 Assessment Institute in Indianapolis

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Outline

- Introduction (5 minutes)
- Pairs discussion(5 minutes)
- General Education process at WU (10 minutes)
- Group discussions (20 minutes)
- Numeracy Assessment at WU (5 minutes)
- Individual reflection (5 minutes)
- Large group discussion: Common questions/suggestions (10 minutes)

Description

As stated on the Office of the Provost's Accreditation & Assessment page:

*"Assessment is the process of documenting — **usually in measurable terms** — knowledge, skills, and attitudes of the individual learner and/or the learning community (class, department, program, school)."*

Numeracy


numeracy - Google Search
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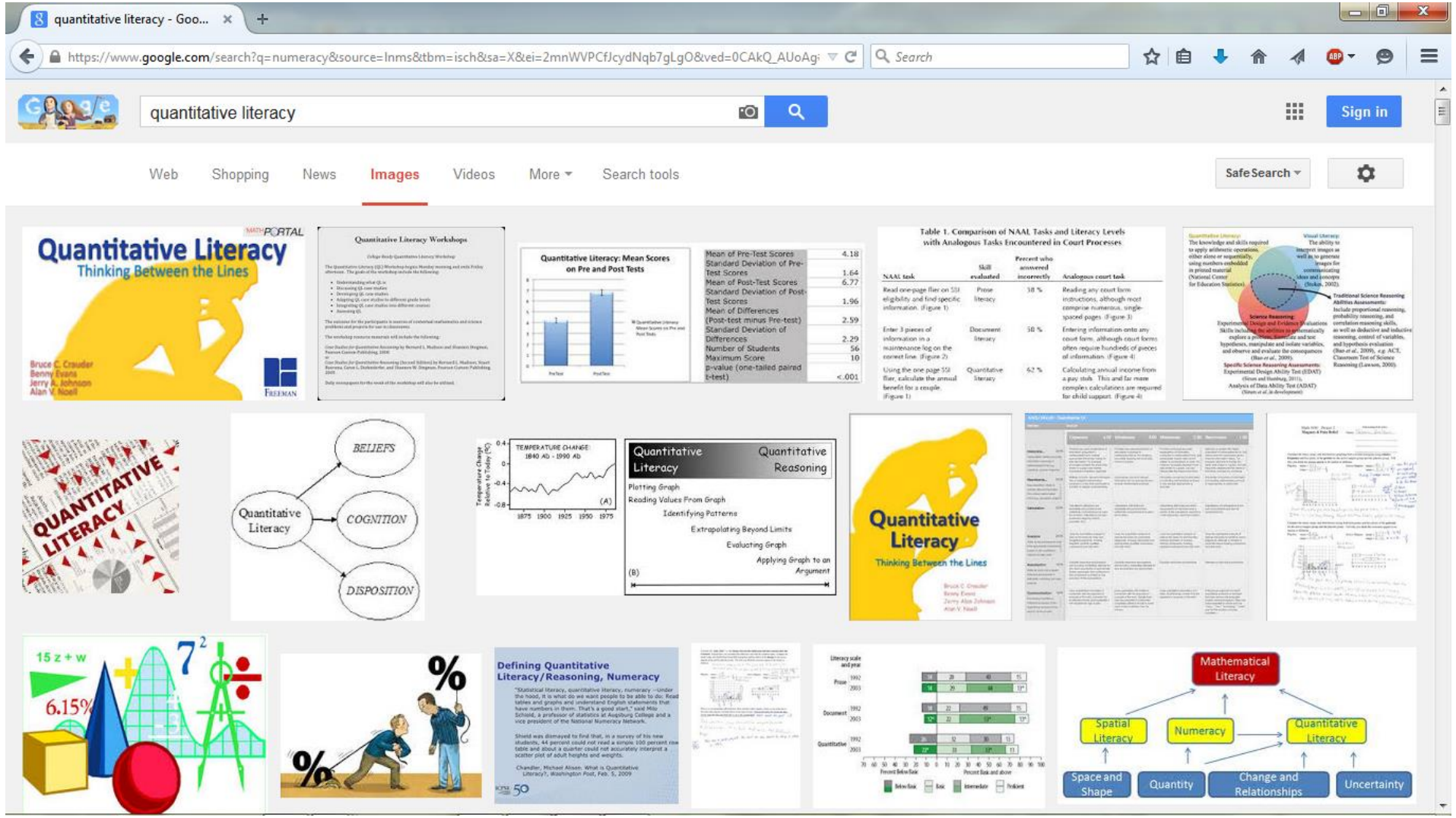
What is numeracy?

- "The ability to identify, understand and use elementary mathematics in everyday contexts" *–Deborah Hughes Hallett, mathematics professor, University of Arizona*
- "[Quantitative Literacy includes] confidence in mathematics, cultural appreciation, interpreting data, logical thinking, making decisions, mathematics in context, number sense, practical skills, prerequisite knowledge, symbol sense" *–Lynn Arthur Steen, mathematics professor at St. Olaf College, former MAA president, and executive editor, Mathematics and Democracy: The Case for Quantitative Literacy(2001)*

What is numeracy?

- “The heart of quantitative literacy is real world problem solving –the use of mathematics in everyday life, on the job, and as an intelligent citizen.” *–Henry Pollak, Visiting Professor of Mathematics Education, Teacher’s College, Columbia University*

Quantitative Literacy



Partnering with stakeholders

Faculty teaching lower- and upper-level courses in:

- Economics
- Education
- Political Science
- Earth and Planetary Sciences
- Psychology
- Mathematics
- Biology
- Physics
- Chemistry

Objectives

Given information in various forms (e.g, graph, table, figure, written information) demonstrating an interaction or relationship between variables, a student should be able to:

- Label and interpret portions of the data illustrating the relationship
- Describe relationships between sets of data
- Identify and extrapolate trends
- Integrate data from more than one source into a new, meaningful graph
- Discriminate between necessary and irrelevant information
- Assess the likelihood of a related particular event occurring
- Display competence working with estimates and approximation, including interpreting error
- Engage in abstract thinking (work with missing or non-standard representations of data)

Ideal test?

- Engaging
- Short
- Tests one skill at a time
- Clearly written
- Mixture of difficulty levels
- Easy to grade

Small Group Discussions

- Form groups of 3-6.
- Each group will receive one sample numeracy question and discuss for 10 minutes.
- Think about how your students would respond to this question type:
  - Would you get useful results? Why/why not?
  - What objective(s) does the question test?
  - How would you grade this question?
  - What are the pros/cons of using such a question?

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Question Type I

19) Evaluate $\int_0^1 x \tan^{-1} x \, dx$.

Exam questions from math course

Pros

- Embedded in course
- Tested during exam
- High participation and effort

Cons

- The students in these courses are probably science majors.
- Skills tested are specific to course.

Question Type II

Data about Student Credit Card Use

To assist you in writing, following are facts about college student credit card use, taken from a 2004 Nellie Mae study unless otherwise stated. You should simplify and/or interpret them as needed to make your case as clearly and forcefully as possible.

- Final year students carried an average balance of $2,864 while freshmen carried an average balance of $1,585.
- Undergraduates reported direct mail solicitation as the primary source for selecting a credit card vendor.
- Twenty-one percent of undergraduates with credit cards reported that they pay off all cards each month; 44% make more than the minimum payment but generally carry forward a balance; 12% make the minimum payment; 11% make less than the minimum required payment each month; 12% gave answers in other categories.
- Many colleges and universities contract with credit card companies to allow solicitation on campus and/or sell mailing lists of their students to those companies. For example, in 1998 the University of Tennessee signed a 7 year contract with FIRSTUSA for over $16,500,000.

Combined literacy/numeracy assessment

Pros

- This is a real-world skill that we would desire students to be able to demonstrate.
- Testing two things at once

Cons

- Students tended to focus on either the numerical or the literacy component.
- Grading is labor-intensive.

Question Type III

Units conversion, mostly between English and metric, has been a costly headache for all industrialized societies. An Air Canada Boeing 767 ran out of fuel in mid-flight due to taking off with what they thought was 20,400 kilograms of fuel, when in reality they had only 20,400 pounds. *(There is a happy ending to the story; search for the “Gimli Glider.")*

How many kilograms of fuel did the Air Canada plane actually have?

Short-answer applications

Pros

- Unit-conversion is a basic numeracy skill.
- Could serve as a test question for whether student is taking test seriously.

Cons

- Conversion factor was not given, and students did not always remember it.
- Students questioned the value of such an exercise.

Question Type IV

An item in a store sells for $36 after a 25% markdown. What was the original price?

(a) $40

(b) $45

(c) $48

(d) $60

(e) $63

GRE-style questions

Pros

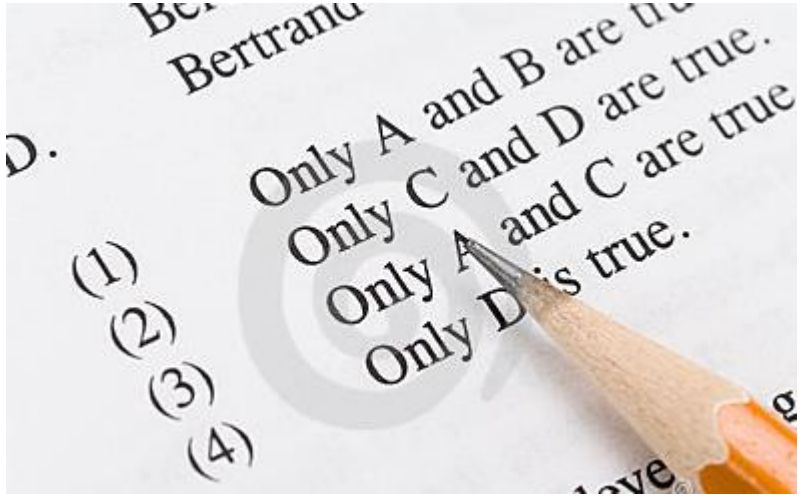
- Easy to administer and grade
- Similar to problems that have already been tested

Cons

- GRE scores are strongly correlated to SAT/ACT scores.
- Students performed well on almost all selected questions.

Basic Design of Current Version

- 20-25 questions
- Multiple Choice
- Timed
- No calculator or outside help
- Fall: First-years and December Graduates
- Spring: Seniors
- Online (Blackboard)



Reflection on your process

- Individually: Use handout to think about what process you already have in place or are working on getting started

Closing Discussion

What challenges do you see for your gen ed assessment process?

Have you combined numeracy and literacy successfully?

How do you motivate student and faculty buy-in?

When and where do you share results with campus partners?

Collaboration across campus @ WU

- The Teaching Center
  - STEM ERG
- Office of the Provost
- The College Office
- The Learning Center
- Center for the Integrative Research on Cognition, Learning, and Education

Thank you!

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