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**Numeracy:
Assessing Basic Skills**

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www.StatLit.org/pdf/2009SchieldMAA6up.pdf

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**Numeracy/QR/QL:
College Grad Skill**

Increasing number of colleges are establishing numeracy/quantitative literacy/quantitative reasoning as a general education graduation requirement.

Justification: All college graduates should have some fluency with numbers in everyday life.

Problem: How can we require something if we can't assess it? How will we know if we need it?

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**Assessing Numeracy:
Very Difficult**

No solid agreement on definition:
Bernie Madison:
"Determining what QR/QL is and how to measure it is a major national issue."

Bookman: *"Assessment items must be set in a real-world context. Not so routine that they require very little thought."*

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**Good Assessment
Needs Validity**

Criterion validity: able to predict an outcome.
SAT: predict first year college grades.
LSAT: predict first year grades in law school.
Numeracy: No agreement yet.

Content Validity: extent to which subject-matter-experts (SMEs) believe a measure represents a social construct such as honesty, depression or numeracy.

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**Key Problem:
Measurement Bias**

Measurement Bias: Bias due to the measurement process or instrument.

In asking subject-matter-experts to rank basic skills and knowledge the choice of categories, the grouping of skills, and the presence or omission of knowledge items can easily influence – bias – the results.

How can measurement bias be avoided?

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**Process:
Open and Transparent**

One way is to present all possible skills and knowledge that have been suggested by leaders with no attempt to eliminate duplicates or to consolidate similar items.

Cost: Assessment survey is much longer
Benefit: Minimizes measurement bias.

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**Process Details:
Two Stages**

Stage 1: Generate a draft survey listing proposed skills and knowledge by author.

- Sons (1994), Utts (2003), McKenzie (2004)
- Madison (2005, 2006), Gillman (2006),
- Lutsky (2006), Gal (2006), Schield (2009).

Rank: Disagree, Neutral, Agree, Strongly Agree, Absolutely Agree, No Opinion (Don't understand).
Solicit additions/comments by SMEs.

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**Survey Process:
Phase 2:**

Revise survey instrument based on feedback from SMEs. Distribute survey to wide group of SMEs:

- Mathematics: MAA QL-SIG (~200)
- Statistics: ASA Statistical Education (~200)
- Numeracy: NNN
- Others: Journalists, Political Scientists, etc.

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Demographic Questions

Perspective: Math/stats/Psy/Phys.Sci/Soc.Sci/Othr.
 Taught QR/QL? ** Yes/No. If Yes, how long?
 Taught GenEd Math for Liberal Arts? **
 Taught traditional Intro Statistics? **
 NNN member: Yes/No
 MAA QL-SIG member: Yes/No
 ASA Stat Ed member: Yes/No
 Taken college Stats?

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**Survey Layout:
A Sample**

Statement of basic skills/knowledge by SME:
 Sons (1994)
 Numeracy should include or feature ...

- #1. **D N A SA AA – NO:** read/interpret graphs
- #2. **D N A SA AA – NO:** read/interpret tables
- #3. **D N A SA AA – NO:** read/interpret schematics
- #4. **D N A SA AA – NO:** represent info visually
- #5. **D N A SA AA – NO:** represent info numerically

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Analysis

Results would be tabulated and disseminated by the sponsoring organization with no attempt to use the data to promote any particular definition or basic skill requirement.

Assessment generators could use this data to objectively ground their assessment instruments (content validity).

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Conclusion

National Numeracy Network **should** sponsor this. Doing so can take Numeracy from a fairly broad idea to an idea that has operational definitions. It may create some internal conflict. But unless and until numeracy can be assessed, it will remain a floating abstraction – like critical thinking – that can not be endorsed by large national organizations such as the AACU.