Assessing Perceived Ability and Attitude in a Quantitative Literacy Course

Becky Matz (matz@msu.edu), Nick Rekuski, Rachael Lund

Michigan State University

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Confidence with mathematics is an important element of quantitative literacy

**Confidence with Mathematics.** Being **comfortable** with quantitative ideas and **at ease** in applying quantitative methods. Individuals who are quantitatively confident **routinely** use mental estimates to quantify, interpret, and check other information. Confidence is the opposite of “math anxiety”; it makes numeracy as **natural** as ordinary language.

Quantitative literacy at MSU

● 2005: Task force reviewed goals for QL at MSU

● 2010: Initial course pilots under existing course names

● 2015: First course offerings under QL course names
  ○ MTH 101 (QL1)
  ○ MTH 102 (QL2)

● 2018: Courses operating at scale (?)
We have addressed a variety of assessment questions in QL

● What is an appropriate assessment of prerequisite QL skills for entering MSU students?

● How were the two QL courses designed?

● How do the students reason quantitatively when discussing their reactions to public issues?

● Questions about student comfort with math, views of math, etc. have been ongoing as the courses have scaled
Survey development

● Reviewed existing surveys and scales about
  ○ Perceived ability
  ○ Preference for numerical vs. prose information
  ○ Perceptions about mathematics
  ○ Mathematics anxiety and self-efficacy
  ○ Confidence

● Narrowed our questions of interest to comfort and attitudes


Example questions

I am comfortable working with fractions.

<table>
<thead>
<tr>
<th>Disagree strongly</th>
<th>Disagree somewhat</th>
<th>Agree somewhat</th>
<th>Agree strongly</th>
</tr>
</thead>
</table>

If a cookie recipe calls for 1 \( \frac{3}{4} \) cups flour, and I want to make a half batch, I am comfortable computing the amount of flour needed without a calculator.

<table>
<thead>
<tr>
<th>Disagree strongly</th>
<th>Disagree somewhat</th>
<th>Agree somewhat</th>
<th>Agree strongly</th>
</tr>
</thead>
</table>
Data collection

- Pre- and post-survey in the two Summer ‘18 QL1 courses

<table>
<thead>
<tr>
<th></th>
<th>Pre-survey</th>
<th>Post-survey</th>
<th>Matched students</th>
</tr>
</thead>
<tbody>
<tr>
<td>QL1 - Section 1</td>
<td>25 / 34 (74%)</td>
<td>25 / 28 (89%)</td>
<td>22</td>
</tr>
<tr>
<td>QL1 - Section 2</td>
<td>18 / 26 (69%)</td>
<td>18 / 23 (78%)</td>
<td>13</td>
</tr>
</tbody>
</table>

- Each survey took students 5-10 min to complete

- Also included open-ended questions about topics of interest to students
Pre - I am comfortable working with fractions

Post

Pre - If a recipe calls for 1 ¼ cups flour, and I want to make half the recipe, I am comfortable computing the amount of flour needed without a calculator

Post (WSRT p = .007; ST p = .013)
Pre - Understanding math is not really required once a person leaves school

Post

Pre - Math is just a set of rules and procedures that needs to be memorized

Post

Number of students

1 = Disagree strongly
2 = Disagree somewhat
3 = Agree somewhat
4 = Agree strongly
Compared to the beginning of this course, my confidence in my math abilities has decreased, not really changed, or increased.

**Not really changed**

- *Was not motivated to learn much.*
- *Many of the topics I have already learned about but were taught in odd ways*
- *Due to strong prior knowledge from other courses*
- *I'm still just as confident in my abilities*
Compared to the beginning of this course, my confidence in my math abilities has decreased, not really changed, or increased.

**Increased**

- I hadn't done some of these topics previously, but now I know how to.
- Because I thought I sucked at math before
- I re-learned basics like converting fractions and such.
- I feel that I've learned how to use logic more accurately in my everyday life
What did students think were important big ideas from the course?

Different ways to calculate percentages. I now know my chances of winning the lottery are slim.
What did students think were important big ideas from the course?

I learned that numbers can be manipulated. I always thought numbers were absolute truth but I see that - like anything - they are also subject to manipulation.
What did students think were important big ideas from the course?

I can't think of anything I didn't already know
What did students think were important big ideas from the course?

- Learn how to work with your classmates

<table>
<thead>
<tr>
<th>Topic</th>
<th>Number of instances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent, correlation, probability</td>
<td>15</td>
</tr>
<tr>
<td>Interpreting charts and graphs</td>
<td>10</td>
</tr>
<tr>
<td>Relationship between math and logic</td>
<td>5</td>
</tr>
<tr>
<td>Nothing</td>
<td>2</td>
</tr>
<tr>
<td>Multiple problem solving paths</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
</tr>
</tbody>
</table>
Initial findings

- The general and specific comfort questions show interesting differences that perhaps depend on the nature of the specific question.

- Student attitudes about mathematics did not appear to appreciably shift during these summer courses.

- Most students described either no change or increased confidence in their mathematics abilities.

- The big ideas that students identify in the course largely align with overall course goals.
Thank you!

Questions for discussion

- What affective measures have you used with success?
- How have you tried to improve student affect? And what outcomes have you observed?
- What relationships between course performance and affective measures have you observed?
Pre - I am comfortable reading graphs and charts

- Post

Pre - Given the following chart, I am comfortable figuring out which birth control method (implant or IUD) was used by more teens in each year

- Post

Number of students

1 = Disagree strongly  2 = Disagree somewhat  3 = Agree somewhat  4 = Agree strongly

0  5  10  15  20  25  30  35
Compared to the beginning of this course, my confidence in my math abilities has decreased, not really changed, or increased.

**Decreased**

- *The class reminded me what I didn't know and the method for teaching was very different than what I experienced before.*
- *Because I think the styles of teaching makes a huge impact how well you can grasp the material and understand it the right way and memorise everything more.*