Quantitative Reasoning Assessment

HWC Assessment Committee
Quick Facts on the Fall 2009 Assessment
September, 28th, 2011
Presentation by Jeff Swigart

Acknowledgements

- Chris Sabino: Authored most of the assessment, with help from others on the committee.
- Many Faculty: Volunteered students to take the assessment.
- Chris Kabir and Keenan Andrews: Inputting data to electronic form.
- Chao Lu, Chris Sabino, Kurt Sheu, Jeffrey Swigart: Graded the short answer portions of the assessment.
- Chris Sabino, Jeffrey Swigart, Michael Heathfield: Wrote the final report.
- Phillip Vargas: Strengthened the statistical analysis for the final report.

Basic Facts

- Administered in Fall 2009, November 9th to November 14th.
- 1132 students, mostly from 61 volunteered class sections.
- 14.65% of the student population at the time
- Monday, Tuesday and Wednesday highest traffic.
- Average 69% participation rate in volunteered classes.

Demographics

- Full-time students over-represented in our sample.
- Large percentage of students in lower math classes.
- Much more demographic data is given in the full report.

Full-Time Versus Part-Time	
Students Taking Assessment	
Full-Time (12 or More Credits)	80.48%
Part-Time (Fewer Than 12 Credits)	18.99%
Blank	0.53%

HWC Overall	
Full-Time (12 or More Credits)	58.6%
Part-Time (Fewer Than 12 Credits)	41.4%

Current Math Class or Math Class Eligible For	
PC Math 3001 - Math 99	49.65%
Math 118 - Math 140	30.83%
Math 141 - Math 212	12.90%
Blank	6.63%

Comfort

- Students asked to self-report comfort level in different subjects:
  - Highly Uncomfortable = 0
  - Uncomfortable = 1
  - Comfortable = 2
  - Highly Comfortable = 3

Subject Comfort	**Mean (On a scale of 0 to 3)**
Comfort with Reading	2.35
Comfort with Writing	2.14
Comfort with Arts	2.13
Comfort with Science	1.76
Comfort with Math	1.72

Appreciation of the Complexity of Mathematics

- Students gave level of agreement with a series of 20 statements on appreciation of the complexity of mathematics. Higher agreement means higher appreciation.
  - Strongly Agree = 3
  - Agree = 2
  - Disagree = 1
  - Strongly Disagree = 0
- Statement with Highest Average Agreement: "Being able to read and understand a word problem is critical to being able to solve it." (Mean 2.48)
- Statement with Lowest Average Agreement: "Mathematics has been an important tool to help me learn other subjects." (Mean 1.66)

Competence

- 8 multiple choice questions and 4 short answer questions.
- 2 Points per question for 24 possible points.
- Sample Question: “If 0.58% of all U.S. tax returns are audited, approximately how many returns are audited for each 1000 returns filed?”
  - (a) 1
  - (b) 60
  - (c) 580
  - (d) 6
- Answer: (d)

Competence

- Mean scores as percents, by topic:

Question Topic	Mean as a Percent
Graphs	92%
Graphs	87%
Graphs	83%
Linear Reasoning	44%
Area	42%
Area	39%
Linear Versus Exponential Reasoning	30%
Percentages	28%
Perimeter and Area	27%
Basic Statistics	25%
Linear Reasoning	20%
Percentages (Sample Question from Last Slide)	11%

Competence and Cohort

- Competence scores were compared by cohort:
  - Cohort 1: FS Math 3001-2, Math 98, Math 99
  - Cohort 2: Math 118, 121, 122, 125, 140
  - Cohort 3: Math 141, 144, 146, 204, 207, 208, 209, 210, 212

Cohort	Mean Score (Out of 24)
Cohort 1	10.637
Cohort 2	12.166
Cohort 3	11.223

Statistical Comparisons	P-Value <.05
Increase From Cohort 1 (10.637) to Cohort 2 (12.166)	Significant
Decrease From Cohort 2 (12.166) to Cohort 3 (11.223)	Insignificant
Increase From Cohort 1 (10.637) to Cohort 3 (11.223)	Insignificant

Competence and Repetition of a Math Class

- Competence scores were compared according to whether or not students had ever repeated a math class.

Repeated a Math Class?	Mean Score (Out of 24)
Yes	9.798
No	11.804

Statistical Comparison	P-Value <.05
Increase From Students Who Had Repeated a Math Class (9.798) to Students Who Had Not Repeated a Math Class (11.804)	Significant

Competence and Comfort

- Competence scores were compared according to self-reported level of comfort in math.

Level of Math Comfort	Mean Score (Out of 24)
0	9.623
1	10.686
2	11.313
3	12.826

Statistical Comparison	P-Value <.05
Increase From Comfort 0 (9.383) to Comfort 1 (10.629)	Significant
Increase From Comfort 1 (10.629) to Comfort 2 (11.452)	Significant
Increase From Comfort 2 (11.452) to Comfort 3 (13.229)	Significant

Competence and Appreciation of Complexity of Math

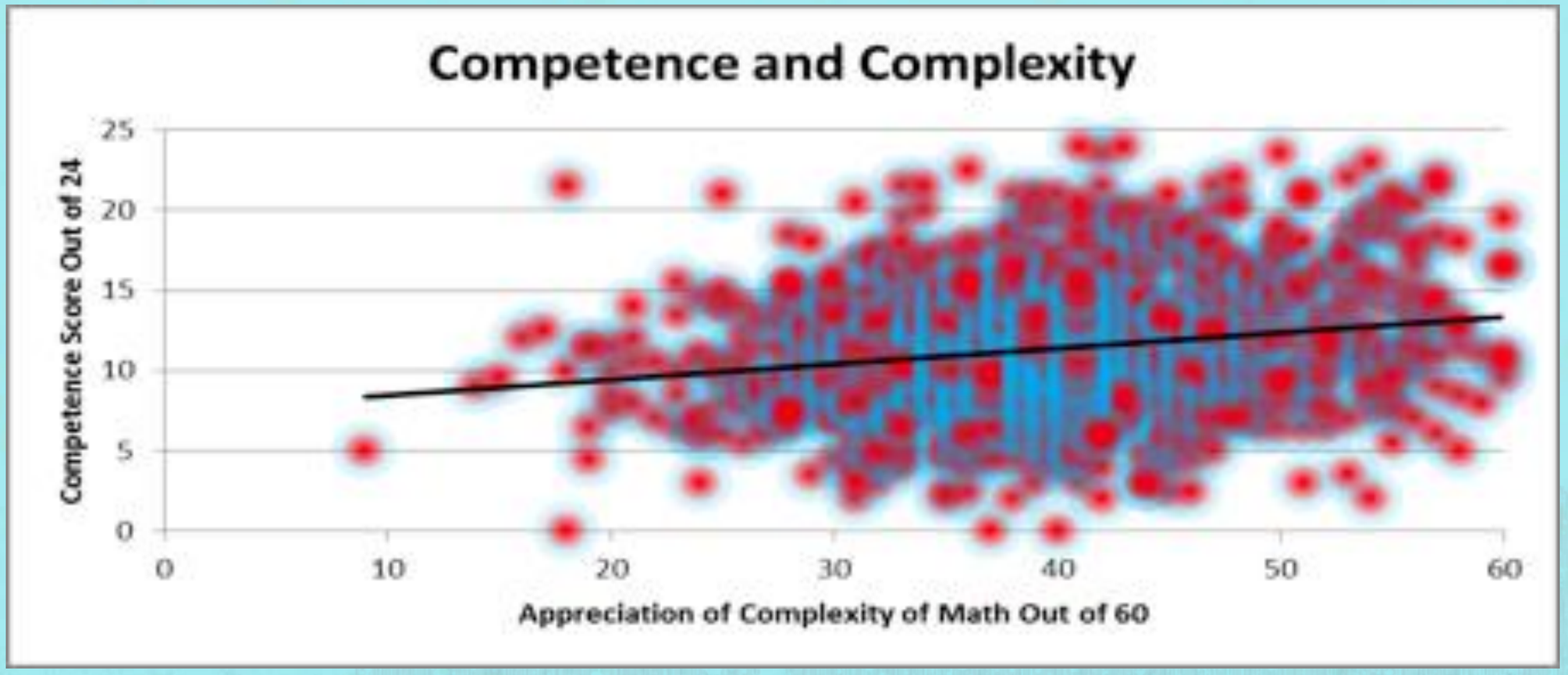
- Competence scores were compared according to level of agreement with the first appreciation statement: “Math helps me understand the world around me.”

Level of Agreement	Mean Score (Out of 24)
0	9.623
1	10.686
2	11.313
3	12.826

Statistical Comparison	P-Value <.05
Increase From Agreement of 0 (9.623) to Agreement of 1 (10.686)	Insignificant
Increase From Agreement of 0 (9.623) to Agreement of 2 (11.313)	Significant
Increase From Agreement of 0 (9.623) to Agreement of 3 (12.826)	Significant
Increase From Agreement of 1 (10.686) to Agreement of 2 (11.313)	Insignificant
Increase From Agreement of 1 (10.686) to Agreement of 3 (12.826)	Significant
Increase From Agreement of 2 (11.313) to Agreement of 3 (12.826)	Significant

Competence and Total Appreciation of Complexity of Math

- The sum of the answers to the 20 appreciation questions were taken to be a total appreciation score out of 60. These were compared to the competence scores out of 24.
- Correlation present (r=0.1958).



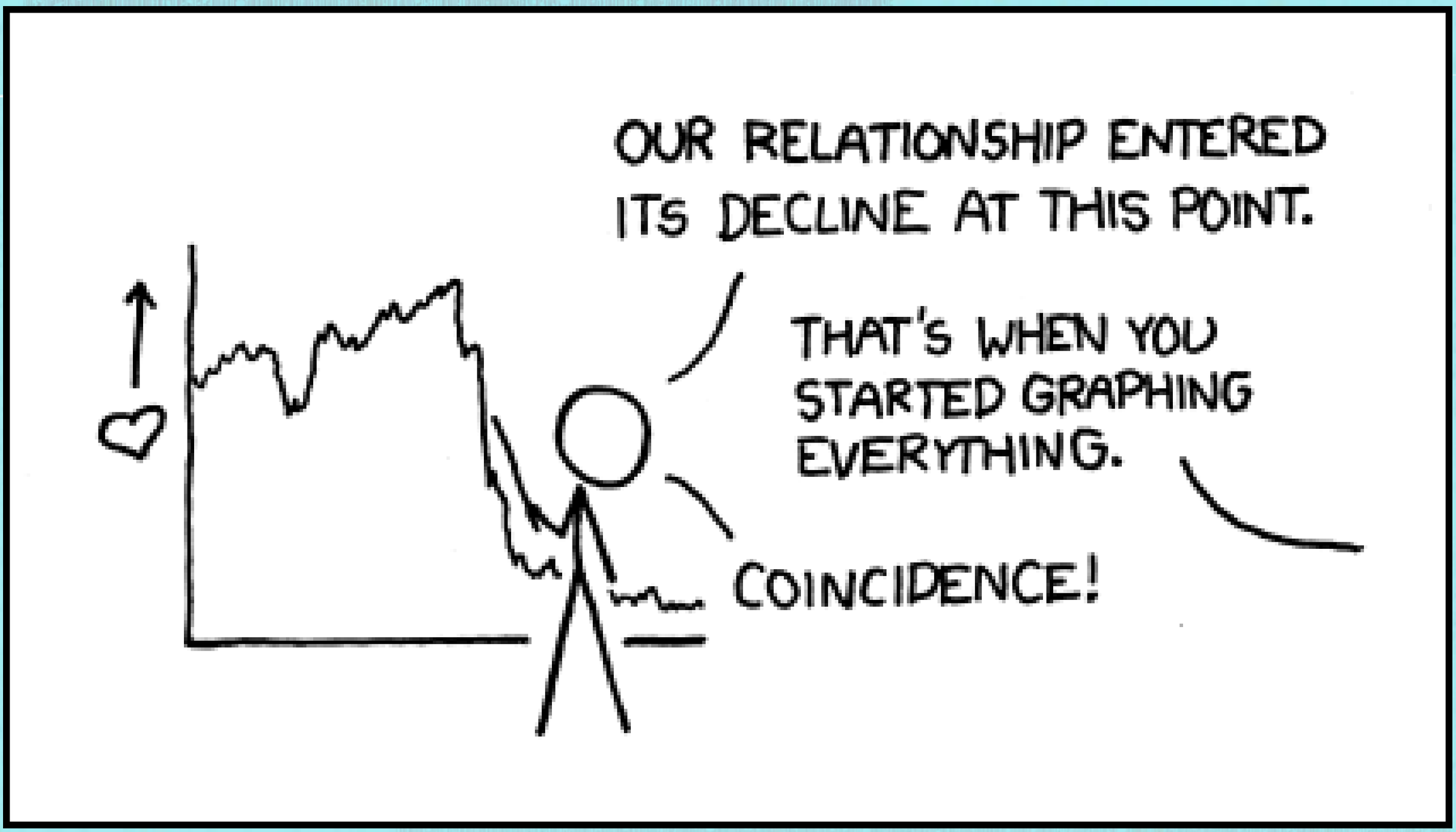
Recommendations

- Dissemination of results to math department and elsewhere.
- Improve students' perception of math.
- Basic math skills in higher math classes, without losing time.
- Math across the curriculum.
- Percents across the curriculum.

(Many more recommendations in the full report.)

Sample Percents Mini-Lesson on Payday Lending

- $300 loan, $30 interest in 1 year. Annual interest rate?
  - 10%
- $300 loan, $30 interest in 6 months. Annual interest rate?
  - 20%
- $300 loan, $30 interest in 1 month. Annual interest rate?
  - 120%
- $300 loan, $30 interest in 2 weeks. Annual interest rate?
  - 260%
- $300 loan, $60 interest in 2 weeks. Annual interest rate? (Typical payday loan.)
  - 520%



✳ (XKCD Webcomic)