Assessment of Quantitative Reasoning Across a General Education Curriculum

STEPHANIE LOPEZ CANO, NANDINI KANNAN AND ERMINE ORTA

DEPARTMENT OF MANAGEMENT SCIENCE AND STATISTICS
UNIVERSITY OF TEXAS AT SAN ANTONIO
SAN ANTONIO, TX, 78249
Public universities in Texas have a General Ed Core Curriculum that includes 42 - 48 credit hours distributed across several domains.

Texas Higher Education Coordinating Board requires 3 credit hours in the Math domain (typically a course in College Algebra).

Institutions may have additional Math/Stat course requirements.
University of Texas at San Antonio

- 2nd largest component in the UT-System, 7th in state
- 42 hours in the core: 3 in the Math domain
- Students may choose College Algebra or Basic Statistics (about 2000 vs 500 per semester)
- The Intro Statistics course level: Peck et al, Triola
Quality Enhancement Plan

- Quantitative Scholarship: From Literacy to Mastery
- Part of the Southern Association of Colleges and Schools reaccreditation process.
- Enhance the quality of undergraduate education by improving teaching and student learning of quantitative reasoning skills
- Help students to “understand and evaluate data, assess risks and benefits, and make informed decisions in all aspects of their lives”
Student Learning Outcomes

Learning to **EVALUATE**

DATA
- **Explore**
- **Assimilate**
- **Visualize**
- **Understand**
- **Analyze**

**Logic**

**Translate**

**Express**

**DECISIONS**
Assessing Quantitative Reasoning

- An instrument for assessment of quantitative reasoning skills developed
- The Quantitative Literacy Assessment Test (QLAT) will be administered at various stages during the student's program of study
- Pilot Study: QLAT administered to a sample of UTSA entering Freshmen
- QLAT used in a pre-test post-test design in two basic Stat classes
The QLAT

Questions intended to test students’ abilities in 4 areas:

1. Reading and interpreting basic graphs, charts, and tables
2. Simple probability calculations
3. Interpreting data and simple data summaries, including the mean, range, standard deviation
4. Understanding sampling and bias
Sample Questions

Probability
Sample Questions

Sampling Bias
Sample Questions

Variability
### UTSA Student Population

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hispanic</td>
<td>43%</td>
</tr>
<tr>
<td>White</td>
<td>37%</td>
</tr>
<tr>
<td>African-American</td>
<td>9%</td>
</tr>
<tr>
<td>Asian</td>
<td>6%</td>
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<tr>
<td>Other</td>
<td>4%</td>
</tr>
</tbody>
</table>

### Results for UTSA Freshmen

![Bar Chart: Percentage (N=987)]

- **Hispanic (n=394)**: Basic 26%, Intermediate 38%, Proficient 36%
- **White (n=388)**: Basic 16%, Intermediate 28%, Proficient 56%
- **African American (n=97)**: Basic 24%, Intermediate 34%, Proficient 42%
- **Other (n=108)**: Basic 10%, Intermediate 35%, Proficient 55%
QLAT Score versus SAT Math Score for UTSA Freshmen

Average Score on QLAT

<table>
<thead>
<tr>
<th>SAT Mathematics Score</th>
<th>Average Score on QLAT</th>
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</thead>
<tbody>
<tr>
<td>280-400 (n=50)</td>
<td>57.2</td>
</tr>
<tr>
<td>410-450 (n=118)</td>
<td>62.8</td>
</tr>
<tr>
<td>460-500 (n=191)</td>
<td>70.8</td>
</tr>
<tr>
<td>510-550 (n=168)</td>
<td>76.2</td>
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<tr>
<td>560-600 (n=166)</td>
<td>80.9</td>
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<tr>
<td>610-650 (n=125)</td>
<td>84.3</td>
</tr>
<tr>
<td>650-800 (n=54)</td>
<td>89.4</td>
</tr>
</tbody>
</table>
Preliminary Results

- 90% could not identify sources of bias or define the population for a study;
- 40% were unable to determine which dataset varied more.
- Approximately 26% of Hispanic and 24% of African-American students scored at or below a basic level of quantitative literacy.
In general,

- Students lack fundamental skills in reading, interpretation and critical thinking.
- A majority had difficulty extracting relevant information from word problems.
The QLAT was administered to Basic Statistics and Business Statistics classes as a pre- and post- test.

Overall results for 477 students, (percentage correct):

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std</th>
<th>Min</th>
<th>Max</th>
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<tbody>
<tr>
<td></td>
<td>76.5</td>
<td>14.84</td>
<td>20</td>
<td>100</td>
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<td></td>
<td>78.6</td>
<td>15.02</td>
<td>23</td>
<td>100</td>
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</table>
Pre-Test Post-Test Results

- Instrument split into two parts A and B
  - Part A included
    - Graphs, Charts
    - Probability
  - Part B included
    - Sampling, Bias
    - Numerical Summaries
- Post-test included Forms A and B: administered in the final week of the semester
Pre-Test Post-Test Results

- Improvement observed across the sections on certain types of problems

- Students struggle with problems that require critical thinking and translation
What’s Next?

- Instrument Validation

Current data:
- New Freshman data
- Spring Pre-Post data (in Stat classes)
- Longitudinal Assessment
Thank You...

- For more info contact: Stephanie.Cano@utsa.edu

- For info about the UTSA QEP:
  - [www.utsa.edu/qep/](http://www.utsa.edu/qep/)
  - Contact: Nandini.Kannan@utsa.edu