Addressing & Assessing Empirical & Quantitative Skills

Beginning in Fall, 2014 required in 3 components:

Mathematics
Life & Physical Sciences
Social & Behavioral Sciences
I didn't have any accurate numbers so I just made up this one.

Studies have shown that accurate numbers aren't any more useful than the ones you make up.

How many studies showed that?

Eighty-seven.
Overview

- **THECB Definition of Empirical & Quantitative Skills (EQS)**
- **A few FAQs**
  - By including EQS, is the course automatically considered a Q-course?
  - What is a Q-course?
  - What benefit to students is a Q-course?
- **Addressing EQS**
- **Assessing EQS**
  - Examples of Embedded Exam Questions
  - Using Rubrics
THECB Definition of Empirical & Quantitative Skills (EQS)

“[The] manipulation & analysis of numerical data or observable facts resulting in informed conclusions.”
A few FAQs

By including EQS, is the course automatically considered a Q-course?

Yes, courses included in one of the three core curriculum components requiring EQS are automatically considered Q-courses and are assigned a “Q” attribute in Banner.

If the course is in another core component or if it is not a part of the Core Curriculum, contact Dr. Nancy Martin, Associate Vice Provost-Core Curriculum & QEP for information regarding how to become a Q-course.

Email: Nancy.Martin@utsa.edu
What is a Q-course?

A course that seamlessly integrates quantitative reasoning & communication skills with a focus on contextual learning

What benefit to students is a Q-course?

In addition to enhancing students’ quantitative literacy skills, Q-courses are identified on the transcript as one that “focuses on quantitative reasoning.”

Students in the 2012-14, 2014-15 and 2015-16 catalogs must have earned credit for at last one Q-course in order to graduate.
Addressing EQS

To prepare students for assessment, plan in-class activities & assignments that require the use of numerical data &/or observable facts.
Assessing EQS

- Most likely be assessed via embedded exam questions

- However, EQS may be assessed using a rubric in some circumstances.
  
  Example: Students use data as part of a larger class project or paper.
What is the best estimate of the correlation depicted in the scatterplot above?

a. +.03
b. -.03
c. +.80
d. -.80
Create a scatterplot using the data below.

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

* Note that this exam question addresses both EQS and Visual Communication.
Using Rubrics

Give an assignment requiring students to use data.

Example: Using a data set provided by the instructor, students will calculate the incidence and prevalence of a communicable disease (e.g.: STIs, HIV, chicken pox) over a 10-year period. Based on their calculations, students will assess potential patterns and implications for social behavior.

Use a rubric to evaluate assignment demonstrating EQS.

LEAP VALUE Rubrics provide a good starting point for assessment. (See sample on next slide.) VALUE Rubrics are available in Word in the Resources section of this website.
# Quantitative Literacy VALUE Rubric

**Definition**
Quantitative Literacy (QL) - also known as Numeracy or Quantitative Reasoning (QR) - is a "habit of mind," competency, and comfort in working with numerical data. Individuals with strong QL skills possess the ability to reason and solve quantitative problems from a wide array of authentic contexts and everyday life situations. They understand and can create sophisticated arguments supported by quantitative evidence and they can clearly communicate those arguments in a variety of formats (using words, tables, graphs, mathematical equations, etc., as appropriate).

Evaluators are encouraged to assign a zero to any work sample or collection of work that does not meet benchmark (cell A) level performance.

<table>
<thead>
<tr>
<th>Interpretation</th>
<th>Capstone 4</th>
<th>Milestone 3</th>
<th>Milestone 2</th>
<th>Milestone 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to explain information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words)</td>
<td>Provides accurate explanations of information presented in mathematical forms. Makes appropriate inference based on that information. For example, accurately explains the trend shown in a graph and makes reasonable predictions regarding what the data suggest about future events.</td>
<td>Provides accurate explanations of information presented in mathematical forms. For instance, accurately explains the trend data shown in a graph.</td>
<td>Provides somewhat accurate explanations of information presented in mathematical forms, but occasionally makes minor errors related to computations or units. For instance, accurately explains trend data shown in a graph, but may mislabel the slope of the trend line.</td>
<td>Attempts to explain information presented in mathematical forms, but draws incorrect conclusions about what the information means. For example, attempts to explain the trend data shown in a graph, but will frequently misinterpret the nature of that trend, perhaps by confusing positive and negative trends.</td>
</tr>
</tbody>
</table>

| Representation | Skillfully converts relevant information into an insightful mathematical portrayal in a way that contributes to a further or deeper understanding of the data. | Competently converts relevant information into an appropriate and desired mathematical portrayal. | Completes conversion of information but resulting mathematical portrayal is only partially appropriate or accurate. | Completes conversion of information but resulting mathematical portrayal is inappropriate or inaccurate. |

| Calculation | Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem. Calculations are also presented elegantly (clearly, concisely, etc.). | Calculations attempted are essentially all successful and sufficiently comprehensive to solve the problem. | Calculations attempted are either unsuccessful or represent only a portion of the calculations required to comprehensively solve the problem. | Calculations are attempted but are both unsuccessful and are not comprehensive. |

| Application / Analysis | Uses the quantitative analysis of data as the basis for deep and thoughtful judgments, drawing insightful, carefully qualified conclusions from the work. | Uses the quantitative analysis of data as the basis for competent judgments, drawing reasonable and appropriately qualified conclusions from this work. | Uses the quantitative analysis of data as the basis for workmanlike (without inspiration or nuance; ordinary judgments, drawing plausible conclusions from this work. | Uses the quantitative analysis of data as the basis for workmanlike (without inspiration or nuance; ordinary judgments, drawing plausible conclusions from this work. |

| Assumptions | Explicitly describes assumptions and provides compelling rationale for why each assumption is appropriate. Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions. | Explicitly describes assumptions and provides compelling rationale for why assumptions are appropriate. | Explicitly describes assumptions. | Attempts to describe assumptions. |

| Communication | Uses quantitative information in connection with the argument or purpose of the work, present it in an effective format, and explicate it with consistently high-quality. | Uses quantitative information in connection with the argument or purpose of the work, though data may be presented in a less than completely effective format or some parts of the explication may be uneven. | Uses quantitative information, but does not effectively connect it to the argument or purpose of the work. | Presents an argument for which quantitative evidence is pertinent, but does not provide adequate explicit numerical support. (May use quasi-quantitative words such as "many" or "for," "increasing," "small," and the like in place of actual quantities.) |
See *Resources* section for additional guidance.