Challenges of Quantitative Reasoning Assessment

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After almost 20 years, I can tell you:

- Teaching faculty must be involved
- One size does not fit all
- We need to be intentional
- There is no easy way to do this

If we want to assess Quantitative Reasoning……

We're going to have to use some

Think about Desired Test Use

- One test cannot fulfill all needs
- Accountability vs. Program Improvement

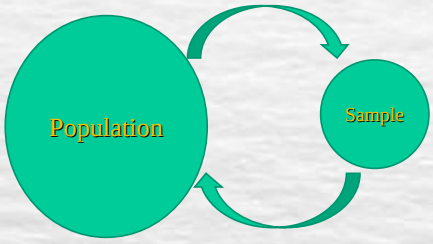
Our philosophy:

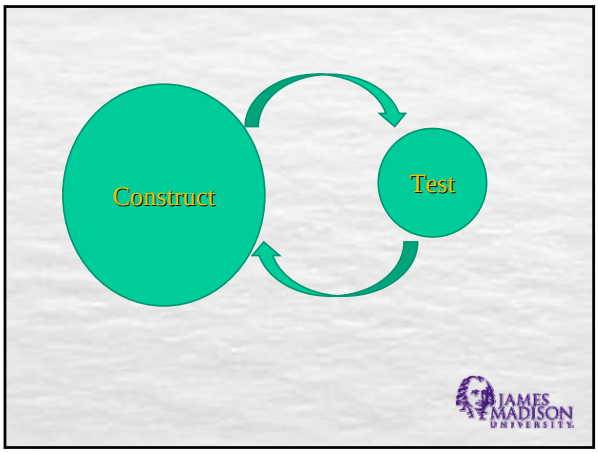
"If we conduct quality assessment, accountability will take care of itself."

- So far, this has been true with SACS, AACSB, ABET, NCATE, SCHEV, and many others.

It's all about inferences……

- What population?
  - Who should we sample?
  - How should we sample?
- What is the construct?
  - What are the learning objectives?
- Are the students motivated to perform well?





A Thought Experiment:

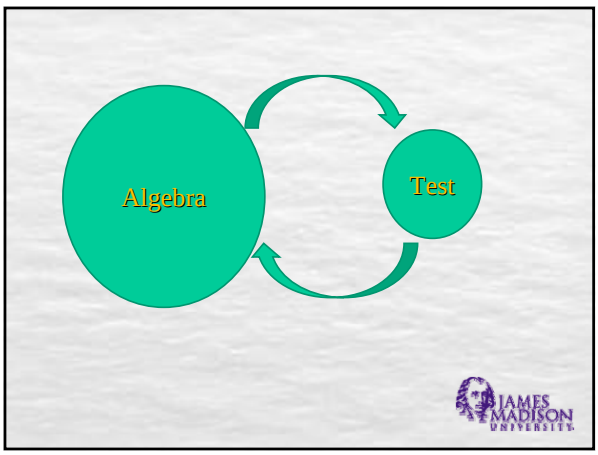
- Create a group of 3 people that you DO NOT KNOW
- Begin a discussion of Quantitative Reasoning (QR) to answer the following questions:
  - What population do you want to make inferences about?
  - How do you conceptualize QR for this group?

What Did We Learn?

- Populations can be defined at many levels:
  - Classroom of students
  - Students in a given major
  - A university general education program
  - High school students across the nation
  - Adult learners
- Each level involves very different inferences
- Each requires different sampling

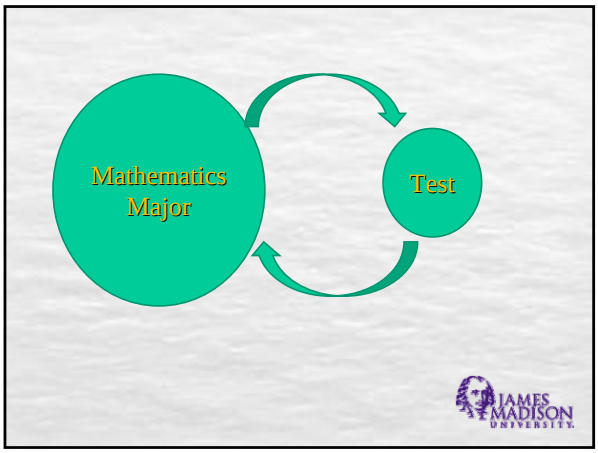
How Does the Construct Change?

- We may be interested in Quantitative Reasoning at all levels, but the construct will change
- Classroom Inferences
  - Relate to focused learning objectives
  - Very useful for informing instruction and learning
  - Generally, easier to write items



Inferences About Majors

- Learning objectives become more global
- It becomes harder to explicate and agree on the desired outcomes
- Creating assessment methods requires more cooperation and real involvement
- This work takes time and commitment

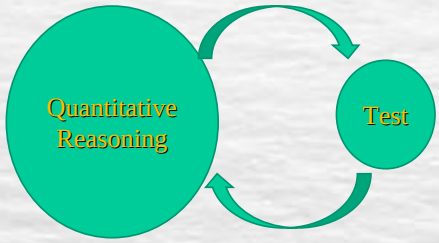


Inferences About General Education

- It can take years to define meaningful learning objectives
  - Most institutions have not really completed this step successfully
  - Very difficult to write good items
    - Items cannot privilege one course over another
    - Takes you back to the construct again and again and again….

Inferences about General Education: Quantitative Reasoning

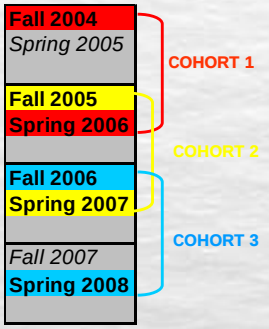
- General Education Program Inferences
  - Learning objectives will become more global
  - This is the essence of general education
  - Gaining faculty involvement requires an infrastructure and support
  - Generally, much more difficult to write good items
  - Faculty write better items outside their area of expertise



Assessment Days at JMU

- Twice a Year
  - Fall Assessment Day: All entering 1st year students in August
  - Spring Assessment Day: All students with 45-70 credit hours
- Use of student ID numbers for assignments
- Spring Assessment Day: Classes are canceled
  - No time or room conflicts!
  - This day is also used for assessment in the major
- We hire and train community and student proctors
- Result: Excellent data collection!!

Data Collection Scheme: *Repeated Measures*



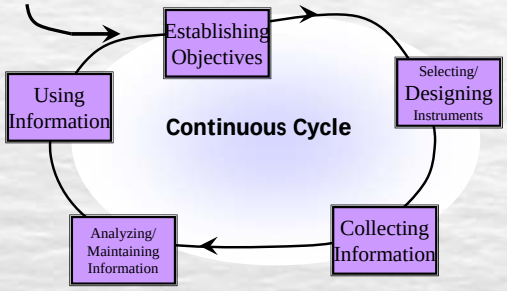
Students in each cohort are tested twice on the same instrument – once as incoming freshmen and again in the second semester of the sophomore year.

Stages of the Assessment Process

1. Establishing objectives
2. Selecting or designing methods
3. Collecting credible information
4. Analyzing and maintaining information
5. Using information for teaching and learning improvement

*Regardless of the level of assessment required, whether it be a single learning objective, a course, a curriculum, or an entire program, the process is the same.

Stages of the Assessment Process



Stage 1: Establishing Program Objectives

- This is the hardest step!
- In order to create a successful assessment program, clear program goals and objectives must be established and agreed upon.
- Objectives drive the assessment process; assessment methods are based on the objectives that are being measured.
- Student learning objectives form the assessment engine!

Stage 2: Selecting or Designing Instruments

- Clear learning objectives will determine what assessment method is best. An appropriate instrument must be used to conduct meaningful assessment
  - Pre-existing instruments can be found at other universities or from other sources
  - If existing instruments do not closely match the objectives being assessed, an instrument can be created
- Define expected outcomes for every instrument

Stage 3: Not Just Any Data Will Do…

- If we want faculty and the public to pay attention to the results, we need credible evidence
- To obtain credible evidence:
  - We need all students to participate
  - We need good instrumentation
    - Representative sample from content domain
    - Reliability and validity
  - We also need students who are motivated to perform

Stage 4: Different Analytic Methods

- ***Group Differences:*** Do we see expected differences in performances by different student groups?
- ***Relationships:*** Do we see relationships between performances and grades in relevant courses?
- ***Growth:*** Do student performances change over time?
- ***Competency:*** Do students meet faculty performance expectations?

Stage 5: Using Information for Program Improvement

- This is where the infrastructure must come into play
  - Committees that work, not just meet
  - This SHOULD be intellectually stimulating!
- Involves feedback from faculty members and careful consideration of the assessment results

  I meet with QR/SR faculty every 2 weeks!!
- Examples of using information for program improvement: curricular change, resource allocation or reallocation, changes in instructional delivery and emphasis; course resequencing

What Have We Learned?

Here's a Sampler:

- It's very difficult to create a good test
- We are on our 9th version; it does get better
- Our faculty wrote this test; they like it
- The test isn't about QR use in physics and chemistry; it assesses process and thinking
- Our students like the test; they feel like they have a chance to perform well
- They like tables, charts, pictures and graphs
- We think it's about General Education

What Have We Learned?

Here are a few more findings:

- Entering 1st year students are not a pre-test
- Students do change significantly with more related course work
- Correlations between QR scores and Grades in QR courses are positive
- Students completing their QR course work don't perform to the level our faculty would like
- AP and JMU grades are good predictors of QR
- Transfer credit hours are not

What Have We Learned?

Here are a few more findings:

- Our test items map to the objectives of other institutions:
  - Truman State University: 100%
  - Michigan State University: 98%
  - Virginia State University: 97%
  - St. Mary's University (TX) 92%
  - Virginia Tech 84%
  - Virginia CC System 78%

Our NSF grant helped us to advance assessment of QR and SR nationally

Let's Open The Session for Questions

- You may have advice for the group
- If you want more information; go to

  www.jmu.edu.assessment/

Look under assessment resources

Contact me (Donna Sundre) at:
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