Quantitative Literacy: It Starts with Faculty Development

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NNN Fall 2012 Conference
National QL Faculty Development Effort

- NSF TUES dissemination grant
  - Build on previous and current efforts to improve education in SS by infusing teaching and curriculum with QL
  - Design and conduct faculty development focused on use of QL in teaching lower division courses using online resources
  - Assess outcomes and impact on student learning based on use of online resources
  - Determine how to effectively disseminate innovative, online QL resources
Project Components

- Faculty Development (FD) for social science instructors using QL modules
- Survey of instructors on use of social science digital resources
- Dissemination webinars re: QL modules
- Update existing and introduce new analytic datasets using American Community Survey data (previously decennial census)
- Closely linked to TeachingWithData.org development and design
SSDAN: DataCounts!

Welcome to DataCounts!

DataCounts! is an interactive website designed to help integrate social statistics into the classroom setting. We have several collections of data, including American Data from 2004-2006, the 1980 and 1990 social trend data from 1950-2000, the Census, and the Current Population Section contains a wide variety of data that can be viewed online with WebCASS. It houses a collection of teaching tools that have been created by teachers across the social science data into their classes.

Please click the "How-To" button in the navigation bar for help using the site and software.

Latest News

DataCounts! has undergone a major reorganization. Browse through the website to see:
- Fresh new site design
- Newly up-to-date teaching materials
- Redesigned modules page
- Module Assessment page coming soon...

Quickly connects users to datasets or data driven learning modules

http://ssdan.net/datacounts/index.html
# SSDAN: DataCounts!

## Module Components

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### Context for Use

This lab activity helps students understand the types of teaching situations for which this activity is appropriate. Students must be at the appropriate educational level, class size, institution type, etc. Is it lab, lecture, or field exercise, or a longer project? How much time is needed for the activity? Is there special equipment that is necessary? Are there skills or concepts that students should have already mastered before beginning this activity? How is this activity situated in the course? Have easy (or hard) would it be to adapt the activity for use in...?
Outcomes of Faculty Development

- Rubric for assessing QL student learning outcomes in sociology
- Two cohorts (A & B) of faculty members from 4-year institutions and community colleges
- Revised course assignments & classes with QL learning outcomes integrated
- QL assessment plans and tools based on rubric developed & tested
## Assignment Level QL Rubric

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Unacceptable</th>
<th>Acceptable</th>
<th>Accomplished</th>
<th>Exemplary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculation: Ability to perform</td>
<td>Performs few/less than half of calculations correctly.</td>
<td>Successfully performs many calculations but patterns of errors are evident.</td>
<td>Successfully performs most calculations, errors are rare.</td>
<td>Consistently performs all calculations successfully.</td>
</tr>
<tr>
<td>Calculation: Accuracy</td>
<td>Incorrectly explains information in key forms of presentation or with many errors across types of data.</td>
<td>Correctly explains information in some forms correctly (but not others) or makes several errors across various data forms.</td>
<td>Correctly explains information in most forms consistently or makes few errors across various data forms.</td>
<td>Correctly explains information presented in a variety of forms consistently.</td>
</tr>
<tr>
<td>Interpretation: Ability to explain</td>
<td>Unable to convert data from one mathematical form into any other form or makes significant errors when doing so.</td>
<td>Able to convert data from some mathematical forms into some, but not all, other forms or converts among all forms with several errors.</td>
<td>Able to convert data from most mathematical forms into other forms, or converts among all forms with a few errors.</td>
<td>Able to convert data from any mathematical form to any other form with no errors.</td>
</tr>
<tr>
<td>Representation: Ability to convert</td>
<td>Rarely or never makes correct judgments based on data presented.</td>
<td>Generally makes correct judgments based on data presented.</td>
<td>Often makes correct judgments based on data presented.</td>
<td>Reliably makes correct judgments based on data presented.</td>
</tr>
<tr>
<td>Analysis: Ability to make decisions</td>
<td>Consistently unsure of the correct mathematical operations (e.g., does not correctly measure of central tendency or bivariate tests appropriate to the level of measurement) to answer research questions.</td>
<td>Accurately chooses the correct mathematical operations and answers research questions of some the time.</td>
<td>Accurately chooses the correct mathematical operations and answers research questions most of the time.</td>
<td>Accurately chooses the correct mathematical operation to answer research questions each time.</td>
</tr>
<tr>
<td>Method selection: Ability to choose</td>
<td>Unable to assess the limitations of a method or type of analysis. Chooses a method that is inappropriate or misinterprets the unknown quantities.</td>
<td>Able to assess the limitations of some methods under most circumstances and typically predicts reasonable quantities in many cases.</td>
<td>Able to assess the limitations of most methods under most circumstances and typically predicts reasonable quantities based on relevant data.</td>
<td>Able to assess the limitation of virtually all methods and under all circumstances and reliably provides reasonable estimates based on relevant data.</td>
</tr>
<tr>
<td>Method selection: Logical support</td>
<td>Does not develop an argument or bases it on weak or incorrect quantitative information. Presents the information without taking the audience into account.</td>
<td>Develops an argument using quantitative information that is incomplete, irrelevant, or somewhat misinterpreted, therefore weakening the argument. The argument may not have the audience into account.</td>
<td>Develops an argument using quantitative information that is either slightly incomplete, not the most relevant, or with slight misinterpretations, or presents the argument in a way that does not fit the intended audience.</td>
<td>Develops an argument using quantitative information that is suitable for the intended audience.</td>
</tr>
</tbody>
</table>

- Calculation
- Interpretation
- Representation
- Analysis
- Method Selection
- Estimation/Reasonableness Checks
- Communication
- Find – Identify - Generate Data
- Research design
- Confidence
- Content Learning Outcomes
What We Learned: Cohort A Faculty Development

• Participants selected based on past support for QL
  • Instructors did not include specific QL learning outcomes in course design, activities or assessment

• After faculty development, participants
  • Successfully applied rubrics in re-design of courses and modules
  • Learned new assessment methods and its use in curriculum re-design efforts

• Challenges
  • Student resistance to new teaching methods
  • Technology confounded measuring learning
What We Learned: Cohort A - Student Learning

• Students showed improved learning
  • Improvement related to specific tasks, e.g., a specific type of table or graph
  • Inconclusive about student ability to apply skills in new situations

• All instructors reported gains in student self-confidence in QL

“I worked a lot in this class, and was always taken to the brink of overwhelmed but not crossing over....The data analysis we did was a particular challenge. I came away from the exercise knowing I learned something completely out of my comfort zone.” (CC student)
Faculty Development Program (Cohort B)

• Re-implement FD program with broader group of instructors
  • Cohort A participants recruited partners (Cohort B) from own school or different schools to adopt & test modules
    • Cohort A mentored Cohort B to
      • Revise curriculum to include online modules
      • Teach with modules
      • Assess results
  • Based on mentor part of the program, design & implement online Faculty Development program
What We Learned: FD Program - Cohort B

• Adoption challenges are formidable; peer pressure not enough to make change
  • Only 2 new instructors participated
  • Without mentors new instructors may not have overcome barriers to implementation
• Rubric was useful for grading multiple choice tests & writing assignments
• Size of class hindered use of writing-intensive assessment methods (time to score, lack of scorers)
• Rigid curriculum approval requirements made experimentation almost impossible
• Similar changes in student learning and confidence observed
• Involvement at national level energized Cohort A who became engaged ambassadors for QL – but not in the way we intended
Lessons Learned - Project

• Use of (QL) student learning objectives in sociology is nascent
  • No agreed-upon definition of QL among practitioners
• Implementing innovations with assessment can be ‘too much’
  • Assessment activities may confound adopting an innovation (even when instructors say they support adopting an innovation)
  • BUT, Linking assessment to innovation can uncover resistance to adoption of the innovation
• Use of rubrics is a significant hurdle for instructors new to writing intensive assignments
Lessons Learned (continued)

• Online learning modules need to be designed from the beginning to include QL learning outcomes, especially for assessment purposes

• Types of campuses/students make a difference
  • Community college instructors often can only implement changes if approved by curriculum committee

• Unreasonable to expect untenured instructors to participate fully
  • Learning to use a module and redesign a course to address learning outcomes took significant time; assessment activities added to time burden.

• Mentoring is new to teaching culture in sociology
Recommendations for Faculty Development

- Focus training on (re) designing modules specifically created to promote QL and linked to rubric
- Link Bloom’s taxonomy to rubric to strengthen assessment
- Scaffold training to better link curriculum change to support QL, assessment, and technology
- Group instructors by course – social sciences especially difficult because courses often aren’t sequenced – no single set of outcomes that can be expected from any one course or level
Survey Results (2010)

• 1,037 instructors responded (22% economics; 26% political science; 26% sociology)

• QL skills important for non-methods/stat courses:
  • Explaining information presented in a mathematical form
  • Making judgments based on quantitative analysis
  • Identifying or generating appropriate information to answer a research question
  • Understanding the links between theory and data

• Most significant differences found among community college or economics faculty
  • Follow on interviews confirmed differences in how they perceive teaching, role of QL in courses.

• 65% of faculty use digital resources by others with little or no modification at least somewhat frequently
Final Observations - Questions

- How do we overcome systemic obstacles to change?
  - Class size
  - Rigid curriculum requirements
  - Competing priorities of academic role

- How do we encourage instructors to appreciate need to integrate QL into learning activities?
  - Include QL in student learning objectives, class activities
  - Get over ‘not my job’

- How do we overcome barriers adoption of innovations?
  - Technology (lack of access, knowledge about resources)
  - Assessment (over reliance on multiple choice to measure learning)