

Quantitative reasoning throughout the curriculum: A case study from the College of Public and Community Service

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Introduction: An oppositional institution

When we began the process of curriculum revision three years ago, we had a spirited debate about whether to include words such as ‘anti-racist’ and ‘anti-sexist,’ explicitly in our mission statement. Those of us who were arguing for their inclusion lost, mainly because of external political realities. Instead, our mission statement includes phrases supporting “educating students to foster the public good and aid the transformation to a more equitable society” and promoting our college’s endeavors “to function as an inclusive, democratic, and participatory learning community which promotes diversity, equality, and social justice.” One of the descriptions of a successful graduate is a life-long learner who demonstrates “the critical consciousness needed to clarify and challenge prevailing values, ideologies, and practices.”

Clearly, in the USA context, we are what I call an ‘oppositional’ institution politically. What our curriculum revision makes clear is that we are also an oppositional institution educationally. We believe that one of the underpinnings to creating a curriculum to fit our oppositional mission is to integrate the teaching of skills and concepts and contents. To achieve this, we have created interdisciplinary competencies across levels of intellectual development. What follows is an annotated collection of documents that illustrate the ways in which we are integrating quantitative reasoning throughout our curriculum, and which show the various ways in which all students and faculty are involved in learning, teaching and evaluating quantitative reasoning about public and community service issues. The annotations also raise problems that we are trying to solve through the new curriculum and new concerns raised by the new curriculum.

The mission of the College of Public And Community Service (CPCS)

The complete text of the Mission Statement is the first document. Our students at the College of Public & Community Service (University of Massachusetts at Boston) are mainly working class, urban adults aged thirty to fifty and older who have not been ‘tracked’ for college; many of them were labeled failures in secondary school. Most have internalized negative self-images about their knowledge and ability in ‘academic’ disciplines. Approximately 60 percent are women; 30 percent, people of color. Most work (or are looking for work) full-time, have families, and attend school full-time. Most work in public and community service jobs; many have been involved in organizing for social change. Students can work toward their degree using prior learning from work

or community organizing, new learning in classes, or new learning from community service.

Many of our faculty and administrators are activists as well as intellectuals; approximately 50 percent are women, 30 percent people of color. Teachers have less institutional power over students than in most universities because we don't give grades, and students can choose another faculty member to evaluate their work if they are dissatisfied with the first evaluation. We cannot require attendance or any other work that is not clearly discussed in the competency statement, which details the criteria and standards for demonstrating knowledge of the topic that students are studying.

The CPCS learning plan: An overview of the entire CPCS curriculum

The next document is a draft of our Learning Plan—the names and levels of the core knowledge and skills competencies are included, as well as the structure of the entire curriculum. Our curriculum is focused on public and community service ‘majors’—so students graduate with concentrations in areas like Community Planning (which might include work as a tenant organizer), Legal Education (which might include work as a human services advocate), Labor Studies (which might include work as a union negotiator), Human Services (which might include work as a teacher), and Community Media (which might include work on community cable TV or setting up websites for community organizations). If a student wants to study a more traditional academic discipline, such as History or Mathematics, they attend the University of Massachusetts College of Arts and Sciences.

The mission for quantitative reasoning throughout the CPCS curriculum

There are many reasons driving the decision to expand the quantitative reasoning aspects in our new curriculum. First, because of the specialized nature of our curriculum, mathematics education at CPCS is focused on using math to understand and act to increase justice in public and community service. We believe people need a critical mathematical literacy in order to both “read the world” and “re-write the world.”

In addition, internally, we felt that too many of our students were stopping their education—not graduating—because they ‘got stuck’ at our math requirement. We knew they all understood some math from functioning as adults in the work-world of the USA. Further, we knew they could connect this prior math knowledge with the ‘academic’ math they needed to complete their course of study. But, for many, one or two learning activities focused on math was not enough time to do this, especially after a lifetime of avoiding any math that was not absolutely necessary. Even many students who demonstrated the two math competencies that were required for graduation, did not retain and/or use that knowledge in their other academic, or citizen, lives. In order to address these concerns we decided to include criteria in many of the new competencies

that connected to quantitative reasoning and to also have a thread of competencies that intensively addressed quantitative reasoning.

Finally, there continue to be external pressures from government officials and business officials, governed by the general right-wing ideologies that inform ‘taken-for-granted’ knowledge in the USA. One of these pressures is to narrow accessibility to the public universities. So, people who don’t score well on (de-contextualized) math tests are denied admission. We reasoned that if the quantitative reasoning we wanted our students to understand occurred throughout our curriculum, those external forces could not figure out who and what to exclude.

The quantitative reasoning competency statements

The third and fourth documents are the main quantitatively focused required competencies in our curriculum—Understanding Arguments at Level 1, and Quantitative Reasoning at Level 2. We are also developing an optional Statistical Reasoning competency for Level 3. Although Understanding Arguments has only one criteria that directly mentions numerical data, we are attempting to get all the instructional activities and evaluation demonstrations of that competency to include a preponderance of arguments whose reasoning is supported by numerical data. The Quantitative Reasoning competency details how we are defining that area of knowledge in our context.

Many of the other CPCS competencies include connections to quantitative reasoning. For example, the Media Literacy competency includes standards that require students to address “how verbal and non-verbal messages are used not just to convey information, but also to construct emotions, values, and ideologies...[which] might include...choice of words, graphics and numerical measures (graphs, charts, statistics), writing style, manipulation of data/information, tone, volume, image and sound quality, grain of the voice, camera angle, lighting, editing, pacing, tempo, phrasing, contextualization, etc.... Examination of data...should address...What data (including qualitative and quantitative) are presented? Is it useful? relevant?”

Moreover, instructional activities addressing any competencies can focus intensively on quantitative areas. For example, the Critical Inquiry competency—“Can plan and carry out a focused inquiry, including selecting a topic, posing questions for exploration, critically reading different texts, and using the information to gain new understanding and knowledge on a topic or issue”—can involve finding statistical information to answer the questions students pose, or can be demonstrated through inquiry about areas such as mathematics ‘anxiety,’ that prepare students to understand and change their ‘math avoidance.’

Other competencies, such as Exploring Community and Economic Distribution focus largely on quantitative reasoning in all instructional and demonstration formats.

Student involvement in assessment of quantitative reasoning

We are currently debating the balance between student self-assessment and faculty advising concerning registration for instructional activities. The fifth document is my argument for the purposes of self-assessment. It includes an outline of a self-assessment workshop for students to begin that process with faculty guidance, and a Self-Assessment for students to evaluate their understandings of “Understanding Quantitative Arguments.”

Faculty involvement in teaching quantitative reasoning

One of the most challenging aspects of institutionalizing our new interdisciplinary curriculum has been involving faculty from across the disciplines. The sixth document represents my first attempts to delineate what we realistically expect faculty to contribute to a ‘quantitative reasoning throughout the curriculum’ program when they are not experienced mathematics teachers. It also contrasts the expectations of the two kinds of involvement—teaching a QR-Connected course compared to teaching a QR-Intensive course.

Administrative structures to attend to quantitative reasoning

Because our new curriculum is so interdisciplinary, including integrating quantitative and communications skills and concepts, it no longer makes sense for us to organize ourselves along traditional academic disciplinary lines. We are in the process of trying various arrangements of faculty groupings to decide what structure we will use. This year each of us will belong to/meet with (at least) three different kinds of groupings—Clusters organized around career major concentrations such as Community, and Justice; Affinity Groups organized around the developmental levels in the curriculum; and, Competency Teams organized around competency threads such as Understanding Arguments and Quantitative Reasoning. We also continue to elect representatives to college and university faculty governance committees. And, of course, we have extensive office hours/meetings with individual and small groups of students.

Conclusion: The tensions between theory and practice

We started our first cohort of students in this new curriculum in Fall 2000, and are phasing in all levels and new career cores over the next few years.

Jose Segarra is evaluating aspects of the quantitative reasoning curriculum from the students’ perspective; various committees have been informally evaluating the outcomes as well as the processes throughout the entire curriculum. This year we hope to have the resources to design a more formal process for evaluating our entire curriculum revision.

As the glimpse of our new curriculum and organizational/meeting structure suggests, one of our tensions is the amount of time we need to put our ideas into practice. We have created a very labor-intensive curriculum. We think our ideas

are right for our mission and our context. But, we feel over-extended and speeded-up. That has been a major impediment to involving many faculty in focusing on QR in their courses. We are now in the process of identifying all the issues and continuing to create new solutions.