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Parts of the Whole: Institutional Research, Service-Learning, and NNN

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Parts of the Whole: Institutional Research, Service-Learning, and NNN

Abstract

This essay outlines how faculty interested in service learning could be helpful to an organization such as the National Numeracy Network by conducting institutional research. As a preliminary example, students in a statistics class used online research to determine the percent of colleges and universities with a quantitative reasoning center or with quantitative reasoning courses within mathematics departments. The students found that 46% of two-year colleges and 37% of four-year colleges offer a quantitative reasoning course through the mathematics department, usually for credit but not always in response to an institutional requirement. Only 19% of two-year colleges and 25% of four-year colleges have a center dedicated to quantitative literacy. The column concludes with suggestions for how to formalize service learning that assists the National Numeracy Network, or similar organizations, with basic research needs.

Keywords

Service-learning, student research, quantitative reasoning, numeracy

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Cover Page Footnote

Dorothy Wallace received her B.S. in mathematics at Yale University and her Ph.D. at the University of California at San Diego, and is currently professor of mathematics at Dartmouth. She has broad background in many kinds of mathematics, with approximately 100 publications in pure, applied, and educational topics.

From 1995 to 2000, DW led the seminal Mathematics Across the Curriculum project funded by the National Science Foundation. She was 2000 New Hampshire CASE Professor of the Year and won the Dartmouth Graduate Faculty Mentoring Award in 2005. In the last 9 years, she has supervised 45 undergraduates conducting research through internships, independent study, and senior theses. Her research papers in mathematical biology include 29 undergraduates among her coauthors. She was a charter board member of the National Numeracy Network and is a founding co-editor of this journal.

Parts of the Whole

A Column by D. Wallace

The problem of how best to improve the numeracy of a society is a thorny one, embracing the learning process of a single student but rising in scale to include the management and alteration of an entire system of education. With the issue of quantitative literacy always in mind, this column will consider various aspects of the systemic workings of education: the forces acting on classrooms, teachers, and students and mechanisms of both stasis and change. With the issues of volume 9, the column has grown to include thoughts on pedagogy from developing and teaching various courses, in addition to continuing to explore strategies for systemic change in quantitative education.

Institutional Research, Service-Learning, and NNN

The world is full of work that needs to be done. Our schools are full of people who sometimes wonder what use is their education. The apparent lack of connection between classroom education and work of social value is filled by a particular pedagogy referred to as “service-learning.” Intended to foster critical thinking through community service, service-learning asks students to use skills acquired in the classroom to solve practical problems requiring critical thinking and to reflect on their experiences.¹

Common dictionary definitions indicate two common meanings for *community*. The first is “trait and location based,” referring for example to a business or interest group in a town. The second refers to a “feeling of fellowship” as well as common attitudes and interests.² While sending students to study a problem facing a local town or business draws on the first definition, there is no reason that the second definition couldn’t apply as well.

I confess I do not engage my students in service-learning, at least not intentionally. I do engage them in research at various levels, whenever possible. They are my minions and I tell them what to do. But it’s no abuse of power if an assigned math problem leads to new, relevant, useful information rather than being just an exercise.

This essay describes how I engaged two statistics classes to help me do institutional research that could be helpful to the National Numeracy Network

1 <https://serc.carleton.edu/introgeo/service/index.html>. (All websites accessed June 3, 2018).

2 <https://www.google.com/search?q=community+definition&ie=utf-8&oe=utf-8&client=firefox-b-1>

(NNN). It describes some of our results, which may be of interest to *Numeracy* readers. It concludes with reflections on how such an activity could be of continuing use to NNN if recast as a service-learning project and outlines how this might work. The example given here is just that: an example. For quantitative reasoning (QR) instructors interested in service-learning, it could serve as a potential prototype for service-learning projects. The resulting recommendations to NNN could as well be addressed to the other party always present in service-learning: the community member or organization with questions that could be answered through research.

NNN as Part of a Community

The National Numeracy Network was conceived as a network, connecting those wishing to improve quantitative reasoning across subjects and levels through a variety of measures. It may not quite be a community yet, as is evident by the ongoing discussions of what exactly “numeracy” is and the large variety of priorities and interests represented by its members. But the network is an actor in the larger community of educators, and its members interact with that larger community through teaching, scholarship, and administration.

It is easy to think of college faculty and staff as a community with shared interests and goals, many centered on teaching. It is less clear how to think of the students as part of this community, even though they make up most of the people in the college. We, the faculty and administrators, are like a community of farmers whose common concern is their cows. The cows are not really part of the community of farmers, but they are the reason for it. And yet all of our concerns, whether about teaching or preparing students for jobs, citizenship, or higher education, are concerns shared by the students we teach. Arguably they, too, are part of this community.

Thinking about our home institution this way puts service-learning on our doorstep. It also makes NNN an actor with respect to our community that could potentially be assisted through service-learning on the part of our students, whose hard work and cleverness are an underutilized resource. Including NNN as an active participant in our educational mission, within the classroom itself, could have the added effect of increasing the visibility of quantitative reasoning and its merits among students, while assisting NNN in various ways. Done in a thoughtful way, service-learning could strengthen quantitative reasoning courses while simultaneously strengthening NNN through research. What follows is an example of how student research could be helpful to NNN or any organization participating as the community member in a service-learning context.

How Prevalent Are Quantitative Reasoning Courses and Centers in Colleges and Universities?

One question that has been on my mind for several years concerns the current state of quantitative reasoning as an institutional priority. I felt that NNN was hampered by a lack of data about how many colleges actually have QR centers and courses. In an engineering sense, we do not know the state of the system. In an early attempt to measure this, Audrey Brown and I engaged the Mechanical Turk³ to collect data from college and university websites. What we learned from this attempt was that we phrased our survey questions poorly and were obtaining a biased sample of answers. We also came to appreciate the administrative difficulties of the Turk. The opportunity to teach introductory statistics gave us a new chance to gather information with an improved set of directions and more motivated researchers. Data were collected about four-year colleges and universities by students in 2016 and about two-year colleges in 2017.

The University of Texas at Austin used to maintain lists of two- and four-year institutions, respectively.⁴ We randomized these lists using an online gadget and used the results to obtain a random sample. Students were given a list of institutions and worked in pairs to answer over 25 survey questions based on the institution's website. The results were collated and returned to the students for analysis. A full description of the results will not be given here, but I will focus on five questions that address institutional buy-in of quantitative literacy.

Students were directed as follows: "Search the institution's web pages for the word 'Center.' Look at the first 50 entries that the search produces." The students were directed to consider two questions based on these: "Is there evidence of a Quantitative Literacy Center, or similarly named center, at the institution? Is there evidence of a Center for Teaching and Learning, or similarly named center, at the institution?" Then the students were directed to the institution's mathematics department website and responded to three questions: "Is there a quantitative literacy or quantitative reasoning course offered? If yes, does credit appear to be offered for the course? If yes, does the course description indicate that it satisfies any institutional requirement?" Results were entered in spreadsheets as 0 (no) or 1 (yes).

The results of this part of the survey are in Table 1. It became clear that the survey questions were still a bit ambiguous and could be improved, but since it was a class activity, most confusion was cleared up during the process of completing the survey.

³ <https://www.mturk.com/>

⁴ A similar list is now available at <http://doors.stanford.edu/~sr/universities.html>

Table 1
Summary Data from Five Survey Questions

Survey Item	Two-Year Institutions, 2017 % (95% confidence)	Four-Year Institutions, 2016 % (95% confidence)
The institution has a Quantitative Literacy or similarly named center	19% (13–26)	25% (18–32)
The institution has a Center for Teaching and Learning, or similarly named center.	56% (48–64)	53% (45–61)
A quantitative literacy or quantitative reasoning course is offered in the mathematics course listings.	45% (37–53)*	37% (29–45)
A quantitative literacy or quantitative reasoning course is offered in the mathematics course listings for course credit.	46% (38–54)*	35% (27–43)
A quantitative literacy or quantitative reasoning course is offered in the mathematics course listings and it satisfies an institutional requirement according to the course description.	28% (21–36)	29% (21–36)

Note: Survey results with 95% confidence intervals to nearest integer.

** Clearly a transcription error in one of the data entries, as the percent offering such a course for credit cannot exceed the percent of institutions offering such a course.*

Because of the learning goals for the course, students were asked to reflect on the process of data collection and on the meaning of the answer, but only in a statistical sense. There was no attempt to contextualize the activity in terms of its potential value to any organization or community; specifically, students were not asked to interpret the results in terms of policy recommendations resulting from institutional research. Thus, in this way, the students were not enlisted to be part of the higher education community that reflects on curriculum trends and the place of quantitative reasoning in education. As “students in a statistics class,” it seemed almost unfair to subject their opinions on this topic to public discussion or a grade. However we are free to notice some interesting facts and comparisons.

- A sizeable proportion of institutions offer QR courses through their mathematics departments.
- Institutions are more likely to offer quantitative reasoning courses in the math department than to put a center in place that supports QR across the whole curriculum.
- QR courses offered in a mathematics department usually carry course credit but do not necessarily satisfy any institutional requirement.
- Four-year colleges are more likely to have a QR center than two-year colleges, although the “Center for Teaching and Learning” is a more prevalent entity in both types of institutions.

These findings provide useful statistics. They point to a fairly large demand for services that NNN might provide, if it were to seek funding, as well as the potential for new network members. All of these courses and centers reflect one of the reasons NNN exists: to be the professional organization for QR instructors. Professional development opportunities could serve this group well. The data also point to potential problems and questions to be addressed. Clearly mathematics departments are pitching in to promote quantitative literacy. But how well does this effort serve students in classes across the curriculum? And how are other departments supporting QR in their discipline? It would be useful to know these things. It is easy to imagine a steady stream of institutional research that would be useful to NNN, including far more extensive projects such as obtaining contact information for QR centers and surveying center directors about their professional needs.

Could This Student Research Become Service-Learning?

My statistics class was a mix of students with heterogeneous career goals, but none of them were going into education. It is unlikely that I would be able to make them as interested in the needs of the NNN as I am. Service-learning “applies equal focus to both learning and the service goals.”⁵ It also implies that the students consider themselves part of the community, in this case the community of people with an interest in a particular educational goal. My students were not part of such a community. So what we did, although perhaps useful to NNN, was not service-learning.

What would turn this kind of effort into true service-learning, which has potential advantages for both students and NNN? The first requirement would be that the student engages directly with the community and feels like a part of it. Students interested in careers in teaching or data analysis would have a natural reason to want to engage with NNN as educational consultants, providing a valuable service via their research. Rather than the instructor setting the problem, the class or team of students would interact directly with NNN representatives to formulate a plan for collecting and analyzing data in response to questions that the board of directors should be routinely asking. Their results, while inevitably turned in for a grade in a class, would also be submitted as a report to NNN and possibly a research note for *Numeracy*. Someone who teaches statistics regularly in an institution with these kinds of students could routinely make his or her statistics class a valuable resource to NNN through service-learning.

⁵ <https://serc.carleton.edu/introgeo/service/what.html>

Alternatively, an institution that supports service-learning on a regular basis could begin a relationship with NNN that supports ongoing student research.

Several interested faculty members, along with their students, could make a real difference in our understanding of national trends, the state of QR in various contexts, and what steps still need to be taken. They could provide valuable data that would be the basis for finding financial support to take those steps. The faculty and students thus engaged could be honored for their research through awards from NNN or other recognition that matters to their institutions or to them.

So I will conclude with the recommendation that a subgroup of faculty interested in pursuing such a possibility be paired with an NNN committee dedicated to formulating institutional research questions important to the organization. Taking this step would address multiple goals of (1) conducting institutional research important to NNN, (2) fostering ongoing deep interactions between NNN and selected universities, and (3) community outreach through awards or other recognition.