A WAY OF INTEGRATING CIVIC LEARNING INTO STATISTICS COURSES: MEDIA REPORTS

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In this paper, we present a brief history of our efforts to incorporate civic learning into our statistics curriculum, highlighting our most recent approach, media reports. We discuss implementation issues, educational objectives, and give examples of student projects. Learning objectives, expected outcomes, and our assessment process are also given. An important aspect of this effort is the use of technology in report generation and dissemination. We discuss the development of these tools and how they have been used. We conclude with remarks on sustainability and possible future directions.

INTRODUCTION

Civic learning provides statistics students with opportunities to use newly-acquired statistical skills on issues of interest to their own communities. We believe the exploration of issues of community interest motivates student learning of statistics, and enhances their own sense of community and caring for others. The media reports approach presented in this paper is in the spirit and direction of changes and innovations in statistics education described in Scheaffer, Gnanadesikan, Watkins, and Witmer (1996), Rossman (1996), Cobb (1992), and Moore, Cobb, and Meeker (1995). Statistics students who are more interested in the class have internal motivations, and thus learn better, when course content and course structure involve wide range of interesting problems, situations, and contexts that touch or inspire these internal motivations. Concentrating on a community of interest to the student is one way to accomplish this goal. In addition to our own teaching experiences, and those of other instructors, there is considerable theoretical support for our assertion. Previous work by Lovett and Greenhouse (2000), and Garfield (1995) suggest that cognitive theory supports our assertion that exposing students to problems and concepts in a variety of contexts facilitates student learning. Learning statistics through notions of community also enables students to bring their own community experiences and interests to support the constructivist view of learning new material, Von Glasersfield (1987).

Our instructional experience with integrating civic learning into statistics instruction is in its third stage. These stages have been: community service learning projects, a civic engagement workbook for statistics, and this media report project. The details of the first two stages are given in Anderson and Sungur (1999, 2002), and Sungur, Anderson and Winchester (2005). Some additional work in this area has been discussed by Root and Thorme (2001). In the following sections we provide a background and motivation for civic learning, present our media reports project design and process, and discuss implementation and assessment issues.

BACKGROUND AND MOTIVATION FOR CIVIC LEARNING

The University of Minnesota, Morris (UMM), is a public liberal arts college and a part of the land-grant University of Minnesota system in the United States. Our campus is located in Morris Minnesota, a rural community of about 5000 residents located in west-central Minnesota. We have approximately 1900 undergraduate students with academic programs in the sciences (including major and minor programs in statistics), social sciences, humanities, and education. Our students typically come from smaller or mid-sized communities in the Midwest, or from the Minneapolis – St. Paul metropolitan area. We also have a substantial number of international students, and students from many other states. In the west central Minnesota region, expert knowledge in many fields can be difficult to secure outside the academic community. The economic, social and cultural development of the region is heavily dependent upon the activities of the university. This shapes the importance of civic learning as a pedagogy.

The introduction to statistics course at our university is designed for a variety of academic majors, and a way to fulfill an abstract systems general education requirement. It is a

first course in statistics with only high school algebra as a pre-requisite. We currently use the *Introduction to the Practice of Statistics* by Moore and McCabe (2006) as the text for the course. We cover descriptive statistics, producing data, basic probability, basic inferential statistics including inference for categorical data and analysis of variance. The course is taught by three faculty members in the statistics discipline. We typically enroll about 360 students in a two semester academic year.

When we define civic learning *"as a pedagogy that utilizes community service, community-based research, or other civic engagement activities along with regular reflective activities and assignments to meet both course goals and identified community needs and to teach students the skills they need to grow as thoughtful citizens and leaders,"* the importance of it in statistics education becomes apparent. Figure 1 compares traditional stages of statistical practice, with those using civic learning. The key differences are in the initial and final stages. In the civic learning model, the starting point is the problem identified based on the needs and interests of the community. In later stages the process does not conclude with the interpretation of results, but continues with discussing implications in a wider context, formulating possible solutions, and taking actions. In a liberal education the last three stages carry an important role - students use knowledge gained in other courses such as economics, sociology, and political science.
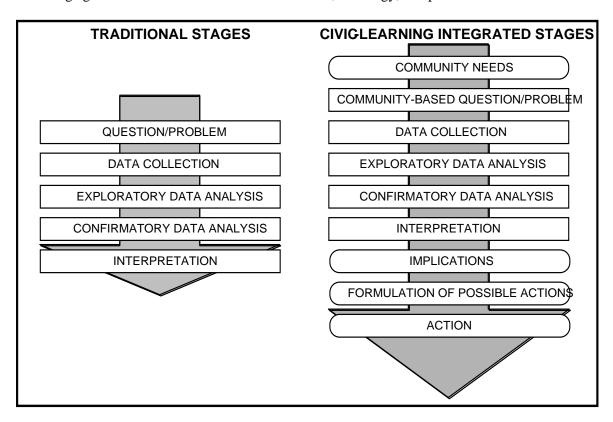

Figure 1: Stages of statistical practice for traditional and civic-learning integrated approaches

Civic learning components have been implemented in all of the courses we teach, including Introduction to Statistics, Statistical Methods, Regression Analysis, Multivariate Statistical Analysis, and Nonparametric Statistics. From a course procedure point of view, a civic learning component can be implemented in many ways. Instructors could provide everything students need; context, data sources, community contacts, etc. In contrast, students might formulate research questions and collect all the information needed. Thus, teaching approaches can range from practice-based learning to inquiry-based learning. In this article we focus on our media reports project in the introductory statistics course.

MEDIA REPORTS PROJECT

This project is a collaborative effort by the Statistics Discipline, UMM Center for Small Towns, and UMM External Relations. The mission of the Center for Small Towns is to focus the University's attention and resources toward assisting Minnesota's small towns. Locally identified issues create applied learning and research opportunities for faculty and students. In our previous civic learning initiatives, namely the Community Service Learning Projects, and the Civic Engagement Workbook for Statistics, community benefactors identified and defined a problem, then the Center for Small Towns coordinator formulated a way to integrate the solution process of this problem into course structure. Students worked on the problem and communicated their findings to the community benefactor. This integration involved teaching elements such as classroom examples, homework and exam questions, learning checks, required or optional chapter or course projects, and classroom discussions.

In this Media Reports Project, each student in the introductory statistics course identifies and defines a problem or issue to a community of interest to the student. This is typically easy for the student, due to substantial past experience with at least one "community" of some sort. The student then collects data, creates a relevant graphical display, and writes a short summary of findings. This summary is designed to be of interest to community members, and available for use by media.

Figure 2 summarizes most of the features of the project, including, student learning objectives, other expected outcomes, timeline for a fifteen week semester, elements of the process, and units involved. We have developed a process that integrates learning objectives of statistics and community data analysis needs. At the same time we are building skills and knowledge in students for use after the course is complete. The media reports project has a wide range of impacts: enhancing student statistical communication, providing topics of interest for undergraduate research in other disciplines, and giving visibility to the institution. The details of the project are given at www.morris.umn.edu/services/cst/statbook/, and the students' work can be viewed at www.morris.umn.edu/services/cst/statbook/maps/.

GOALS, LEARNING OBJECTIVES AND EXPECTED OUTCOMES

There are three general goals of the project: enhance student learning of statistical concepts, concentrate on the higher level of the integration in collaborative structures, and integrate civic learning with broader institutional goals. By this, we envision civic learning impact beyond student learning in a course, such as impacting admissions and external relations activities.

The project has a wide range of student learning objectives. Of course, primary goals are to improve students' learning on main concepts and improve their communication of statistical information. We also expect to increase student awareness and sense of community, enhance learning motivation through a sense of ownership of the learning activity, and improve student research and computing ability. Another direct, teaching-oriented objective of the project is to carry out an alternative student learning assessment. Evaluations by peers, the Center for Small Towns staff, and the instructor gives a comprehensive assessment process.

Other expected outcomes can be grouped into two areas: community, and the university in general. An important outcome is to help the community understand statistical data that is available to them. This helps formulate good questions, enhance decision-making, and make progress on the issue of interest. Universities will create a more efficient and effective institutional environment by coordinating efforts at various levels. Achieving this institutional efficiency and effectiveness is a key expected outcome of the project. By having media reports as a common connection, the admissions office, the external relations office, and other units, can more effectively promote and publicize the University.

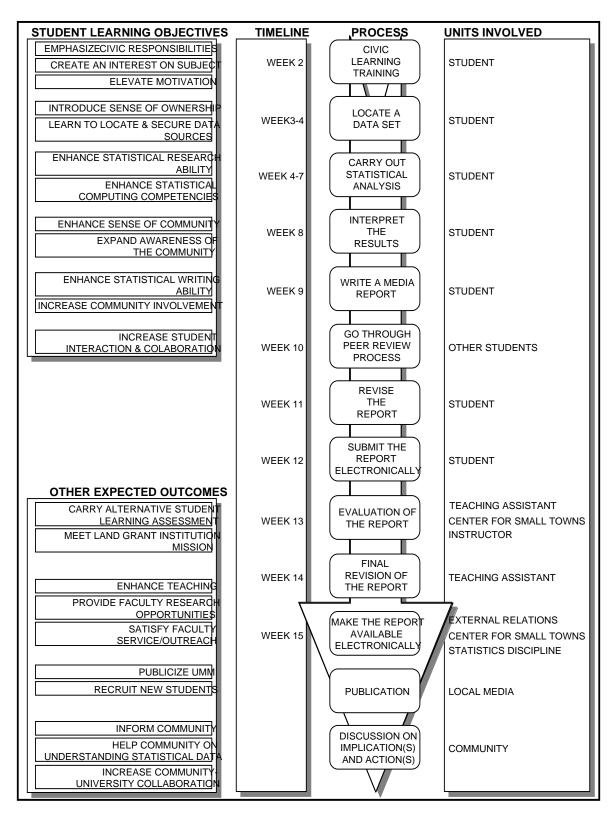| STUDENT LEARNING OBJECTIVES	TIMELINE	PROCESS	UNITS INVOLVED
EMPHASIZE CIVIC RESPONSIBILITIES CREATE AN INTEREST ON SUBJECT ELEVATE MOTIVATION	WEEK 2	CIVIC LEARNING TRAINING	STUDENT
INTRODUCE SENSE OF OWNERSHIP LEARN TO LOCATE & SECURE DATA SOURCES	WEEK 3-4	LOCATE A DATA SET	STUDENT
ENHANCE STATISTICAL RESEARCH ABILITY ENHANCE STATISTICAL COMPUTING COMPETENCIES	WEEK 4-7	CARRY OUT STATISTICAL ANALYSIS	STUDENT
ENHANCE SENSE OF COMMUNITY EXPAND AWARENESS OF THE COMMUNITY	WEEK 8	INTERPRET THE RESULTS	STUDENT
ENHANCE STATISTICAL WRITING ABILITY INCREASE COMMUNITY INVOLVEMENT	WEEK 9	WRITE A MEDIA REPORT	STUDENT
INCREASE STUDENT INTERACTION & COLABORATION	WEEK 10	GO THROUGH PEER REVIEW PROCESS	OTHER STUDENTS
	WEEK 11	REVISE THE REPORT	STUDENT
	WEEK 12	SUBMIT THE REPORT ELECTRONICALLY	STUDENT
OTHER EXPECTED OUTCOMES			
CARRY ALTERNATIVE STUDENT LEARNING ASSESSMENT MEET LAND GRANT INSTITUTION MISSION	WEEK 13	EVALUATION OF THE REPORT	TEACHING ASSISTANT CENTER FOR SMALL TOWNS INSTRUCTOR
ENHANCE TEACHING PROVIDE FACULTY RESEARCH OPPORTUNITIES SATISFY FACULTY SERVICE/OUTREACH	WEEK 14	FINAL REVISION OF THE REPORT	TEACHING ASSISTANT
PUBLICIZE UMM RECRUIT NEW STUDENTS	WEEK 15	MAKE THE REPORT AVAILABLE ELECTRONICALLY	EXTERNAL RELATIONS CENTER FOR SMALL TOWNS STATISTICS DISCIPLINE
		PUBLICATION	LOCAL MEDIA
INFORM COMMUNITY HELP COMMUNITY ON UNDERSTANDING STATISTICAL DATA INCREASE COMMUNITY-UNIVERSITY COLLABORATION		DISCUSSION ON IMPLICATION(S) AND ACTION(S)	COMMUNITY

Figure 2: Model and the process for the media reports project

PROJECT DESIGN

The project is designed for a fifteen-week semester. Figure 2 provides a visual diagram of the progression of the student project during the term. During the second week the students have been introduced to the concept of civic learning, and a basic description of the project is provided. Students are instructed to produce a report about an issue of interest to a community of their

choice, suitable for release to media such as newspapers, radio, television, or other internet sources. The report is expected to be of interest to members of the relevant community.

Students are provided with information about commonly used data sources and their usage. For example, the US Census Bureau is a commonly used data source by our students. Guidance is also provided on report writing, graph preparation, and submission of the project. Links to examples and previous projects are also provided to students.

The students are expected to locate a data set within weeks 3 and 4 based on their interests. The instructor assists the students in finding suitable data sources, and provides guidance on working with community partners that may be needed for the project. Students are responsible for determining the variables needed for their report. In weeks 4 through 9, the students carry out graphical data analysis, interpret the results, and write a media report. It is expected that the report should be written in very plain language without using technical terms. The key here is to be able to express and communicate statistical results to the general public. Our experience shows that effective communication requires a good understanding of the statistical concepts.

During week 10 the students go through a peer review process. This process enhances learning because by giving other reports critical examination, students then can find improvements to their own report. Two sets of guidelines on reviewing reports are provided, one on graphical displays the other on interpretation. The student reviewers are asked to evaluate aspects such as the quality of the writing, effectiveness of the graphical display, and the overall clarity of the interpretation. Based on the peer reviewer's comments the student revises the report and submits it electronically. The following week is devoted to the evaluation of the student work by the teaching assistant, Center for Small Towns staff, and the instructor. At this stage, the best media reports are selected to be displayed in the statistics discipline display area. Also, an award such as a flash drive is given to the writers of the best media reports.

Before the projects placed in an electronic data base, final corrections are made by a teaching assistant during week 14. Then, the projects are made available on the internet to the community. The university's external relations office notifies relevant media outlets about the site. When a visitor enters the site, they can search for projects by topic or region.

IMPLEMENTATION AND ASSESSMENT

We did not face major problems during the project implementation. However, much of this success is due to the excellent project submission and project management tools developed by an undergraduate student on the staff of the Center for Small Towns. The project submission process is very clear and easy. Students simply create their projects in the correct format in a word processing document, and the web submission process simply requires them to copy and paste items as directed. The result is a database of submitted projects that can be reviewed, edited, and assessed by teaching assistants and instructors. After final evaluation and editing, this database of projects is available for the public. The basic idea of using media reports as an instructional tool is simple to implement at any institution, but to really have the reports used by media and organizations outside the institution requires additional effort and structure like the project management tools described here.

Keeping the project simple and well integrated with the course substantially increased its effectiveness. The initial motivation for these media reports was a finding from our learning assessment in statistics courses. We observed our students lacked the ability to communicate their findings correctly and effectively by using simple words that can be understood by non-statisticians. The Media Reports Project improved our students' communication skills while addressing other important objectives. Media reports can be viewed at www.morris.umn.edu/services/cst/statbook/maps/.

From other learning assessments, we have found using real-world data, and particularly data relevant to a community of interest to the student, is associated with more motivation to learn statistics, and more interest in community issues. The project also reinforced our students' research and writing abilities. An unanticipated student benefit of this activity has been the valuable experience gained by simply obtaining the data for the project. Through this activity students have been exposed to national, and regional data sources. We believe that because of this

exposure, typically early in their undergraduate career, we have observed students using similar data sources more frequently in projects for other courses and in undergraduate research projects.

CONCLUDING REMARKS

The Media Reports project is an effective and efficient way of integrating civic learning to the statistics curriculum. Media reports were designed to improve statistics education, but they also address other important issues and objectives. Our initial vision of this tool was to study concerns of rural communities, but have found it can be used in a variety of "communities." From a faculty point of view, it helps integrate efforts on teaching, research and outreach. We have limited the media reports to graphical data analysis to make it more attractive for the community and to increase the chance of publication in media such as local newspapers. In the next stage, we plan to incorporate more sophisticated confirmatory statistical analysis on community data. We expect that our media reports project will create a more receptive audience for the next stage.

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