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This chapter describes the experience of two faculty members who implemented laptop technology in a lower-division social science course. The authors focus on the pragmatic issues associated with incorporating this technology into the social science classroom and recommend several strategies and resources.

Teaching with Laptops for the First Time: Lessons from a Social Science Classroom

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This chapter describes how two sociology professors initially implemented laptop technology in their classrooms. In our case, this came in the form of a laptop course in which all our students had access to the Internet during class. This situation presented enormous benefits as well as significant challenges. We explain both, along with our distinct approaches to integrating laptop technology into a course, and give our limited assessment of the impact of laptop use on our students' learning outcomes.

Laptops are the latest in a series of technologies that are revolutionizing classroom teaching (Lengel, 2004b). Much of the early work incorporating computer technology into the classroom occurred in disciplines such as engineering, computer science, and mathematics (Lengel, 2004a), while humanities and social science students primarily used computers outside the classroom. Recently, however, the development of inexpensive laptop computers along with the growing availability of wireless networking has made it much more feasible to bring this technology to the social science classroom.

There are important ways in which laptop instruction in the social sciences differs from that found in disciplines such as engineering or mathematics. First, the latter are what could be called "problem-based disciplines," where many courses involve mastery of specific problems that can be adapted for software programs such as Excel, Mathematica, or AutoCAD. A second and related benefit in these disciplines is that mastering the use of specific

pieces of software can contribute directly to mastery of the intellectual material presented in these courses. For example, business statistics students who complete homework assignments in Excel learn both statistical concepts and a state-of-the-art application of those concepts; further, they finish the course with a skill they can list on a résumé.

Engineering students can design prototypes on computer-assisted design packages similar to those they will use in the workplace, mastering both theory and practice in ways that relate directly to their long-term career goals. Such benefits can be a compelling reason for both students and faculty to invest the considerable resources required to incorporate laptop technology into the classroom—for students, the $2,000 to $3,000 to purchase the computer, and for faculty the time required to integrate laptops into lesson plans, homework assignments, and assessments.

Until relatively recently, such potential did not translate cleanly to the social sciences or the humanities, and as a result the expense rarely justified the benefits. Over the past several years the Internet has exploded with resources relevant to teaching sociology as well as other social sciences. (See the Appendix for a list of some of the Web sites we use most frequently.) Many of these sites have been around for years, and we both had incorporated some of them into lectures and homework assignments. Yet our use of them was frustratingly limited. On our campus, classroom access to computers for social science instruction was restricted to a relatively small number of on-campus labs, which meant our students primarily used these Web sites outside of class (say, as part of a homework assignment). In-class use usually had them watching passively while we gave demonstrations from the lectern. In both cases, the Internet's enormous potential to enhance student engagement and learning stayed in the distance.

Several advances in laptop technology have brought us today to a place where their widespread incorporation is both practical and appealing. First, they are now powerful enough to download large files quickly, an important feature for use during valuable classroom time. Second, newer laptops are small and lightweight enough that faculty can reasonably require students to bring them to class regularly. Third, they have become relatively inexpensive, allowing universities to require that incoming students purchase one before arriving on campus. (In absolute terms, of course, the extra expense can be quite burdensome for less wealthy students.)

The relatively recent availability of laptops that are powerful, fast, lightweight, and affordable represented a critical step toward bringing laptops into the social science classroom. However, their use was still somewhat limited because it remained quite difficult to get students onto the Internet during class. Harnessing the fullest potential for laptop teaching required availability of the second technology, wireless Internet access.

This access allows computers to be connected to the Internet (or a computer network) via radio waves, eliminating the need for data ports and Ethernet cables. This makes it possible for an entire class to be connected

to an Internet site without any physical connection to a network. With the purchase of a small number of wireless transponders, any ordinary classroom can become a computer laboratory.

Levine (2002) has written that the true benefit of laptop technology in the classroom comes from its ability to create "two classrooms in one." When laptop lids are closed, the environment is that of a traditional classroom. With lids up, the classroom becomes a computer lab, and Levine argues that laptops enhance learning most effectively as instruction moves seamlessly between these two environments. In our experience, the widespread availability of wireless networking was essential before both environments were possible during sociological instruction.

Of course, making laptop computers and wireless networks widely available does not necessarily improve student learning. The true advantage of these technologies is the opening they give us to teach differently (Spurlin, 2003). Using somewhat dissimilar approaches, we each set about incorporating laptops into our teaching of the introductory course in sociology. In the next section, we describe our two approaches and their respective advantages and disadvantages.

Implementing Laptop Technology for the First Time: Two Experiences

We each brought our own priorities, circumstances, and levels of technological sophistication to our respective laptop courses. One of us is an untenured assistant professor and a somewhat unsophisticated technology user. The other is an associate professor who has taught courses on the Internet in society and has a specialty in online data collection methodologies. Our differing backgrounds colored our approaches to using laptops in the classroom. The untenured assistant professor, concerned with balancing teaching and research responsibilities, sought to incur minimal disruption to her existing lesson plans, resulting in a course design that included five designated "laptop days" during which students completed a graded in-class assignment that applied recent lecture material. In contrast, the tenured associate professor chose a more integrated implementation of laptop technology in which students used their laptops daily and for a variety of classroom purposes. Students were encouraged to use them to take notes and, more important, use the wireless environment. This environment was offered to the students as a means to access outside Internet resources as a real-time supplement to classroom-based activities and communicate "silently" with their peers during class. From this faculty member's point of view, students' minds often wander in the classroom, and they regularly engage in an ongoing conversation of sidelong glances, knowing looks, and discrete whispers. The aim here was to use technology to channel these normal classroom behaviors in a way that would be more efficient and perhaps less disruptive. In addition,

this faculty member used periodic, planned group laptop activities not unlike those of his colleague.

Before detailing our respective approaches, we will outline the environment in which each of us taught these laptop classes. In fall 2002, Clemson University began requiring incoming engineering and science students to purchase laptops; by fall 2004, this laptop mandate was universitywide. Since laptops first appeared on campus, faculty members had the option of creating "laptop sections" in which all enrolled students were required to own a working laptop and bring it to class. During the spring 2004 semester, we were each assigned to teach one of these sections, as well as a second nonlaptop section of the same course, Introductory Sociology, with a typical enrollment of fifty students per section. In addition, prior to teaching the laptop section we each completed a series of preparatory workshops designed to facilitate our transition to laptop-based instruction.

As mentioned earlier, we chose our own strategies for implementing laptop technology in our classrooms. Here we detail those strategies and their outcomes.

Approach One: Integrated Use of Laptops

This instructor hoped to have the students use their laptops during most lectures and discussions, and to use them to access a Blackboard virtual classroom that was always "in session." The idea was to allow students to record and exchange their questions and comments in real time. The instructor's goal was to follow the discussion in real time and try to incorporate the chatter into the class. On occasions when this proved too difficult, the archive function in Blackboard allowed the faculty member to review the discussion later and address it in the next class. This instructor also used breakout groups for class discussion. Students were expected to use their laptops to ground their discussion and prepare their class presentations. Students often had to search for relevant online resources, and in these instances their report was to include URLs and other relevant resources they had found.

This integrated approach ran into some significant technological barriers. For example, though the classroom had long tables with ample workspace for students' laptops, it had only a few power plugs, which meant that students who hadn't fully charged their batteries before class needed to shut down before the ninety-minute class ended. In addition, significant limits to bandwidth hampered in-class communication at times, particularly at the start of class when many students were trying to log onto the network at the same time. Finally, the Blackboard virtual classroom application encountered problems, especially its archiving features.

None of these technological barriers were insurmountable; indeed, all shrank significantly during the semester. Nonetheless, they presented real problems for the integrative laptop approach. In particular, student buy-in, a key predictor of success for any type of instruction, was questionable at

the start of the semester. Still, about one-third of the students were regular in-class laptop users, taking notes, asking others questions, and looking for relevant (and sometimes not so relevant) online materials.

Though the integrated laptop approach was not an overwhelming success, at least not in this first attempt, this effort contributed to the success of discrete, spontaneous laptop activities that sprang up both in response to student questions and when the instructor felt the class would benefit from something different from what was planned.

The instructor regularly used semester-long breakout groups of six to eight students. These groups prepared their own study guides for exams in exchange for the instructor's and researched and reported in class on special topics (for example, everyday experience with racism and prejudice). In the laptop section, students used the Internet to inform their discussion and presentation. For example, during the discussion of education as an institution in contemporary society, each group was assigned a topic from among online education, elite higher education, home schooling, vocational and technical education, the No Child Left Behind Act, and continuing education. While researching their topics, the groups circulated URLs to Internet universities, Harvard University, a Web site for home-schooling parents, a White House information page on the No Child Left Behind Act, and a local community college.

Another successful laptop exercise followed an assigned article that proposed a typology of the various ways in which religious organizations use the Internet. (Essential to the sociological method, a typology is an analytical construct used to categorize empirical social phenomena.) The typology posited three basic ways the Internet is used for religious purposes: (1) passive presentation of church information and religious content, (2) interactive exchange of church information and religious content, and (3) online worship. The groups found online examples of each use, as well as online religious materials that did not cleanly fit into the typology.

Approach Two: Discrete Use of Laptops

This approach incorporated in-class laptop activities with minimal impact on existing lecture material and course design. The instructor made lecture notes available in both PowerPoint and Word format and encouraged students to augment these notes during class. All class handouts and study guides were also distributed by way of the course management system rather than on paper.

These efforts were intended to encourage students to make regular use of their laptops and bring them to class regularly. However, the primary pedagogical use of the laptops occurred when students completed exercises designed to reinforce concepts covered during lecture (the "laptop days"). In each case, resources available on the Internet were key elements of the exercise. For example, after hearing a lecture on evaluating sources of

sociological data, students surfed the Web to find examples of both unreliable ("bad") and reliable ("good") statistics about the social world. The assignment served multiple instructional purposes. First, it reinforced lecture material by having students apply it. Second, it sparked a lively discussion of the many ways in which sociological data are used to manipulate public opinion. Third, by identifying reliable statistics students often found sources of good online data that they could use in future exercises, in other classes, or for their own information.

A second exercise followed a series of lectures on components of culture, particularly values (societal standards for judging right from wrong), beliefs (what members of a society believe to be true), and norms (rules for social behavior). In preparation for this assignment, students were taught to access a Web site containing data from the General Social Survey (http://www.icpsr. umich.edu/gss; see the Appendix for details). The survey, which has been conducted almost every year since 1972, contains the opinions of a representative sample of noninstitutionalized adult Americans on a variety of issues, including abortion, drug use, politics, work and career, and beliefs about success. It is an enormously valuable tool for illustrating social science concepts ranging from political orientation to childhood socialization.

The Web site also contains a simple analytical program from which students can quickly learn to run frequencies (that is, a table with percentages) or cross-tabulations. This assignment had three components. First, students discussed what percentage of respondents would need to "agree" with a given question before it could reasonably be considered a "widely held" aspect of the culture. Second, they explored the General Social Survey Web site, examining the percentage of respondents who, for example, supported legalization of marijuana or believed success usually came to those who worked the hardest. Third, they each identified one survey question that they felt captured a widely held element of American culture. Students shared these results in class and related their findings back to the lecture material.

Laptops and Student Learning Outcomes

We chose to provide some detail about these exercises because we believe they highlight several ways in which combining laptop technology and Internet resources can benefit social science instruction. First, the Internet is a vehicle through which social science concepts can be directly applied, giving students an opportunity to test their mastery of ideas presented in lecture and their textbooks. For example, during the exercise on culture described in the previous section, students were asked to identify which element of culture their question represented. Their responses often revealed significant gaps in their understanding of these concepts and gave the instructor the opportunity to clarify the related material.

Another benefit of exercises of this kind is that they offer enormous potential for teaching critical thinking in a setting that appeals to students

more than traditional venues do. During the lesson on good and bad sources of statistical data, students received a list of characteristics of reliable data and searched the Internet for examples of both good and bad data, obtaining concrete evidence for their assessments. Many students found this exercise challenging because they were often reluctant to deem a statistic unreliable, especially if its presentation looked particularly professional or it validated a personal belief they held. This furnished a powerful opportunity to illustrate the principles of critical thinking, and to help students hone their ability in this area. Further, real-time Internet access, combined with the chance for students to debate these issues as they arose, added a sense of immediacy and energy that were lacking when the same assignment was given as homework.

Given these benefits, we think laptop technology merits continued use. However, merit considerations cannot be complete without exploring how the technology affects student outcomes. The circumstances under which we taught our first laptop classes allowed us to conduct a limited field experiment. As mentioned earlier, we were each assigned to teach one laptop and one nonlaptop section of introductory sociology during the same semester. With the exception of laptop-related activities, we used the same textbook, lectures, and course materials in both sections, so we could compare the sections and make a limited assessment of their outcomes.

The students in the laptop class using a discrete approach (assignment of specific laptop days) achieved an average final grade of 86 percent, or a B. Those in the nonlaptop class conducted by the same instructor received an average final grade of 85 percent (also a B). We compared grades on midterm exams and found no significant difference there either. Even the students in the integrated laptop class (ongoing use of laptops throughout the semester) did not perform significantly better than those in the nonlaptop class on their midterm or final grades.

One likely reason laptops did not improve our students' scores was the disconnect between our teaching and our assessment instruments. Learning with laptops is a more interactive process than is traditional classroom instruction, yet we both used assessment tools such as multiple-choice exams that test memorization of detail rather than interactive mastery of concepts.

We explored the possibility that our assessments masked some of the benefits of laptop learning by comparing class performance on another kind of class assignment, one that required higher-order thinking. Students in the class using the discrete laptop approach were assigned a small project in which they identified a research question, collected and analyzed a small amount of data, and presented their results. These students had many more opportunities to analyze and discuss social research than their counterparts in the same instructor's nonlaptop section. So we might expect them to perform better on this assignment than the nonlaptop students. Indeed, the laptop-section students scored six points higher (half a letter grade) on

average on this assignment than did the nonlaptop students, a statistically significant difference ($t = 3.6$, $df = 60$, $p < .001$).

Clearly this small field experiment does not definitively show that laptop technology generates better learning outcomes. If anything, it suggests how complex it can be to make such an assessment in a social science or humanities course. Further, it confirms that laptops are no different from any other technology in that it is the teaching they allow rather than their mere presence that improves student learning.

Conclusion

Our initial forays into teaching with laptops have convinced us that it has enormous potential to increase learning, particularly when combined with Internet resources. We believe that the power of the technology derives from the opportunities it creates to bring abstract, intellectual concepts to life, enliven and deepen interaction between students and instructors, and empower students to teach themselves and one another. It also contributes to one of the core goals of a social science education, creation of an educated citizenry. For these reasons and despite the sometimes significant hurdles that must be overcome, we conclude that using laptops in class can enhance both students' academic progress and their intellectual development.

Appendix: Recommended Internet Resources

The resources here may be useful for teaching sociological and other social science concepts.

http://www.icpsr.umich.edu/gss The Web site for the General Social Survey data from 1972 to 2000. It contains an application that supports analysis ranging from simple percentage tables and bar graphs to sophisticated multivariate analyses. Data downloads are available but are not necessary in using the analysis tool. The software program SDA performs the data analysis. A Web description of the software and of other data sets that use it for online analysis can be found at http://sda.berkeley.org.

http://www.fedstats.gov A portal that links users to all of the publicly available statistical data published by the federal government. Through this link students can access myriad descriptive statistics as well as raw data. The portal organizes the information in several ways, by topic, state, agency, and so on. An additional link, Data Access Tools, takes users to selected online databases maintained by federal agencies (Bureau of Justice Statistics, Bureau of Labor Statistics, U.S. Census Bureau, Bureau of Economic Analysis, and others).

http://unstats.un.org A general source of international statistics.

Useful Web sites for specific focus areas:

http://www.claritas.com A market research firm that offers, on its homepage, a link to a free Web-based program called "You Are Where You Live," a breakdown of the sociodemographic composition of every zip code in the United States; helpful for illustrating concepts such as inequality and social class.

http://www.opensecrets.org data on political funding, campaign financing, and political contributors.

http://www.prb.org Population Reference Bureau, formerly the AmeriStat Web site; sources of population data.

Web sites focused on aging and older populations:

http://www.aarpmagazine.org/ American Association of Retired Persons Magazine
http://www.aarp.org/ American Association of Retired Persons
http://www.ssa.gov/ Social Security Administration
http://www.alz.org/ Alzheimer's Association
http://www.leisureworldarizona.com/ Leisure World Community Association
http://www.nia.nih.gov/ National Institute on Aging

Web sites of formal organizations (both controversial and noncontroversial):

http://www.adl.org/adl.asp Anti-Defamation League
http://www.democrats.org U.S. Democratic Party
http://www.rnc.org U.S. Republican Party
http://www.scouting.org Boy Scouts of America
http://www.wckkkk.org White Camelia Knights of the Ku Klux Klan
http://www.sierraclub.org Sierra Club
http://www.catholic.org Catholic Online (not directly affiliated with the Vatican or the Roman Catholic Church)

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