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Teaching Digital Responsibility

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Overview

As one of the first wired campuses where students, faculty, and staff depend on the computer network for educational connections, Carnegie Mellon requires all first-year students to take a for-credit program called the Computing Skills Workshop (CSW). This program has been required at Carnegie Mellon for more than 20 years—since 1985. The program covers Carnegie Mellon–specific computing information, and it helps students understand what resources are available to them and what responsibilities they have as users in the Carnegie Mellon computing community.

The program has evolved with the changing needs of first-year students, skills with which they enter the institution, and expectations about appropriate behavior in this increasingly computer-dependent environment. Recently, this program has included more sophisticated tools, instruction on how to use library databases, and a module on responsible computing.

While many universities recommend similar introductory programs, CSW is a graduation requirement for all undergraduate students regardless of major. Using an unusual, if not unique, teaching model, the program is presented using a peer-to-peer format in which undergraduate instructors are selected and trained to teach the content. This approach not only builds leadership skills among the student instructors but also allows us to present the program material to a large body of students concurrently, ensuring that all freshmen begin their studies with a similar set of computer-related skills.

This research bulletin provides an overview of the rationale for the CSW program and explores the methodology behind preparing students to be successful teachers in a peer-to-peer format. It is intended to assist higher education executives plan and execute similar programs by identifying key issues and providing resources.

Highlights of the CSW Program

Students entering colleges and universities as freshmen today are typically considered to be part of the Net Generation, which refers to those born between 1980 and 1994. These individuals have been raised with technology and use it frequently. According to the National Education Technology Plan of 2004 (Paige, Hickok, & Patrick, 2004), 90 percent of children between the ages of 5 and 17 use computers, and 94 percent of teens use the Internet for school-related research. The plan also indicates that 48 percent of online teens say they relied mostly on Internet sources for their last big school project, 48 percent say their use of the Internet improves their relationship with friends, and 75 percent use instant messaging. Carnegie Mellon has taken these statistics into consideration as the CSW curriculum has evolved, creating new instructional modules to address issues that the Net Generation might encounter.

The CSW course is delivered to approximately 1,400 freshmen in the first semester of the academic year. It is divided into two 7-week mini-sessions that meet twice a week for fifty minutes each meeting. In the fall of 2006, we scheduled 48 classes in several computer labs across campus, using both Macintosh and Windows platforms. Student scheduling is done with the cooperation of each schools' academic advisors. One of the strengths of the program is that classes consist of students from all schools, providing a forum for class interaction that the students may not receive outside of their chosen major. This format builds on Carnegie Mellon's interdisciplinary approach to learning.

The classroom format is supported by the Caruso and Kvavik ECAR study of 2005. The Key Findings for that study state, "Most students prefer face-to-face interaction with their instructors and with other students, though this preference is not universal" (Caruso & Kvavik, 2005, p. 4).

In the same study, Caruso and Kvavik identified six areas to which institutions must pay particular attention when incorporating information technology (IT) into students' university experience:

- Integration of IT into the curriculum
- Definition of IT skills
- Training for students and faculty
- Common learning environments and consistent instructional approaches
- Accessible and effective IT service and support
- Monitoring and benchmarking

Carnegie Mellon's CSW program addresses these six categories. The program then takes additional steps to discuss the responsibilities that go along with using technology.

The current CSW curriculum, taught through peer instruction, includes:

- **Computer Security.** This one-hour mandatory session is presented during orientation week and details user account security and password guidelines, network security and bandwidth guidelines, early recognition of potential virus attacks and phishing attacks, and protection from identity theft.
- **Networking.** Four classes are devoted to Carnegie Mellon–specific networking information: Introduction to Andrew File Space, MyFiles, UNIX, and FTP.
- **Responsible Computing.** Bandwidth, academic integrity, and copyright guidelines are covered in this session. It includes a section that explains safe and secure use of social networking sites such as Facebook. We present recorded case scenarios, review related policies and guidelines, and facilitate discussions to enhance the comprehension of students' responsibilities.

- **Quantitative Analysis Tools.** This session covers basic functionality of Excel: creating a spreadsheet, performing calculations with formulas and functions, basic formatting, and charting.
- **Research Tools.** Students are taught to use the library catalog (Cameo) and utilize the many periodical, newspaper, and other publication databases. A Web evaluation tutorial helps students recognize what to look for when gathering valuable research data and also provides Web searching tips.

Instructor Training

A carefully planned instructor-training program has been one of the hallmarks of success for the CSW program. The program is taught by 30 to 35 student instructors. By keeping a student-to-instructor ratio of approximately 12:1, Carnegie Mellon provides entering students with sufficient instructor attention necessary to master the skills being presented.

Developing leadership skills among the student instructors is a significant part of the program. This process begins when the instructors are hired during the spring semester. We look for instructors who have an interest in teaching, have tutoring experience, and have proficient computer skills. Once instructors are hired, they are required to attend two training sessions: one in the spring and one prior to the start of fall classes. The spring training component consists of the following:

- Position introduction and expectations
- Group dynamic exercise
- Beginning presentation skills

The spring training format allows for an early introduction to the expectations of both administrators and instructors, provides an opportunity for team building, and gives new instructors a chance to present in front of their peers. These key elements are the beginning steps in developing leadership among our student instructors.

The fall training component is much more intense and consists of a variety of pedagogical methods:

- Effective presentations
- Group facilitation and discussion
- Student performance assessment

This week-long instructor training begins prior to the start of the fall semester. Instructors become familiar with the instructional materials, cases, discussion questions, and assignments that they will present to their classes. They prepare and present course materials both to their peer instructors and management, receiving feedback on presentation skills, content knowledge, and teaching ability. In addition, customer

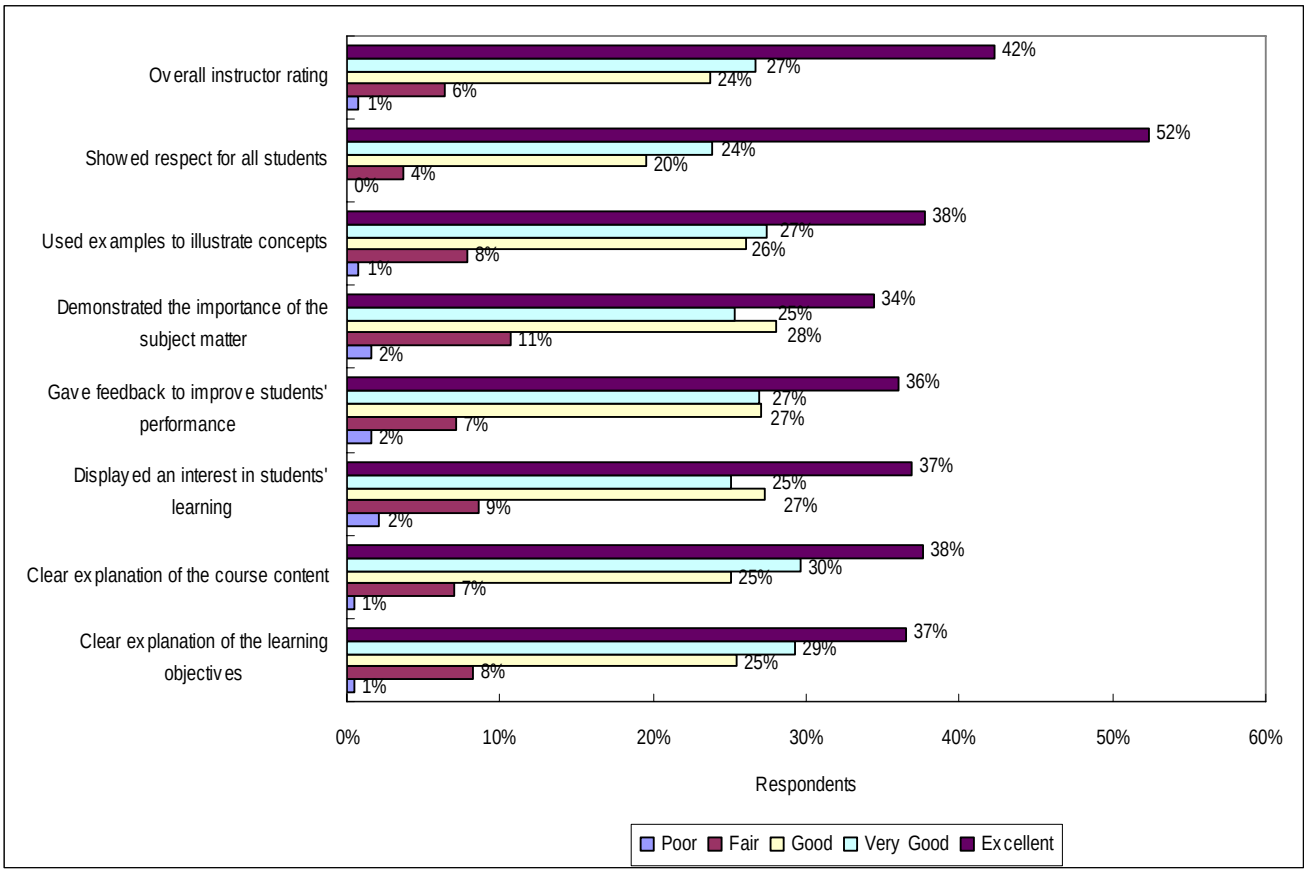
service skills and how they apply to the role of instructor are discussed. This ongoing process helps instructors gain the confidence necessary to be successful leaders and teachers in their classrooms.

Instructor Evaluation

To ensure that the student instructors have the support that they need to conduct classes, student instructors and course directors/developers meet as needed. This interaction gives course developers information to adjust and fine-tune the course content and delivery approach.

Instructors are evaluated through a two-pronged approach. Mid-course and end-course evaluations are administered to measure instructor effectiveness. Course evaluations provide each instructor with feedback on how to improve. Figure 1 shows the end-course evaluation for fall 2006.

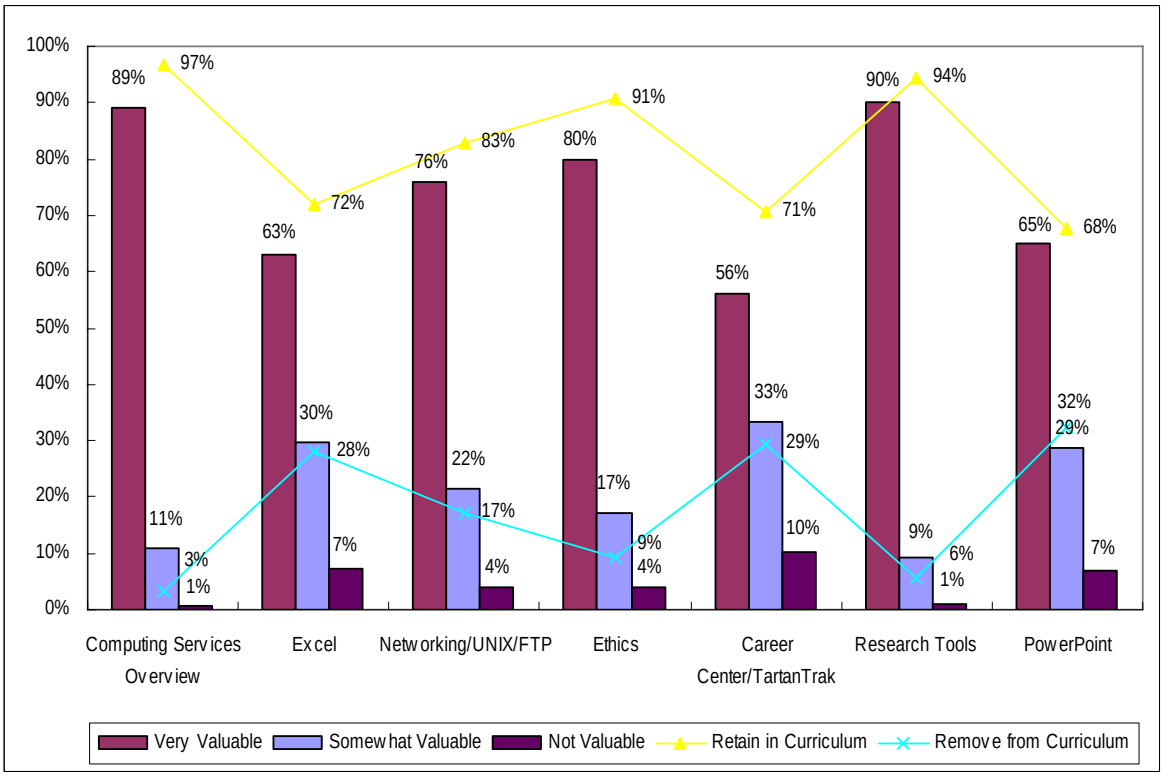
Figure 1. End-Course Instructor Evaluations, Fall 2006



In addition, CSW management conducts performance assessments for each instructor. The learning environment established by these evaluation methods creates a unique 360-degree relationship between students, instructors, and management.

Each year, the CSW curriculum is evaluated to ensure that the skills taught provide incoming freshmen with the tools they need to succeed at Carnegie Mellon. The most recent survey, conducted in spring 2005, surveyed academic advisors, a subset of faculty, and a random sampling of students (see Figure 2). Our survey asked faculty and academic advisors to rate the value of the course modules with regard to incoming students' experience. They were then asked if the module should be retained or removed in the fall 2005 curriculum.

Figure 2. Faculty and Academic Advisors Rating of Module Value and Curriculum Appropriateness (N = 250)



The survey confirmed that overall, faculty and advisors feel the curriculum is valuable. Computing Services Overview, Networking, Ethics, and Research Tools received the highest ratings in terms of value and also in terms of what the faculty thought we should keep in the curriculum. Excel, Career Center, and PowerPoint received the fewest "Retain" responses.

The same survey was administered to a random sampling of undergraduate students. If we make the assumption that students used their own skill level as a basis for deciding whether a module should stay in the curriculum, the student survey results align with the

findings in the 2005 Caruso and Kvavik study, which points out that students are comfortable using core information technologies and rate themselves as skilled in their use. It also says that the majority of students perceive that they need no additional training to use these technologies. Our student survey results are indicated in Figure 3.

Figure 3. Student Rating of Module Value and Curriculum Appropriateness (N = 197)

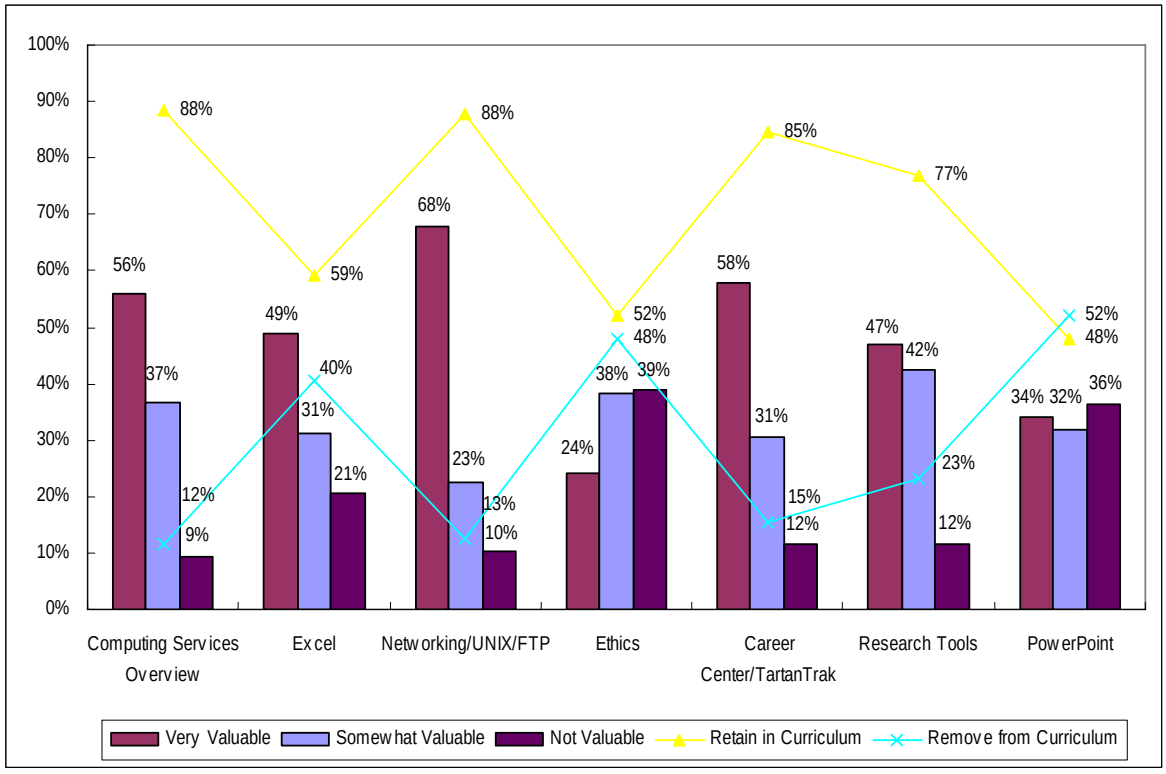
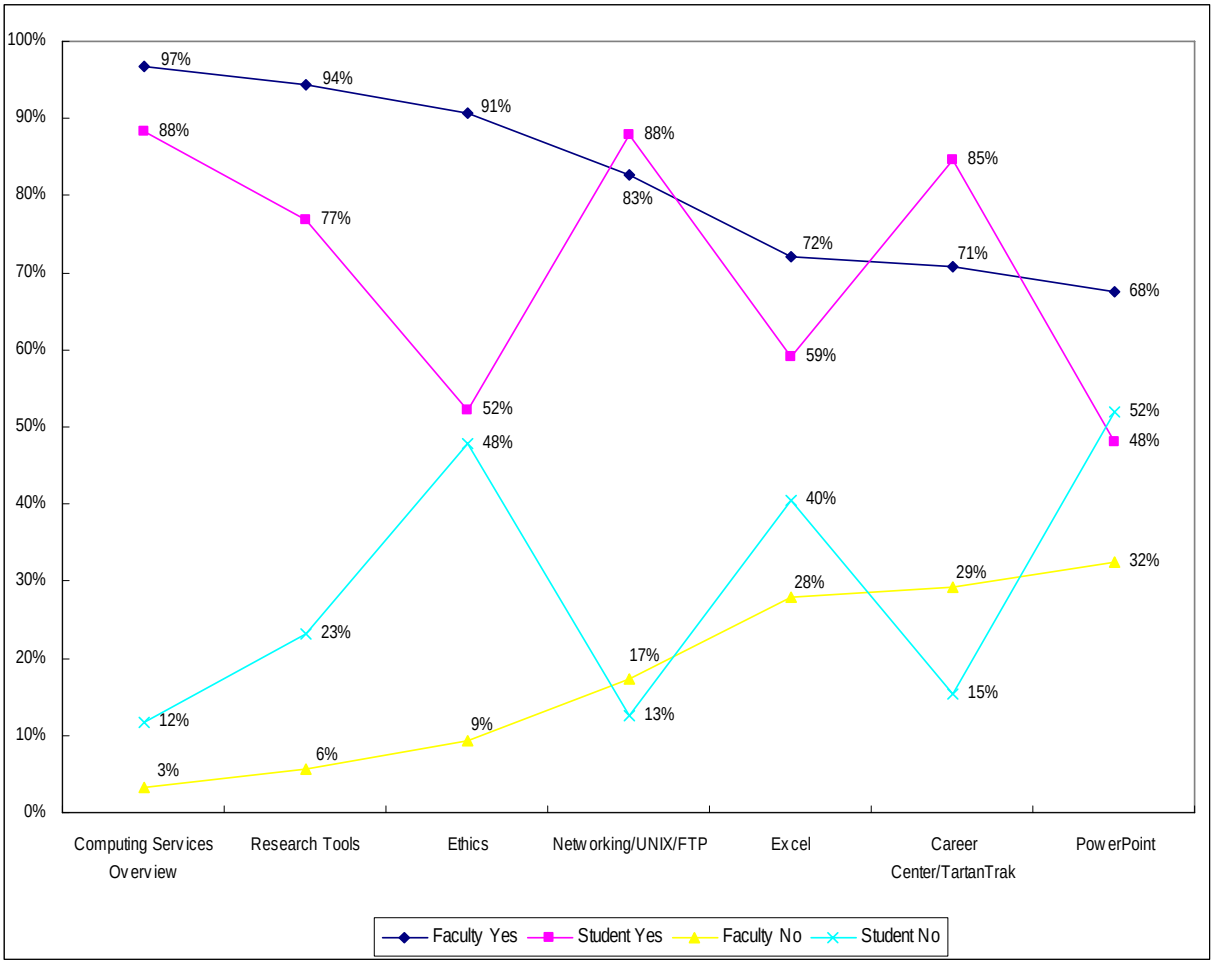


Figure 4 shows an interesting comparison of student and faculty responses to the question “Should the module be included in the fall 2005 curriculum?” The main disparity is between students’ opinion of the importance of the Ethics module, which was added in fall 2003, and the faculty perspective on that module. As an outcome of this disparity, we modified the Ethics portion of the class to be more relevant, specifically focusing on responsible computing. The shift in curriculum from ”Ethics” to ”Responsible Computing” has been a powerful one, providing students not only with practical, real-life examples on how to behave responsibly in the Carnegie Mellon community but also what to look for and how to address questions in other situations.

Figure 4. Should the Module Be Included in the Fall 2005 Curriculum?



In the 2006/2007 academic year, the library is administering the Standardized Assessment of Information Literacy Skills (SAILS) test to all undergraduate students. Project SAILS is a standardized test of information literacy skills (see https://www.projectsails.org/). The results will be used to determine future curricula materials for the Research Tools portion of the class.

The CSW program is evaluated through curriculum surveys. Student progress is assessed with exams. Students must pass each exam with a score of 80 percent or higher. The Networking and Excel exams are task-based, where students enter the programs and perform specific tasks taught in class. The Responsible Computing exam is a multiple-choice exam that covers scenarios, policies, and guidelines. We have been able to maintain extremely successful completion rates, as illustrated in Table 1.

Table 1. CSW Incoming Class Statistics

Semester	Enrolled	Failed	Withdrew	Did not complete class
Fall 2001 (whole semester)	1,134	2.0%	0.3%	2.3%
Fall 2002 (mini 1)	679	2.5%	0.6%	3.1%
Fall 2003 (mini 1)	623	4.0%	0.9%	8.2%
Fall 2004 (mini 1)	704	2.3%	0.1%	2.4%
Fall 2005 (mini 1)	711	2.3%	0.0%	2.3%

Governance

An Advisory Committee governs the CSW program. The committee provides an essential link between the academic departments and administration. Members of the committee represent their colleges and assist with gathering and applying information from their departments to curriculum decisions that affect the course. The CSW program has representation from:

- Carnegie Institute of Technology, College of Engineering
- Vice Provost for Education
- School of Computer Science
- College of Humanities and Social Sciences
- Mellon College of Science
- College of Fine Arts
- Tepper School of Business
- Eberly Center for Teaching Excellence
- Computing Services

What It Means to Higher Education

A CSW program should enhance students' existing IT knowledge, provide training on relevant university-specific technologies, and educate students to make responsible decisions regarding their technology use. The instructor program creates and develops student leaders who have a strong understanding of campus policies and can communicate this knowledge to other students.

This methodology supports Carlson's contention that it is beneficial to use flexible instruction, including a blended approach of face-to-face, online, and multimedia lessons (Carlson, 2005).

Generally, schools provide students with basic training on campus computer systems and commonly used software tools. Computer ethics courses are offered at numerous universities, and often they are presented as upper-level electives. Universities to date have generally focused their attention on the development and enforcement of campus-wide IT policies that are tucked into student handbooks and, at best, are briefly discussed during student orientations. While this is a good first step in addressing some of the clear-cut issues such as prohibitions against plagiarism, it is impossible for sets of policies to provide complete guidance regarding more complex issues, including:

- Academic integrity
- Copyright issues
- Safe online computing

Similarly, it is impossible for such policies to anticipate and address new issues that emerge from the development of new computer technologies and their accompanying capabilities.

Because of this, teaching all students how to thoughtfully reason through and make conscientious choices regarding the appropriate use of IT is invaluable. This ensures that they become responsible users of the campus computing facilities, and it also lays the groundwork that will prepare them to function as responsible citizens after they graduate. At Carnegie Mellon, we combine technology and computer-skills training with a responsible computing component, providing students with relevant knowledge and a more sophisticated set of intellectual skills, enabling them to use computer technology fully and deeply and to understand the responsibilities and challenges that come with this powerful tool.

Key Questions to Ask

- What skills do we want students to have, and what do we want students to understand about their computing responsibilities when they become citizens of our university community?
- What are students' entry skills upon admission to the university, and is there a significant change in skill levels from the freshman year to graduation?
- In what ways are we providing our students with the computing skills they need in order to be successful once they graduate?
- Does our institution have, or do we need, a formal computer skills program for students?
- Where is the digital divide among students in our institution, and what should we do about it?

Where to Learn More

- Carnegie Mellon University, Computing Skills Workshop, http://www.cmu.edu/computing/csw
- Carnegie Mellon University, Computing Skills Workshop Curriculum 2005 Survey Results, http://www.cmu.edu/computing/csw/SurveySummary.pdf
- Project Sails, https://www.projectsails.org/sails/aboutSAILS.php

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