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COMPUTING FOR THE MASSES: EXTENDING THE COMPUTER SCIENCE CURRICULUM WITH INFORMATION TECHNOLOGY LITERACY*

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ABSTRACT

Enrollments in computer science programs continue to drop as demand for workers skilled in computing increases. Information technology scholars face the ironic challenge of attracting more students into computing disciplines in the age of ubiquitous computing. This paper chronicles a decision by a department of computer science and information systems to offer an information technology literacy course as a service to its institution. Educational and curricular justifications for the course progressed in parallel with recognition of the course's strategic value to the department in the face of sharp declines in the number of students majoring in CS or IS. Following our approach, other departments in the computing disciplines can ride the coming wave of information technology literacy in higher education.

Keywords

Information literacy, curriculum, information technology education, computer science education.

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1. INTRODUCTION

Enrollments in computer science programs continue to drop as demand for workers skilled in computing increases [8]. On a macro scale, economies confront the long-term implications of growing gaps between supply of and demand for professionals with computer skills. Information technology (IT) scholars, on the other hand, face the ironic challenge of attracting more students into computing disciplines in the age of ubiquitous computing. This paper chronicles a decision by a department of computer science and information systems to offer an IT literacy course as a service to its institution. Educational and curricular justifications for the course – the case for IT literacy – progressed in parallel with recognition of the course’s strategic value to the department in the face of sharp declines in the number of students majoring in computer science or information systems.

The first section of the paper builds a case for IT literacy in the higher education curriculum. In the next section, dimensions of the IT literacy construct are discussed. Then the IT literacy course *Computers and Your World* is outlined. The paper closes with a description of the majors of all students who enrolled in the elective course over the two years since its inception – evidence of the broad appeal of a well-designed course aimed at computing for the masses.

2. THE CASE FOR INFORMATION TECHNOLOGY LITERACY

No educator argues the merits of assessing and amplifying math and English skills. In fact, reading, writing, and arithmetic skills are not only closely scrutinized but also widely accepted as predictors of college success via assessments such as the SAT and ACT. Perhaps surprisingly, recognition of IT literacy as the *fourth literacy* has yet to manifest broadly at any educational level in the form of standardized assessments, remedial courses, or inclusion in core curricula. There are exceptions, of course, but IT literacy is indeed a distant fourth at most educational institutions. This is problematic because IT literacy – like reading, writing, and arithmetic – is a meta-competency that transcends major, discipline, and profession. Perhaps the ubiquity of computers is partly to blame for the delay in acceptance of the fourth literacy. That is, many educators might assume that there is no need to assess the IT literacy of students who are exposed daily to computers and the Internet. However, our research [4] and experience teaching an IT literacy course indicate that *exposure* does not constitute *understanding* or prepare students to use computer technology and applications, or the Internet, to solve real-world problems.

We wondered if colleagues in our combined computer science and information systems department shared our conviction that all students, regardless of major, should be required to complete an IT literacy course. As Table 1 illustrates, there was strong agreement on the desirability of requiring an IT literacy course, and general agreement that benefits accrue to the department from offering a service course to the institution. It is also noteworthy, however, that our colleagues felt less than enthusiastic about themselves teaching an IT literacy course. It would be interesting to explore the degree to which this reluctance to teach a basic course in computing manifests in other departments in the discipline. The disinclination would certainly create challenges for computing departments that aim to ride the wave of the fourth literacy at their respective institutions.

Table 1: Survey of 24 professors in a combined computer science and information systems department.

Question	Scale				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. All students should be required to take an IT literacy course.	67%	13%	13%	4%	4%
2. If all students are required to take an IT literacy course, our department should offer the course.	71%	21%	8%	0%	0%
3. The benefits to the department outweigh the costs of offering a service course to the university.	35%	20%	35%	5%	5%
4. Offering a service course to the university is a way for the department to remain visible during downturns in enrollment of majors.	50%	33%	8%	8%	0%
5. I would enjoy teaching an IT literacy course.	32%	14%	36%	18%	0%

3. WHAT CONSTITUTES IT LITERACY

There are many perceptions of what constitutes IT literacy; defining and operationalizing the construct is a central challenge of developing an IT literacy course. The traditional definition of computer literacy as the ability to use computers to perform a variety of tasks is no longer adequate. The Internet-enabled computer of today is also a medium of communication and a source of nearly limitless information. IT literacy therefore encompasses not only functional and problem-solving dimensions; it must also capture the notion of information literacy – the ability to assess the validity of various sources of information.

The genesis of the IT literacy course described below was a realization that many students who were taking our classes, some CS and IS majors but many not, were ill-prepared with regard to IT literacy. Even more surprising was our institution’s internal digital divide – the high degree of variance in IT literacy that we observed among our students.

4. AN IT LITERACY COURSE – *COMPUTERS AND YOUR WORLD*

The course described in this section is an articulation of the dimensions that comprise our definition of IT literacy: basic functionality, problem-solving, and information literacy. *Computers and Your World* is comprised of three modules: 1) hardware and operating systems; 2) productivity software; and 3) networks, the Internet and information literacy. In Module 1, students become familiar with computer hardware terminology and learn basic operating system functions. A key assignment in this module requires students to configure a computer system to execute a mock online computer purchase. Module 2 focuses on word processing, spreadsheet and presentation software. One assignment in this module requires development of a spreadsheet with which a student can monitor progress in the course by entering scores earned throughout the term. The spreadsheet assignment introduces

algorithms and basic programming logic. Also in Module 2, students develop a presentation that entails imparting advice on the decision to upgrade an existing computer or purchase a new system. Module 3 encompasses networks, the Internet and information literacy. Students learn basic HTML (hypertext markup language), create a basic website, and upload files to a web server. Assessing the validity of online sources of information is a critical aspect of this module.

Course Description

Start | Run | Learn. Computers and the Internet have revolutionized society. Every profession has been affected. Communication, education and commerce have been transformed. Music, films, photography and books are digitized. News is streamed via podcasts and RSS feeds. Students who enroll in this course will rip a music CD, edit and e-mail a digital photograph, download and install software, conduct research on the web, secure a wireless router, participate in an online community and create a web site. Issues explored include security, privacy, globalization, diversity and ethics. Be a well-rounded, informed and curious user of computers and the Internet.

Learning Objectives

As a result of this course, a student will be able to:

- Become a well-rounded, confident and curious user of computers and the Internet.
- Use computer applications to solve common problems encountered at school, work or home.
- Protect a networked computer from various security and privacy threats.
- Be familiar with how computers and the Internet are used in various professions.
- Conduct research on the Internet, assessing reputability of Internet sources.
- Be aware of the social impacts of computers and the Internet.
- Be sensitive to how the Internet has impacted globalization and diversity.
- Articulate a position on ethical issues regarding computers and the Internet.

5. ENROLLMENTS IN AN IT LITERACY COURSE

The IT literacy course *Computers and Your World* was pilot-tested with one section in spring 2006. Five sections were offered in fall 2006, all in 25-student cohorts called learning communities. At the same time, we were experiencing sharp declines in the number of students declaring both CS and IS as a major. We recognized the potential strategic value in offering *Computers and Your World* as a service course to the institution. However, the course was not required in any degree program, not even in our own department's programs.

In spring 2007, the course was opened to the university community and was positively received. Five sections were again offered, with a total enrollment of 122 students. Only one section, with 16 students, was in a learning community. Again, multiple sections of the course were offered in fall 2007, with a total enrollment of 151. In spring 2008, 149 students enrolled in the course, of which 76 were participants in learning communities. In just a two-year span, 543 students enrolled in this elective IT literacy course.

As Table 2 shows, students enrolled in the course represented a wide array of majors from many academic disciplines. Psychology and political science represented the largest groups of majors among students who were not in a learning community. This is most likely because these degree programs require students to demonstrate competence in an area of science, math or technology. Not surprisingly, more variety in majors was seen among students who participated in learning communities. It was encouraging that so many students – 272 females and 271 males – enrolled in the elective IT literacy course. In fall 2008, IS and communications majors will be required to take *Computers and Your World*. Going forward, we will pursue two approaches to increase enrollment in the course: encourage other departments to require it of their majors, and propose that the course become an offering in our institution's core curriculum.

6. CONCLUSION

Computer science as a discipline will always exist. However, declining enrollments may force many computer science departments to find ways to remain relevant at their institutions. Moreover, it is clear that the discipline cannot continue to exist in isolation, as noted by Jeannette Wing, President's Professor of Computer Science at Carnegie Mellon University and Assistant Director, Computer and Information Science and Engineering Directorate, National Science Foundation. Wing eloquently points out that the drivers of computing are all-encompassing and can be found in society, technology and science [7]. Students interact with computers on a daily basis and computers impact almost every area of modern life. Computers and computing technologies also stand as the most important mechanisms behind innovation. As computing scholars, we must find ways to motivate all students to become more IT literate. A number of students who enrolled in *Computers and Your World* changed their major to CS or IS. Following our approach, other departments in the computing disciplines can ride the coming wave of information technology literacy in higher education.

Table 2: Declared majors of students enrolled in an information technology literacy course.

Learning Community			Non-Learning Community		
	Freq	%		Freq	%
Business			Business		
Accounting	3	1.41%	Accounting	4	1.21%
Business – non specified	6	2.82%	Business - non specified	12	3.64%
Economics	0	0.00%	Economics	1	0.30%
Finance	3	1.41%	Finance	4	1.21%
International Business	1	0.47%	International Business	0	0.00%
Management	18	8.45%	Management	11	3.33%
Marketing	16	7.51%	Marketing	6	1.82%
Professional Sales	1	0.47%	Professional Sales	2	0.61%
Social Sciences and Humanities			Social Sciences and Humanities		
Communication	13	6.10%	Communication	13	3.94%
Criminal Justice	0	0.00%	Criminal Justice	4	1.21%
English	0	0.00%	English	3	0.91%
Geographic Information Systems	0	0.00%	Geographic Information Systems	1	0.30%
History	3	1.41%	History	2	0.61%
International Affairs	4	1.88%	International Affairs	2	0.61%
Modern Language and Culture	1	0.47%	Modern Language and Culture	1	0.30%
Political Science	5	2.35%	Political Science	59	17.88%
Psychology	13	6.10%	Psychology	90	27.27%
Sociology	0	0.00%	Sociology	2	0.61%
Health and Human Services			Health and Human Services		
Health and Exercise Science	4	1.88%	Health and Exercise Science	8	2.42%
Human Services	0	0.00%	Human Services	1	0.30%
Nursing	4	1.88%	Nursing	10	3.03%
Sports Management	2	0.94%	Sports Management	0	0.00%
Education			Education		
Early Childhood Education	8	3.76%	Early Childhood Education	8	2.42%
Middle Grades Education	0	0.00%	Middle Grades Education	2	0.61%
Secondary English Education	1	0.47%	Secondary English Education	1	0.30%
Secondary Math Education	8	3.76%	Secondary Math Education	2	0.61%
Secondary History Education	1	0.47%	Secondary History Education	2	0.61%
Secondary Biology Education	1	0.47%	Secondary Biology Education	0	0.00%
P-12 Art	1	0.47%	P-12 Art	0	0.00%
P-12 Music	1	0.47%	P-12 Music	0	0.00%
Science and Mathematics			Science and Mathematics		
Biology	18	8.45%	Biology	16	4.85%
Biochemistry	1	0.47%	Biochemistry	0	0.00%
Biotechnology	1	0.47%	Biotechnology	2	0.61%
Chemistry	12	5.63%	Chemistry	7	2.12%
Computer Science	8	3.76%	Computer Science	5	1.54%
Information Systems	2	0.94%	Information Systems	8	2.42%
Mathematics	3	1.41%	Mathematics	3	0.91%
Fine Arts			Fine Arts		
Art	5	2.35%	Art	7	2.12%
Music	1	0.47%	Music	2	0.61%
Undeclared	44	20.66%	Undeclared	26	7.88%
			Non-matriculated	2	0.61%

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