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SOFTWARE APPLICATIONS IN HIGHER EDUCATION: NECESSARY EVIL?

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Abstract

This paper investigates whether a one-hour undergraduate information systems “skills course” is still needed in the curriculum. Since such a course requires significant institutional resources and entering students already possess some computer skills, a survey was administered and analyses conducted to determine if the course should continue to be required. The survey focused on previous knowledge, knowledge gained by taking the course as well as demographic data such as major and whether the student owns a computer. Pedagogical implications are discussed in light of the paper’s findings.

Introduction

Since many of our current students have been exposed to computers since they were very young and often bring their own computers with them to college, many students and administrators alike feel that a one-hour undergraduate “skills” course covering the Microsoft Office suite is unnecessary. Furthermore, some faculty feel that these software applications are easily self-taught, and a curriculum requirement for such a course may be outdated. To further complicate the issue, there is no consistency among schools as some schools have no requirement, some a one-credit hour requirement, and some a three-credit hour requirement. These varying-credit courses may include only software applications or may include computer theory as well. Schools also differ in the manner in which these courses are taught. Some are taught in large mega-section lecture halls with teaching assistants to help in the labs while at other schools the class is taught in small classes with faculty proportional to demand. Regardless of how this material is presented, there is a large financial implication. Can we now assume students have (or should have) this knowledge when arriving at college, or do we still have a responsibility to provide this instruction. If so, what type of pedagogy should be employed and to what kind of an audience should it be geared?

Review of the Literature

A study by Ahao et al (1998) found that business educators and business managers recommend that students possess knowledge that includes the Microsoft Office applications. Recognizing the need for these skills, many schools require the course for certain cohorts, for example particular majors, class standing, etc. The methods for providing software application instruction differ among institutions. Some schools present the material in lectures and some in labs, and some in a combination of both. Studies have shown that college-level students prefer to learn information technology in labs using hands-on, problem solving techniques (Mukherjee and Meier, 1966).

Students enter college with varying skill levels and attitudes about computer usage. Jones and Berry (1955) found that those students who own a personal computer feel more comfortable using it and will use it more often. Wiggs, et.al. (1998) concluded that there is a direct relationship between prior computer background and achievement in a computer class. Self-efficacy and success with computer-related courses has also been studied. Thus, we proposed that:

H1: Students’ who own a computer will view a computer literacy course as more important and relevant.

In addition, research shows different results in the role gender plays in computer attitudes and anxiety (Gatiker and Hlavka, 1992; Dyck and Smither, 1994; Webler, 1992). For example, Havelka (2003) found no significant differences between gender and self-efficacy. Thus, we propose that:

H2: Students' gender will influence their view of the importance of a computer literacy course.

Bretz and Johnson (2000) concluded that students have a positive outlook about educational experiences that enable them to be effective managers of their own time by completing work ahead of schedule. Instructors become facilitators of the learning process, not the purveyors of knowledge and 3 instructors are more productive and are able to teach larger classes which increasing the credit hour per faculty member and lowers the instructions costs.

The number of years that a student has owned a computer would be expected to positively influence the students' perceived computer knowledge. Harrison and Rainer (1997) found a positive relationship between computer experience and computer skill. Frequently students generalize their computer knowledge based upon their experience with a computer. Thus, we propose the following hypotheses:

H3: Students' previous use of computers influences their knowledge of Microsoft Word, PowerPoint, and Excel before taking the course.

H4: Students' previous use of computers influences their knowledge of Microsoft Word, PowerPoint, Excel, and Access after taking the course.

Finally, Chung et al (2002) and Hevelka (2003 and 2004) found that students who majored in business had a higher degree of computer self-efficacy with MIS and economics majors having the highest levels of self-efficacy while general business and management majors have the lowest. Perhaps only students with certain majors need to take the course? We contend that:

H5: There are differences in students' knowledge of Microsoft Word, PowerPoint, and Excel before taking the course and their college major.

H6: There are differences in students' knowledge of Microsoft Word, PowerPoint, and Excel before taking the course and their gender.

Background

Our university requires a one-credit-hour course in software applications of all students who attend the university—both graduate and undergraduate. The graduate students must attain an intermediate skill level in Microsoft Word, PowerPoint, Excel, and Access. The undergraduate students must attain an intermediate skill level in Word, PowerPoint, and Excel. These courses must be taken the first year for undergraduate students and the first semester for graduate students. The intent is to have the students all have the skills necessary to use the applications in classes without the instructor needing to provide instruction in the application.

Frequently, the students believe they possess sufficient knowledge prior to taking the course. For those students, a hands-on waiver exam is available to permit those with the requisite skills to waive the requirement of taking the course. The waiver exam may only be taken once, and no course credit is given for successfully completing it. Some students choose to take the course even if they feel they have the requisite skill level. About three-quarters of the graduate students who take the waiver exam pass it, and about one-quarter of the undergraduates pass it. This standardized wavier exam software is used by over 100 schools nationwide.

An on-line software package is used for both training and testing of the software applications. This software is used by over 3,000 schools in the U.S. The course is presented slightly differently for grads and undergrads. The graduate students follow a completely self-taught, tutorial approach while the undergraduates receive a minimal amount of instructor training along with the tutorial materials.

This paper is going to examine the undergraduate program since not all schools have a graduate program. Information leading to improvement/changes will have significant impact on various institutional resources.

Course Description

Introduction to Computers (ITM 200) is taught through a combination of approaches. The class meets one hour a week. The students meet for the first two weeks in large lecture halls (60-80 students). A Ph.D. instructor uses those two sessions to introduce the course, demonstrate the on-line software and demonstrate Blackboard which is used to communicate with the students. Two other sessions are conducted in the lecture hall during the term--an overview of Microsoft PowerPoint and an overview of Excel. The students meet the remainder of the weeks in labs of 20 with a lab instructor who is an MBA graduate assistant.

In the labs the students use an on-line tutorial to train themselves in Word, PowerPoint, and Excel. They are also provided with on-line practice exams. All of this on-line material is also available on every computer on campus, and students can use it at home if they have a PC compatible machine with internet connection. Students practice at their own pace both in and

out of lab, as needed, but they must take a proctored exam in the lab by an assigned date. Students may take exams early, but each exam may be taken only once. Attendance is required up to the point when the student takes an exam, after which, the student is no longer required to attend lab until after the lecture on the next application.

Research Methodology

A Course Evaluation questionnaire—a copy of which is available from the authors—was administered to all students before they took their final exam. Students completed the questionnaires in the lab and then gave them to the Lab Assistant. Confidentiality was protected. The questionnaire included questions used to determine student perceived knowledge level with computers and the required software applications before and after taking the course. Also included were questions about student attitudes about needing the course before and after taking the course as well as the student’s major and gender. A total of 712 usable questionnaires were collected.

Results & Discussion

Of the students who completed the questionnaire, 67% were male and 32% were female. 94% of all respondents own their own computers. (This latter statistic may be high for the student population as a whole, since the sample in this survey is taken from a small, private relatively affluent university). Approximately 25% have owned a PC for between 1 and 3 years’ and 50% have owned and used a PC for more than three years.

Importance of the Course

With respect to the importance of the introductory computer literacy course (ITM 200), undergraduates had varying opinions. More than a third (42.4%) found the course to be “extremely unimportant” or “somewhat unimportant” while only slightly more than a quarter (26.3%) found the course to be either “somewhat important” or “extremely important”. Approximately one-third (31%) did not find the course helpful while 42% found the course very helpful; however, the course met the needs of 43.3% of the students while 21.7% felt that it did not meet their needs.

Table 1. Importance/Relevance of ITM 200 vs. Computer Ownership

			Course Important/Relevant?					Total
			Extremely Unimportant	Somewhat Unimportant	Neither/nor	Somewhat Important	Extremely Important	
Own Computer?	yes	% within Own Computer?	19.9%	21.6%	31.2%	20.3%	6.9%	100.0%
		% of Total	18.8%	20.4%	29.4%	19.2%	6.5%	94.3%
	no	% within Own Computer?	7.1%	50.0%	28.6%	7.1%	7.1%	100.0%
		% of Total	.4%	2.9%	1.6%	.4%	.4%	5.7%
Total		% within Own Computer?	19.2%	23.3%	31.0%	19.6%	6.9%	100.0%
		% of Total	19.2%	23.3%	31.0%	19.6%	6.9%	100.0%

Almost twice as many students (27% compared to 14%) felt that the course was important and relevant. Of those that felt it was largely unimportant, fewer students who own a computer felt this way. This provides at least some support for the argument that students who own a computer will view the course as more relevant and/or important.

Table 2. Importance/Relevance of ITM 200 vs. Gender

			Course Important/Relevant?					Total
			Extremely Unimportant	Somewhat Unimportant	Neither/nor	Somewhat Important	Extremely Important	
Gender	Female	% within Gender	17.0%	25.5%	32.7%	19.4%	5.5%	100.0%
		% of Total	11.4%	17.1%	22.0%	13.1%	3.7%	67.3%
	Male	% within Gender	23.8%	18.8%	27.5%	20.0%	10.0%	100.0%
		% of Total	7.8%	6.1%	9.0%	6.5%	3.3%	32.7%
Total	% within Gender	19.2%	23.3%	31.0%	19.6%	6.9%	100.0%	
	% of Total	19.2%	23.3%	31.0%	19.6%	6.9%	100.0%	

The role of gender is significant in terms of course importance/relevance. Twice as many females (16.8%) felt the course was either somewhat important or extremely important as males (9.8%). Conversely, females were also twice as likely (28.5%) to view the course as unimportant than were males (14%). Thus, there is some support for hypothesis 2 in that gender does play a role in the important/relevance of the course.

Table 3. Use Frequency vs. Skills Before Taking Course

		Frequency of Word usage					Total
		Never	Almost Never	Sometimes	Very Often	Always	
Skills on Word before taking the course	No skills		.4%			.8%	1.2%
	Poor skills	.4%		.8%	1.6%	.8%	3.7%
	fair	.8%	.8%	4.9%	9.8%	7.8%	24.1%
	Good skills	.8%		2.4%	22.4%	21.6%	47.3%
	Excellent skills	.4%			5.3%	18.0%	23.7%
Total		2.4%	1.2%	8.2%	39.2%	49.0%	100.0%
		Frequency of PowerPoint usage					Total
		Never	Almost Never	Sometimes	Very Often	Always	
Skills on PowerPoint before taking the course	No skills	6.1%	4.1%	1.2%	1.2%		12.7%
	Poor skills	2.9%	8.6%	2.9%	1.2%		15.5%
	fair	3.3%	14.3%	10.2%	3.3%		31.0%
	Good skills	2.9%	7.3%	15.1%	4.1%	1.2%	30.6%
	Excellent skills	1.2%	1.6%	3.7%	2.9%	.8%	10.2%
Total		16.3%	35.9%	33.1%	12.7%	2.0%	100.0%
		Frequency of Excel usage					Total
		Never	Almost Never	Sometimes	Very Often	Always	
Skills on Excel before taking the course	No skills	17.6%	2.9%	1.6%	.4%	.4%	22.9%
	Poor skills	11.0%	12.2%	2.0%	.8%	.4%	26.5%
	fair	7.8%	10.2%	11.0%	1.6%	.4%	31.0%
	Good skills	2.4%	5.3%	4.5%	3.3%	1.2%	16.7%
	Excellent skills	.8%	.4%	.8%	.8%		2.9%
Total		39.6%	31.0%	20.0%	6.9%	2.4%	100.0%

Hypothesis 3 contends that Students' previous use of computers influences their knowledge of Microsoft Word, PowerPoint, and Excel before taking the course. Table 3 provides support in that students who used applications more often (i.e. Word) reported better skills than when they were less familiar with an application (i.e. Excel). Overall, students felt more comfortable with Word and less comfortable with Excel and PowerPoint (see table 3).

In interesting development occurred with respect to the post-course survey of skills. There was no change in the comfort level when compared to the frequency of usage. Recall from Table 3, students who are more familiar with an application report better skills. After completing the course, their level of comfort with all applications increased and hence, so did their frequency of use. This is particularly true with Excel and PowerPoint (see table 4).

Table 4. Use Frequency vs. Skills After Taking Course

		Frequency of Word usage					Total
		Never	Almost Never	Sometimes	Very Often	Always	
Skills on Word after taking the course	No skills		.4%		.4%	1.2%	2.0%
	Poor skills			.4%			.4%
	fair	.8%		2.5%	2.9%	2.0%	8.2%
	Good skills	.8%	.8%	2.9%	17.2%	13.9%	35.7%
	Excellent skills	.8%		2.5%	18.4%	32.0%	53.7%
Total		2.5%	1.2%	8.2%	38.9%	49.2%	100.0%
		Frequency of PowerPoint usage					Total
		Never	Almost Never	Sometimes	Very Often	Always	
Skills on PowerPoint after taking the course	No skills		.4%		.4%	.4%	1.2%
	Poor skills	2.0%		.4%			2.5%
	fair	4.1%	10.7%	2.9%	1.6%		19.3%
	Good skills	4.9%	18.9%	13.9%	4.5%	.4%	42.6%
	Excellent skills	5.3%	5.7%	16.0%	6.1%	1.2%	34.4%
Total		16.4%	35.7%	33.2%	12.7%	2.0%	100.0%
		Frequency of Excel usage					Total
		Never	Almost Never	Sometimes	Very Often	Always	
Skills on Excel after taking the course	No skills	2.0%	.4%				2.5%
	Poor skills	8.6%				.4%	9.0%
	fair	13.1%	13.5%	7.0%	1.2%		34.8%
	Good skills	10.2%	11.5%	9.0%	3.3%	.8%	34.8%
	Excellent skills	5.3%	5.7%	4.1%	2.5%	1.2%	18.9%
Total		39.3%	31.1%	20.1%	7.0%	2.5%	100.0%

Recall that Chung et al (2002) and Hevelka (2003 and 2004) found that students who majored in business had a higher degree of computer self-efficacy. We proposed that **there are differences in students' knowledge of Microsoft Word, PowerPoint, and Excel before taking the course and their college major.** Analysis of the data supports this hypothesis in that college of business majors (denoted COB) had between two and four times the frequency of use with all applications than students from the college of liberal arts (CLAS) or from Nursing (see table 5). While this may be the result of greater emphasis on these skills within the major or school, the students taking the course are Freshmen and most have not begun to take courses in their major as yet. This might also lend credence to the argument that business majors have different needs and such an introductory course may not be sufficient alone.

Table 5. Skills Before Taking Course vs. Major

		Skills on Word before taking course					Total
		No skills	Poor skills	fair	Good skills	Excellent skills	
Major	COB: Acc/Eco/Fin/IB/Mkt	.8%	.8%	3.3%	12.2%	8.2%	25.3%
	COB: Mgt general		.8%	1.2%	1.6%	1.6%	5.3%
	CLAS: Bio/Marine/Exer.Sciences			4.1%	11.4%	3.7%	19.2%
	Nursing/Psychology	.4%		1.6%	5.7%	3.7%	11.4%
	CLAS: Comm/Educ/ SporMgt/Crim/IntS		1.2%	7.3%	7.3%	3.3%	19.2%
	CLAS: Fine Arts		.4%	.8%	2.0%	.4%	3.7%
	Other		.4%	5.7%	6.9%	2.9%	15.9%
Total		1.2%	3.7%	24.1%	47.3%	23.7%	100.0%
		Skills on PowerPoint before taking course					Total
		No skills	Poor skills	fair	Good skills	Excellent skills	
Major	COB: Acc/Eco/Fin/IB/Mkt	2.4%	3.7%	5.7%	9.4%	4.1%	25.3%
	COB: Mgt general	.4%	.4%	1.6%	1.6%	1.2%	5.3%
	CLAS: Bio/Marine/Exer.Sciences	1.2%	1.6%	8.2%	6.5%	1.6%	19.2%
	Nursing/Psychology	.4%	.8%	4.5%	4.9%	.8%	11.4%
	CLAS: Comm/Educ/ SporMgt/Crim/IntS	4.1%	5.3%	4.5%	4.1%	1.2%	19.2%
	CLAS: Fine Arts	2.0%	.4%	.4%	.4%	.4%	3.7%
	Other	2.0%	3.3%	6.1%	3.7%	.8%	15.9%
Total		12.7%	15.5%	31.0%	30.6%	10.2%	100.0%
		Skills on Excel before taking course					Total
		No skills	Poor skills	fair	Good skills	Excellent skills	
Major	COB: Acc/Eco/Fin/IB/Mkt	5.7%	6.1%	6.9%	4.9%	1.6%	25.3%
	COB: Mgt general	.4%	1.2%	2.9%	.4%	.4%	5.3%
	CLAS: Bio/Marine/Exer.Sciences	3.7%	5.3%	4.9%	5.3%		19.2%
	Nursing/Psychology	.8%	3.3%	5.3%	1.6%	.4%	11.4%
	CLAS: Comm/Educ/ SporMgt/Crim/IntS	6.1%	5.7%	4.9%	2.4%		19.2%
	CLAS: Fine Arts	2.0%	.4%	.8%	.4%		3.7%
	Other	4.1%	4.5%	5.3%	1.6%	.4%	15.9%
Total		22.9%	26.5%	31.0%	16.7%	2.9%	100.0%

When post-course analysis is compared, our final hypothesis, **there are differences in students' knowledge of Microsoft Word, PowerPoint, and Excel before taking the course and their gender**, is supported as well. While the differences are not as pronounced as before the course is taken, there is still a two-to-one ratio between the college of business majors and their liberal arts and Nursing counterparts (see table 6).

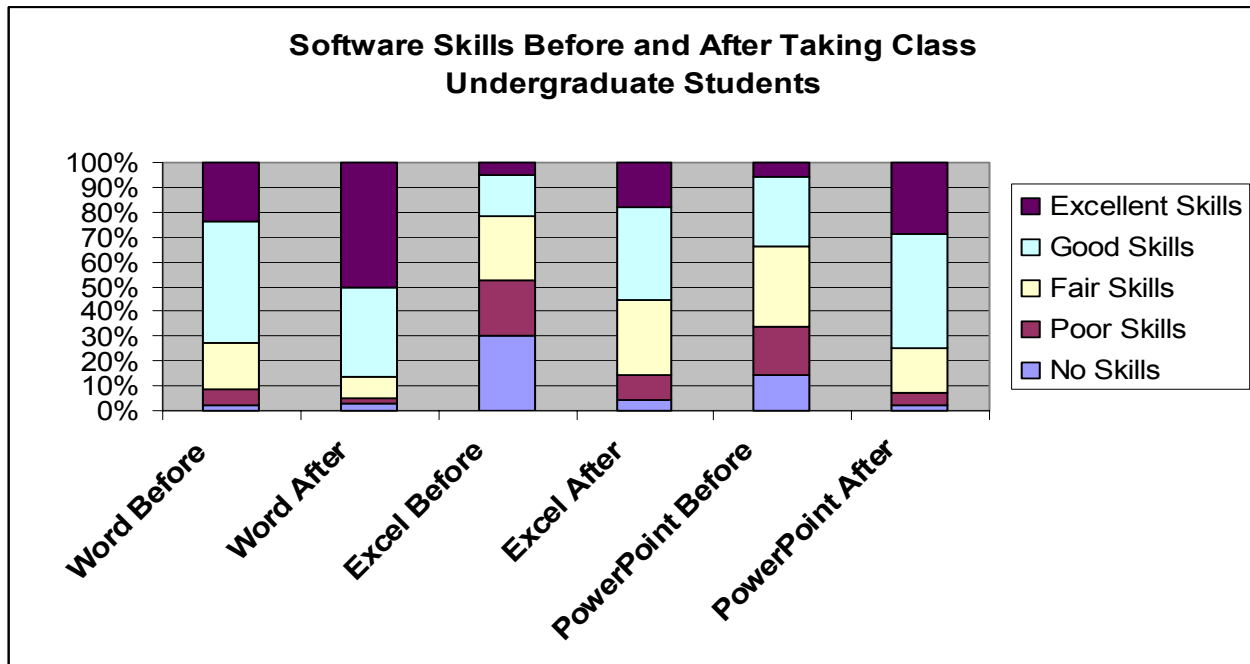
Table 6. Skills After Taking Course vs. Major

		Skills on Word before taking course					Total
		No skills	Poor skills	fair	Good skills	Excellent skills	
Major	COB: Acc/Eco/Fin/IB/Mkt	1.6%		1.2%	5.3%	17.2%	25.4%
	COB: Mgt general				1.6%	3.7%	5.3%
	CLAS: Bio/Marine/Exer/Sciences			2.0%	7.4%	9.8%	19.3%
	Nursing/Psychology	.4%		.4%	4.5%	6.1%	11.5%
	CLAS: Comm/Educ/ SporMgt/Crim/IntS			2.9%	7.4%	8.6%	18.9%
	CLAS: Fine Arts		.4%		2.0%	1.2%	3.7%
	Other			1.6%	7.4%	7.0%	16.0%
Total		2.0%	.4%	8.2%	35.7%	53.7%	100.0%
		Skills on PowerPoint after taking course					Total
		No skills	Poor skills	fair	Good skills	Excellent skills	
Major	COB: Acc/Eco/Fin/IB/Mkt	1.2%	.8%	3.7%	8.2%	11.5%	25.4%
	COB: Mgt general				2.0%	3.3%	5.3%
	CLAS: Bio/Marine/Exer/Sciences		.4%	2.0%	10.2%	6.6%	19.3%

	Nursing/Psychology			2.5%	5.3%	3.7%	11.5%
	CLAS: Comm/Educ/ SporMgt/Crim/IntS		.4%	7.4%	4.9%	6.1%	18.9%
	CLAS: Fine Arts		.4%		2.0%	1.2%	3.7%
	Other		.4%	3.7%	9.8%	2.0%	16.0%
Total		1.2%	2.5%	19.3%	42.6%	34.4%	100.0%
		Skills on Excel after taking course					Total
		No skills	Poor skills	fair	Good skills	Excellent skills	
Major	COB: Acc/Eco/Fin/IB/Mkt	1.2%	2.5%	7.0%	7.0%	7.8%	25.4%
	COB: Mgt general			1.2%	2.0%	2.0%	5.3%
	CLAS: Bio/Marine/Exer/Sciences		2.0%	4.9%	8.2%	4.1%	19.3%
	Nursing/Psychology		.8%	4.5%	4.1%	2.0%	11.5%
	CLAS: Comm/Educ/ SporMgt/Crim/IntS	.4%	2.0%	9.0%	6.6%	.8%	18.9%
	CLAS: Fine Arts			1.6%	1.6%	.4%	3.7%
	Other	.8%	1.6%	6.6%	5.3%	1.6%	16.0%
Total		2.5%	9.0%	34.8%	34.8%	18.9%	100.0%

When students' skills are compared before and after taking the class, there are noticeable differences in each of the three applications. More students feel that they have good or excellent skills in Word than either Excel or PowerPoint, but still show gains in each category after completing the class. A significant number of students have either no skills or poor skills in Excel and PowerPoint, but after completing the class this drops to almost none. Few students initially feel that have good or excellent skills and, likewise after completing the course, many feel that they are now competent in these skill sets.

Figure 1. Comparison of Undergraduate Students' Skills in Microsoft Word, Excel & PowerPoint before and after Taking the Course



Implications for Educators

The resource costs (salaries, labs, software, etc.) of requiring the software competencies course are significant. With the uncertainty of both faculty and students about the need for the course, it is important to look at what students perceived they knew before and after the course to see if the gains justified the high costs.

Undergraduate students began Word with 72% perceiving their skills to be good or excellent. After the course 88% perceived their skill to be in these categories with 50% in the excellent category. This indicates that even if they felt their skills were at least fair, at the end of the course, their skills had definitely improved. Word was the application with which the students felt they had the highest prior skill level. Excel and PowerPoint had similar results, although more dramatic. More students began with no or poor skills and improved significantly during the course.

These results indicate that the course is worthwhile for both undergraduate and graduate students. Looking at each application provided important information. Students should be provided with these results before they take the course. It would encourage a more positive approach to the course. Faculty should also be shown the results. They also would be more confident that the students actually need to take the course and that the expenditure of scarce resources is justified. Providing the students with an opportunity to take a waiver exam prior to the course helps ensure that those who are taking the course either perceive that they need the skills, or they want to improve their skills or their GPAs.

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