SURVEY OF TECHNOLOGY SKILLS OF INCOMING FRESHMEN: A LONGITUDINAL STUDY 2001-2004

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ABSTRACT

The major objective of the initial study was to provide an understanding of what computer skills and background the typical freshman student possesses when entering college. A profile was developed to help identify the skill level of incoming freshmen students in a variety of computer-related areas, including software applications and hardware. A comparison of the computer skills and backgrounds of freshmen students for three consecutive years provides additional insights for faculty regarding the differences between typical freshman students.

Keywords: Computer literacy, computer skills, technology, comparison of computer skills.

INTRODUCTION

All levels of our educational system are impacted by the dynamic nature of the IT field. With this volatility comes many challenges, including defining competencies such as the term "computer literacy" (3,8,9. One recent study on piloting a computer literacy test reported 16 definitions of the term (5). Computer literacy first became an issue in the mid-1980s with the primary focus on word processing (9). In the 1990s we expanded the concept to include additional applications like spreadsheets and databases. In the 21st century we expect our students to possess additional skills in using course delivery technologies and e-mail communication. Our students must broaden their computer skills to meet these increased expectations and our educational institutions must be prepared to do this (9).

Many states, like Michigan, have developed curriculum for high school business education programs (1,4,5). For the 2003-04 academic year, Michigan has implemented a new business education curriculum (cross-walked to the Federal Career Clusters) which includes a comprehensive IT program as a major component. Michigan's new business education curriculum has been aligned with not only state and national guidelines for IT, but has also partnered with the IT Career Cluster Initiative (ITCCI). ITCCI is sponsored by the U.S. Department of Education and the National School to Work Office whose goal it is "to create a national model and career cluster curricular framework for IT careers that involve the design, development, support and management of hardware, software, multimedia and systems integration services" (10).

PURPOSE OF THE STUDY

The primary purpose of the current study was to compare the computer skills and background of incoming college freshman for three consecutive years. In continuing the study in 2003-04, a comparison of the computer skills and backgrounds of freshmen students for three consecutive

years provides additional insights for faculty in recognizing what, if any differences may exist from year-to-year. Additional demographic information was also gathered including the age students first began using a computer and number of computer classes taken in high school. Specific computer skills and the extent of these skills as perceived by students were determined as they related to:

1. Application software such as word processing, database, presentation, statistical, website development, and Windows and the application students use most.
2. Use of the Internet for conducting effective research, buying/shopping online, and various personal interests such as downloading music, games, and chat rooms.

OBJECTIVES

The major objective of this study was to provide an understanding of what computer skills and background the typical freshman student possesses when entering college. By identifying and comparing the technology skills and background of typical incoming freshmen for three consecutive years, faculty can accomplish the following objectives:

1. Update and improve the relevance of computer literacy and introductory computer courses and curriculum.
2. Incorporate learning experiences in these courses to address the different levels of skills.
3. Establish a better understanding of how high school computer courses impact the post-secondary IT curriculum.
4. Understand the potential for differences in computer skills between students from year-to-year and identify trends and/or patterns.

METHODOLOGY

This study was conducted at a Division I comprehensive public university in the Midwest with enrollments of 17,509 undergraduates. The freshmen class consisted of 4,665 students of which 3,623 were considered new freshmen attending school for the First Time In Any College (FTIAC). The university has students enrolled from 48 states and 69 countries. The average ACT composite score for entering new freshmen for 2003 was 22. The average high school GPA of these new freshmen was 3.33. Gender and minority data of these new freshmen consisted of 59.1 percent male, 58.5 percent female, and 8.9 percent minority students.

A 22-item descriptive survey instrument was administered to all sections of a 100-level computer literacy class, *Computers and Society*, during the fall and spring semesters of 2003-04. Table 1 shows the classification of students for the three years of the study. A total of 366 students were surveyed for 2003-04. The vast majority (93.9 percent) of these students graduated from public high schools.

To easily identify the specific years of the study in this discussion of the data, we will refer to the first year of the study, 2001-02 as “year 1”; 2002-03 as “year 2”; and 2003-04 as “year 3”. In year 3, nearly 79 percent of the respondents were freshmen and 73 percent graduated in 2003. In year 2, 74.9 percent were freshmen and 73 percent graduated in 2002.

Table 1. Classification of Students by Year

Classification	# Responses			% Responses		
	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Freshmen	358	373	288	100%	74.9%	78.7%
Sophomore	0	96	51	-	19.3%	14.0%
Junior	0	12	17	-	2.4%	4.6%
Senior	0	17	10	-	3.4%	2.7%
Total	358	498	366	100.0%	100.0%	100.0%

As shown in Table 2, the age at which students first began changed dramatically in year 3, with the highest percentage of respondents (40.8 percent) reporting the age they first began using computers to be 1-4 years of age, followed closely by 5-7 years of age with 37.7 percent.

Table 2. Age Students First Began Using a Computer by Year

Age	Year 1		Year 2		Year 3	
	# Responses	% Responses	# Responses	% Responses	# Responses	% Responses
1-4	6	1.8%	8	1.6%	117	40.8
5-7	48	13.8%	91	18.5%	91	37.7
8-10	157	45.3%	208	42.4%	42	14.6
11-12	64	18.4%	103	21.0%	22	7.7
13 and above	70	20.1%	81	16.5%	15	5.2
Total	347	100.0%	497	100.0%	287	100.0%

Table 3 compares the number of high school computer classes taken for the three years of the study. The largest percentage (36.7 percent) of students in year 1 reported having taken two computer classes. In year 2 the largest percentage (31.4 percent) of students took one computer class, while 26.4 percent took two computer classes. Worth noting is the substantial increase in the number of students who took three computer classes (23.3 percent in year 2 versus 16.8 percent in year 1). In year 3, only 7.6 percent reported that they did not take any computer classes in high school while the remaining respondents reported taking one or more computer classes. More than 32.8 percent reported that they took three or more computer classes in high school.

Table 3. Number of Computer Classes Taken in High School by Year

No. of Computer Classes	Year 1		Year 2		Year 3	
	#	%	#	%	#	%
	Responses	Responses	Responses	Responses	Responses	Responses
0	50	14.0%	94	18.9%	28	7.6%
1	116	32.5%	156	31.4%	102	27.9%
2	131	36.7%	131	26.4%	116	31.7%
3 +	60	16.8%	116	23.3%	120	32.8%
Total	357	100.0%	497	100.0%	366	100.0%

Students were asked to rate their skill levels in using a variety of applications on a five-point scale with one being “none” and five being “high”. Tables 5a, 5b, and 5c show the results of each year and provide a comparison of the responses. In year 1 (Table 5a) the largest percentage of students (48 percent) rated their skill level highest at “5” for Windows with the second largest

percentage of students rating their skill level for word processing applications as a "4". In comparison, the largest percentage of students (56.5 percent) in year 2 (Table 5b) rated their skill as a "4" for word processing applications with the highest skill rating of "5" for any application being Windows (55.6 percent). As may be expected, the software application used most by student respondents for all three studies was Word (94.3 percent in year 3; 90.3 in year 2; and nearly 75 percent of students in year 1).

Table 5a. Year 1 Student Ratings of Skill Level in Using Applications (n=353-356)

Application	Rating *"none"* # / %	Rating # / %	Rating # / %	Rating # / %	Rating *"high"* # / %	Total # Responses/%
	1	*2*	*3*	*4*	*5*	
Word Processing	2 .6%	13 3.7%	82 23%	167 46.9%	92 25.8%	356 100%
Database	52 14.6%	86 24.2%	134 37.6%	64 18%	20 5.6%	356 100%
Presentation	25 7.1%	78 22.1%	110 31.2%	99 28%	41 11.6%	353 100%
Statistical	115 32.3%	87 24.4%	81 22.8%	55 15.4%	18 5.1%	356 100%
Website Dev.	85 23.9%	92 25.8%	93 26.1%	58 16.3%	28 7.9%	356 100%
Windows	0 0.0%	11 3.1%	42 11.8%	132 37.1%	171 48%	356 100%

Students rated their skill level lowest as a "1" (or none) for statistical software in both studies (32.3 percent in year 1 and 47 percent in year 2). Although only statistical software skills were rated as a "1" (or none) in year 1, two applications were rated as "1" (or none) by students in year 2: statistical software and website development (34.1 percent). When comparing the two studies, it is noteworthy to report students in the year 2 study rated their skill level for four applications (word processing, database, and presentation, and Windows) as "4" or "5" compared to only two applications (word processing and Windows) being rated this high in the year 1. In year 3, the highest ratios of respondents rated themselves as having "none" in terms of the skills in database, statistical and website development. Students rated their skill levels as "4" in word processing, presentation, and windows software.

Table 5b. Year 2 Student Ratings of Skill Level in Using Applications (n=482-499)

Application	Rating *"none"* # / %	Rating # / %	Rating # / %	Rating # / %	Rating *"high"* # / *I*	Total # Responses
	1	*2*	*3*	*4*	*5*	
Word Processing	4 .8%	10 2%	33 6.6%	282 56.5%	170 34.1%	499 100%
Database	38 7.9%	104 21.6%	109 22.6%	211 43.8%	20 4.1%	482 100%
Presentation	58 11.6%	73 14.6%	73 14.6%	215 43.1%	80 16.1%	499 100%
Statistical	234 47%	120 24.1%	73 14.7%	59 11.8%	12 2.4%	498 100%
Website Dev.	169 34.1%	84 17%	60 12.1%	139 28.1%	43 8.7%	495 100%

Windows	2 0.4%	10 2%	21 4.2%	188 37.8%	276 55.6%	497 100%

Table 5c. Year 3 Student Ratings of Skill Level in Using Applications (n=354-365)

	"none"				*"high"*	
	Application	Rating	Rating	Rating	Rating	Rating
	1	*2*	*3*	*4*	*5*	Total
Word Processing	10	22	79	186	60	357
	2.8%	6.2%	22.1%	52.1%	16.8%	100%
Database	147	116	64	24	8	359
	41.1%	32.3%	17.8%	6.7%	2.2%	100%
Spreadsheet	41	94	123	79	23	360
	11.4%	26.1%	34.2%	21.9%	6.4%	100%
Presentation	54	54	103	108	35	354
	15.2%	15.2%	29.1%	30.5%	9.9%	100%
Statistical	216	66	50	22	5	359
	60.2%	18.4%	13.9%	6.1%	1.4%	100.0%
Website Dev.	166	81	65	30	17	359
	46.2%	22.6%	18.1%	8.4%	4.7%	100.0%
Windows	13	17	53	159	117	359
	3.6%	4.7%	14.7%	44.3%	32.6%	100%

Statistical analysis was also conducted to determine if there was any significance in various factors when compared across the three studies:

(1) There were significant differences in factors related to the class of high school when correlated to the computer skills of the students. Michigan uses a classification system (AA, A, B, C, and D) for high schools based on enrollment with AA being the largest schools. In year 2, the word processing skill reported by students who graduated from class A schools was significantly different from that reported by students from class B schools. The technology skill of using the Internet for shopping online was different between students from the A and D schools as well as between B and D schools. In each case, students who graduated from the larger school rated their computer skills higher overall. In year 3, a one-way ANOVA test was used to determine whether the class of high school affected the students' computer skills. There was significant difference ($p=0.012$) among the skill levels of using the Internet for email between students from AA and those from C schools. Students from class AA schools reported a higher skill level using the Internet for emails.

(2) In year 2 and year 3, there was significant difference in the computer skills reported by the students who had taken varying numbers of computer classes in high school. In year 3, there was significant difference in the word processing skill level among students who had taken 0, 2, 3, and 4 classes. The more computer classes a student had taken, the greater his/her reported computer skills in word processing. In year 2, there was also a significant difference in the spreadsheet skills of those who took 0, 1, or 2 computer classes and those who had taken 3 computer classes. The mean skill level for those who took three computer classes was higher. In year 3, there was significant difference in the spreadsheet skills among student who had taken 0,

2, 3, 4, and 5 classes. The more computer classes a student had taken, the greater his/her reported level of computer skills using a spreadsheet.

In year 3, there was significant difference in the presentation skills among students who had taken 0, 2, 3, and 4 classes. Students who had taken 2, 3, or 4 computer classes reported a higher level of computer skills that those who had taken zero classes. In addition, there was significant difference in the presentation skills between students who had taken 1 and 3 classes. Students who had taken three computer classes reported a higher skill level than those who had taken just one computer class.

In year 3, there was significant difference in the Windows skills among students who had taken 0, 1, 2, 3, and 4 classes. The more computer classes a student had taken, the greater his/her reported level of computer skills using Windows. There was significant difference in using the Internet for email skills among students who had taken 0, 1, 2, 3, and 4 classes. The more computer classes a student had taken, the greater his/her reported level of computer skills using the Internet for emails. In fact, in year 3, the reported skills related to the use of word processing, spreadsheet, presentation software, Windows, and the Internet for email, have a positive correlation with the number of computer classes a student had taken. On the other hand, there was enough evidence to say that the computer skills related to database, statistical software, web site development, Internet for research, Internet for shopping online, and computer games were not affected by the number of computer classes students had taken in high schools.

(4) In year 3, an independent sample t-test was used to test whether there were differences in the level of computer skills between male and female students. With $p=0.785$, there were no significant differences between the computer skills reported by female students and male students. These results are consistent with other studies that indicate that computer skill differences between male and female students no longer exist (2).

SUMMARY AND CONCLUSIONS

It is important to keep in mind that since the skill level data in this study was self-reported, the potential for respondents to overstate or understate their skills is inherent in these results. This may explain some of the outcomes. Based on the 2002-03 and 2003-04 studies, it can be concluded that those students who began using computers at age 13 or later rated their overall skill level lower than those who started younger than age 13. As we continue the study it will be interesting to see if we continue to see the "age first began using computers" to be as young as the "1-4 years of age" indicated by the 2003-04 respondents; a significant decrease in age by respondents when compared with the 8-10 year old range given in the first two years and the impact this age factor could have on reported skill levels.

To summarize the results of this study over the past three years, we can develop a profile of the typical incoming college freshman for this university. The following list provides this profile information:

Factor	Year 3	Year 2	Year 1
Age First Began Using Computers:	1-4	8-10	10
# Computer Classes Taken in High School:	1-2	1	2
Classification of High School Graduated From:	"A"	"A"	"A"
Most Used Application:	WP (Word)	same	same

Skill Level for Application Software *(1= none; 5=high)*	Year 3	Year 2	Year 1
Word Processing	4	4	4
Database	1	3	3
Spreadsheets	3	4	n/a
Presentation	4	4	3
Statistical	1	1	4
Web Site	1	1	3
Windows	4	5	5

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