Does a Technology Intensive Program Improve Student Comfort Using Information Technology?

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ABSTRACT

This paper compares the comfort level of students in a laptop initiative business program and students in a non laptop initiative business program to use information technology such as Excel or the Internet to solve quantitative problems. The results, based on 584 students, indicate that students in the laptop initiative tended to show a preference for the use of information technology and the laptop initiative program is significant to the students' comfort level with the use of word processors and spreadsheets but the comfort for using the Internet is about the same.

INTRODUCTION

As an attempt to increase student skills in the use of technology, many colleges and schools of business are adopting technology intensive initiatives that require students to own a laptop or have access to some type of computer in the classroom and encourage faculty to actively use computers in the classroom. For faculty, the question becomes how to make the use of the computer relevant to their individual courses and engaging enough to garner enthusiasm and interest by students, especially since technology skills are pertinent to future careers.

But even with technology intensive initiatives, professors are encouraged but not required to use technology in their instruction (Bruce & Levin, 2003). A recent survey of a technology intensive initiative found students felt that professors do not fully integrate technology in a meaningful way to support their curricular goals, that is, the projects assigned and demonstrated in the classroom did not justify the use of the laptop and that the same goal could be accomplished as easily if not faster using manual methods such as the calculator or paper and pen (Booker, 2007).

Complementary to the notions of a narrow construction of technology and the instrumental use of technology in some teachers' practice has been the idea of "division of labor" (Hass & Neuwirth, 1994) among many instructors who believe that use of computers is covered by management information systems or computer information systems courses. This attitude may invade the classroom as well, inadvertently discouraging students from seeing the benefits of developing their technology skills. So when professors have with limited knowledge of how to actively engage technology in the classroom, professors are likely to continue inadvertently implying that the use technology is more for instrumental purposes, as a tool to "learn from" (Jonassen, Howland, Moore, & Marra, 2003) rather than as a business tool itself.

This paper examines student attitudes towards the use of technology in general. We surveyed 584 students of which 295 were students enrolled in a laptop initiative business program and 289 were enrolled in non laptop initiative programs.

REVIEW OF LAPTOPS IN EDUCATION

Several studies investigated the use of laptops in the classroom and found that the electronic notebooks had several benefits, such as increasing students' motivation and collaboration, strengthening connections between disciplines, improving students' problem solving skills, and promoting academic achievements (Kiaer, Mutchler, & Froyd, 1998; Mackinnon & Vibert, 2002; Siegle & Foster, 2001; Stevenson, 1998). In a study conducted by Finn and Inman (2004), laptop computers were provided to all incoming freshman. The results indicated a positive change in students' attitudes related to the educational program, and that digital divides, based on gender and field of study, were diminished.

Although there are many studies that present positive aspects, several studies describe the shortcomings of laptop usage in educational settings. A recent study found that the availability of laptop computers may increase students' opportunities for non-learning usages and limit or even reverse benefits when measured in terms of academic performance (Grace-Martin & Gay, 2001).

METHODOLOGY

The purpose of the paper is to examine student comfort with using information technology. Our specific interest was whether or not students in the laptop initiative program felt more comfortable with using tools such as Excel and the Internet, and the significance of the initiative on the student comfort level. To conduct the study, students were given a survey that asked whether or not they had completed an Introduction to Computers course before enrolling in the college and the preference for using Excel, a calculator, the Internet and/or paper and pencil to solve certain types of problems. The study covered three academic semesters: Fall 2007, Spring 2008, and Fall 2008. The questions used in the survey were developed from a qualitative survey taken during the Spring 2007 to capture student concerns about the lack of use of the laptops in the classroom. To help understand the type of tasks the students interviewed wanted to learn or felt should be covered during the class, the survey questions focused on data analysis as well as the technology students wanted to learn more about.

ANALYSIS AND DISCUSSION

There were 584 usable surveys submitted. The first step in the analysis was to determine how similar the two institutions were in terms of demographics. As Table 1 shows, institution 0 (the non laptop initiative program) had 289 respondents. Institution 1 had 295 respondents. Both institutions have a total business college enrollment of approximately 1000 undergraduate students so the approximate 30% of respondents provides a strong basis for drawing conclusions.

Institution	0				1			
	N=289				N=295			
	Mean	Std. Deviation	Min	Max	Mean	Std. Deviation	Min	Max
Age 18-21	0.51	0.50	0	1	0.55	0.50	0	1
Age 22-25	0.45	0.50	0	1	0.40	0.49	0	1
Age Over 25	0.05	0.22	0	1	0.06	0.24	0	1
Male	0.51	0.50	0	1	0.45	0.50	0	1
Required	0.83	0.37	0	1	0.88	0.33	0	1
Completed an Intro2Comp	0.99	0.10	0	1	0.99	0.10	0	1
TakenOnline	0.41	0.49	0	1	0.37	0.48	0	1
OwnComp	0.93	0.25	0	1	0.94	0.24	0	1
Own<year	0.38	0.49	0	1	0.50	0.50	0	1
OwnYear-2	0.30	0.46	0	1	0.25	0.44	0	1
Own>2 years	0.25	0.43	0	1	0.19	0.39	0	1
InternetComfort	4.02	0.82	3	5	4.11	0.80	3	5
CalculatorComfort	4.46	0.50	4	5	4.53	0.50	4	5
WPComfort	3.96	0.91	2	5	4.19	0.84	2	5
SSComfort	3.11	0.84	1	5	4.00	0.97	1	5
Task1Pref	2.51	1.19	1	4	2.47	1.21	1	4
Task2Pref	1.71	0.87	1	4	1.63	0.72	1	4
Task3Pref	2.95	0.81	2	4	2.73	0.87	2	4
Task4Pref	2.90	0.88	2	4	2.80	0.90	2	4
Task5Pref	2.82	0.84	2	4	2.58	0.87	2	4

Table 1-Institutional Demographics and Means for the Dependent Variables

Other key factors from the data show that similar percentages of students at both schools own computers. The students at the laptop initiative have owned their computers for less time but that is because the college requires students to purchase a specific computer to enroll in laptop course sections. The means for the comfort variables show there is little difference between the technology comfort levels except for the spreadsheet comfort. The comfort for using

spreadsheets for the non laptop initiative program is about average (3.11) whereas the comfort for the laptop initiative is above average (4.00). Although the difference between the two is almost one, we ran a t-test to determine and confirm if the mean difference was significant. The results are shown in Table 2-Independent Sample (Spreadsheet Comfort) T-Test.

			SSComfort	
			Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances	F		14.26622	
	Sig.		0.000175	
t-test for Equality of Means	t		-11.79	-11.81
	df		582.00	574.67
	Sig. (2-tailed)		0.00	0.00
	Mean Difference		-0.89	-0.89
	Std. Error Difference		0.08	0.08
	95% Confidence Interval of the Difference	Lower	-1.03	-1.03
		Upper	-0.74	-0.74

Table 2-Independent Sample (Spreadsheet Comfort) T-Test

The t-test indicates that the difference for spreadsheet comfort was significant at .00. So the initial analysis implies that there is some value-added to being in the initiative program beyond just having owning the computer. We then analyzed student preference for using a manual technology (paper and pencil or calculator) or an information technology (Internet or spreadsheet) to solve certain types of problems. To understand the preferences, we ran frequencies for each of the five tasks. The preferences were coded as 1 for preference to use the Internet, 2 for preference to use Excel, 3 for preference to use paper and pencil, and 4 for

preference to use the calculator. The resultant frequencies for each institution and task are shown in the tables 3 through 7.

Task1Pref

Institution			Frequency	Percent	Valid Percent	Cumulative Percent
0	Valid	1	72	24.9	24.9	24.9
		2	93	32.2	32.2	57.1
		3	28	9.7	9.7	66.8
		4	96	33.2	33.2	100.0
		Total	289	100.0	100.0	
1	Valid	1	81	27.5	27.5	27.5
		2	92	31.2	31.2	58.6
		3	23	7.8	7.8	66.4
		4	99	33.6	33.6	100.0
		Total	295	100.0	100.0	

Table 3-Frequencies for home loan payment

Task2Pref

Institution			Frequency	Percent	Valid Percent	Cumulative Percent
0	Valid	1	148	51.2	51.2	51.2
		2	90	31.1	31.1	82.4
		3	37	12.8	12.8	95.2
		4	14	4.8	4.8	100.0
		Total	289	100.0	100.0	
1	Valid	1	146	49.5	49.5	49.5
		2	114	38.6	38.6	88.1
		3	32	10.8	10.8	99.0
		4	3	1.0	1.0	100.0
		Total	295	100.0	100.0	

Table 4-Frequencies for student loan debt

Task3Pref

Institution			Frequency	Percent	Valid Percent	Cumulative Percent
0	Valid	2	101	34.9	34.9	34.9
		3	101	34.9	34.9	69.9
		4	87	30.1	30.1	100.0
		Total	289	100.0	100.0	
1	Valid	2	163	55.3	55.3	55.3
		3	50	16.9	16.9	72.2
		4	82	27.8	27.8	100.0
		Total	295	100.0	100.0	

Table 5-Frequencies for calculating a Payoff Matrix

Task4Pref

Institution			Frequency	Percent	Valid Percent	Cumulative Percent
0	Valid	2	127	43.9	43.9	43.9
		3	63	21.8	21.8	65.7
		4	99	34.3	34.3	100.0
		Total	289	100.0	100.0	
1	Valid	2	156	52.9	52.9	52.9
		3	43	14.6	14.6	67.5
		4	96	32.5	32.5	100.0
		Total	295	100.0	100.0	

Table 6-Frequencies for Calculating means and standard deviation for 10 numbers

Task5Pref

Institution			Frequency	Percent	Valid Percent	Cumulative Percent
0	Valid	2	131	45.3	45.3	45.3
		3	78	27.0	27.0	72.3
		4	80	27.7	27.7	100.0
		Total	289	100.0	100.0	
1	Valid	2	200	67.8	67.8	67.8
		3	19	6.4	6.4	74.2
		4	76	25.8	25.8	100.0
		Total	295	100.0	100.0	

Table 7-Frequencies for Calculating means and standard deviation for 100 numbers

Overall, the students at the laptop initiative were less likely to choose paper and pencil as the mode of calculation. They were also more likely to choose information technology to solve the problems, especially as the problem grew in complexity such as calculations for a sample of 10 to calculations for a sample of 100. But calculators were still the first choice for many of the students in the laptop initiative.

The next step in the analysis was to determine the contribution the laptop initiative made if any to the student's comfort level with the various technologies. Regression analyses were run using each technology's comfort as the dependent variable, and the various ages, how long they own the computer, whether or not the person had taken an online course, and gender as the independent variables. The results for Word Processing Comfort are shown in Table 8-Word Processing Regression Model.

Coefficients(a)						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.67	0.41		8.97	0.00
	OwnComp	0.00	0.16	0.00	0.00	1.00
	Own>2 years	0.18	0.10	0.08	1.73	0.08
	Own<year	-0.01	0.09	-0.01	-0.14	0.89
	Male	-0.03	0.07	-0.02	-0.46	0.65
	Completed an Intro2MIS	0.38	0.36	0.04	1.04	0.30
	TakenOnline	-0.04	0.07	-0.02	-0.51	0.61
	Age 18-21	-0.09	0.16	-0.05	-0.55	0.58
	Age 22-25	-0.11	0.16	-0.06	-0.65	0.51
	Institution	0.24	0.07	0.14	3.27	0.00

Table 8-Word Processing Comfort Regression Model

The R-squared for the model is .029 which means the model variable Word Processing Comfort is not adequately explained by the independent variables listed in the table. However, note that institution is significant at .00 and contributes positively to Word Processing Comfort. The only other variable with any level of significance is the length of ownership of two years, which is significant at the .10 level.

For Internet comfort, we used the same independent variables and substituted Internet Comfort for the dependent variable. The results are shown in Table 9-Internet Comfort Regression Model. The R-squared for the Internet Comfort model is .031 again indicating that few of the independent variables explain the dependent variable. But noteworthy in the results is the lack of significance of the institution but the significance of ownership.

Coefficients(a)						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.58	0.38		9.48	0.00
	OwnComp	0.42	0.15	0.13	2.82	0.00

	Own>2 years	0.00	0.10	0.00	0.01	0.99
	Own<year	-0.06	0.08	-0.04	-0.73	0.46
	Male	-0.10	0.07	-0.06	-1.42	0.16
	Completed an Intro2MIS	0.25	0.34	0.03	0.74	0.46
	TakenOnline	-0.10	0.07	-0.06	-1.51	0.13
	Age 18-21	-0.13	0.15	-0.08	-0.84	0.40
	Age 22-25	-0.04	0.15	-0.02	-0.27	0.79
	Institution	0.09	0.07	0.06	1.33	0.18

Table 9-Internet Comfort Regression Model

We next analyze the spreadsheet comfort. Again we used the same independent variables and substituted Spreadsheet Comfort for the dependent variable. The results are shown in Table 10-Spreadsheet Comfort Regression Model. The R-squared for the model is .225, better than the other two models but again indicating that few of the independent variables explain the dependent variable. But in this model, the institution not only contributes to the comfort in the use of spreadsheets, it contributes almost a whole point (.92) and is significant at the .00 level. But while the initiative contributes to the comfort level, the requirement to purchase the laptop as indicated through the lower ownership time actually detracts some of the gains of the program. The variable for ownership of less than 1 year is significant at the 0.00 level and contributes a negative 0.26 to the variable. Since there is no data to compare a technology intensive program that does not require students to purchase a specific laptop, the assumption made for this study is that the overall benefits of the program may be slightly clouded by the demand to purchase a specific model as dictated the college. That particular variable needs further analysis and study to ascertain the meaning behind the results.

Coefficients(a)						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.19	0.42		7.62	0.00
	OwnComp	-0.03	0.16	-0.01	-0.19	0.85
	Own>2 years	0.17	0.11	0.07	1.59	0.11
	Own<year	-0.26	0.09	-0.13	-2.88	0.00
	Male	0.01	0.07	0.01	0.17	0.86
	Completed an Intro2MIS	0.01	0.37	0.00	0.04	0.97
	TakenOnline	-0.08	0.08	-0.04	-1.10	0.27
	Age 18-21	0.02	0.17	0.01	0.10	0.92
	Age 22-25	0.03	0.17	0.01	0.16	0.87
	Institution	0.92	0.07	0.46	12.34	0.00

Table 10-Spreadsheet Comfort Regression Model

RESULT AND CONCLUSION

In two of the three models, the students benefit from being in the laptop initiative program. Students in the program were more comfortable with the use of word processing and spreadsheets than their non-laptop initiative counterparts. This implies but not confirms that students who participate in the laptop program are more likely to view the technologies as a tool. Further analyses are needed to confirm the significance and importance of the comforts and the use of laptops. For example, does major matter? If majors are studied, are some majors such as accounting and finance more likely than management majors to feel comfortable with the tools? Does the laptop initiative program by design attract more technology comfortable students or more technology oriented majors? These are the questions we plan to study for the next iteration to further understand the impact of laptop initiatives in business programs.

REFERENCES

Available upon request