



The laptop alternative: Student reactions and strategic implications [☆]

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Abstract

Designing the technology infrastructure for a college or university is a strategic decision that affects the quality of the educational experience for both students and faculty, and influences an institution's image and its ability to attract students. This article reports the results of survey research which explored student reactions to a campus-wide laptop initiative at a small liberal arts institution. Student perceptions of the value of the laptop are examined in seven contexts: academic success, study habits, faculty utilization, the development of a learning community, personal use, future plans and cost. The results broaden our understanding of the relationship between technology and learning and will assist institutional decision-makers as they evaluate technology options.

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1. Introduction

By April 2002, approximately 140 institutions in the US, Canada, Japan, Amsterdam, the UK and Australia had embarked on campus-wide technology programs using laptop or notebook

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computers (Brown, 2002). Yet, during the same period, Duke University and other institutions announced that their infrastructure development would shift from a laptop base to “ubiquitous” computing environments, using both laptop and desktop computers (Olsen, 2002). Although stories about institutional experience with laptop initiatives appear in the press, these contain little information about the differential utilization or impacts of the unique characteristics of laptop technology (Carlson, 2001; Olsen, 2001; Young, 1997). While some institutions have conducted in-house evaluations (Holleque, 2002; Fuller, 2002; Ehrmann, 1995) systematic research that describes student experience with laptop computers, particularly regarding their opinions about the value in academic and social contexts, is scarce.

Designing the technology infrastructure for a college or university is a strategic decision involving major financial resources that affects the quality of the educational experience for students and faculty, influences institutional image, and its ability to attract students (Landry, 2000; NERCHE, 2002; Twigg, 2000). This article reports the results of research that explored student reactions to their laptop experience at a small liberal arts institution. It expands our understanding of the student–technology interface and is intended to assist institutional decision-makers as they evaluate technology options.

Whether launched in a wired, or wireless environment, laptop computers can enrich the academic experience in specific ways (Fuller, 2002). Their portability should make computer access more convenient for students and faculty, and when coupled with classrooms set up for connectivity, enhance on-site learning and classroom experiences (Driver, 2002). Usable in campus settings outside classroom or library contexts, laptops offer students more opportunities to work on academic projects individually, to support group projects, or simply to explore class work with fellow students “out on the lawn.” The increased access to communication, through e-mail, chat rooms, bulletin boards, or instant messaging supports more timely interaction, as well as a higher density of interaction around specific topics or projects. As students become more accessible to each other, and as faculty become more accessible to students, a laptop strategy could be viewed as a means to further develop a sense of community on a campus or in specific classes.

Like all computer-based teaching initiatives, a laptop program brings implementation issues related to the adoption of new technology, and modification of curriculum or revision of syllabi. The nature of support for innovators and early adopters affects the pace of implementation, as do incentives for the majority of faculty to shift attention from other high priority tasks to their teaching responsibilities (Bates, 2000; Owen, 2001).

2. Research context and questions

Supported by The Ohio State University Battelle Endowment for Technology and Human Affairs (BETHA), a joint research project between The Ohio State University and Ohio Dominican College (now Ohio Dominican University) was initiated in July 2001. Ohio Dominican University (ODU) is a small, Catholic-affiliated liberal arts institution, enrolling approximately 2600 students, primarily commuters, and employing about 60 full-time faculty. In 1994, ODU adopted a multi-year, carefully staged plan to create the infrastructure and academic foundation to support a program requiring all incoming students to lease IBM *Thinkpad* (notebook) computers beginning in Summer and Autumn 2000.

ODU first installed a campus-wide fiber-optic network in classroom buildings and residence halls, then set up computer labs where faculty could experiment with the new technology. *Thinkpads* were made available to all full-time faculty, a campus communication network established with common software and file storage, and four renovated “wired” classrooms were designed. Training and support were offered to faculty to help them create web-based enhancements for their courses using WebCT. Orientation for students was designed, and a help desk was established to assist students, staff and faculty and service the hardware and software. In academic 2000–2001, 537 incoming students leased laptop computers for the first time. Each succeeding group of incoming students was to follow suit, so that by autumn 2003, all students would have laptops.

In November 2000, the Project Director met with senior administrative and faculty leaders of the laptop initiative to discuss strategies for understanding the impacts of the program on student learning and student lives. The resulting research design involved focus group interviews with students in October and November 2001 which served as the basis for developing a grounded survey that was extended to all the students who participated in the first year of the laptop initiative in the spring of 2002. The purpose of the research collaboration was to explore the impacts of laptop computers on the quality of the student academic experiences and the development of a sense of campus community.

Based on focus group comments, a 120-item survey questionnaire was constructed to explore six themes related to the student experience: (1) reactions to and feelings about the laptop initiative overall, (2) how the laptop affected students in their academic endeavors, (3) the impact of the laptops on classroom experiences, (4) impact of the laptops on student communication patterns or interpersonal interactions with faculty and others, (5) the nature of impacts on family members or relationships, and (6) student experience with the technical aspects of the computer and campus network. The survey included 86 Likert-scale questions (5-point), 12 open-ended questions, and 24 descriptive questions, including demographic information.¹ This article presents the results of this collaborative research.

3. Survey development and respondents

Seven 90-min focus groups, involving 25 students were conducted in October and November 2001. The gender and ethnic profile of focus group participants paralleled that of the 2000–2001 student population, with a male/female ratio of 1:2, and Caucasian/non-white of 3:1. A thematic analysis of the interview data, coded independently by the members of the research team and then consolidated, yielded a rich set of 26 topics. Key among the themes were academic and social use of laptops, general use of laptops, e-mail and instant-messaging, faculty utilization, web uses, comparisons with desktops, cost, library use, problems, family utilization, service and help, convenience, network access, worry, hardware and software. Student opinion on each topic varied dramatically. Two student comments about classroom utilization illustrate the range of opinions. One student said, “None of the four classes that I’ve been in have used it as a requirement.”

¹ The questionnaire is located at the following web address: [<http://www.coe.ohio-state.edu/ademb/>].

Another student said, “It was all related to the class and it really got people thinking about what we were studying.”

In January 2002, the survey was pilot-tested with ODU students for sensibility, resulting in a few word changes. An Internet-accessible version of the questionnaire was created, as well as a hard copy version. In March, of the 537 students who had been enrolled in 2000–2001 academic year and participated in the first year of the laptop program, 272 were then enrolled at ODU and addresses were available for 196 who had not returned in Autumn 2001. E-mail invitations to participate in the survey were sent to enrolled students, giving them a hotlink to the web site, along with a personal access code. Reminder e-mails were sent three weeks later. Faculty were asked to highlight the project, and posters were put up around campus. Hard copies of the survey were mailed to the “non-returning” students, with follow-up letters sent three weeks later. For each set of students, a prize drawing for a \$30 gift certificate to a local *Best Buy* store was offered as an inducement. Twenty-five percent of enrolled students (50 students) responded along with 15% of the non-returning students, for an overall response rate of 20%.

The demographic profile of the 73 students responding to the survey differed somewhat from that of the entering class in academic year 2000–2001, which was 33% male, and 71% Caucasian. The respondent group over-represents women (with 80%) and Caucasian students (with 80%) relative to the original incoming student population. All respondents answered virtually every question, including the open-ended items, where the response rate varied from 80% to 93%.

4. Questionnaire results

The quantitative questionnaire items were analyzed using *SPSS* Version 11.0.1 (*SPSS* for Windows Release 11.0.1, 1989–2001). A series of open-ended questions asked students about the impact of the laptop computers on their lives academically and socially and requested recommendations for improving the laptop program. These responses were coded for themes and analyzed using *HyperRESEARCH* (*HyperRESEARCH*, 1998). Tables 6–13 present the frequency distributions.

To create a baseline data set, frequency distributions were calculated for each item of the entire questionnaire in three population sets: mail survey respondents, web survey respondents and combined mail and web survey respondents. An independent sample *t*-test was used to determine whether differences between the web and mail respondent populations were significant. Significant differences were found on six items out of 88 (7%) at the $\alpha = .05$ level.² The small number of significant items did not support further separation, so respondents were treated as a single population for further analyses.

The same procedures used to determine whether there were significant differences between male and female respondents yielded significant differences at the $\alpha = .05$ level, on 12 items out of 88, about 14%.³ The small absolute numbers of males in the total sample (14, or 20%), where $N = 71$,

² Items: 1, 38, 45, 62, 64, and 98.

³ Items: 6, 11, 28b, 28e, 28f, 43, 48, 57, 58, 71d, 85 and 86.

did not support further analysis of the gender difference. In addition, the sample was too small to undertake meaningful analysis on the basis of race or ethnicity.

The appearance of a pattern of response involving students for whom the laptop was their first computer, led to analyses to determine whether there were significant differences between this group of respondents and others. Eighteen of the 73 respondents to this item (25%) indicated the laptop was their first computer. Significant differences were found, at the $p = .05$ level on 25 of 88 items or 28%, and so this dimension was explored in succeeding analyses.

Twelve subscales were developed which grouped the items in clusters consistent with themes reflected in the focus group interviews and the literature (see Table 1): (1) student academic success; (2) the creation of a learning community on campus, among students and/or between students and faculty; (3) student personal use of computers; (4) student preference for a laptop or a desk-model PC; (5) student study habits; (6) student e-mail use; (7) student concern about laptop damage or security; (8) the student's future plans regarding computer purchase; (9) student

Table 1
Sub-scales and related questionnaire items

Subscale (# of items)	Sample questionnaire items	Alpha coefficient	Mean
Academic success (10)	I found laptops an essential part of college learning. I used my laptop regularly to access the Internet for class projects/research.	.8745	3.38
Learning community (10)	I often use my laptop to facilitate the work of a group class project. The laptop helped me to interact with my advisor.	.8150	2.77
Personal use (6)	I use my laptop frequently to access the Internet to pursue my own personal interests.	.8011	2.91
PC vs laptops (6)	I found my laptop more convenient than accessing a PC.	.6591	
Study habits (5)	I often took my laptop places where I would not otherwise have access to a computer.	.7753	3.22
E-mail (3)	I used e-mail more frequently because I had a laptop.	.6997	
Damaging laptop (3)	I was unwilling to share my laptop with anyone because I was afraid of damage to my unit.	.5589	
Future plans (2)	My experience with the laptop was valuable in preparing me for my professional work.	.8971	3.21
Faculty classroom use (6)	In class/es where my professor/s used the laptop and network, the technology really helped and enhanced my whole learning experience.	.8534	2.87
Cost (3)	Students should be provided better information about the cost factors involved in laptop leasing and use.	.7728	4.04
Laptop reliability (3)	Mechanical or service problems greatly influenced my view of the usefulness of the laptop.	-.0367	
Network reliability (2)	The ODU [sic] Computer Network was generally reliable.	.4971	

perception of faculty use of the laptops in classrooms; (10) cost of the laptop; (11) reliability of the laptop; and (12) reliability of the campus network.⁴

Analyses of reliability were undertaken for the 12 subscales, and Cronbach alpha results are also shown on Table 1. Seven subscales appeared reliable from their alpha coefficients (academic success, learning community, personal use, study habits, future computer purchase plans, faculty classroom use, and cost) and were analyzed further. Two subscales, PC vs. laptop, and E-mail, were of marginal reliability, but were also analyzed (light grey). Three were dropped because the alpha coefficients were too small: damage to the laptop, laptop reliability and network reliability (dark gray). Subscale means are provided for the seven that were reliable.

Five of the means were greater than 3 (on a scale where 1 = strongly disagree and 5 = strongly agree), indicating that students agreed that the laptop was important to their academic success, that the laptop was a positive influence on their study habits, that their future plans would likely include the use of a laptop, and that the cost structure of the program was important to them. The means that were below 3 indicated that students *disagreed* that the laptops encouraged computer use that linked them closely to a learning community, that faculty used the computers effectively in the classroom, and that they were most likely to use the computers for personal interests.

Exploratory ANOVA analyses were performed on seven survey questions listed below to determine relationships with the subscales (see Table 2):

- 13. The laptop and case were too heavy to carry around easily so I did not take it to campus.
- 87. I have purchased a laptop.
- 95. The cost structure of the program greatly affected my view of the program.
- 102. I live on/off campus.
- 104. My ODU laptop was my first computer (yes/no).
- 110. I attend classes full-time/part-time.
- 112. Academic majors.

A regression analysis was conducted to detect the effects of the Faculty Classroom Use subscale on responses to Questionnaire items 1 (laptop is an essential part of learning) and 2 (laptop helped me become a more successful student). The resulting p value of .000 for each question indicated a very close correlation between student perception of the effectiveness of faculty classroom use of technology and their feelings about how essential the laptop was to their learning, and how important it was to their success as students. More specifically, it appears that the more students perceived faculty classroom use of computers to be effective, the more likely they were to feel that the computer was essential to their learning and to their success as students.

A cross-tabulation analysis showed that access to other computers appears to have no effect on the nature of student response to Question 1, whether laptops are an essential part of college learning (Table 3). The distribution of responses is bi-modal: 27 students with access *strongly* or *somewhat disagree*, and 38 students *strongly* or *somewhat agree*, that laptops are an essential part of college learning.

⁴ Subscale items on the survey are: Academic success, 1, 2, 7, 9, 19, 27a, 27b, 27c, 28a, 28b; Learning community, 42, 46, 47, 48, 51, 52, 53, 54, 58, 92; Personal use, 10, 28c, 28d, 28f, 29, 57; PC vs laptop, 3, 4, 11, 20, 87, 106; Study habits, 6, 23, 64, 76, 91; E-mail, 8, 28e, 30; Damaging laptop, 14, 15, 66; Future plans, 85, 86; Faculty classroom use, 36b, 37, 38, 44, 45, 89; Cost, 90, 94, 95; Laptop reliability 80, 81, 82; Network reliability, 74, 75.

Table 2
ANOVA analysis of the subscales ($p \leq .05$)

Survey item	Subscale								
	Academic success	Learning community	Personal use	PC vs laptop	Study habits	E-mail use	Future plans	Faculty use	Cost
13. Laptop too heavy; did not take to campus	.367	.646		.320	.351				
87. I would purchase a laptop									.260
95. Cost structure affected my view of laptop	.346	.515					.317	.178	
102. Live on/off campus		.016							
104. ODU laptop my first computer	.015	.004	.001	.001	.028	.002	.023	.085	.984
110. Full/Part-time	.080	.557		.714	.575			.324	.260
112. Academic majors	.459	.649		.734	.934	.823	.760	.492	.025

Table 3
Cross-tabulation of questions 1 and 105

		105. I have access to other computers besides my laptop		
		No	Yes	Total
1. I find laptops an essential part of college learning	strongly disagree		12	12
	somewhat disagree		15	15
	undecided	1	5	6
	somewhat agree	1	19	20
	strongly agree	1	19	20
	Total	3	70	73

Frequency analyses yielded results consistent with the subscale analysis. For example, there were thirty survey items where more than 50% of students *Strongly* or *Somewhat Agree* with the survey statement (Table 4). The statements with the greatest percentage of agreement dealt with the following: wanting more information about the cost of the program (Items 90, 94, 95), the usefulness of the computer and software for preparing class assignments (Items 7, 27a, 27c, 28a, 43), the usefulness of the laptop for personal use (Items 10,55), the appeal of the portability of the computer (Items 3,12), as well as the cumbersome weight involved in carrying the laptop (Item 13). Responses to related open-ended questions revealed more about the ways students used the computer and how study habits have changed (see Tables 6–10).

Two items with a 49% response are also worthy of note. Forty-nine percent of students *Strongly* or *Somewhat Agreed* that (Question 85) the experience with the laptop has been valuable in preparing me for my professional work, and that (Question 86) they see themselves using their laptops more in their future academic career at ODU. Alternatively, more than half the respondents were neutral or disagreed with these statements. Student opinion was decidedly split on these points.

Table 5 shows the 20 items where more than 50% of respondents *Strongly* or *Somewhat Disagreed* with the sense of the questions. Students seem less concerned about security or breakage (Items 15, 16, 17). Most students do not consider the computer to offer an unhealthy distraction (Item 18), and more than half indicate that playing games and/or downloading music are not part of their computer repertoires (28c, 28d). Electronic discussion environments are not appealing (47,46, 52) for many students. For two-thirds of students, repairs do not seem to be an issue (81).

Responses close to the 50% level provide strong evidence of student opinion about faculty utilization of computers in coursework. As shown on the table, 51% of respondents *disagreed* that faculty demonstrated how the laptops could enrich their experience (Item 37). Forty-eight percent *strongly* or *somewhat disagreed* that (Item 45) teachers strongly encourage the use of laptops outside of class for class projects, and forty-five percent *disagree* (Item 44) that teachers strongly encourage the use of laptops outside class for homework.

The data from five of the open-ended questions (24b, 31, 32, 34, 59) focusing on social and academic life, including changes in study habits, appear to relate to this point. A significant group of respondents on these questions (between 7 and 30 individuals) consistently wrote that the laptop “did not matter to me.” On four of the questions (24b, 32, 34, 59) between thirty-two and forty-five percent of the respondents said the computer made no difference. Thirty-one percent

Table 4

Survey items where more than 50% of respondents *strongly* or *somewhat agree*

27a.	Microsoft Word is very useful for doing papers for class	89%
90.	Students should be provided better information about the cost factors involved in laptop leasing and use	82%
94.	The cost of the laptop is a very important factor as I finance my education	78%
27c.	PowerPoint is a very useful tool for doing class presentations	77%
12.	An important aspect of my laptop is that it is portable	74%
28a.	My laptop is essential for writing papers	73%
10.	I use my laptop frequently to access the Internet to pursue my own personal interests	67%
55.	The laptop helps me keep up-to-date with campus activities through e-mail	67%
3.	I find my laptop more convenient than accessing a PC	66%
7.	I use my laptop regularly to access the Internet for class projects/research	66%
78.	Everyone on campus having the same software is a real advantage	64%
95.	The cost structure of the laptop program greatly affects my view of the usefulness of the laptop	63%
13.	The laptop and case are too heavy to carry around easily, so I do not take it to campus	62%
74.	The ODU Computer Network is generally reliable	60%
57.	The laptop makes it easier for me to stay in touch with friends and family who live some distance away	59%
76.	I find it very easy to find Internet and power source connectors (outlets) on campus to use my laptop outside of class	59%
11.	I think laptops are a luxury item	58%
91.	The ODU laptop program has made computer technology more convenient for me	58%
43.	I search for library resources on my laptop more often than I go to the library to search for library resources	56%
93.	The laptop program makes me feel as though I am at a school that is a leader in higher education	56%
1.	I find laptops an essential part of college learning	55%
14.	I am unwilling to share my laptop with anyone because I am afraid of damage to the unit	55%
62.	The laptop is really useful for my family	54%
80.	I have found the college laptop computer Helpdesk useful in solving my laptop-related problems	54%
73.	Off campus, ROAM provides fast Internet service	54%
4.	I prefer to use my laptop over other computers	54%
89.	The use of laptops will improve on this campus once the majority of faculty incorporates the use of laptops into their courses	53%
38a.	My professors do not incorporate laptops effectively into class	52%
8.	I use e-mail more frequently now that I have a laptop	51%
23.	I often take my computer places where I would not otherwise have access to a computer	51%

have never been in a classroom that was wired to support laptop use. And, thirty-five percent have been in no classes where the use of the laptop was essential. So, for about one third of the students, classroom utilization was non-existent. Eighty-two percent responded “no” to the item that asked whether they had used the laptop to meet with their professors online for online office hours.

Student responses also described their utilization of the laptop. Sixty-four percent of respondents used their laptops once a day, or several times a day. Convenience, typing and research use of the computer dominated the answers to how the laptop impacted academics and study habits.

Table 5
Survey items where more than 50% of respondents *strongly* or *somewhat disagree*

18.	I am concerned that I use my laptop so much that I neglect doing other things	79%
15.	I worry so much about breaking my laptop that I avoid using it	75%
16.	I worry a lot about losing my laptop	73%.
81.	My laptop has needed to be “in the shop” for repairs at the ODU Helpdesk too often	69%
47.	Using my laptop to participate in a chat room for class is an important activity for me	66%
54.	The laptop has helped me get to know other students	66%
30.	I do not use my ODU e-mail account because I have another one that is my main account	64%.
17.	I worry so much about the security of my laptop that I do not carry and use it on campus	62%
63.	My family members have become more comfortable using computers after using my laptop	59%
28c.	Playing games is one of the things I do most often with my laptop	58%
56.	I participate more in campus events because I get e-mails regarding events	53%
19.	The laptop has helped me develop new habits for studying	53%
65.	I feel motivated to demonstrate my laptop’s capabilities to friends and family	53%
46.	Using my laptop to access online bulletin boards for class is important to me	53%
52.	I feel more comfortable expressing myself in a chat room or an online message board vs in a classroom	52%.
5.	I know much more about how to use computers as a result of this laptop program	51%.
28d.	Downloading music is an important use of my laptop	51%
37.	My professors demonstrate how using my laptop can enrich my college experience in their discipline	51%
29.	I use my laptop much more for personal matters than for doing schoolwork	50%
66.	I never let my siblings use the computer because I do not want it to get damaged	50%

Table 6
Question 24b. If you use your laptop, how have your study habits changed ($n = 60$)

Response code	Frequency
<i>No difference – subtotal</i>	27 (32%)
Does not matter to me	19
Distracted me	4
Use other computers	3
Faculty use limited	1
<i>Made a difference – subtotal</i>	57 (68%)
Research is easier, access to more study tools	15
Convenient, portable or small	10
Type notes for study	9
Type papers	9
Use class websites, helpful for assignments	6
I do not procrastinate as much	5
Communicate more w ODU students	1
Computer skills comfort increased	1
Remote connection helpful	1

“Communication” was the dominant response to social impacts. To Item 49 which asked “Of the professors you had last semester, how many professors use e-mail?”, sixty-eight percent of students indicated two or more of their professors used e-mail, while only 8% said none did.

Table 7
Question 31. Examples of how I study with my laptop ($n = 65$)

Response code	Frequency
Does not matter	7
Download music	1
Subtotal	8 (7%)
Type papers	19
Access Internet	18
Type notes for study	18
Research is easier, or library research	14
Use WebCT	10
Helpful for assignments, receive teacher note guides, access more study tools	6
E-mail professors	5
Make Powerpoint presentations	3
Communicate more w ODU students	3
Storing information	2
Convenient or portable, small	2
Chat session for class	1
Personal grade sheets	1
Take to class	1
Subtotal	103 (93%)

Table 8
Question 32. Summarize the impact of the laptop on your life academically ($n = 68$)

Response code	Frequency
<i>No difference – subtotal</i>	38 (45%)
Does not matter to me	18
Financial options	6
Desktop faster, use other computers	4
Angry	3
Too heavy	3
Laptop costly	2
Faculty use limited	1
Unreliable	1
<i>Made an impact – subtotal</i>	47 (55%)
Convenient, portable or small	12
Useful for assignments	11
Tremendous	9
Access more study tools	7
Computer skills comfort	4
More organized, professional	2
Internet means better informed	2

Seventy percent of the respondents indicated having had problems with their laptops; difficulties were split evenly between hardware and network problems. In addition to the responses to Items 73 and 74, regarding off campus ease of access to the campus network and its reliability,

Table 9

Question 34. What new habits have you developed since having the laptop? ($n = 63$)

Response code	Frequency
<i>No new habits – subtotal</i>	32 (38%)
Does not matter	23
Download music	4
Distracted me	4
Financial options	1
<i>New habits – subtotal</i>	52 (62%)
Check e-mail often	9
Type notes	6
Access Internet	6
Typing skill	4
Type papers	4
Do not procrastinate	3
E-mail professors	3
Research is easier, library research	3
Use WebCT	2
Computer skills comfort	2
In touch w friends or family	2
Helpful for assignments, or making Powerpoint presentations	2
Other	6

Table 10

Question 59. Summarize the impact the laptop has had on your life socially. ($n = 62$)

Response code	Frequency
<i>No impact or negative impact – subtotal</i>	32 (44%)
Does not matter	30
Desktop faster	1
Faculty use limited	1
<i>Positive impact – subtotal</i>	40 (56%)
In touch w/family or friends	23
Lower phone bills, or fewer letters and phone calls	6
Communicate w/ODU students	3
Informed about ODU activities	2
Internet means better informed	2
More important social than academic	2
Tremendous	2
Internet means global friends	1
I like it	1

50% of students indicated the frequency of problems with their laptop, as “never” or “not very often.” About 20% experienced problems “every time I used it” or “quite often.” Nonetheless, 64% of respondents said they would recommend purchase of a laptop, with 95% of those individuals commenting on the machine’s portability, size or convenience.

Table 11

Question 84. If you have had problems with your laptop, what problems have you had? ($n = 52$)

Type of problem	Frequency
Hardware: computer freezing, floppy or hard drives, screen, keyboard, power sources, error messages	30 (40%)
Network problems: access, general problems, password, slow, e-mail connections	30 (40%)
Software missing	5 (6%)
Other: minor problems, needed-reimaging, slow service, too many problems	10 (13%)

Table 12

Question 96b. Your reasons for recommending purchase of laptop vs desktop ($n = 71$)

Response code	Frequency
<i>Recommend desktop - subtotal</i>	23 (32%)
Desktop better investment	14
Desktop monitor bigger	3
Laptop is unreliable	2
Desktop faster	2
Laptop costly	1
Remote connection slow	1
<i>Recommend laptop - subtotal</i>	45 (63%)
Portable or small	29
Convenient	14
Continuously upgraded	1
Hassle free	1
<i>Other responses – subtotal</i>	3 (4%)
<i>Does not matter</i>	2
Depends on purpose	1

By contrast with the response to Item 93 (Table 4), where 55% of students indicated that the laptop program made them feel they attended a school that was an educational leader, half the students indicated that the laptop initiative was “not at all important” to their decision to come to ODU. In fact, fewer than 10% indicated that the program was *important* or *very important* to that decision.

5. Discussion

For about two-thirds of the respondents at ODU in academic year 2000–2001, the laptop computer made a significant difference in study habits and to their academic and social lives. They found the computers helped with classroom assignments, e-mail, communication, and research. For the remaining one third of the students, the laptop either had no impact or may have been a distraction. These results are echoed in first year findings from Kathryn Holleque’s survey of students at Valley City State University (VCSU). In 1997, the first year of her study, 69% used their computers more than three times daily (Holleque, 2002). However, by 2002, data from her

six-year longitudinal research showed 78% of students using their computers at least four or more times a day for a variety of academic and personal uses, with an additional 13% using them at least three times daily, e.g., 91% of those polled.

The subscales developed from the survey questions cluster student reactions by topic and provide one way to organize and elaborate a discussion of the findings. Four of the subscale topics deal with different dimensions of how students reacted to the laptop initiative in an academic context: academic success, learning community, study habits, and faculty classroom use of computers. Three other subscales deal with dimensions of how students reacted personally to the laptop initiative: personal use, cost, and future plans.

5.1. Academic context

The subscale means on academic success and study habits were both greater than 3, indicating, on balance, that students felt their use of laptops was important to their academic success and had resulted in positive changes in their study habits. Responses to the open-ended questions provide a more detailed picture of student behavior. Students provided many examples of how their laptops were used for studying (Question 31). Two-thirds of students felt the laptop had changed their study habits (Question 24b). And more than half the students felt the laptop made a substantial difference in their academic performance (Question 32) and social interaction (Question 34). They found the computers helped with classroom assignments, e-mail, communication and research. At the same time, about one third of the students did not change their study habits after getting the laptop, and slightly more, 45%, of students felt the laptop did not make much of a difference to them academically or socially (38%). By contrast, large percentages of the VSCU students in the longitudinal study *Agree* or *Strongly Agree* that using technology tools “increases critical thinking” (77%), and “enhance the learning experience” (92%) (Holleque, 2002).

Most ODU students appear to feel that they have made good use of the laptop. About two-thirds of the students attribute changes in study habits and academic life to their use of the laptop computers. Other students apparently felt they already had computer-related habits which the laptop simply made more convenient to pursue. The responses to Question 34 show more detail: “typing papers, notes and developing typing skills” accounts for 16% of overall reported utilization, or 30% of utilization by those indicating they had developed new habits. Twenty-seven percent of utilization involved the Internet or communication, or 45% of the new habits reported.

The means for the learning community and faculty classroom use of computers were both lower than 3 (where 1 = *strongly disagree* and 5 = *strongly agree*). Student perception of the value of the laptop to their academic success was tightly correlated with their perception of the success of faculty in integrating the laptop into teaching and classroom activity. More than half the students felt their professors did not incorporate computer technology effectively. Student perception of faculty utilization of the computer in classroom activities was the single most powerful predictor of whether students felt the laptops were *essential* to their learning, or to their academic success. Analysis of these responses showed no significant difference by academic major, full or part-time status, whether the laptop was the student’s first computer, or how they felt about the cost structure.

ODU appears to be experiencing a pattern of faculty adoption of technology similar to that of many other institutions. Research indicates that after the lone rangers and early adopters, there is

often a time lag in the adoption curve that is “chasm-like” for the next tier of users. Institutions that have bridged the chasm implemented changes in faculty reward systems, institutional climate, workload structures, and incentive schemes to encourage faculty to integrate technology into their teaching (Bates, 2000; Daniel, 1996; Moore, 1991; Owen, 2001; Scott, Chenette, & Swartz, 2002). Academic 2000–2001 was the first year the students participated in the laptop initiative at ODU. Internal institutional evaluations conducted at other schools over longer periods, such as Valley City State University, indicate that faculty use and student perceptions of value can improve over time (Holleque, 2002).

The negative response to the learning community subscale (Table 1) appears to reflect several different factors. First, where students lived appeared to affect the way students engaged in activities that related to the creation of an intellectual community, termed by ODU “a community of learners.” Those students living on-campus were more likely to respond positively to this subscale than were those living off-campus. Second, students indicated they did not use technology in many of the ways that might increase the feelings of community. Sixty-six percent did not use chat rooms (see Table 5). On Item 50, a yes/no question about whether they used online advising sessions with their professors, eighty percent said “no”; the mean response to Item 53, “the laptop helped interaction with advisors”, was 2.7 (where 1 = strongly disagree, and 5 = strongly agree). The mean response to Item 42, “I used the laptop frequently for communication in group projects,” was 2.86, on a scale where 1 = strongly disagree and 5 = strongly agree. Because the student population on this campus is largely a commuter population, these communication tools could serve as very important means to engage students more actively as part of a community if they were better utilized.

5.2. Students' personal reactions

The mean student response to the personal use subscale was slightly in the negative direction, 2.91, indicating (where 1 = *strongly disagree*) that a substantial number of students *disagreed* that the computer was useful for personal or social purposes. In part, this may reflect student experience with network and hardware reliability, both of which were troublesome during 2000–2001, the first year of the program. For those reporting problems with their computers, half involved access to the network or its slow speed, and the other half reflected hardware problems. Family members were given access to about half the computers and appear to have made use of them, although half the parents and many siblings, appear to have had almost daily access to other computers and so for them, the laptop was a not a significant opportunity.

The mean student response to future purchase of laptops, by contrast, was positive, 3.21, where 5 = *strongly agree*. Apparently student perception of the academic value outweighed their perceptions of personal use. The vast majority of students appreciated the convenience of the laptop, especially its portability and small size. Two-thirds of the students would recommend purchase of a laptop computer.

The strength of student frustration about the cost structure of the laptop program was one of the most striking findings. The mean response for the cost subscale was 4.04, where 5 = *strongly agree*, and provides clear indication that students wanted much more cost information and choice. Eighty-two percent of students felt they needed more information. Seventy-eight percent of students defined the cost of the laptop as a very important factor as they financed their education and

Table 13

Question 100: What are the most important recommendations you would make for improving the laptop program at ODU? ($n = 65$)

Type of recommendation	Frequency
Improve financial options, or laptop costly	25 (33%)
Provide choice	12 (16%)
Laptop hardware options, or memory	8 (11%)
Network improvements, slow connection, password	8 (11%)
Faculty use limited	5
None	5
Create introductory course	4
Provide upgrade information	2
Other	7
Total	76

63% said the cost structure greatly affected their view of the usefulness of the laptop (see Table 4). Thirty-three percent of students responding to Question 100 (Table 13), which asked for recommendations for improving the program, criticized the financial aspects of the laptop initiative. Sixteen percent recommended that students be given a choice between a laptop or a desktop computer and another eleven percent suggested more hardware options, for a total of twenty-seven percent who recommended changes in the hardware. Other specific comments suggested network improvements and broader hardware options regarding zip, floppy drives and memory, and directed attention to possibilities for providing students with more information about the computer, through more introductory courses or online information about upgrades. A handful of students had no comments.

While it is clear that the majority of students liked their laptops and used them heavily, their inability to choose either their laptop configuration, e.g., Zip or CD ROM drives, or to choose between a laptop and a less expensive desktop, was very important. The strong positive responses to many academic uses suggests that students were willing to separate their reactions to questions about the usefulness of the laptop from frustrations about hardware choice when responding to the survey. These strong negative reactions to the cost structure only appeared in response to five very specific survey items.

5.3. Special student populations

As indicated earlier, preliminary analysis suggested that the students for whom the laptop was their first computer appeared to respond differently than other students. The ANOVA analysis confirmed these differences (see Table 2). “First computer” students were more likely to feel that the laptop was integral to their academic success and to use the laptop in activities, such as group projects, that increased their sense of being part of an intellectual community. They were more likely to use the laptop to access the Internet and e-mail, and were more likely to utilize the laptop for personal use. Given a choice between a laptop and a desktop, they indicated a preference for the laptop and would consider purchasing one after graduation. Despite the clarity of the quantitative results, knowing that these students had no previous experience with desktops, we

must question whether their responses reflect a “laptop” effect, or perhaps, to some degree, simply a “first computer” effect.

Academic majors are another way of segmenting student populations, and often the disciplines utilize technology in such different ways that the majors represent distinct populations in terms of their perceptions of technology. From this survey data, the only item where academic majors appeared to differ was in relationship to the cost subscale. Examination of these results yields no particular pattern. Analyses indicated no statistically significant differences whether by science vs. social science, or heavy-use majors, e.g., business and education, or by other majors. We can offer no logic to explain the data beyond idiosyncratic and individual reaction to financial matters often seen in other contexts. This would be an area where further research could generate more useful insight.

6. Summary and conclusions

There are limitations to our ability to generalize from the findings of this study. At a small, religiously affiliated campus with a predominantly commuter student population, including a significant population of returning adults, student response to the technology might differ from those at a larger, non-sectarian institution with a younger, residential population. However, as larger numbers of working adults choose to enter colleges and universities as students, the nature of the ODU population becomes even more relevant rather than serving as a limitation.

The small sample size prevented significant analysis using gender, race/ethnicity or academic majors as population segments. We encourage other campuses pursuing these initiatives to undertake research specifically designed to compare student reaction along these lines. And, finally, this research presents student response to the first year of a laptop program, and does not provide longitudinal data.

The results of the research conducted with ODU are richly suggestive and do provide guidance for administrators considering technology configurations for their campuses. Three key dimensions of technology programming can be highlighted.

First, consistent with findings at other campuses and with research on technology adoption, the major factor affecting student perception of the value of their laptops to their academic success is their perception of the quality of faculty utilization of the technology for teaching. Assisting faculty to gain the imagination and skills that will help them creatively integrate technology into their pedagogy is the biggest challenge facing ODU and its peers across the country. In an environment where classroom connectivity is dramatically enhanced, new pedagogical strategies are required to avoid an expensive investment that simply mimics current teaching patterns or gives the “sage on the stage” flashy new presentation tools. Achieving “technology fluency” at a proficiency level that equates with the ability to design technology enhanced learning experiences is much more challenging than asking faculty to use e-mail, or create web-pages supporting threaded discussions. Gaining sufficient experience with a new computer system to achieve “teaching fluency” requires a substantial investment of time and attention. The majority of faculty are not equipped to venture into these areas without the support of pedagogical experts, instructional designers, and technical staff (Scott et al., 2002).

Second, students are consumers. The academy may not appreciate the consumer attitudes that students bring into the educational environment, but the academy must respond. Consumers want good information and they want choices (Mooney & Bergheim, 2002). Colleges and universities seeking to maintain sensible cost structures for supporting student computers, as well as the sanity of their tech support staffs, must balance those needs with the “customization” required to serve their students well. “Ubiquitous computing” is a goal that can be achieved in a variety of ways, and laptops can play a special role in an educational environment. They offer possibilities for creative interaction that immobile desktops cannot provide. The key question is how to define the elements critical to the institution’s cost considerations, while offering students choice among options in a ubiquitous environment.

Finally, it seems that hardware problems continue to plague the best of new technology. Some years ago, a brilliant IBM advertisement showed a two-page spread of dozens of sheep against a blue-sky background – all were white except for a single black sheep. The commentary said something like, “even if we are 99% trouble-free, what do we tell the one customer whose computer doesn’t work properly?” Campus leaders and vendors may need to bear in mind an important lesson from the restaurant business: one disgruntled customer can undo the goodwill engendered by ten satisfied customers (Friedman, 1999). Machines that come in for repair more than once or twice should be pulled from the pool and replaced. If the goal is education and the computer simply a tool, neither the student nor the institution is served when the tool does not work reliably and students are unable to complete assignments or access communication networks.

The responses to this survey indicate that a slight majority of students found their laptop computers essential to their academic success. These students appreciated the convenience of the laptops, and could generate a long list of examples of how the computer was useful to their learning. The strongly mixed nature of student response highlights the centrality of the faculty classroom dynamic. By helping faculty better integrate the technology, and by responding to student requests for more choice, the value of the computer to student academic experience is likely to be enhanced even further.

References

- Bates, A. W. (2000). *Managing technological change*. San Francisco: Jossey-Bass.
- Brown, R. C. (2002). *List of colleges & universities with laptop or notebook computer initiatives*. Available: <http://www.aack.edu/~arayb/NoteBookList.html>.
- Carlson, S. (2001). A small college’s mixed results with technology. *The Chronicle of Higher Education* (March) 35.
- Daniel, J. S. (1996). *Mega-universities and knowledge media*. London: Kogan Page.
- Driver, M. (2002). Exploring student perceptions of group interaction and class satisfaction in the web-enhanced classroom. *The Internet and Higher Education*, 5, 35–45.
- Ehrmann, S. C. (1995). Asking the right question: What does research tell us about technology and higher learning. *Change*, XXVII(2, March/April), 20–27.
- Friedman, T. (1999). *The Lexus and the olive tree*. Anchor Books.
- Fuller, T. (2002). Houghton’s laptop program. *Presented at the annual conference of National Association of Christian College Admissions Personnel*. Asuza, CA.
- Hollique, K. (2002). *Technology and education at Valley City State University*. Available: http://community.vcsu.edu/facultypages/kathryn_hollique/Surveys.htm.

- Landry, S. G. (2000). Costs of ubiquitous computing: a case study at Seton Hall University. In M. J. Finkelstein, C. Frances, F. I. Jewett, & B. W. Scholz (Eds.), *Dollars, distanced and online education*. Phoenix: Ace/Oryx.
- Mooney, K., & Bergheim, L. (2002). *The ten demandments*. USA: McGraw-Hill.
- Moore, G. A. (1991). *Crossing the chasm*. New York: HarperBusiness.
- NERCHE (2002). The technology challenge on campus from the perspectives of the chief academic officers. Available: <http://www.nerche.org/briefs/brief1/brief1.html>: NERCHE.
- Olsen, F. (2001). Colleges differ on costs and benefits of ‘ubiquitous computing’. *The Chronicle of Higher Education* (January) 45.
- Olsen, F. (2002). Duke U. decides against requiring freshmen to own laptops. *The Chronicle of Higher Education* (January) 44.
- Owen, P. S. (2001). Leadership change related to technology use for student learning at an urban community college. Unpublished doctoral dissertation, The Ohio State University, Columbus, OH.
- ResearchWare. (1998). HyperRESEARCH: A content analysis tool for the qualitative researcher Randolph, MA: ResearchWare, Inc.
- Scott, H., Chenette, J., & Swartz, J. (2002). The integration of technology into learning and teaching in the liberal arts. *Liberal Education* (Spring), 30–35.
- SPSS Inc. (1989–2001). SPSS for Windows Release 11.0.1 Chicago: SPSS Inc. Headquarters.
- Twigg, C. A. (2000). Institutional readiness criteria. *EDUCAUSE Review* (March/April), 42–51.
- Young, J. R. (1997). Invasion of the laptops: More colleges adopt mandatory computing programs. *The Chronicle of Higher Education*, 33.

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