Ubiquitous mobile computing: UMC’s model and success

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Abstract
This article presents the findings, between 1993 and 1999, of the implementation of the world’s first ubiquitous laptop computing learning environment. The report of the findings focus on how faculty and students view the benefits, impact, and integration of ubiquitous laptop computing into classroom teaching and learning. Most surveys were administered online to faculty and students. The results show that ubiquitous laptop computing supported by visionary leadership and comprehensive instructional and technical support have a tremendous impact on teaching and learning. The University of Minnesota Crookston has been transformed from a “static” to “mobile”, “passive” to “interactive”, and “paper” to “digital” learning environments.

Keywords
Ubiquitous, laptop, interactive, learning, teaching.

Introduction
In 1993, the University of Minnesota Crookston (UMC) embarked on a bold initiative of implementing a ubiquitous mobile computing and learning environment for the entire campus, becoming the first laptop university in United States. All faculty members and students were issued a laptop computer. Although faculty members were initially quite resistant toward using the laptop computers, we implemented an aggressive training and support program that got most faculty to embrace the use of technology for the enhancement of learning. Most students did not have any resistance to using the computers to do class-related work. The UMC experience in ubiquitous laptop computing became a laptop campus showcase for the nation. Hundreds of higher education delegations across the nation and from around the world came and looked at our model and implementation.

The UMC Model
The ubiquitous computing model used at UMC consisted of visionary leadership, a laptop for every faculty and student, totally wired environment, comprehensive training, interactive courseware support, technical support, personal visitation and follow-ups, faculty presentations, faculty mentoring, and generous technology integration incentives. The primary objectives for ubiquitous laptop computing are designed to enhance the learning experience of students, strengthen instructional strategies of faculty members, and rejuvenate university teaching. No external funds were involved in implementing the initiative. It was done through internal reallocation of financial resources and staff reassignment.

Funding and Staffing
Students pay $480 technology fee per semester, a total of $960 for the school year (Sep to May). They will receive a laptop, technical support, and 24-hour Internet access. There is a $500 deductible for insurance. If the laptop is stolen, a student will have to pay the $500 deductible. No subsidy from any vendor. The vendor does provide some instructional support funds for each computer rollover for instructional technology projects. The lease model seems to work best for most laptop universities in U.S. In staff reassignment, some department personnel were given more technology-related work. Many faculty members no longer have secretaries do clerical work for them. Budget for new positions was used for hiring several technology staff.
Problems Encountered

Recently, we have had a great deal of difficulty preparing for technology transition for each new school year. The need for more staffing during summer to help prepare for the new school year continues to be a challenge. Whether it's a computer rollover or upgrading operating systems or software, we have not been able to "iron" out all implementation bugs by the time students return in the Fall.

New software and technology upgrade each school year seems to cause some technology "fatigue" among some faculty members. The challenge is to design customized training that helps ease the transition. If integration of new technologies implemented is not quickly and smoothly worked into teaching and learning, I'm afraid future technology implementation may appear to be merely a publicity or recruiting ploy by the institution.

Time to developing technology-enhanced course materials remains the major issue at our campus. Unless faculty members are given appropriate release time to develop technology-enhanced materials, both the quantity and quality of technology-enhanced courses will not make much headway. We are lucky to get 25% of faculty members who attended training to actually find time to create technology-enhanced courses. Without an effective mechanism to provide release time and attractive incentives, very few faculty members are willing to spend their nights and weekends for technology developments.

1995 Findings

The initial phase of the implementation was to convince students and faculty of the benefits of ubiquitous laptop computing. In a 1995 survey of “Most frequent uses of notebook computer by UMC students”, almost 90% of students surveyed reported crucial benefits from using laptop computers. Almost 90% of students surveyed perceived that technology skills obtained at UMC were helping their career preparation. 90% of students surveyed indicated that technology exposure and skills they learned would enable them to continue learning after graduation. 87% of students surveyed indicated more efficient learning process and getting their assignments done more quickly. 75% of students surveyed indicated enhancement in the amount and quality of learning. The positive response from students gave a huge boost to the ubiquitous computing initiative.

In another survey conducted among the faculty in 1995, 90% of faculty surveyed indicated that ubiquitous laptop computing would expand students’ learning and exploring opportunities. Almost 90% of faculty surveyed indicated that ubiquitous laptop computing environment would expand communications between faculty and students. 75% of them indicated that it would foster growth of linkages with outside organizations and increase student employment prospects. Almost 70% of them indicated that it would improve flexibility in classwork and assignments.

In the same survey, 90% of faculty surveyed were regularly using presentation and office software. Almost all faculty surveyed are using resources on the Web and electronic libraries.

Almost 80% of faculty surveyed indicated that the ubiquitous laptop computing environment had changed the way they teach and communicate. 60% of them indicated that the university had become a more exciting place to work and teach.

1997 Findings

A similar “Most Frequent Uses of Laptop Computers” survey was conducted among students and faculty in 1997. Among students surveyed, 95% were using their laptop computers to write papers or complete assignments outside of class. 88% were participating in sending and receiving emails while 78% were using their laptops computers for exploration purposes. As expected, 90% of them were using their laptop computers for games and other forms of entertainment. Among faculty surveyed, 100% were using their laptop computers for word processing and electronic mail. 93% of them used their laptop computers to prepare presentations. 89% of them used their laptop computers to access the Internet.

In the same survey, when asked about the benefits of using laptop computers, 93% of students surveyed indicated that laptop computers were helping them build technology skills needed in their careers. 85% felt that they had improved research and information gathering skills. 75% indicated that technology had encouraged collaboration with other students. When asked about the benefits of using laptop computers, 90% of the faculty
surveyed indicated that laptop computers had increased project learning opportunities for students. 78% of faculty surveyed felt that laptop computers had improved their communications with other faculty while 77% were changing their teaching approach because of using laptop computers.

1998 Findings

In 1998, a campus-wide “Student Satisfaction Survey” was administered to all students via the World Wide Web. A total of 278 students completed the survey. Almost 80% of students who completed the survey indicated that they were not very familiar (25%) to somewhat familiar (54%) with computers before coming to UMC. 71% of them eventually spent at least 11 hours per week using their computer for a variety of activities (11-20 hrs: 38%; 21-30 hrs: 20%; > 30 hrs: 13%).

In Fig 1, almost 80% of students surveyed were satisfied (47%) or very satisfied (32%) with the level of computer training received at UMC. The high percentage of satisfaction with computer training is likely to contribute toward a high usage of computers for learning. The high satisfaction rate among students surveyed in the use of emails and web accounts was crucial to online interaction and learning.

In Fig 2, 90% students surveyed were comfortable with using laptop computers. This is very crucial for paving the way for students to use laptop computers for various learning tasks. Knowing students are comfortable with using their laptop computers, faculty would be more willing to invest their time and effort in developing interactive learning applications for presentation and online learning. 80% of students surveyed indicated that they perceived skills in computer use as important to their career as well as anticipating using a computer on the job. It is intended that students would transfer their learning and skills to the workplace, meeting a very important component of UMC’s polytechnic mission. 80% of students surveyed indicated that the laptop computer has been integrated into all courses where appropriate. It is an important goal in the ubiquitous laptop initiative to strive for 100% integration of laptop computer usage in all courses, even though some courses will be more interactive than others.
In Spring 1999, a general survey was conducted among graduating students to assess their learning experience at UMC. The survey was administered online. Out of 250 graduating students, 84 filled out the online survey consisting of 57 questions. Fig 3 shows how students surveyed responded to the section that rates students’ assessment of the different aspects of the coursework in their program major. On the whole, students surveyed had a very positive outlook toward the various aspects of their major coursework. The question on the incorporation of the use of notebook computers into courses received an overwhelming positive rating from 92% of students surveyed (Good=27%; Very Good=29%; Excellent=36%). It shows that our laptop computing integration plan is on track.
In Fig 4, graduating students surveyed also indicated that laptop computers had a significant impact on the way they learn and their future career. 90% of them indicated that laptop computers had helped them assume responsibility for learning. The flexibility of accessing their computers at any time was important to them (95%) and gave these graduating students more opportunities to learn to be responsible for their learning. When students realize that they are personally responsible for their learning, they tend to be less reliant on extrinsic factors for motivating their learning. 93% of them also indicated that computer skills developed at UMC were essential to their future employment. Indeed, UMC graduates are now known for their computing skills no matter what their declared majors are.

**Conclusion**

The ubiquitous laptop computing initiative to enhance learning has changed the way we teach and learn at UMC. Following the paradigm shift from “static” to “mobile” learning, faculty not only made courses available anytime, anywhere, but also interacting with students more frequently than before. Another paradigm shift from “passive” to “interactive” online learning had also made a strong impact on learning. Interactive online learning gives students more control, increased participation, and setting their own pace in their learning. The next phase in the ubiquitous laptop learning environment is to shift from “paper” to totally “digital” (paperless) learning, saving not only a few trees and scarce storage space, but also impacting on the university workplace in the reduction of paper bureaucracy. The results at UMC show that ubiquitous laptop computing supported by visionary leadership and comprehensive instructional and technical support can have a tremendous impact on teaching and learning. We are striving to be the first totally interactive ubiquitous computing-based learning campus in the world.