TEACHING WITH LAPTOP COMPUTERS: KEEPING THE EFFECTIVENESS UP AND THE HYPE DOWN

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ABSTRACT

During the past few years laptop computers have become progressively more commonplace in the college of business. As with many technologies, a period of hype frequently precedes implementation and effective deployment, and numerous articles have been written that address whether or not laptops should be used. This article picks up after a decision to implement has been made, and addresses issues relevant to their deployment and use. Anticipated and realized benefits of a laptop program are addressed along with operational and faculty related issues that surfaced in an on-going laptop program at a masters level one business college located in the Northeast United States. The purpose of this paper is to identify critical issues that may arise, to present possible solutions for these, and thereby to explore ways to increase the effectiveness of laptop computers in the college of business.

Keywords: Laptop computers, teaching with technology, teaching with wireless, faculty laptops, student laptops

INTRODUCTION

Bryant College is an AACSB accredited business school located in Smithfield, Rhode Island that offers five traditional undergraduate concentrations: accounting; computer information systems; finance; management and marketing. It also offers three new bachelors degree programs in communication, information technology and applied psychology. There are approximately 2700 undergraduate students, most of whom live on campus, and approximately 500 graduate students participating in MBA, MS in Accounting, MS in Taxation, and MS in Information Systems programs. Bryant made the decision as did other colleges (1) to require all incoming freshmen to have college provided laptop computers beginning in the fall semester of 2002. Factors driving this decision include competitive pressure in a geographic region having many fine business schools and programs, an ambitious college wide building program whose showcase is the 25 million dollar Bello Center for Information Technology, and the culmination of a five year program to build technology infrastructure which resulted in Bryant being listed as one of the most “wired” colleges in the northeast.

BENEFITS OF A LAPTOP PROGRAM

Anticipated benefits to the college were seen to be gaining competitive advantage, building a critical mass of technology in support of a 21st century learning environment, providing uniform need-blind student access to electronic tools and information, and opening the door to a shift from the traditional teaching based to more of a learning based classroom experience. This is
consistent with what others are reporting (2). It was thought, and as it turns out rightfully so, that today’s video acute students arriving at campuses all around the country each fall have very high expectations for state-of-the-art technology and connectivity, and that making this technology readily available is an important vehicle in getting students to engage in the learning experience 24 x 7 x 365. It was also anticipated that the mix of traditional computer labs and classrooms would change with a possible shift of some costs from the college directly to students.

Anticipated benefits to Students and Parents were seen to be portable access to technology and information, uniform distribution of well equipped IBM Pentium 4 laptops such that all students enjoy consistency of hardware and software, a financial model that makes it possible to finance a laptop computer as part of tuition (1,2), and given the two year rollover feature of the program, assurance that students will have the latest and greatest available computer for their entire college experience. Another significant benefit derives from the previously mentioned critical mass of technology. Laptops were introduced after the campus had wired 100 megabit connectivity to every pillow in every dorm, to the library, and to most classrooms. Wireless networking was added to the library and subsequently to most classroom areas. The class registration process using SCT Banner was moved on-line, Blackboard classroom management software (3) was made available to faculty and students, Campus Pipeline was deployed for college wide e-mail, and for the portal/intranet to supplement the College’s already versatile and functional extranet/website.

Today’s students expect life and work on their own terms and without time or physical constraints. This array of technology provides a continuous synchronous and asynchronous environment that meets and in many cases exceeds these expectations. It is an environment in which they can customize the desktop of their laptops, can listen to mp3 music, can play video games, and can instant message at will, with or without being connected by a wire. Nearly three years into the laptop program a number of issues have arisen. Some have been addressed and efforts to solve others and to make the program ever more effective are ongoing. As a result of the implementation experience, and in order to better understand these frequently overlapping items, we have clustered the discussion into operational and faculty issues.

OPERATIONAL ISSUES

As with most major undertakings that will literally impact thousands of people and millions of dollars, planning is critical. Bryant elected a four year phased approach to implementation. such that each incoming freshman in each of the academic years beginning in Fall 2002 would receive laptops. By the end of four years 100% of undergraduates would have a laptop. In a departure from tradition, it was decided to charge incoming freshman a different level of tuition than would be paid by sophomores, juniors and seniors. Freshman tuition was to be higher by the amount required to provide every freshman with a computer, with support for that computer, with insurance against loss or unintentional damage, with College specified software including anti-theft/tracking, antivirus, and the Microsoft Office Professional Suite. The phased approach has been effective, and has provided students, staff and faculty with a relatively user friendly learning curve.
Rollout. In the fall of 2002 the challenge was to issue and get signed receipts for approximately 750 laptops in a single day, to provide 750 students with basic laptop “care and feeding” guidelines, and to provide that one half (375 students) who were not scheduled to take the introductory computer skills course (PPS101 Personal Productivity Software) until spring 2003 with an introduction to the College’s Cyberspace environment. The second year rollout was similar to the first, but the third year rollout planned for fall 2004 has another wrinkle in that it will be necessary to issue 750 new computers to freshman, to collect 750 turn-in machines from juniors, and to issue the 750 juniors updated machines. Instead of handling a mere 750 machines it will be necessary to handle 2250 machines, which is not a trivial exercise. The plan is to issue laptops to freshman on a predetermined date during their first three days on campus, and to make the exchange with juniors later in that same week.

Training. Two freshman orientation programs sprang from the need to familiarize students with their new laptops. The first, Care and Feeding of Laptops was provided by the IT Department before laptops were issued to students. This program explains basic use, security, care, and maintenance. The second, Cyberspace Odyssey was presented jointly by the CIS Department and Faculty Development staff, after laptops were distributed. This program covers how to use the Banner class registration program, Blackboard classroom management program, and e-mail. It was quickly learned that student interest in attending instructional sessions after laptops were issued dropped precipitously, and many students did not acquire the requisite software knowledge. In the year two rollout, both the Care and Feeding and Cyberspace Odyssey programs were presented before the laptops were issued.

Printing issues arose on two fronts. Students in the first rollout had not been adequately advised that they needed to bring a printer to school, and were subsequently making higher than expected demands on campus print booth facilities. Second, printer driver configuration in laptops did not link appropriately with classroom and campus on-line printers. Although these issues were largely resolved by the second rollout, a new phenomena was emerging which is evidently caused by the expanding use of Blackboard. Faculty began a major shift toward posting syllabi, course documents, and handouts on Blackboard and requiring students to print these materials prior to class. The net affect was to decrease faculty and support staff time in making and distributing copies, and to lower departmental copying costs. This is good and productive in that it saves time, shifts a direct cost to students, and provides more opportunity for students who are so inclined to study class materials in advance of class. The downside is that students still tend to do excessive printing at print booth facilities rather than on their personal printers.

Connectivity. A large and largely unforeseen effect of the laptop program was precipitated by the decision to rely entirely on the web for connectivity, and not to place a Novell or other LAN client on laptops. This saves the significant cost of client software and the more significant labor cost of managing an additional 750 clients for each class of students, but it effectively precludes the use of longstanding network file and folder security vehicles, and severely limits the ability of faculty to collect, distribute and manage multiple files.

Wireless connectivity is proving to be a mixed blessing. On the one hand it is very convenient, reasonably fast when dealing with small files, and largely available throughout campus. On the other hand it requires that two network interface cards (landline and wireless) be available on
laptops, it is too slow for large multimedia files, it is a temptation for students in class to instant
message one another, and on occasion unfortunately to exchange answers on quizzes and exams.

**FACULTY ISSUES**

Faculty issues relate to their own use of laptops, to their policies on student laptop use in class,
and to availability of specialized software for use on laptops in selected classes. Bryant’s
longstanding practice of providing faculty desktop or laptop computers on a three year
replacement model was well established before the student laptop program began. Laptops were
first introduced to faculty in a combined summer effort of the Faculty Development Committee
and the CIS Department in 1997. Twenty faculty members were each given a school owned high
end laptop computer if they agreed to attend a two week concentrated course in laptop use,
introducing technology into the classroom, and multimedia content creation. The program was
fully subscribed and marked the beginning of a voluntary rollout of laptops to faculty in both the
liberal arts and business sides of the College. It is estimated that by the time of the first student
rollout in Fall 2002 more than half the faculty had opted for laptops.

*Faculty polices* in regard to student laptop use in class vary widely. Some allow students to take
notes on the computer during class (quiet keyboards make this feasible), others do not. Some
order textbooks that contain relevant software that students can load and maintain on their
laptops, and others prefer to reserve traditional computer labs already loaded with their
specialized software. Many seek new ways to integrate the laptop and technology into the
learning experience (4), and others do not. Some create pedagogical multimedia content that
can be posted to blackboard, and others do not. Electing to engage in these activities frequently
take faculty out of their traditional comfort zone, but in the long run aid in the gradual movement
from a classic lecture driven teaching model to one of technology enhanced learning.

The *Technology Enhanced Learning Model* (TELM) in a mature form can drive a fundamental
re-engineering of how class time is used by students and faculty. The TELM is comprised of
three elements. First, faculty can create electronic multimedia components of their lectures.
These are particularly useful for conveying ideas because multimedia is an “electronic
communication that touches multiple human senses and utilizes text, still images, sound,
amination, video and interactivity to convey more information, more quickly, and more
effectively” (5) than traditional, single channel communications such as a voice lecture.
Second, students can be given assignments with multimedia deliverables (6). For example
when teaching computer architecture one of the authors assigns students the task of creating
electronic logical diagrams of processes such as cache memory and hardware interrupt
operations. This causes students to conceptually think through the interaction of these various
processes, and those who have had multimedia training can add animation and interactivity,
thereby making a graphic and readily understandable representation of complex things. After
grading, I frequently project or run the two or three of best submissions in class to demonstrate
sometimes very different views of the topics being studied. This is an immediate reward to
students who have invested the time, and who best understand and can communicate the central
ideas.
The third factor underlying the re-engineering of class time deals with archiving these electronic teaching and learning materials. Faculty and student created content can be stored electronically for subsequent posting to Blackboard. It can be accumulated over semesters and courses, and if needed can be combined and recombined to suit the teaching needs for individual courses given by a particular faculty member. It can also be assigned for pre-viewing along with reading assignments. Because ideas simple and complex can be viewed by students prior to class, the class can contain more discussion of the ideas and less actual passing of the initial facts from instructor to student. In this way the classroom experience becomes one of reinforcing ideas as much a conveying ideas. The traditional idea of class time (7) or perhaps more appropriately learning time is expanded in a technology enhanced learning environment. Students seem by nature to be nocturnal. They use laptops, do electronic home works, and send e-mails to each other and to faculty nearly 24x7. The concepts of class time, learning time, and faculty office hours are converging, and could perhaps be viewed as pre-class, class and post-class aspects of the electronic learning environment.

Reliability of technology is a key issue. Early this semester more than one instructor placed lecture notes, electronic overheads, and web sites to be used in class on Blackboard in preparation for two hour evening graduate classes to be delivered in a different building. Shortly after beginning the class it became evident that Blackboard was not operational, and instructors were left with a challenging situation. Technology failures are reported to be quite common (8), and the instructors had no overheads or class notes. Technology is highly useful when it works, but contingency plans for the use of time in any given class must be in place for when it does not.

Uniformity of hardware and software is an issue. Students first use their new laptops in the previously mentioned Personal Productivity Software Course (PPS). It is assumed that they are already familiar with Word, and the course covers how to navigate Bryant cyberspace including Banner, Blackboard, and e-Mail, plus PowerPoint, basic multimedia, Front Page and Excel. Because PPS faculty are on a two year laptop replacement program as are students, their computers were somewhat different from those of the second laptop class arriving in fall 2003. The students had 40GB hard drives versus 20GB on faculty machines, and they were equipped with a firewire port to enable faster transfer of digital media. It proved problematic to demonstrate and use firewire peripherals when the faculty machines did not have that feature. Another compatibility issue relates to software because having different hardware, and a different release of the Windows XP operating system, the Windows Moviemaker was not compatible with the earlier version. Printer drivers were also different and caused a repeat of the year earlier student print problems. The burden is on the faculty member to pretest and identify these potentially disruptive issues, preferably before class time, and for the IT department to provide timely remedies.

Classroom discipline and exam security in the electronic environment is an issue. When 30 students are sitting in a classroom, each with his or her own laptop configured to their choices, each with active instant messaging, each with video, sound, games, and internet at their fingertips, the laptop becomes paramount to a personalized cyberspace dorm room that students carry with them, much like a turtle carries his shell. The temptation is for students to lapse into this cyberspace comfort zone and invest little or no attention on what is taking place in the
classroom(9). Another and equally important risk is the aforementioned potential for students to cheat by electronically exchanging answers in the “wild west” wireless and LAN-less environment. In the LAN-less environment of the web, deactivating the wireless signal and shutting off web access is not a viable solution because there would remain no manner other than pencil and paper to distribute and collect exams and quizzes. In order to circumvent this problem exams are given in a traditional computer classroom with 30 LAN based workstations and when quizzes are given on the laptop, students are required to submit a screen print showing the quiz and their desktop. If instant messenger appears on the screen print, collusion is at least enabled if not used, and remedial action can be taken with the student.

File collection and distribution in the LAN-less web environment is problematic because electronic homework assignments and other deliverables are either e-mailed to the faculty member, or placed in Blackboard’s digital drop box. Either way an instructor needs to copy files one at a time from e-mail or the drop box into a file folder on his or her laptop. The graded assignments then need to be posted or mailed back to students one at time. A PPS instructor with having three sections of 30 students each must handle each of 90 electronic deliverables two times for every homework assignment. This becomes a time consuming and burdensome task, especially when the deliverable is a student created web site containing multimedia and many files. The process is so cumbersome that students are asked to use the CD Burner on their laptops to create and submit web creation CD’s. In this case faculty are handling 90 CD’s a day, which physically awkward to carry. At present we are testing a virtual server package that mimics the file structure of a LAN, and may work for files less than 1MB in size.

In addition to the operational and faculty laptop related issues discussed here, there are student, classroom and curriculum issues that are better discussed in a subsequent article.

**FINDINGS AND CONCLUSIONS**

Given the considerable investment in planning, technology, training, implementation and support, the laptop program at Bryant has turned out to be a homerun when using student satisfaction and opportunity for change as metrics. An informal survey of the first inbound freshman class to receive laptops conducted in Fall 2002 indicated an 87% satisfaction rate. Approximately the same percentage of students felt the program was worth the extra cost of tuition. Conversations with faculty and students indicate similar on-going impressions. In retrospect it appears that introducing laptops to faculty five years before students, providing extensive network connectivity infrastructure before the rollout, introducing on-line class registration, on-line Blackboard class management software, requiring that all students have a college provided laptop, and carefully integrating the rollout with necessary training contributed substantially to the success of the program. Another key contributor to success is the nature of the laptops themselves. The IBM Thinkpad P4 computers with large hard drives and 256MB of memory have proven able to do whatever today’s video and web savvy students ask of them.

**FUTURE IMPLICATIONS**

For those contemplating a student laptop program, the following summarizes key issues to be addressed: rollout strategy, pre and post implementation training, printing, connectivity, re-
engineering of class time, reliability of technology, uniformity of hardware and software, exam security, electronic file distribution and collection, and financial cost.

Although considerable progress has been made, a good deal remains to be done. Multiple file handling and security problems must be addressed, on-going faculty training in the creation and use of multimedia content needs to be accelerated, and the reliability and response time of IT support for the electronic classroom needs to be enhanced. On a broader scale, the more important finding of the program may be the potential of the laptop, as a communication tool in the electronic environment, to enable a fundamental change in the teaching/learning process. Laptops are enabling a 24x7 process of student engagement that gradually moves from the traditional emphasis on teaching to a more participative emphasis on learning. When students and faculty have continuous, fast, portable access to information, they are able to work and study in a pre-class, class, and post class continuum that has the potential to make education more effective.

REFERENCES