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Collaboration in Support of Curricular Innovations

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The migration of traditional anatomy and pathology wet labs to a digital format requires significant planning and collaboration amongst key faculty, administrative, and technology personnel. In addition to conversion of course materials, the changed format necessitated the refurbishment of a traditional bench lab as a state-of-the art digital classroom, significant IT investment, and ongoing coordination by library, classroom and computer resources personnel. Standardized policies and procedures were developed to guide additional requests for software to support new educational initiatives.

INTRODUCTION

Historically, curricular innovation has been almost exclusively in the hands of the teaching faculty. Now, however, the ability to incorporate digital images culled from repositories and databanks, mount course materials on learning management systems, and create multi-media modules for independent study necessitates faculty partnerships with multiple entities. The chasm between 'the old technology and the new tools, between the offline and the online' has been called the '*space between*.'[1] Hertz notes that 'one aspect of this *space between* is a change in focus from the individual to the group'. This is clearly evident in curricular development and implementation in support of medical education. In order to create and deliver new educational programming, faculty must collaborate with educational technology experts, librarians, and the people responsible for providing institutional information technology services.

Interest in moving to digital-based instruction for pathology education began as early as the mid-1990s. With programming developed by a medical student with extraordinary computer expertise, a CD-ROM-based Virtual Microscopy program was created in the 1995–96 academic year.[2] *PathLab*, comprising nine cases in haematopathology, was designed to bridge the gap between the pathology and morphology of disease and clinical management. Microscopic images of specimens are presented to the user, who can view the images at successively higher magnifications, thereby simulating an examination under a real microscope. While the cases continue to be used, further development was shelved once the student programmer graduated as there was no other funding for this initiative.

To augment the curriculum, the Library's AV Study Center provided access to slide reels supplementing pathology lab sessions. As student interest in digital technology grew, Library staff worked with the Pathology course coordinator to digitize the slide sets in the pathology Kodachrome collection. Thirty-nine lab sessions were completed. The images were made available to students via a web-based, password-protected site. While interest in moving to digital-based microscopy for pathology education was genuine, it would be another six years until we found an affordable solution which sufficiently simulated microscopic examination of images and met the faculty members' other curricular expectations.

PILOT STUDY

During the 2003 academic year, faculty responsible for both the MS I Microscopic Anatomy and MS II Pathology courses agreed it was time to replace light microscopes with a new virtual microscopy system. It was both difficult to maintain the glass slides used in the laboratory exercises and expensive to repair

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the microscopes. The students' enthusiasm for digital images which supplemented the curriculum further bolstered the initiative to move to a digital curriculum. With the support of the Medical Center's Computer Applications Support Services department, the Chairmen of Anatomy and Pathology engaged in a pilot project with Bacus Labs,[3] an established laboratory company that had created an innovative digital microscopy viewer.

An important part of the pilot phase of this project was communication with other schools which had implemented similar initiatives. Although there was great interest in moving to a totally wireless environment, we learned that those institutions which had followed that direction had encountered significant problems in delivering images to the students' desktops in an acceptable timeframe. This information led to our decision to provide for a wired classroom and to question throughput capability of the recommended server.

Bacus provided a small dedicated server and the Anatomy Department replaced two of its former wet labs with digital labs held in the library's computer classroom. Selected glass slides were digitized and stored on the small server dedicated to the pilot project. Due to the limited number of available computers, multiple students shared each computer during the lab session. Overall, the pilot project was successful, although some technical difficulties were encountered due to the number of simultaneous users and the capabilities of the pilot project server. Based on this success, a proposal was sent to the Dean of the School of Medicine & Health Sciences to convert to a totally digital lab environment.

METHODOLOGY: A COLLABORATIVE TASK FORCE

With positive feedback from both faculty and students, the Dean named a Task Force to oversee the transformation of an old wet lab into a state-of-the art digital classroom equipped to handle the technological needs required by a total conversion of these two courses to digital format (*Figure 1*).

This Educational Technology Task Force consisted of the Associate Vice President for Educational Resources, Director of Clinical Informatics for the School of Medicine, the University CIO, the University's Chief Technology Officer, the Assistant Vice President for Health Economics, and the Special Assistant to the Vice President for Health Affairs. Soliciting input from all interested parties, they met weekly to guide

Figure 1. The original laboratory.

development of the specifications, capital and operational budgets including all elements of the implementation plan for the classroom (room design, AV requirements, room access security system) and IT infrastructure requirements (workstation specifications, software needs for the workstations, servers configured for the Bacus system with consideration for load balancing, additional Library workstations, and an increase in IT support staffing).

Beginning in November 2003, the Task Force worked with the Chairmen of Anatomy and Pathology and the departments' respective teaching faculty to ensure that all curricular needs were addressed. In addition, the Director of Computer Applications and Support Services, the Manager of Classroom AV Services, and the Library's Assistant Director, Curriculum and Technology Services, were continually informed of all discussions and decisions. They were given ample opportunity to provide input to the project. In April 2004 final requirements were turned over to Facilities Management for architectural design, wiring, lighting, and other components of a major renovation. Renovations of the room could not begin until Spring 2004 classes ended in June. Working on a tight timetable between the end of June 2004 and the mid-August start of the Fall semester, work was successfully completed on time to everyone's satisfaction, as determined by post-implementation interviews (*Figure 2*).

The final reconfiguration of the amphitheatre-style classroom was 180 seats/tables. After extensive review of teaching methodology, faculty agreed there would be one computer for every two students. Wireless hubs were installed for use by students who owned their own laptops. Realizing the migration to a digitally-based curriculum for two core basic sciences courses would translate into increased student use of computers; capital funding for this project included the addition of forty eight additional computers in the Health Sciences Library (*Figure 3*).

Based on the experience during the pilot study, we knew that a single server was insufficient. The computer services group worked with Bacus to determine exact specifications for two dedicated servers which would be required for proper load balancing, considering the number of simultaneous users. We also successfully demonstrated the need for an additional staff person in the computer support department based on the addition of two servers and 138 workstations (ninety in the classroom and forty eight in the library).

Security for the classroom was a concern and the classroom was equipped with a card reader. While the room is 'unlocked' during normal class hours, only designated faculty or AV and IT staff have access during

Figure 2. The new digital classroom.

Figure 3. Students share the computer with one other person.

restricted hours. A process for approving and submitting names to the University ID card control office was agreed upon. Assigning responsibility for this task is critical, as is monitoring and updating the access list.

During the wet lab facilities renovation, attention had to be directed simultaneously at building the digital database to support the curriculum. The Library's Assistant Director, Curriculum and Technology Services, served as the project coordinator for the development of the digital anatomy and pathology content. Anatomy and Pathology faculty in each department selected and organized the desired glass slide images which had to be packed and shipped to Bacus for imaging. One department chose to send all slides at one time for digitization, while the other department sent the slides in batches by subject. In addition, one department chose to spend additional funds for a custom website in which all the slides are organized in easy to locate folders by organ system to facilitate student access and self-directed study outside formal lab sessions.

The department which elected to send images in batches to Bacus Labs encountered delays as other schools were also sending materials in preparation for the new academic year. A feature of Bacus is that it provides a consortium-based library of digital images. All participating schools must sign an agreement giving rights to use the images to other participating institutions. While that was an important factor in deciding on Bacus as our digital platform, we prepared faculty to use images from other schools if ours were not imaged and ready by the date needed.

While the room was designed to accommodate the new digital Anatomy and Pathology labs during the day, it also housed various classes and labs for the School of Public Health and Health Services in the evenings, particularly computer-intensive statistical courses. All of the software requirements for these classes were incorporated into the standard image set of software for the computers in this new room. The primary programs were Microsoft Office, various statistical analysis packages, as well as standard web browsers with appropriate plug-ins and utilities. Due to the large number of computers and the busy schedule of the IT staff, the image set could only be altered once each semester in preparation for the coming semester.

RESULTS

The newly renovated digital classroom was successful from the beginning. During the planning stages for the room renovation, faculty members were extensively surveyed about their software needs. We

demonstrated classroom management software, a program that would allow the instructor to share the instructor screen image with the students or monitor their screens. The faculty all agreed that there was no need to install this software in the new room. However, several weeks into the semester, the faculty changed their minds and requested the software be installed *immediately*. Last minute funding was provided through an educational grant and the purchase and installation process was rushed through the various Medical Center channels in order to have the software quickly installed on the workstations.

In addition to Anatomy and Pathology labs during the day and Public Health statistical classes in the evening, other departments immediately began requesting access for their classes. Several departments had ideas for computer labs for their programs in our state-of-the-art digital classroom. The requests to use the classroom were frequently accompanied by requests to add curricular software for use in these labs and classes. As a result, we developed and disseminated a detailed policy and procedures for requesting and evaluating new educational software. The procedure for evaluating software was based on the Library's established criteria for software evaluation which had been implemented years earlier for the acquisition of software for its computer labs. Information about the policy was sent to all faculty via the institutional faculty *list-serv* mail-list with links to the GWUMC Institutional Software Request Policy and Software Request Form on our web-site.[4,5]

It quickly became evident that the Computer Applications & Support Services staff could not continuously update the image for the workstations. With the classroom in constant use, we decided we would add new software only at specified times during the year. We agreed to schedule a software update prior to the start of each semester. As part of the software request policy, faculty have been advised they need to consider software requirements for classes the semester before they plan to implement its use.

DISCUSSION

With the knowledge that any curricular innovations are dependent on the IT infrastructure and the participation of Library and Instructional Media staff, the Dean has retained the services of this Educational Technology Task Force. The Task Force is now working on the renovation of the Anatomy Gross Dissection Lab and will soon engage in other classroom renovation projects. Among the new faculty proposals is a request to hold online exams in a secure, digital environment. The Task Force will be active participants if, and when, the School of Medicine decides to require notebook or tablet computers for students.

On 31 March 1967, The New York Academy of Sciences convened health sciences leaders for a conference titled: Biomedical Communications: Problems and Resources. The presentation on facilities spoke to the importance of careful planning to insure appropriate incorporation of media into facilities.[6] Four decades have passed and our classrooms are generally equipped to handle AV media. But we have now come full circle. Our classrooms of the 1970s and 1980s, in many cases, are insufficiently equipped to handle the demands and implications of new digital media. The profound impact of information technology on universities was aptly noted by Gillespie in 1983.

> The growth of information services has led to a situation in which offices report to different vice-presidents and executive officers: the library reports to one person, the academic and administrative computer services to another, communications and printing to another, instructional media services to another … Yet, technology is driving all these information sources together.[7]

Addressing the traditional divide between faculty and IT, Pennock and Bunt ask the question 'Whose system is it, anyway?'.[8] They conclude that involving faculty in planning and implementing administrative systems fosters campus-wide engagement and support, and is essential to the successful implementation of systems. Similarly, faculty must partner with those responsible for IT infrastructure and other academic support services to ensure the necessary ingredients for curricular enhancement are procured and ready for implementation as they adopt new technologies in the classroom. Our institutions must establish a neutral forum for discussion of systems so that the requirements from all interested parties are addressed prior to implementation. Stakeholders can design requirements into the project plan rather than point fingers and blame exclusion from the process for failures during implementation. Educational administration leaders must ensure appropriate levels of communication and co-operation exist between faculty, key information technology staff, and instructional media personnel so that curricular initiatives are properly planned and supported.

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