Utilizing a Broadcast Quality Video Production Facility in a Distributed Education Environment

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Introduction

The Distance Learning Prototype Lab (DLPL) at Saint Francis University's Center of Excellence for Remote and Medically Under-Served Areas (CERMUSA) was established in 1999 to explore and demonstrate how the merger of a variety of telecommunications technologies (video production, computer graphics, the Internet and teleconferencing) can improve the pedagogy, quality, and distribution of education and training in distributed learning environments. While the specific numbers have varied from study to study, there is general agreement among researchers that people retain approximately 20% of what they hear, 40% of what they see and hear, and 75% of what they see, hear, and do (Amthor, 1996). Simply adding visual content to existing lecture material and classroom activities would seem to be a simple way to take advantage of that potential for increased retention, but that has not been the case.

The Infrastructure

Development of the DLPL began in 1998 and grew out of the perceived need to improve the appearance and method of distance learning courses, particularly those delivered synchronously via video teleconference, through the use of professional-quality video production equipment and techniques. The major components of this facility were to include a studio area with a "green screen", a control room, and a post-production unit built around a non-linear digital video editing system.

Once funding was in place, bid specifications were prepared and submitted to several vendors. The final specifications eliminated the digital non-linear editing system, replacing it with a linear system utilizing two Panasonic DVCPro format video tape recorder/players already included in the proposal.

In January 1999, a specialist in broadcast video production was hired to manage the DLPL project and equipment installation commenced. Figure 1 illustrates the earliest iteration of the facility's control room. During this phase, a number of changes to the original specifications were made to correct operational deficiencies and to improve ease of use. In the original design, only the three studio cameras and the far end video from the teleconferencing unit were available as possible backgrounds when using the "green screen" effect. The addition of a passive video switcher routed to the digital effects switcher allowed any video source to be used. Because so much archival video was stored on VHS format tape, and because that format remains in common use at the consumer level, an additional S/VHS-VHS video recorder/player was added to the production console.

Figure 1
The DLPL control room as it appeared in 1999.

Over the next several years additional equipment was acquired and added to the system as needed for specific applications. These upgrades included a fixed studio lighting system to improve the quality of "green screen" effects and overall video quality, a video writer for on screen annotation, a prompter system, and a nonlinear video editing facility.

By 2003 it became apparent that the additional technology had greatly outstripped the initial infrastructure design and a professional broadcast engineering firm was hired to redesign the DLPL to meeting current and projected future needs as a multipurpose production facility. That study resulted in a complete rebuild of the facility in early 2004 that included a complete reorganization of the audio and video cabling throughout the studio and control room, as well as providing connection points for exterior connections to two adjacent classrooms and other CERMUSA facilities on the Saint Francis University campus; installation of additional equipment, particularly a video synchronization generator to better manage and "condition" video signals to retain quality; and the introduction of an audio/video electronic routing system to provide a more robust and flexible method of distributing multimedia content, as shown in Figure 2.

Figure 2
The DLPL control room following the 2004 renovation. The encircled area shows one of the routing switchers that provide a higher level of flexibility than had earlier been possible through the use of patch cords and similar temporary measures.

The renovation provided an immediate and visible improvement to the overall output quality. More importantly, it better accommodated the growing demand for electronic delivery of video and audio assets. The system is also far more efficient from the standpoint of human resources. It is possible for a single operator to simultaneously manage a live video production, record classroom lectures, produce multiple copies of existing media assets, and manage live streaming media.

In the post production environment, the DLPL allows content to be produced for delivery on a variety of platforms, including physical media (tape, CD, DVD) as well as data streams as large as Internet2 or as small as a PDA. The video signal quality improvements inherent to the renovations allow producers to far more easily develop content that can be formatted to this wider variety of delivery platforms without the need for totally different production values.

Appropriate Technology Applications

Yale University Emeritus Professor Edward Tufte suggests visual presentation tools are generally misused in both educational and corporate settings (2003). While his focus is the traditional classroom and the corporate boardroom, the extension of his criticism into the arena of distance education is clear. One of the goals for implementation of the DLPL was to make more effective use of the available multimedia tools and to show educators that effective visual communications techniques that work in a studio setting can also provide value in a traditional classroom environment. As Tufte suggests, "If your words or images are not on point, making them dance in color won't make them relevant. Audience boredom is usually a content failure, not a decoration failure" (2003). For this reason, the DLPL has emerged as a multi-purpose tool capable of delivering appropriate multimedia content using a wide range of delivery methods, for instance streaming video that can be viewed over a low-bandwidth connection on a PDA, to very high quality multiple streams transmitted over the ultrahigh broadband Internet2 – but a tool that is effective only when utilized effectively, as part of a broader instructional strategy.

The body of research into the efficacy of electronically connecting discontinuous groups of students with an instructor is sparse, and is generally based on older levels of technology that have evolved considerably in the past several years. A 1995 Australian study, for example, cited frequent technical difficulties as significant distractions that reduced satisfaction levels compared to traditional methods (Freeman, 1998). Over the course of five years and several different distance education research projects, the focused use of multimedia produced in and/or distributed from the DLPL has provided further support for the notion that quality, in terms of the visual element of learning, contributes to improved learning. However, simply incorporating technology does not automatically translate into improved distance education learning outcomes. Adding the tools to improve visual content must be utilized within a pedagogically sound setting. This implies a need for greater collaboration among instructors, content experts, instructional designers, and specialists in areas such as video, audio and web production. The success of the *Bringing the Museum to the Classroom* videoconference prototype can be attributed to the collaboration between experts in content and in multimedia presentation (Davis, 2001). This was one of the earliest sustained uses of the DLPL: a three-year partnership among CERMUSA, the Southern Alleghenies Museum of Art, and a group of K-12 school districts spread along Pennsylvania's

Appalachian Mountains. Lessons learned in this project have been integrated in subsequent CERMUSA Distance Learning prototypes.

To fully leverage the interactivity capabilities of a robust video conferencing system, such as what is available in the DLPL, instructors ideally would choose an instructional method that makes the instructor both an information provider and a facilitator of active student participation, creating an environment where students can hone critical thinking skills. A growing body of research bears this out. MacIntosh (2001) demonstrated how this approach worked effectively in a RN to BSN program offered at a distance to practicing nurses in Canada's Maritime Provinces. The same study examined the appropriate selection of technology for use within a distance environment. The course was then delivered to both locations by two-way interactive video conference.

The integration of multimedia, the increased reliance on stimulating students' minds through multiple sensory inputs is perhaps new in terms of the technology utilized; however, the underlying learning theory is traditional. The 1930s pedagogy of psychologist Kurt Lewin, for example, offers an excellent basis for effective distance education delivery. By implementing Lewin's principles of active learning and cohesive teaching, Stahl argues, educators can vitalize distance learning (1999). It is just as easy to fall into the trap of allowing multimedia to follow the passive paradigm of entertainment television, using it solely to provide students with visual stimulation. Tufte argues strongly against the frequently seen misuse of visual content, specifically the now nearly ubiquitous PowerPoint presentation, suggesting that rather than enhancing educational content, often presentation slides disrupt, dominate, and trivialize content (2003).

The research studies utilizing the DLPL have focused on a total course development model rather than simply adding rich media to the mix. Whether the DLPL is utilized for synchronous or asynchronous content delivery, it represents only one part of the technology toolkit. CERMUSA's distance and distributed learning research efforts have included comparative tests of course management software systems, with a variety of student and instructor populations. One such study makes use of video-based case studies produced in the DLPL studio and post-production facility and delivered online as on-demand continuing medical education for practicing pharmacologists. Another project involved the production of supplementary content for an undergraduate level physics course, allowing students to review in-class demonstrations of such topics as wave propagation or the effect of gravity on items of varying mass.

A Documentation Tool

The DLPL serves as the principal electronic documentation tool for all CERMUSA activities. Major organizational events are documented, and video products are produced for use in a variety of presentations and public expositions. Individual CERMUSA research projects that do not utilize the DLPL directly for content development make use of the facilities for documentation of research activities.

Administration and Logistics

Aside from the application of the technology, there exist the administrative challenges of balancing the research and operational elements, as well as agreeing on the appropriate division of responsibilities between IT and Operational staff in the maintenance and management of the DLPL. The former is resolved through effective project management processes; while the later is a reflection of similar debates throughout the commercial telecommunications industry, and is a product of the convergence of telecommunications and computer technologies. Depending on one's perspective, the DLPL is either a television production facility heavily invested in computer technology, or conversely, a robust Information Technology environment that produces multimedia content requiring considerable IT resources.

This convergence remains both the DLPL's greatest opportunity and its most significant challenge. Related to that is the storage and management of the growing volume of video products residing on a variety of media in several formats. Digital Asset Management (DAM) systems exist in the commercial sector, but have not yet reached a mature point in the development cycle. This remains a fertile area for future research and development.

Conclusion

As one of many tools in the educator's toolkit, the DLPL provides the opportunity to enrich existing courses and expand the reach of instructors from the traditional classroom to anywhere on the planet. The larger question remains, is it worthwhile?

One of the earliest DLPL projects offers some insight into that question of value. By leveraging the advantages of visual learning, while respecting the boundaries imposed by technological limitations such as narrow transmission bandwidths, a willing "buy-in" by instructors and administrators at participating schools, the SAMA/CERMUSA *Bringing the Museum to the Classroom* project reveals the potential of this delivery mode and these multimedia tools as an adjunct to conventional classroom instruction (Davis, 2001). While outside funding was available to deliver this course to rural schools, demand was intense. Demand dropped to zero when local school boards were asked to pay a share of the delivery costs for what they viewed as an electronic field trip.

Other DLPL projects have focused on the comparative costs of multisite synchronous delivery by video conference versus the use of adjunct instructors at remote sites. The recent advances in video conferencing over IP-based networks, allowing institutions to leverage already existing (and fixed cost) broadband connections, has finally established a cost parity allowing university administrators to measure the two delivery modes on qualitative criteria.

The ongoing value of the DLPL rests in its ability to perform a variety of missions in a cost, time, and quality effective manner. For educators, the lessons learned here in the development and deployment of multimedia content have direct application whether that content is developed by a similar production facility, self-made (creating and editing one's own video is a topic in itself), or obtained as part of a textbook bundle. As we watch a new generation become ever more

immersed in digital content, we must look at how best to integrate these new channels of communication into a wider array of teaching and learning modalities.

This project was supported by the Center of Excellence for Remote and Medically Under-Served Areas (CERMUSA) at Saint Francis University, Loretto, Pennsylvania, under the Office of Naval Research Grant Number N000140111002.

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