Audio Visual Technology on Campus

How AV technologies can help your institution make the most of its 21st century assets to enhance learning and improve teaching

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Executive Summary

Audio visual technology in the college classroom is now the norm rather than the exception. Today, along with notebook computers, classrooms and lecture halls are being equipped with ceiling-mounted projectors, large projection screens, multiple video monitors and document scanners. Many also boast whiteboards and video conferencing equipment.

One direct result of all this new AV technology on campus is that a more participatory, interactive educational experience has been replacing static, one-way lectures in which instructors speak to students at length with few interruptions.

In this AV-friendly environment, instructors interact more with their students, calling them to the front of the class to write on whiteboards or search the Internet. And with video conferencing, students beamed in on large-screen monitors from hundreds of miles away can ask questions and take part in classroom discussions in real time.

Administrators and faculty recognize that today's students — so-called Internet natives who grew up with ubiquitous web access, video games, MP3 players and wireless communications — have different learning styles than past generations and expect to use technology both in and out of the classroom.

For IT staffs at colleges and universities, the rise of the technology-based classroom presents tremendous support and organizational challenges. The prospect of possibly needing a tech person in every classroom and lecture hall is a daunting proposition.

University IT teams are working on ways to make technology easy for instructors and students to use, with as little technical assistance as possible. On the organizational front, there is a need to find ways to integrate the work of IT, AV and instructional design into one cohesive policy.

This white paper examines the latest trends in AV technology and offers insights into how these new tools can dramatically change learning and teaching on college campuses. It also serves as a guide to better understand the technologies and how you can apply them to make the most of digital classrooms at your institution.

Enhancing the Learning Process

A report issued by the trade group InfoComm states that no matter what a student's particular learning style (be it auditory, visual or tactile), the introduction of audio visual technology drives up retention and comprehension of information.

Why? Because audio visual enhancements encourage right-side brain visualization and left-side brain processing to work together more efficiently.

The results are clear: A survey of 250 educators by research group IDC found that 98 percent of respondents believed that using visuals through projection technology significantly increased student attention. The vast majority of the group also cited improved retention of information as an important motive for using projectors in the classroom.

Another study, sponsored by 3M and the University of Minnesota, found that audiences who were presented information with visual supports were 10 percent more likely to retain what they had learned. Additionally, these individuals were significantly better prepared to use and apply the new knowledge.

The same positive results that corporate presenters obtain from using visuals during their presentations at trade shows and conferences can be applied to the college classroom. Today's tech-savvy students simply respond more positively and are more engaged by a visual presentation compared to an educator writing notes in chalk on a traditional blackboard.

Visuals bring students into the learning process. Instead of a one-way lecture, which the University of Washington reports that 80 percent of its professors still rely on (and quite likely is the case on many campuses), AV technology encourages students to participate, whether it's by making annotations on an interactive whiteboard or sending an e-mail or text message query to a professor during or after class.

New AV technologies all support e-mail and texting, messaging technologies that draw students into the ongoing discussion — students who might not normally communicate with their professors at all during the course of a semester.

In the past, AV meant merely that students watched movies or slide presentations. Today, they can become part of the movie.

One good example is at the University of Pennsylvania, where French instructors ask their students to each create a character from World War II and make a video in French detailing the fictitious person's experiences. The students ultimately present these films in class. These kinds of tools make learning fun and meet modern students' expectations that they will use technology as a integral part of their learning process.

Recovery Act Drives Video Conferencing Expansion

Research group Frost & Sullivan reports that an important driver for the expansion of video conferencing in the education market is the new focus of the government in targeting improvements in technology infrastructure through the $787 billion economic stimulus plan.

Under the American Reinvestment and Recovery Act of 2009, a number of universities and colleges created plans to improve their technology infrastructure through available government grants.

Overall, the research group reports that the combined impact of the reduction in travel for cost cutting, awareness of travel's impact on an organization's carbon footprint and improvements in video technology is driving organizations to deploy video conferencing systems.

According to Frost & Sullivan, the global video conferencing and telepresence market reached $2.4 billion in 2008, growing at 23.8 percent over the previous year. The research group predicts this market to nearly double within five years, to $5.7 billion.

Improving Teaching

Students needn't be the only ones having fun. That's the view of Randy Jackson, an instructional designer at the University of Washington. He challenges college educators to draw more students into participating in the standard 50-minute class period. He insists that colleges can do better, especially when, on average, questions from students comprise less then five minutes of class time and only 19 percent of students typically seek advice after class.

Technology can help spark and retain student interest during class. An example might be an American history class in which the professor was prepared to talk about the first year of the Civil War. What if students raised questions about the circumstances that led to Ulysses S. Grant being appointed as commander of the Union Army in 1864, much later in the conflict?

The professor could address this line of inquiry by quickly pulling a presentation she had prepared on Grant's campaigns from a remote server. Shifting topics may not be what the professor had in mind, but technology offers a way to keep the class engaged while covering required curriculum materials.

And once the class ends, the professor could then post the original presentation and the new information about Grant on her website. The professor could also e-mail all the material covered in the class directly to the students to elicit further questions and discussion.

Another good example of how technology can improve teaching is the way in which modern audio visuals and up-to-the-minute news online can enhance a political science course. Suppose during a lecture on health-care legislation, a student asks a question and then refers to a video recently broadcast on CNN.com that highlights a Senate discussion on the Senate version of the legislation. The professor could then bring up the CNN site, let the class view the video clip and open up the discussion to the entire class.

The ability to immediately show video on a projector screen or interactive whiteboard brings the debate to life and draws students into the discussion in a way not previously possible.

Although some instructors enter this new tech world with apprehension, most IT managers and instructional designers report that once educators experiment with AV tools and develop their own interactive lesson plans, the technology becomes contagious. The reality is that educators are limited only by their own creativity.

AV-IT Management Convergence

The convergence taking place between AV and IT presents a considerable management issue for colleges and universities. Now that every device (from a projector to digital signage to a whiteboard) has an IP address, when a device fails, who fixes it? Does the instructor call the AV department? Or should an e-mail be sent to the IT department?

Traditionally, notebooks come under the IT department's domain, but if they include links to projectors and document scanners, does the AV team take over responsibility? Faculty tend to view the entire classroom presentation system as a single unit, rather than discreet components that require specialized support.

Everything needs to function as a whole, from the network to computers to the AV equipment. Without that capability, classroom instruction is compromised. These are issues that higher education institutions need to address.

Over the past few years, Towson University in Maryland, like many many institutions, has struggled with these issues. The university has given consideration to integrating its IT, AV and instructional design staff. But so far, the right solution has not been agreed on.

At this time, Towson has implemented a number of interim measures, such as staff cross-training, along with organizing closer collaboration and communication among the various support groups. Although specialty skills are required for some tasks, both the AV and IT staffs are acting as first-responders to assistance requests. Both groups have been trained to handle typical classroom issues, such as checking cables or explaining hardware features.

These kinds of interim measures are a good start, but many challenges await, such as how AV-IT convergence will affect the budget, where the funding will come from, sorting through staff chain of commands and prioritizing classroom support requests into other office responsibilities.

Training has proven critical because a major goal of the instructional designers is to make technology easy enough to use that instructors don't need tech staff stationed in the classroom. Some applications are easier to use than others.

For example, professors at Towson now have access to a digital media classroom that lets them record lectures and post them on the Internet with the click of a few buttons. Many instructors now rely on

that application almost automatically. On the other hand, some of the video conferencing applications require technicians to be on hand to manage calls and zoom in on students asking questions or making points during class.

On the management front, many new devices can be set up to automatically notify the IT department via e-mail when a projector's lamp light nears the end of its life or if a circuit on an LCD panel fails, causing the picture to go out.

In the case of projector lamps, these alerts let the IT team plan replacements more efficiently. And in the case of failed LCD panels, the automated capability means a support person can respond sooner to repair or replace problem panels. Instead of hearing about it during the middle of the school day, the field support team can now learn about failures the night before and schedule technicians to fix problems before classes start.

Interactive Whiteboards

Whiteboards, large interactive displays that work in conjunction with a computer and projector, allow teachers and students to interact with one another and the educational content displayed. The screen images can be saved, printed or distributed over a network.

The projector displays the computer's desktop on the whiteboard's surface, where users control the board using a special electronic pen or through touch. The whiteboards, typically mounted to a classroom wall or a floor stand, connect to a computer through a wired USB, a serial port or via a Bluetooth wireless connection.

Many colleges have been phasing in interactive whiteboards as replacements for traditional whiteboards or combinations of flipcharts, DVD players and TV systems. Beyond the in-classroom connection, whiteboards also allow instructors to connect to the school's digital video distribution system, as well as tap shared annotation and drawing repositories found online, such as vector-based graphical websites. Such features come in especially handy for math and science instruction.

A major benefit of interactive whiteboards is gained before classes even begin. By using the technology to prepare and share lessons, lectures and resource materials with their peers during course and curriculum development, instructors find that they have more time to address the individual needs of students.

Additionally, the technology's ability to support various types of media within a lesson helps educators easily adapt to students' multiple learning styles and abilities. Multimedia features built into most interactive whiteboards let professors integrate still images, spreadsheets, moving images and sound, as well as incorporate images, text and videos off the Internet.

In many instances, a link to Google software applications is facilitated through the whiteboard's software bundle. Armed with these capabilities, instructors can better assist students who may not learn best through simple text or static images alone.

Interactive whiteboards also let instructors record their lessons as digital video files that can be posted for review by students following the class. This is especially effective for students who benefit from repetition, or those who simply need to see the material presented again because there was a specific point in the lecture that they either didn't understand or that required follow-up with the teacher.

This feature lets students follow up on the course material on their own time; something that many students juggling work, school and family commitments appreciate. The video files are also convenient for students who may have been absent because they were ill or for prepping before exams.

Whiteboards also let instructors annotate diagrams. For example, a biology or medical school instructor teaching an anatomy course could identify specific body parts on a 3D image of a human body. Another good example would be in a botany class where the instructor could do research on a particular tree species, bring in text information and an image of the tree, and then annotate the specific parts on the whiteboard.

Wireless Projectors Take Center Stage

Projectors are no longer mere output devices. They are now integrated into the network. Projectors can produce HDTV-quality video, and they can process information. The latest projectors are also wireless.

Today's wireless projectors can perform several functions:

- Toggle between multiple computer sources;
- Let users present from a computer placed anywhere in a room;
- Run PowerPoint presentations with limited animation;
- Show edits to a document, such as an Excel spreadsheet, in real time.

Source: ProjectorPeople.com

Whiteboards also help educators teach more effectively to students with disabilities. The color, size and style of the electronically captured text can be changed to improve accessibility for all students.

Another useful feature: When an instructor draws a circle, triangle or square, the board automatically creates a perfect image. While math students appreciate this feature because the boards display equations much more legibly, it applies to any course where the instructor spends a lot of time writing notes or drawing figures on the board.

Above all, whiteboards encourage a more interactive educational experience. Instructors can draw students in by encouraging them to come up to the board to explain a specific point or to do Internet research on a question they may have. Annotated notes can also be e-mailed directly to a student group from the whiteboard, which can prompt discussions via e-mail.

Projectors

Projectors, although typically connected to a computer or whiteboard via a video graphics array (VGA) cable or USB port, increasingly rely on wireless or Ethernet connections.

These essential classroom devices come in many shapes and sizes, from portable projectors weighing less than 6 pounds to higher-end projectors that can weigh more than 25 pounds. The size of the room is an important factor to determine what projector will meet your needs. Smaller rooms can make use of portable projectors, while larger auditoriums will benefit from a larger form.

Larger, fixed projectors display the brightest, sharpest images possible, an advantage in large venues such as auditoriums and college lecture halls. Most units feature a brightness of at least 1,000 lumens, though a projector suitable for a medium to large lecture hall on a college campus should support 4,000 lumens.

Resolution, the number of pixels a projector uses to create a picture, is an important factor in image clarity. The more pixels, the more detailed the projected image. The two most common native resolution standards are super video graphics array (SVGA) at 800x600 pixels and extended graphics array (XGA) at 1024x768 pixels.

Both standards are compatible with most desktop and notebook computers and work well for displaying basic graphics, such as those created in PowerPoint and similar office automation programs.

There are two kinds of projector technologies, liquid crystal display (LCD) and digital light processing (DLP). LCD technology operates like a valve, allowing light either to pass through its panels or be blocked using a combination of electronics, optics and chemicals. This process regulates the light and produces the projected image on the screen.

DLP projectors reflect light off the surface of a digital micromirror device (DMD) chip to project an image on a screen. Each DMD chip comprises hundreds of thousands of tiny mirrors. Each mirror represents a pixel that is turned on or off to create the image.

LCD projectors are noted for sharp images at all resolutions. Their precise focusing capabilities become especially important when projecting data such as spreadsheets, but less so for video projection. LCD also features limited distortion, and images will appear clearly even in brightly lit environments.

On the other hand, DLP delivers more light from lamp to screen, which results in more efficient use of lumens. This proves helpful when using a projector in a room where it is difficult to control lighting. DLP projectors can display video more effectively because they produce smooth, high-contrast images with minimal pixilation or graininess.

Projectors offer instructors a tool for creating full-length multimedia experiences. An instructor can connect a notebook computer to a projector to give a PowerPoint presentation or upload a video from the Internet.

A projector also gives students the ability to easily make presentations during class. In the school library, librarians and other educators can surf the web with students to help them conduct research for an upcoming paper. Librarians can also play videos to large groups as part of core lessons and to complement the content with related books.

While stationary projectors are in common use in large lecture halls, manufacturers are offering projectors that are more mobile than ever, allowing the classroom experience to go mobile when needed.

Along with greater mobility, many manufacturers are now offering projectors with a short-throw lens. These projectors project the largest possible image from a short distance, vastly reducing the shadow effects common to front-projection systems. And with the projector closer to the screen or whiteboard, the audience is allowed an unobstructed view of the image. Some manufacturers have even integrated systems that combine a whiteboard, short-throw projector and audio system in one unit.

What Are the Benefits of Digital Signage?

Digital signage brings a host of benefits for colleges and universities to take advantage of.

- **INFORM STUDENTS:** Bulletin board messages often get lost in the clutter. With digital signage positioned in important gathering places, schools can efficiently provide important messages to the student body, whether emergency bulletins or real-time weather and traffic reports.
- **INFORM VISITORS:** Strategic placement in heavy traffic areas such as the student union or admissions offices can help the institution's leadership communicate directly with students and guests.
- **REINFORCE YOUR SCHOOL'S BRAND IMAGE:** Digital signage can power your school's brand with a consistent message while also elevating the overall perception of the school.
- **SAVE ON COSTS:** Static posters and banners are costly to replace over time, especially if you want the content to remain relevant and interesting to your audience. Digital signage saves a step in the production process by going straight from the design phase to live messaging, video and audio.
- **REDUCE ENVIRONMENTAL IMPACT:** Digital signage cuts your overall use of paper, ink and plastics instantly.
- **EXTEND THE NETWORK:** By using your campus's wireless network, you can set up and control the entire display system from a single point.

Source: NEC

Digital Signage

Through digital signage, an LCD unit or plasma screen replaces paper-based bulletin boards and message boards as a campus-wide communications tool.

The latest digital signage tools deliver a multimedia experience, allowing schools to post a mix of information from multiple sources. For instance, digital signage in the library might post the library hours, include a news feed from CNN and a recurring weather report from the Weather Channel, and then offer school-based news running crawler style across the bottom of the screen.

Other uses of digital signage at colleges and universities include posting a change in a class location on a digital display posted outside a building, as well as posting the day's or week's menu outside cafeterias. Colleges also use digital signage to update students on the results of sporting events, along with upcoming game schedules and ticket availability.

Digital signage also serves an additional purpose in providing a campus with an instant alert mechanism during an emergency such as a fire, flood or hurricane. The digital displays can be used to post news stories about specific incidents, or more importantly, messages and instructions from the administration and local public-safety officials in the case of a real emergency.

One major advantage of digital signage is that updating content is relatively easy; messages can be added and deleted with a computer and managed on a server. A media player is typically used to distribute digital signage content. In most current setups, colleges run the signage systems centrally, linking them on the campus network — whether wired or wireless. For some specialized uses, the media player can be located with the display and connected directly to it.

The network that connects the digital signage throughout a college campus usually requires a management server. This can be located anywhere on the network. Users manage and organize new content on the management server, while the actual content displayed on the digital signs resides on the media servers.

Digital signage networks can either be closed or open to the Internet. For closed networks without Internet access, signage content updates must be loaded to the network locally via a portable storage device, or loaded onto a PC or server (from a DVD or CD) that's connected to the network. Once the content is uploaded to the network, digital signage software will drive it to the appropriate displays.

Digital signage networks with Internet access can be updated remotely and stream data from Internet sources for content updates. They also allow real-time data access via RSS feeds.

On some college campuses, digital signage has begun to move beyond messaging and alert systems and into the classroom itself. Some of the first users have been business schools, which have taken advantage of the technology's video capabilities to simulate financial exchange trading floors, complete with stock tickers, commodities information and business news updates. Some business schools are also using these technology deployments as recruitment tools to attract top students.

Tomorrow's Technologies, Today

Projector technology continues to improve. While the latest innovations tend to carry a higher initial price tag, strategic purchasing can help your institution future-proof their projector investments. Here are five leading-edge technologies worth considering today.

1. LCOS (LIQUID CRYSTAL ON SILICON)

Essentially, LCOS combines the best attributes of LCD and DLP technology. Like LCD, LCOS uses liquid crystals. But the crystals are applied to a mirror, making LCOS a reflective technology like DLP. As a result, most LCOS machines sport minimum native resolutions of SXGA+ (1400x1050 pixels).

2. WIDESCREEN AND HIGH RESOLUTION

Every new notebook and desktop monitor has a native rectangular 16:10 aspect ratio, while most projector models still use the square (4:3) aspect, natively. However, wide-format projector models are now coming on strong. Conveniently designated with a "w," native 16:10 projectors offer resolutions equivalent to XGA and above.

3. SHORT-THROW AND ULTRA-SHORT-THROW

Short-throw and ultra-short-throw projectors address the problem of the projected image being disrupted. Short-throw projectors can sit less than four feet from the screen and ultra-short-throw models just under two feet, decreasing the opportunity for disruption of the image.

4. 3D PROJECTORS

With 3D content in the pipeline, manufacturers are rolling out projection equipment to display it. Some are even bundling the projectors with 3D glasses and AV carts specifically designed for education and government uses. Because all 3D models also work with 2D content, 3D projectors have immediate applications.

5. LEDS AND PICOS

Fanless, whisper-quiet LED projectors theoretically never require lamp changes because the light source will outlast the life of the projector. Although LED projectors are still relatively lumen-poor, recent price drops have made them more attractive.

Sources: IDC, Insight Media, iSuppli

Video Conferencing

Video conferencing, a fully interactive telecommunications and computing technology, lets people at two or more locations participate in a multichannel video and audio session.

The main technology supporting video conferencing is real-time digital compression of audio and video streams. A codec, short for coder/decoder, performs the compression.

Until recently, video conferencing had been fairly expensive and travel was inexpensive enough to encourage organizations to allow staff to travel for face-to-face meetings rather than utilize video conferencing. But organizations are now increasingly turning to video conferencing to facilitate meetings and conferences.

Other reasons for the increased popularity of video conferencing include the decline in the cost of bandwidth and LCDs, as well as major improvements in high-definition video technology.

At colleges and universities, video conferencing offers many potential applications. Institutions with multiple locations use it so students at different campuses can reduce travel and attend classes locally. Colleges also use video conferencing to conduct classes and collaborate on research projects with universities in other parts of the country or the world.

Video conferences also provide an avenue for faculty to connect with colleagues in the private sector, the government and the medical community. Today, it makes more sense for a busy CEO to address a class of business school students via video conference as opposed to making a trip to campus. The same is true for resident campus experts.

College administrations are also looking to make more effective use of faculty time and save money on travel through video conferencing. Many now reason that it's better to have a high-priced faculty member working with students or on research than spending inordinate time traveling to and attending costly symposia and conferences.

An example of the far-reaching potential for video conferencing technology is that practicing physicians are using the technology to share the expertise and latest research being conducted at university teaching hospitals. This started in earnest in the 1990s and has only continued to accelerate.

A modest video conferencing setup lets on-campus medical experts reach out to far-flung campuses with reduced facilities to demonstrate the latest techniques and health-care practices.

Another popular application allows businesses to use video conferences to recruit graduating students. Major companies used to spend extensive time and money recruiting on campus. Today, they have turned to video conferences to conduct first-round interviews with prospective candidates, following up with only those serious candidates for face-to-face interviews. This is yet another example of how AV technology lets universities partner with organizations beyond the campus borders.

Manufacturer Options

EPSON AMERICA is the U.S. affiliate of Seiko Epson and a leading provider of digital imaging products. The manufacturer's extensive range of printers, scanners and 3LCD projectors are known for their high quality, functionality, compactness and energy efficiency.

ERGOTRON offers a wide portfolio of AV solutions that are centered around mounting and mobility products for LCD panels, computer monitors and notebooks. Its mounting solutions include wall and desk mount arms, desk stands, carts and vertical lifts.

LG DISPLAY develops and manufactures a few different TFT-LCD solutions for higher education institutions including monitors, notebooks and mobile applications. Its solutions offer improved viewing angles and brightness response times.

LIFESIZE is one of the first manufacturers to develop and deliver high-definition video communications products. The manufacturer markets HD video conferencing applications for colleges and universities worldwide.

MITSUBISHI ELECTRIC manufactures several products for the classroom and lecture hall including a variety of projectors, LED displays and LCD monitors. Its LCDs offer automatic power-saving and power-cycling features to deter image persistence and extend monitor life.

NEC DISPLAY SOLUTIONS OF AMERICA designs and markets innovative desktop LCDs; professional-grade, large-screen LCD and plasma displays; and integrated display solutions. For the education market, the manufacturer produces projectors and digital signage.

POLYCOM is a leader in the creation of collaborative telepresence, video and voice solutions for business, government and education.

POLYVISION manufactures interactive classroom tools, instructional software and student response systems, with an emphasis on interactive whiteboards and panels. It also offers professional development for instructors.

SONY manufactures entertainment and electronics products. The manufacturer has been committed to the education market for several years, where it works closely with colleges and universities to deliver projectors, digital signage and video conferencing systems.

Video Conferencing Applications for Higher Education

Video conferencing technology continues to improve. As more departments and campuses become familiar with the technology, it is being applied in many new and interesting ways, including:

- State-of-the art learning centers
- Innovative robotics, biology, music and medical research
- Peer and institutional collaboration
- Interactive distance learning
- Professional development and continuing education
- Sign-language training
- Community programs

Source: LifeSize