WHITE PAPER

PLUGGED IN: THE ROLE OF THE NETWORK IN FLIPPED CLASSROOMS

How Networked AV Technology Can Make Active Learning More Flexible

EXECUTIVE SUMMARY

The flipped classroom gets its name from the way it "flips" traditional lecturing in class from passively listening and taking notes to watching lecture videos online and coming to class to collaborate and study in groups. The education in a flipped classroom focuses on "active learning," a group-based, interactive learning style that is centered on problem solving and learning by doing. To facilitate this, desks in the classroom are shifting from traditional static rows to movable workstation clusters called "pods," where student groups work together on problems.

Much of this collaborative learning involves students and teachers bringing in a variety of devices and sharing content as well as student and teacher presentations as part of the daily assignments. Technology in flipped classrooms provides this capability, ensuring flexible, scalable methods of distributing audio and video between the various student pods as well as the instructor's station and the main display(s) in the room. By using networked AV that distributes, controls and manages audio and video over a standard IT network, educational institutions can provide the advanced collaborative capabilities these dynamic spaces need, while ensuring the spaces are able to shift and change easily as the needs of the classroom change.

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ABOUT THE AUTHOR

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THE RISE OF ACTIVE LEARNING

One of my earliest "professional" positions was as an AV technician for the University of North Texas, where I was obtaining my master's degree. During that time, I installed, maintained and repaired technology for a variety of different spaces, from small classrooms to large lecture halls to science labs. While the types of classrooms varied greatly, the technology we installed was quite standard for most of these spaces. We had a projector or two, a "room PC," a few auxiliary ports, some sound reinforcement and possibly a DVD player or document camera, if the room was more elaborate.

I always thought that this was strange, because the subjects taught and types of learning involved were quite varied, but the technology was very standard across every space. But it made sense, because most all of these classrooms involved the same basic way of teaching. An instructor stood in front of the class, presented a slideshow, played an occasional video and that was about it for many of these classes. The geology teacher might bring in a rock to show, using the document camera, but that was about as fancy as things got most of the time.

However, as time has passed, the technology involved in classrooms has gotten more and more complex. Much of this coincides with the pervasiveness of mobile technology and ubiquitous cloud computing. As technology advanced and multi-device, multimedia immersion became a standard part of students' lives growing up, the need for more advanced learning techniques to engage these students rose as well. New methods to easily obtain information—particularly the rise in video streaming (and mobile video in particular)—changed some of the basic ideas of what "education" actually is and opened up learning techniques that were not feasible before.

This technological shift also coincided with a development in educational theory itself: the flipped classroom. The "flipped classroom" gets its name from the way it "flips" the portion of education that happens inside and outside of the classroom. Rather than have the in-class portion be traditional lecturing with the students passively listening and taking notes, flipped classroom students watch lecture videos online. Rather than doing concept application and group projects out-of-class, students come to class to collaborate and perform hands-on study in groups. "Stand and present" teaching was moved to online video, and room layouts shifted from traditional static rows to movable clusters.

Flipped classrooms have their roots in a related education approach: active learning. Active learning (also known as collaborative learning) is an instructional method in which students engage in a variety of activities to learn their study material, including reading, writing, talking, listening and reflecting. It is a group-based, interactive learning style that is centered on problem solving and learning by doing.

Students sit at group workstations called "pods." Student pods vary in size depending on the discipline the room is targeting, with most pods sitting between 4–8 students. The particular layout differs from space to space, as the goal of an active learning environment is allowing students more hands-on learning within a particular department. Students can all connect and display information on the display for their pod, viewing and sharing information together as they work on a problem. The instructor can then share the video from any pod or teaching station with the entire class.

Schools may choose to forgo the teaching station altogether, even removing the podiums in some cases. This allows the faculty to be more interactive with the students and encourages the teachers to put the focus on the students, walking among them and having students look up and share information as required.

Active learning classrooms are becoming increasingly popular in higher education, where there is a growing demand for the adoption of this type of classroom. Traditional classrooms have been remodeled into dynamic, technology-rich project rooms, with the focus on spaces that are flexible in potential use and designed to inspire collaboration. While primary and secondary education institutions have been latecomers to active learning, interest in its benefits have increased quickly, particularly in campuses where laptops or tablets are deployed to all students.

Traditional classrooms have been remodeled into dynamic, technology-rich project rooms, with the focus on spaces that are flexible in potential use and designed to inspire collaboration.

WHY FLIPPED CLASSROOMS WORK

Institutions are becoming increasingly interested in flipped classrooms, as the importance of collaboration is becoming more vital for educational success. Numerous studies have shown that when students are able to work collaboratively in an active learning environment, knowledge retention and student satisfaction both increase (Michael, 2006). Historically, learning was a singular process. The communication of information was mostly one-directional, with any conversation between the teacher and the students being mostly Socratic question and answer. However, in recent years, there has been an increased focus on intercommunication and idea-sharing between students.

This is because, despite what traditional teaching models might have you believe, education is not limited to a single person standing at the front of a room lecturing to a group of rapt pupils. Rather, education is an intrinsically social activity, and when you facilitate learning between the individuals who have knowledge and those who need it, it can create an environment of rapid knowledge growth.

This is why schools have begun embracing methodologies to encourage knowledge sharing, both in-classroom and remotely. The ability to use technology to share knowledge and co-learn between people across geographies has shown significant impact on education, as has the ability for students to learn on their own, at their own pace. Flexible classrooms allow students to view lectures and perform solo learning at home, and then meet in the classroom for group activities and interpersonal learning. The addition of remote learning allows students to join in these collaborative exercises from anywhere, extending the size of the classroom and the range of perspectives.

These benefits are backed up by research, with studies reporting that using a flipped classroom approach "increased [the] levels of student achievement, interest and engagement" (Herreid & Schiller, 2013). This was demonstrated in a major study of science education, which found that students in flipped classrooms achieved higher test scores and greater overall classroom success than comparable students in traditional education classes (Ruddick, 2012).

Technology is a key component of the success of this approach. This is because studies have found that "millennials reared on rapidly evolving technologies demonstrate decreased tolerance for lecture-style dissemination of course information" (Roehl, Shweta, & Shannon, 2013). Instead, the majority of teachers in flipped classrooms reported that they prefer "videos over reading materials" for outside student preparation (Herreid & Schiller, 2013).

Once in the classroom, teachers rely on technology to allow students and teachers to share information and work collaboratively on classroom projects, finding that "using class time for active learning versus lecture provides opportunities for greater teacher-to-student mentoring, peer-to-peer collaboration and cross-disciplinary engagement" (Roehl, Shweta, & Shannon, 2013). Indeed, studies have found that "the use of technology [in flipped classrooms] is flexible and appropriate for 21st century learning" (Herreid & Schiller, 2013).

Flexibility, in this case, is the most important part of a flipped classroom and an active learning approach. The in-classroom portion of a flipped class is very much driven by the specific project or activity at hand. Technology, in these cases, allows students to share information and collaborate in the manner and at the level with which they are most comfortable. Students can bring laptops and mobile devices to share information with the class, or they can use other methods of information sharing if they wish. The technology in the classroom allows these students to connect and collaborate in the manner they are familiar with and provides the ability for multiple students to share that information with the class.

COMMON ACTIVITIES IN FLIPPED CLASSROOMS

- Learning and collaborating in a variety of different dynamically changing formats, including whole class, small groups and hands-on individual work
- Connecting a variety of devices (including laptops, mobile devices and more) to local displays on or near student tables as well as to one or more displays at the front of the room
- Using sound reinforcement to ensure everyone can hear the teacher and student presenters
- Controlling volume, input switching and more at each individual student table, teacher's desk and for the whole room
- Receiving support from an AV help desk with real-time equipment monitoring

NETWORKED-BASED AV TECHNOLOGY FLIPPED CLASSROOMS

Video Distribution

Video distribution systems facilitate a presentation through the sharing of video content from laptops and mobile devices. These solutions allow both teachers and students to bring devices into the classroom, connect them to the AV system at the teaching station or student pods and then share content with the class. In an active learning environment, this technology is particularly necessary, as students often bring their own devices during hands-on activities to look up information, work on projects and use software related to the class subject. Without video distribution technology, students and teachers are not able to connect and share what is on their laptops with other members of the class, eliminating the ability for students to collaborate and share ideas as they work on a lesson.

AV Table Box

Students and teachers connect to the AV system using an AV table box, such as the AMX HydraPort architectural connectivity solution. These connection boxes are mounted at the teaching station and each student pod. The student pod has a variety of different connectivity options, including AV connections, power outlets and built-in, retractable cables, ensuring a range of devices can connect to the AV system.

Video Switchers

Once devices are connected to the AV table box, they must be distributed to displays both at the local table and throughout the room. Video switchers change the input between multiple source devices, allowing you to connect them to a signgle video output. Switchers, such as the AMX N7142 all-in-one presentation switcher, allow users to select between multiple laptops connected at the student and teacher tables and display the images on the screen at that table or to all of the displays in the classroom.

Networked Video

Networked video solutions like the AMX N2300 Series allow video to be distributed over a standard Ethernet network, providing high-quality, low-latency 4K video wherever it is needed. Video at the table is connected to an encoder. All of the encoders in the room are connected to a standard network switch. Displays are connected to the network using a decoder. Video can then be switched from any input to any output in the room. Since the video is distributed over a standard IT network, it is endlessly scalable and cost-effective to install. In addition, it is simple and easy to add additional sources or displays one at a time, because all that is required is an additional encoder or decoder.

The AMX N7142 presentation switcher has built in N2300 encoder and decoder cards, providing simplified installation and design in a single device.

Sound Reinforcement

The sound reinforcement or public address system distributes the sound, so the students can hear it intelligibly. In an active learning classroom, this system can be simple or moderately complex, based on the need and/or the challenges presented by the room itself, but there are some basic requirements.

Additional audio considerations include connections for laptops, video players and other devices to share presentations or play multimedia and high-definition movies as well as listening assist systems for ADA compliance.

Microphone

Typically, a flexible classroom is large enough that the instructor wears a hands-free wireless microphone during class. This allows them to move about freely, while still allowing the students hear their instructor, especially when seated at tables farther away. When the students are asked to present, providing gooseneck microphones at each table is a convenient addition, as is a wireless handheld microphone for student presenters who want to stand or roam.

Digital Signal Processors

Once the audio from microphones, PCs and other source devices enter the system, a digital signal processor (DSP), such as the BSS Soundweb London Series, mixes the audio from the different inputs together and processes them for optimal sound. DSPs are useful in active learning classrooms, because they can separate audio into different zones, providing flexibility and quick room reconfiguration based upon presets.

Amplifiers

To ensure adequate volume for room audio, power amplifiers like the Crown CDi DriveCore Series provide clean, high-power audio output for a variety of different applications. Built-in DSPs optimize the output for specific speakers, ensuring a quality audio experience, while a multichannel capability allows a large active learning space to separate into multiple zones. With a range of output options for both 70V and 8 Ohm speakers, there is a great choice for every application.

Loudspeakers

Due to the use of student pods and the need for different, flexible room configurations, sound is often needed in multiple areas, with varying coverage patterns, depending on the activity. As a result, an active learning classroom may have several different loudspeaker requirements. The room may employ ceiling speakers like the JBL Control Series for distributed audio, while using surface-mounted speakers for music/voice playback. Pendant speakers are also an option for isolated sound at individual pods.

Automation

AV control and automation systems simplify the selection and operation of AV equipment, so teachers and students feel comfortable operating the room's technology and confident that it supports both lectures and group interaction. In an active learning classroom, the AV control and automation system performs two important roles. First, it manages all sources of audio, video and computer devices in the room through a central interface (typically a touch-based control panel), distributing content to multiple displays in the classroom. Second, it manages all audio-visual devices used at student tables, distributing sources to a local display at each student pod. Each pod is controlled by a secondary user interface—a keypad or touch panel. The interfaces are designed to be simple and easy to use for both the instructors and students.

Keypads and Switching Buttons

A key part of active learning is the ability for students to take charge of their learning process in class, and part of that is having the ability to control the AV at the student pod. A simple keypad mounted at each pod allows students to switch between devices at the pod, adjust volume and more. Alternately, cable-mounted source selector buttons, like the AMX MyTurn solution, provide a simple “input switching” button right on the cable in the AV table box. By pressing the button on the cable connected to their laptop, they can show the video from their device on the pod TV for the entire group to view.

Touch Panels

A touch panel mounted at the teacher and/or student desks integrates all the AV functionality in the classroom into a single, streamlined interface. The teacher simply presses the "On" button, and the lights come on, the display powers up and switches to the correct input, and the presentation or sharing is ready to begin. A touch panel gives the teacher the power to control all AV technology in the entire classroom from an intuitive, user-friendly interface. With the ability to initiate audio and video presets at the press of a button, the touch panel becomes the center of the collaborative experience.

Central Controller

Central controllers are the backend devices that make a control system operate. Powerful control processors, like the AMX NetLinx® NX Series central controllers, are the brains of the automation system and run programming code that tells it how to respond to commands from the touch panels, keypads and other user interfaces. The control processor in the central controller receives user interactions from user interface devices, and then tells the controlled devices (encoders/decoders, matrix switchers, DSPs, TVs, lights, screens, etc.) to perform the desired action. When students press a button on a keypad to change the input or adjust the volume, it's the central controller that performs the action. Control processors are also available built-in to matrix switchers, such as the AMX Enova Series and keypads, such as AMX Massio ControlPads.

THE RISE OF NETWORKED AV

Now that we've looked at how AV looks in a flipped classroom, let's take a closer look at how the network impacts the way these AV systems operate. To really see why network AV functions the way it does (the benefits of this approach), it's important to understand how AV has changed over the years.

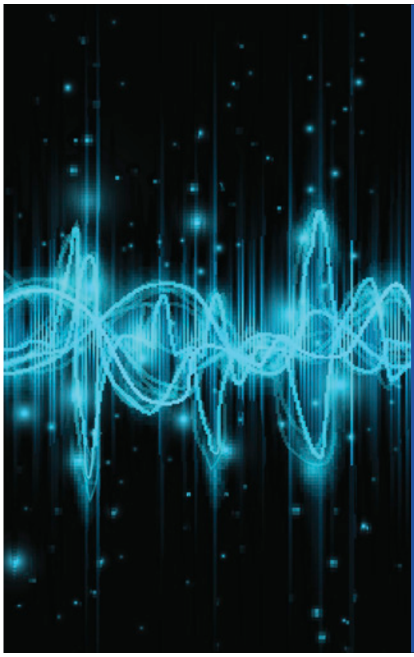
The Days of Analog

Back in the days when I was a university AV technician, everything was analog. Since analog audio and video signals needed to be routed over standard analog formats (coax, RGBHV, etc.), it was natural for this distribution to go into a central hardware infrastructure. A large AV rack contained all the hardware, and there were cables that sent all of the audio and video signals wherever they needed to go. Everything was a maze of wires all tied back to the central rack, with a cable for each audio and video signal.

Because there was a dedicated hardware backplane that connected sources to destinations, you usually were limited on how many inputs and outputs you could have for each device in your system. If you needed more audio inputs than the DSP could handle or more video outputs than you originally planned for your system, you needed to pay for additional hardware and adjust your infrastructure to handle the new device. Handling solutions like flipped classrooms became significant design challenges, especially for the video distribution. It could quickly become an expensive prospect to have the right hardware backplane to handle the amount of video switching involved in a complex active learning environment. You were typically limited by the number of inputs and outputs you needed when initially purchasing the video switching chassis. This made scaling or expanding the AV system a more complicated and expensive task.

Technologies that Drove Change in AV Distribution

While technology is constantly evolving, there were two interrelated concepts that really shifted the conversation from the analog world: Digital AV and Network Distribution. As these two technologies rose in prominence, it changed what was expected out of audio and video, but it also expanded what was possible.



Digital Audio and Video

As the world shifted away from focusing on amplitude and frequency (as we did in the analog world) to the ones and zeros of digital, it prompted an inherent shift in the foundational way AV functioned and performed. There were inherent assumptions about quality that people took for granted in analog that were no longer acceptable. For video, in particular, the shift to digital created a strong need to adopt new technology formats to handle higher resolution and better video quality.

However, as AV moved into this digital realm, the industry naturally fell back on the same basic concept of the large centralized hardware, because everyone was familiar with it. The big black box that sat in the rack and provided distribution for all of the different rooms and spaces was still there, only now the video was digital and high definition.

Eventually, the paradigm would shift to networked AV—thanks, in large part, to the rise of the internet. However, the distribution over the internet was only possible due to the move from analog to digital.

Network Distribution

Ever since people have seen the benefits of the network, they wanted to put audio and video on it, and that manifested in a variety of ways. People found ways to use the network to stream audio and video, using services like YouTube, Netflix, Pandora, etc. They also found ways to use the network to connect to each other over the network, using VoIP audio calling and video-based web conferencing. All of this technology allowed people to have audio and video at their fingertips.

Of course, this naturally set expectations for what was possible, and people naturally wanted to stream things out to a large venue, manage audio and video in exhibit halls, and even distribute AV throughout their active learning classrooms. This gave rise to a variety of different solutions to the problem, such as AVB and Dante for audio distribution, and H.264 and JPEG2000 for video distribution. These solutions allow audio and video to traverse the network, so you can get the signal wherever you need it.

NETWORKED AV IN FLIPPED CLASSROOMS

One of the reasons Networked AV has great benefits for flipped classrooms is that the biggest benefits are flexibility and scalability—the two most important factors for technology in a flipped classroom environment.

As I've said, a flipped classroom has a variety of different configurations and uses, and the needs of these spaces shift over time. By leveraging the inherent flexibility and scalability of the network itself, networked AV solutions provide a solution that is perfect for these highly adaptive spaces.

The flexibility comes because Networked AV can often use the existing wiring infrastructure, so there is no need to pull separate proprietary AV cabling (and then re-pull or adjust as needs in rooms change). Education environments typically have fairly robust IT networks, so schools can typically use the existing network for AV distribution. This makes the AV design flexible, because there is no design need to accommodate running a bundle of AV cables throughout the system. There are normally network drops throughout these spaces, allowing the school to add student tables wherever they need to be—and even move them without rewiring.

When distributing video, in particular, bandwidth is always a concern, though less so now that schools more regularly use gigabit networks. When video first became digital and the idea of putting video on the network was put forth, H.264 quickly became a standard, because it reduced bandwidth usage, making video distribution possible on existing networks. At the time, most of those networks were 10/100 networks, so they only had 100 megabits to work with. H.264 was highly efficient for bandwidth usage compared to other standards of its day, so going with other video encoding standards often required a gigabit network, which was not common when networked AV first came to light.

Unfortunately, while H.264 is an excellent standard for a number of applications, it has some inherent latency and picture quality concerns. These were tradeoffs to get bandwidth down to the level where it was logistically possible to transverse 10/100 networks, but the results weren't always desirable for all applications, such as a flipped classroom.

Today, however, most schools have gigabit networks, which provide more bandwidth and more flexibility. This allows for newer technology options that provide better quality and lower latency. Also, the technology itself has grown to the point that high-quality video can be distributed over local networks without major impact. Technologies, like the minimal proprietary compression (MPC) in the AMX N1000 Networked AV line and JPEG2000 compression in the AMX N2000, open up a lot of applications for Networked AV, where H.264 might not be an ideal choice. With much lower latency than H.264, these new networked video formats can distribute to sources and destinations that are located anywhere on the network, opening up a lot of new use cases for distribution across multiple classrooms on a campus.

Audio distribution has also grown as IT networks have expanded. Originally, audio distribution was single encoded audio streams sent over the network, similar to the way networked video was distributed. Of course, this distribution encountered the same issues as video, though streaming audio uses far less bandwidth than video. However, for network distribution to be truly viable for audio (especially in performance environments), there needed to be a way to distribute a large number of audio channels over the network in a simple and organized manner.

This gave rise to new networked audio formats that allowed multiple channels of audio to be distributed over an IT network at very high quality. Formats like AVB, AES67 and Audinate's Dante became commonly adopted, and they allowed audio devices to sit anywhere on the network and pass audio between them, providing much-needed flexibility in the way audio systems are designed, as the devices can be installed anywhere in a building.

The nature of AV on the network makes it inherently flexible, but it is also infinitely scalable in increments of one. While the needs of the classroom today may simply be to push the instructor's content to students and wall-mounted monitors, tomorrow, they may want to send content from the students' desk locations to the instructor. Eventually, the school may want to start adding additional pods or functionality. Because networked video has a single encoder or decoder for each video input or output, schools can simply add more encoders if they need more inputs or additional decoders to add more displays. In addition, networked audio allows schools to add additional audio devices without additional expensive cabling. Since the system is never tied to a centralized chassis, the school can't outgrow the system. It will grow with the needs of the space.

While the needs of the classroom today may simply be to push the instructor's content to students and wall-mounted monitors, tomorrow, they may want to send content from the students' desk locations to the instructor.

Multiple spaces can even be connected together with audio and video from each space, accessible simply by the nature of the rooms being on the same network. Adding overflow classrooms or remote collaborative spaces is a simple change with a powerful impact.

All of these capabilities are available in a networked AV solution due to the nature of network technology. The topology of a network is, by design, decentralized and scalable. Put simply, devices can plug in anywhere in a normal "hub and spoke" network and connect to any other device in that same network. Networked AV leverages that capability and allows integrators to distribute over more cost-effective category cabling and standard IT network devices rather than a proprietary architecture.

USING AES67 TO INTEGRATE NETWORKED AUDIO AND VIDEO

Since audio and video are both distributed over the same network, it provides the ability to better integrate two these two typically separate systems. Given that the audio and video signals are available on the network, the signals can switch between audio-only sources and destinations as well as sources and destinations with both audio and video. While this seems like a natural quality, AV systems haven't always worked that way.

Back in the analog days, there was the video switching plane and then there was the audio switching plane. Education environments traditionally didn't have many audio requirements beyond switching audio from a source to a destination beyond audio occasionally running through a DSP. Large rooms typically required some form of amplification (typically 70V/100V constant voltage).

Then, the industry started providing digital video solutions, and while we've already spoken about the resolution and quality changes, there was also another significant shift: the HDMI format. With the HDMI cabling format, you could actually have embedded audio with the video. That was a major change for the market. The industry saw a lot of benefit from combining and coupling audio and video with one cable and one HDMI connector. All that media passed on the same cable.

For plenty of applications, this was fine. Discreet audio switching wasn't necessarily needed. If you had an embedded audio path with a video signal, you would be fine. The audio was always going to go to the same place as the video. However, it made it extremely difficult to process the signal, and for situations like a flipped classroom, where there are a lot of audio and video sources and destinations—with the need to mix source audio with microphones and other audio sources—things were more difficult, because you didn't have access like before.

One of the things that networked AV makes possible is the ability to separate the audio and video. With formats like JPEG2000, audio is not embedded with the video. This provides the ability send the audio in a format like AES67, which is available on AMX SVSI Series encoders and decoders, BSS Soundweb London DSPs and Crown DriveCore Install DA Series amplifiers. With the encoders, decoders, DSP and amplifiers all on the network, you can send audio from a source directly to an amplifier over the network or route it to a networked DSP for processing. After processing in a DSP, the audio could be sent on to a networked amplifier or recombined with the video at the decoder—all over the network. The beauty is that the audio and video are both sitting on the network, so you have the option of sending the signal to any input, processor or output on the network without re-cabling. The network itself is being used as a matrix, and you aren't limited to the confined architecture of a matrix switcher.

This is really the whole ecosystem and the flexibility that Networked AV brings to it, with the ability to add or remove audio without additional wiring or even using analog audio inputs or outputs as needed.

IT SECURITY IN THE WORLD OF NETWORKED AV

While putting AV on the network provides a great range of benefits for flipped classroom solutions, as AV systems are put on the network, the IT department expects AV system designers and managers to maintain policies and practices that align with IT security goals. Any device, including AV devices, has the potential for vulnerabilities that a sufficiently determined attacker could exploit. This is an unfortunate fact of life. However, because university and college campus networks are constantly encountering attacks, it is imperative for universities to recognize potential weaknesses and devise a plan for ensuring that AV systems and assets remain secure.

In many cases, security requirements are a matter of regulatory compliance, above and beyond best practices. Security governance typically requires that any device attached to the network has the relevant security features and configuration. AV devices should be compliant with these requirements and stand up to audit.

Modern IT security is implemented with a "Defense in Depth" approach. Defense in Depth is a concept in which multiple layers of security controls are placed throughout an information technology (IT) system. The intent is to provide redundancy in the event that a security control fails or a vulnerability is exploited. For example, if an intruder gets past the firewall, they still have to know a username and password in order to login to a protected system. In practice, security should be implemented everywhere it is practical.

Types of Network Security

Network Security
Security features that protect the network itself, such as firewalls and Virtual Local Area Networks (VLANs)

User Access Control
Protects how people access information, ensuring the right people access only the right information. User access control features include user accounts, passwords, permissions and encryption, among others.

Host Access Control
Protects the servers themselves from infection from viruses or malware that could result in unauthorized information access and transmission. AV implementations can address these issues in a variety of ways, including properly isolating AV devices (as the system design allows) and using LDAP (Lightweight Directory Access Protocol) to centralize control of which users have access to which part of AV devices and systems.

How to Address Security with Networked AV

All devices on the network, even AV devices, should maintain a security posture in alignment with IT security requirements. Given that AV devices are connected to the network, they should have the security configuration in place to ace an IT security audit.

User Authentication

Assures identity of user or connected device using a local password and the ability to manage passwords at an enterprise level.

Role-Based Access Control

Grants rights to users requesting specific permission to access a system asset, service, file or function.

Encryption

Uses approved cryptographic libraries to protect user identities and disclosure to unauthorized persons as well as providing FIPS 140-2 compliance.

Network Service Security

Provides the ability to manage Telnet and SSH servers as well as authentication, access and sockets on all server ports. Supports X.509 credentials for port security.

MANAGING FLIPPED CLASSROOMS

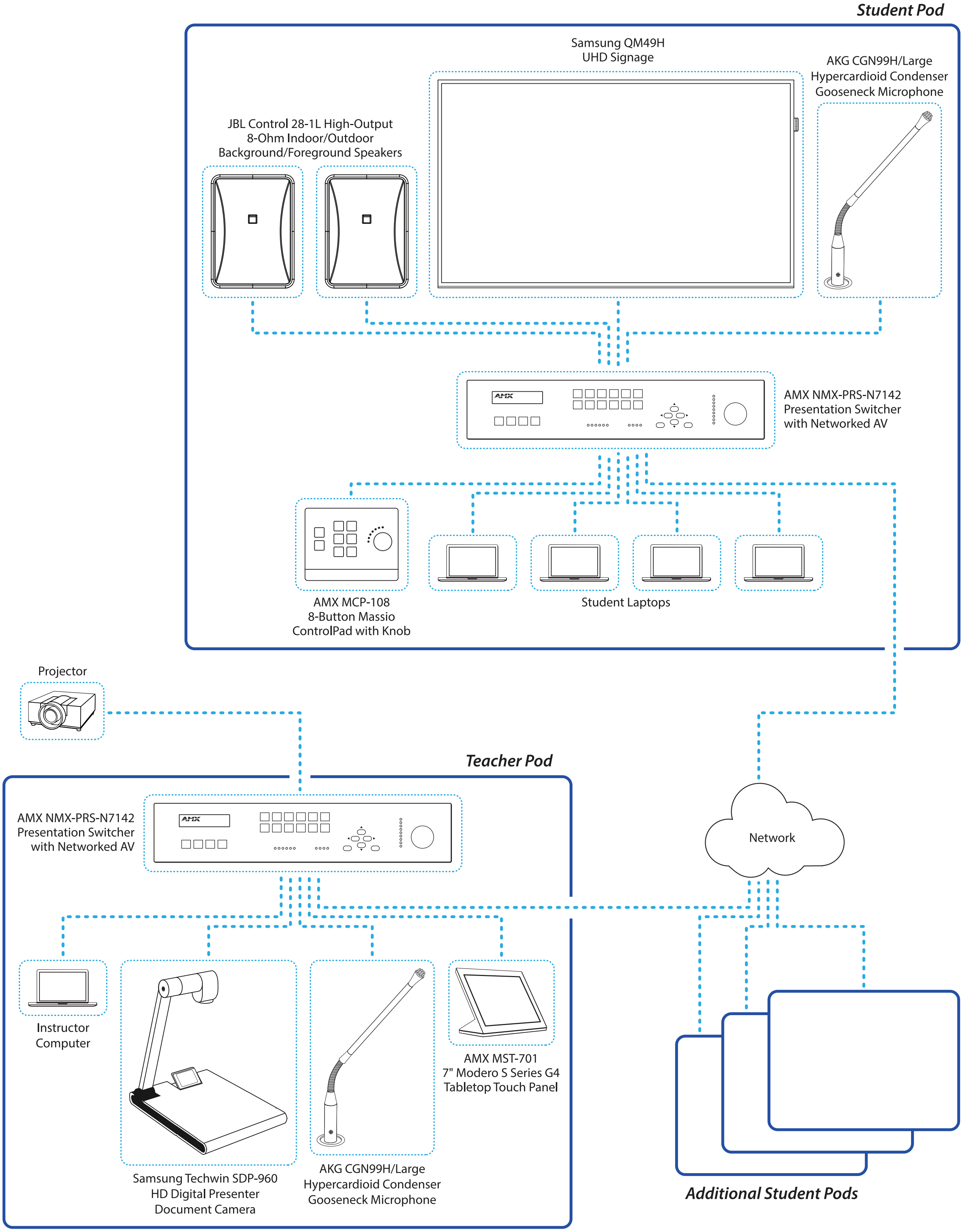
In an active learning classroom, the total number of AV devices increases significantly from a standard AV system. Instead of just one centralized system, there are many subsystems—including one at each student table—that must be evaluated to ensure they are operational. This can become a very time-consuming prospect.

For flipped classrooms to be effective, it requires a significant investment in AV equipment. However, these systems will not be effective if the AV department is constantly chasing issues due to the lack of a centralized system for monitoring and managing the equipment. Without a centralized system, there is no active monitoring of issues, leaving it up to a student to discover that their pod has a problem, hindering the effectiveness of the technology-driven, activity-based learning.

Additionally, without a way to communicate remotely with the AV equipment, support personnel must visit each room in person to troubleshoot problems. This involves additional costs and makes identifying and repairing issues that much more time-intensive to fix. As an AV technician at a university myself, I know the amount of frustration a professor feels when the class must wait for an AV technician to show up and fix a problem.

Software like HARMAN's AMX Resource Management Suite (RMS) Enterprise provides remote management and scheduling capabilities for AV assets and building systems. The software features a user-friendly dashboard, making it easy to centralize the management and monitoring of AV equipment, lights, HVAC and other building functions. This allows IT and AV managers to proactively maintain AV displays before a bulb burns out and receive immediate notification when a device goes offline.

Flipped Classroom with Networked AV



CONCLUSION

The ultimate goal of a flipped classroom is to create a positive learning experience. Active learning is an instructional method in which students engage in a variety of activities to learn their study material, including reading, writing, talking, listening and reflecting. To do that, active learning classrooms must be flexible and scalable, while still being cost-effective and secure to deploy. With the help of Networked AV technologies, traditional classrooms can be remodeled into dynamic, technology-rich project rooms.

Of course, the technology is only one piece of this process. At the end of the day, active learning is about collaborative learning, but collaboration is not a piece of technology, nor will a single piece of technology guarantee collaboration. True collaboration between students requires instructors and an administration committed to the idea of students sharing information for mutual success. The role of Networked AV technology in this context is to ensure that information sharing can occur quickly, easily and across any distance. Learning is a process, and collaboration technology is an integrated system that facilitates that process. When effective teaching and the right technology are used together effectively, there is no limit to the heights of learning students can achieve.

REFERENCES

Herreid, C. F., & Schiller, N. A. (2013, May/June). Case Studies and the Flipped Classroom. Journal of College Science Teaching, 42, No. 5, 62-66.

Michael, J. (2006, December 1). Where's the Evidence that Active Learning Works? Advances in Physiology Education, 30(4), 159-167.

Roehl, A., Shweta, L. R., & Shannon, G. J. (2013, Spring). The Flipped Classroom: An Opportunity To Engage Millennial Students Through Active Learning. Journal of Family and Consumer Sciences, 105(2), 44-49.

Ruddick, K. W. (2012). Improving Chemical Education from High School to College Using a More Hands-On Approach. The University of Memphis.

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