Integration Guide to

ACTIVE LEARNING SPACES

in Higher Education

Collaborative learning and BYOD are shifting the higher education experience and encouraging technology integration into the curriculum. To foster this change, a departure from classic design is necessary and a new type of space, especially in the incorporation of foundational AV essentials, must be constructed.

This guide is designed to help you and **plan accordingly** for foundational AV needs in college AND university active learning spaces.

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Collaborative learning is increasingly taking center stage as the dominant mode of teaching in higher education. According to a 2013-2014 faculty survey by the Higher Education Research Institute (HERI), more than 80% of teaching faculty are incorporating some element of student engagement and collaboration into their lessons. To appropriately handle this new focus, the environment itself must actively enable and encourage exchanges among the professor, students and even the technology that facilitates the transmission and absorption of audiovisual media, remote communication methods, and more. These active learning spaces are becoming the classrooms, lecture halls and auditoriums of the future, but the trend is not limited to conventional class environments. These types of spaces are also transforming libraries and student centers into highly collaborative settings that enable group learning and interaction.

Needless to say, these are high-tech areas that demand added flexibility to accommodate the vast array of assigned and personal devices that may be used within, thus requiring an advanced audiovisual design. These spaces also need to be easy to use for teachers, who can be apprehensive when it comes to new technology. A goal should be to help instructors focus on teaching and engaging. This guide will provide a comprehensive look at the architectural and technological needs of these active learning spaces, and an overview of how to design and integrate them for optimum success in higher education, where learning equally depends on teaching style, media or technology, content and interactivity, and the physical space.

Goal of a Needs Analysis:

Define the functional requirements of the AV system based on the users' needs and desires, and how the systems will be applied to perform specific tasks. It also includes identifying the activities that end users must perform in developing the functional descriptions of the systems that support those needs.
(CTS Exam Guide, InfoComm International – 2013)

ASK BEFORE YOU DESIGN

It is critical to meet with the college or university to analyze the space, the desired functionality, and even the aesthetics prior to designing. A true needs analysis ensures that all possible requirements are identified, though avoiding product level detail—the needs are then considered and narrowed down to begin to shape the design of the active learning space.

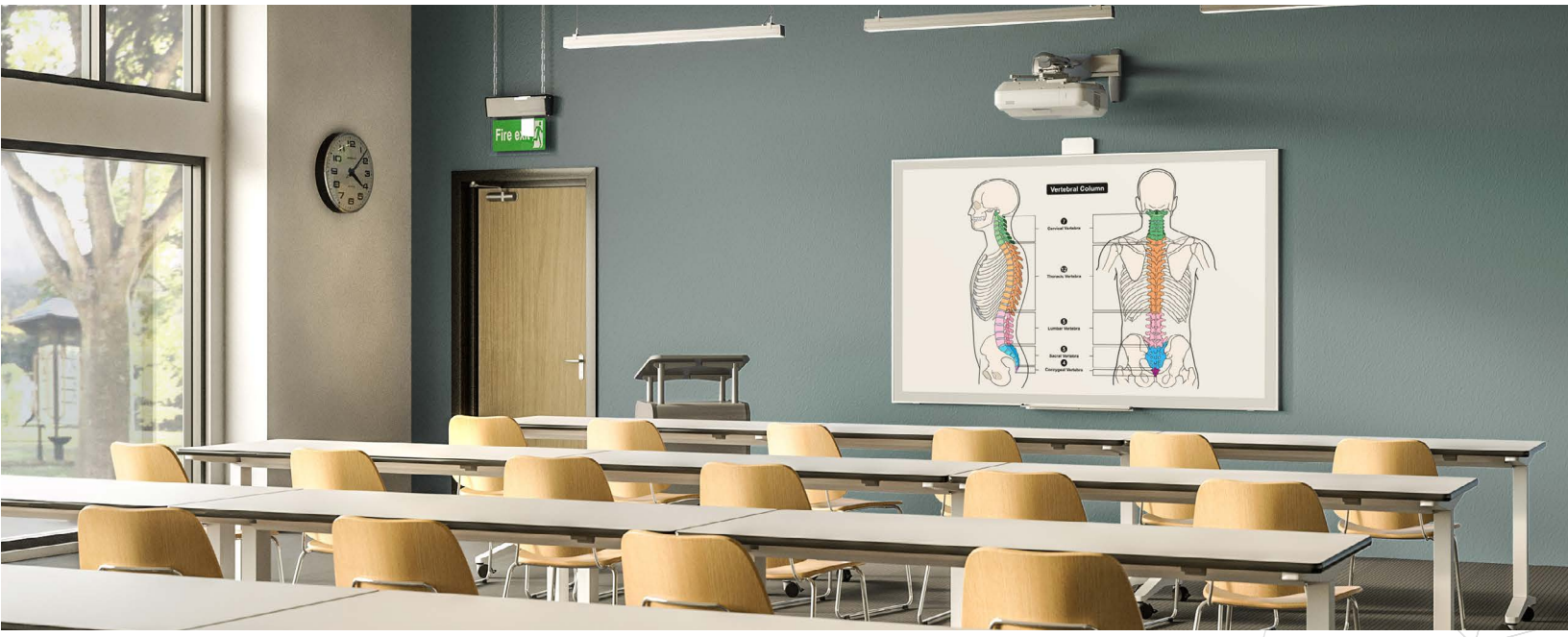
The first step is to help the owner(s) of the space to tell their story. To do this, conduct an open-ended inquiry that facilitates input on function, aesthetics and technology.

Here are some basic questions to get started for retrofit installs:

1. What about your current space helps students learn?
2. What about your current space could be better for learning?
3. What are the current challenges and difficulties for the people using the room?
4. Will the space be used by the community when classes are not in session?

Here are some additional questions to ask during a needs analysis of either a retrofit install or new build:

- What is the purpose for the space?
- What are the human needs? (as opposed to the technical needs?)
- How many students meet regularly in each room?
  - Will a central video display be in use?
- How will interactive learning be encouraged by the design of this space?
  - Which technologies and/or whiteboard offerings are anticipated to be used to collaborate?
  - What materials or technologies will require space on work surfaces?
- How important will it be to connect learners with resources outside the classroom?
  - Is distance learning an established method or one seeking new support?
  - What size are the groups on either end of videoconferences?
- How does access need to be improved?
- What future needs are anticipated now? What will this space need to remain current with teaching and learning in the next five years?
  - What mobile and fixed computing technologies are already in use and will they need to be replaced?
- If the space will be used by the community for events, will it be important to invest in products that contribute to the aesthetic atmosphere?



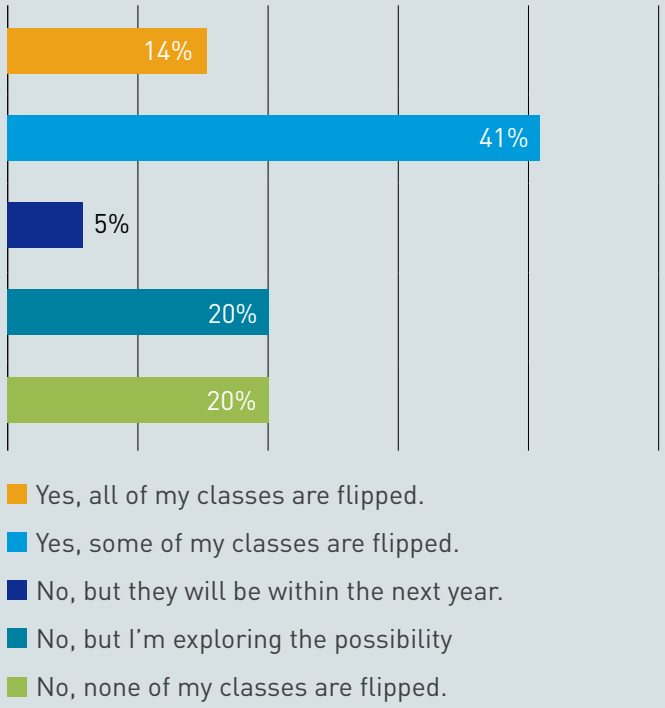
ACTIVE LEARNING SPACES **DEFINED**

The traditional one-to-many educational method, where a single professor addresses a group of students, is evolving to reflect the modern learning environment. Educators are now joined by a classroom full of students who also have access to a multitude of learning tools available via mobile devices as well as personal and classroom computers. These tools can be used for such things as annotating instructor's slides, capturing notes, recording lectures, creating mind maps, watching supplemental videos, participating in surveys, answering polls and shares.

The new generation of learning spaces taps into the rich visual information available through personal devices and/or individual small screens, and shares data for collaboration via larger displays. In 2015, McGraw-Hill Education evaluated digital trends in higher education and found that 85% of students use mobile devices to study (up 40% since 2013), 77% of students claimed adaptive technology helped them improve their grades, while 62% of students felt technology better prepared them for classes.

This shift in teaching style isn't just about accommodating the BYOD trend. The collaborative approach to learning also happens to better match how the human mind operates. Studies indicate that higher retention rates occur when students are cognitively engaged in the learning process, eliciting meaningful relationships between ideas, generating connections, asking questions and providing solutions rather than encouraging passive recording or receiving of information from an educator or textbook. A 2014 study in the *Proceedings of the National Academy of Sciences of the United States of America* found that failure rates under traditional lecturing increase by 55% over the rates observed under active learning. This type of approach can be fostered through blended learning or even the flipped classroom. According to Campus Technology's Teaching and Technology poll, as of October 2016, 55% of faculty are flipping the classroom with 75% blending their lessons to some extent.

USE OF FLIPPED CLASSES



DEFINITION / DIFFERENCES BETWEEN 'BLENDED' & 'FLIPPED' CLASSROOM LEARNING:

BLENDED LEARNING:

Involves online and face-to-face instruction used alongside each other in order to provide a comprehensive learning experience.

FLIPPED LEARNING:

Also known as flipped classroom creates a divide between the technology and face-to-face elements of the learning experience, where in-class discussion and enrichment activities are allowed due to moving content delivery outside of class time. This provides opportunities for students to develop vital skills like critical thinking, creativity, communications and collaboration, all promoting engagement, thus retention.

(Source: Campus Technology's 2016 Teaching with Technology survey.)

Shifts in **pedagogy** toward active learning has translated to creating spaces and technologies to support this new instruction. The new space adaption also supports another major educational trend - that of online learning. The addition of video recording, lecture capture, video conferencing, presenter tracking, and streaming technologies enables new digital learning models for participation outside the classroom, or connecting different classrooms and campus locations. Further, from an audio technology standpoint, a room built for voice recording is also conducive to better communication and information retention in the room. It follows that networking, power provision and control are also optimized for use in-room and beyond, improving the learning experience across venues such as collaborative classrooms, digital lecture halls, distance and online learning rooms, and interactive huddle spaces.

Transcending subject matter, size, and even type, an active learning environment incorporates and supports pedagogy, space and technology. Mastering the mix of the three can be quite a task, but with best practices for design and integration of foundational AV, both the space and technology concerns can be simplified. **Foundational AV** can facilitate and promote new learning space layouts including flexible configurations that adapt to desired learning needs and intent of a course. It can also support and protect technology implementations necessary to flip the learning style and embrace the new digital and BYOD age. Let's take a look to see how the shifting active learning approach changes classic classroom layout, design and integration.

Pedagogy: is the art, science, or profession of teaching. | **Foundational AV:** products that support, protect and connect AV technology.

ACTIVE LEARNING **SPACES**

COLLABORATIVE CLASSROOM

New active learning spaces formats sprang up as a result of the widespread adoption of "flipped classroom" learning. By that method, content is provided to students prior to class in the form of videos, recorded lectures, readings and online modules. Class time is then spent in active peer discussions and debates, experimentation, solving problems, asking questions and being coached, while the teacher is no longer fixed at the front of the room. This method promotes advanced problem solving, communication and collaboration – higher order skills that education specialists state should be the goal of any learning experience.

In addition to improved proficiency demonstrated by students immersed in these "peer teaching" classroom scenarios, studies cited by the International Society for Technology in Education have shown that the inclusion of digital content online (videos, notes, homework, homework solutions, and extra links to help students visualize the subject matter) produced abundant evidence of improved academic performance.

In these active learning spaces, the scenario is often many-to-many, with the emphasis on enabling small group discussion and activities. As a result, room setup is usually based around several conference-sized, round or oblong tables or moveable desks grouped together. Each table or grouping has their own large-format video display, computers or tablets for collaboration. These "pods" are also connected to a central video display for additional sharing with the entire room. Rooms can be reconfigured to meet the needs of the class on any particular day. Planning for flexibility in the AV environment affects camera placement, camera choice, display mount adjustability, carts, and instructor set up to allow the widest array of possible set ups that maintain easy access to information from any seat in the room.

COLLABORATIVE CLASSROOM AV OPTIONS

AV TECHNOLOGY	FOUNDATIONAL AV
Flat panels/monitors mounted at each pod for group sharing of PC sources	**AV switchers** and **extenders** rack-mounted inside of a **lectern**
A central **video display** setup for classroom-wide sharing of PC and video sources, with a viewing distance ranging from eight feet to 45 feet	Consolidated **control** of audiovisual equipment
A projector or **projectors** and **screen(s)** for sharing of PC and video sources	Audio playback system of an **amplifier** and **ceiling mounted speakers**
An **interactive whiteboard and/or flat panel** for annotating and integrating multiple items into a lesson plan such as websites, photos, and music that students can interact with	**Cart, stand** or **wall mount** with an interactive display for students to engage
Audio/video **sources** that may include Blu-ray video, mobile devices and HDMI/DVI/DisplayPort laptop and tablet inputs	**Floor boxes** for connection to infrastructure
Tablets replacing textbooks for students to digest digital content	**Power protection and equipment storage** behind flat panel displays
A ceiling mounted **document camera** for ability to project artifacts, zoom in on fine details, capture working problem solving solutions	**Tech-enabled furniture or pods** to house technology and promote collaboration
Remote AV control devices or applications that enable students to write on whiteboards from their desks	**Raceway systems** for cable management and for power and charging
Interactive software – designed to accelerate core collaborative processes – adding notes, using templates, sharing screens – visual collaboration working better together in the same room or around the world. Ex: Nareva	Flat Panel/Monitor **mounts** to support group sharing in Pods

Chief

1. Short throw projector mount

Da-Lite

2. IDEA Screen

MAP

3. L5 Series Lectern
4. Hub Collaboration Furniture
5. C5 Series Credenza

Vaddio

6. ConferenceSHOT FX camera

Other Recommended Products

- Fusion flat panel display mounts
- PAC Series In-Wall Storage Boxes
- Sliding Mounting Plate
- Wiremold Evolution Series Ceiling Box
- C2G Plenum-Rated Amplifier and Speakers
- DocCAM 20 HDBT ceiling mounted document camera

DIGITAL LECTURE HALL

Lecture halls have evolved to keep pace with the flipped classroom model, even while they retain the familiar features of tiered or sloped seating with capacity ranging from 30 to 300 students and a central multimedia teaching display setup. Today's lecture hall AV technology still supports multiple presentation sources and video annotation, along with recording, archival and distribution equipment. But increasingly, electronic voting systems and a variety of web conferencing solutions are adding more interactivity to lectures. Sometimes whiteboards or smartboards are installed along the lengths of the room for small group collaboration.

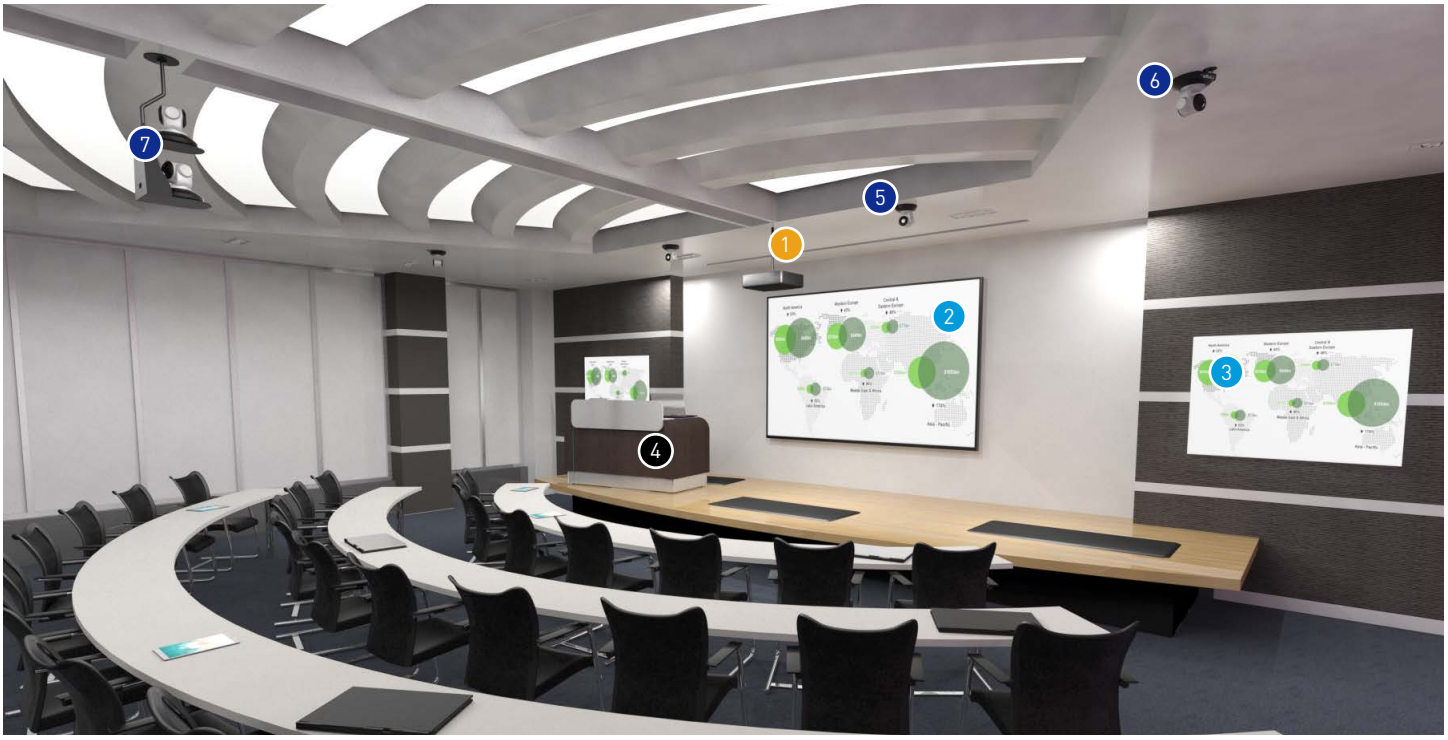
Presenter tracking systems are available for teachers who want to provide distance learning or lecture capture from the lecture hall. Using a pan-tilt-zoom camera, the tracking system automatically follows the teacher as they walk around the presentation area. The instructor may also use pre-programmed camera triggers or sensors to change camera views automatically between the lectern and the whiteboard as they move about the teaching space. Multipurpose AV switchers combine switching and advanced camera control, and allow instructors to enhance their presentations with graphics for a superior user experience. Instructors can then live stream their teaching sessions to cloud conferencing applications such as WebEx, Google Hangouts, Skype and Zoom. The result is a smooth, accurate stream of video and no camera operator is required.

The New Media Consortium predicted in its 2015 Higher Education Horizon Report that even more technology will need to be incorporated into educational environments as the **Internet of Things** become as commonplace as BYOD (bring your own device). With so many new teaching tools at their fingertips, educators are looking for lecture halls that reflect new technology and amplify their new teaching methods.

Internet of Things: The concept of connecting any device with an on and off switch to the internet.

DIGITAL LECTURE HALL AV OPTIONS

AV TECHNOLOGY	FOUNDATIONAL AV
A **large-scale projection** setup or video wall display capable of displaying a variety of sources and media simultaneously	A **lectern** located in front of the room providing content delivery and control, supporting annotation and digital and analog sources with HDCP management
Confidence monitor allowing the educator or student presenter to see exactly what is on the screen behind them without having to turn around	An equipment or control room with **racks or wall racks** that house switching, scaling, signal distribution and monitoring equipment
Wall-mounted HD, PTZ **cameras** capturing a room view and a close-up of the instructor	**Floor boxes** for connection to cabling infrastructure
Wired or wireless **microphones**	Digital extension solutions like **HDBaseT** to span the distance of a hall from source devices to display or projector
Hardware or software-based **videoconferencing codecs**	Reliable AV system **power backup**
Presentation video switcher to switch between active camera feeds, PC devices and other AV inputs that are streaming to in-room projection or lecture capture devices	**In-wall control** of AV devices including multiple projectors
Presenter tracking systems that automate PTZ cameras to track the presenter throughout the presentation area - no operator required	**Projection mounting system** that enables proper image alignment and stability



Chief

1. Projector Mount

Da-Lite

2. Parallax
3. FullVision

MAP

4. L7 Series Height Adjustable, ADA Compliant Lectern

Vaddio

5. RoboSHOT 30 PTZ
6. RoboSHOT 12 PTZ
7. RoboTRAK Presenter Tracking System

Other Recommended Products

- Wiremold Floor Boxes
- UPS Backup System
- Select Series PDU with RackLink
- C2G HDBaseT Extenders
- AV Bridge MATRIXPRO or MatrixMIX with Trigger Devices – PresenterPOD, StepVIEW Mat, IR Sensor

DISTANCE & ONLINE LEARNING ROOMS

Although not as tied to active learning spaces as the other rooms in this guide, distance learning rooms should also be considered as you plan your overall AV learning strategy.

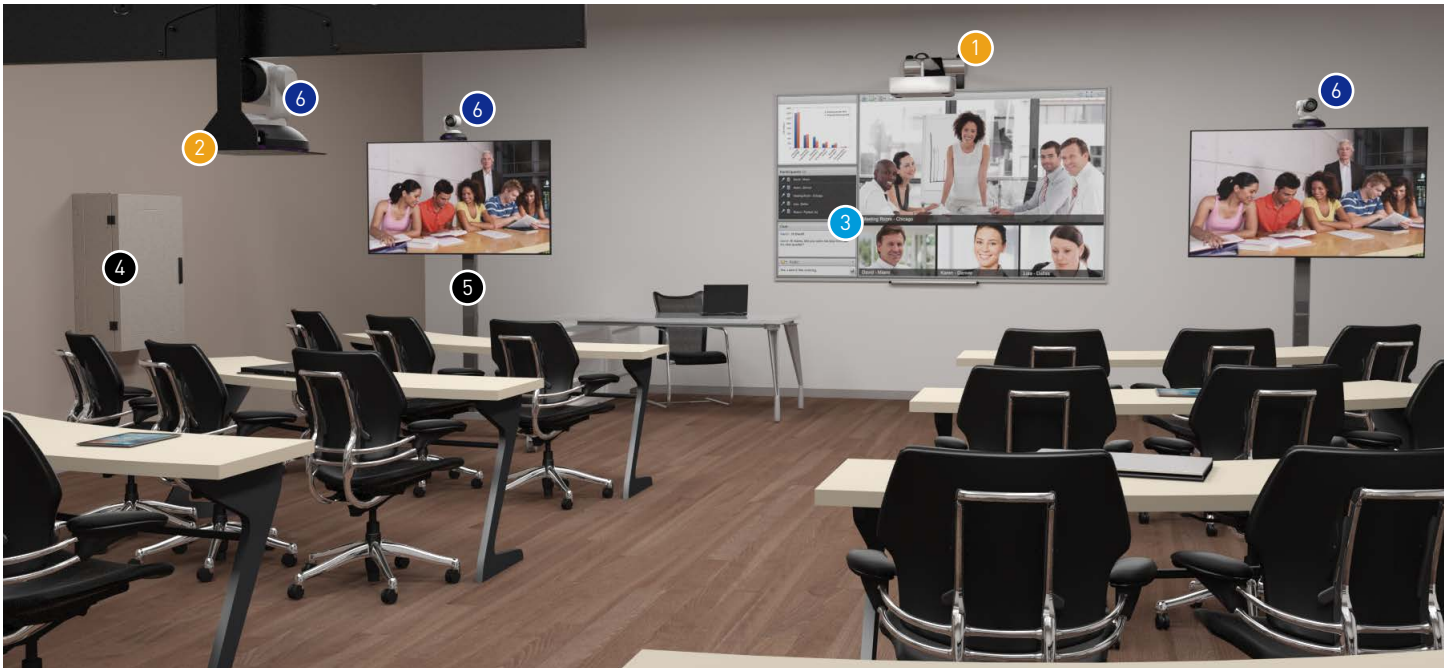
Distance learning is taking on new forms as higher-resolution video technologies become more affordable and educators see the benefits of extending the reach of programs to a wider audience and bringing in the expertise of remote specialists. New, dedicated suites and lecture halls are providing high-quality, live videoconferences between educators and students. Setups range from streaming sessions with only a few participants to full-scale lectures in auditoriums.

Advanced distance learning technology is carrying classroom offerings beyond prerecorded lectures or static webcam shots by including the opportunity for live interaction between local and remote participants.

In these dedicated distance learning rooms, the local students sit around a table facing a largescale video display depicting the remote half of a classroom transmitted from another location, connecting classrooms, campuses, and other learning institutes or experts. Classroom stations are also equipped with PTZ cameras for partner work across the distance. Technology also enables document sharing and real-time collaboration across media. Automated camera tracking systems follow the instructor as he or she moves around the front of the classroom. The instructor can also use pre-programmed camera triggers or sensors to change camera views automatically. This eliminates the need for a camera operator in the room.

DISTANCE & ONLINE LEARNING ROOMS AV OPTIONS

AV TECHNOLOGY	FOUNDATIONAL AV
High definition, pan-tilt-zoom **cameras** capturing both near-end and far-end participants	**Lectern** with control interface, source inputs and document cameras
Wired or wireless **microphones**	**Control interface** to power on and off as well as switch from input source devices for simple, fixed control of all AV devices in one location
Large format **display or projection screen** for viewing lecture content and far-end participants	Network infrastructure to support internet **connectivity** for web streaming and sharing
Additional **video sources**, such as a Blu-ray player	**AV devices**, **power** and **connectivity** housed inside a **rack**
Digital notes from lessons with **lecture capture**	Multi-mount **DC Power Distribution** for AV
Real-time **streaming** to equip educators to deliver to both in-room students and online students in one setting	**Workstation solutions** providing AV, communications, and power to the point-of-use
Presenter tracking systems that automate PTZ cameras to track the presenter throughout the presentation area - no operator required	**Secure mounting system** to support display technologies
Multipurpose AV switchers for live production and automated presentations	



Chief

1. Short throw projector mount
2. Camera shelf

Da-Lite

3. IDEA Screen

MAP

4. VWM Series Wall Rack
5. Middle Atlantic Carts/Stands

Vaddio

6. RoboSHOT 30 or 20 UHD or 12

Other Recommended Products

- Fusion Dynamic Height Adjust Mobile Cart
- DC Power Distribution
- C2G USB Extenders & HDMI Extension Solutions
- AV Bridge MATRIXPRO or MatrixMIX with Trigger Devices – PresenterPOD, StepVIEW Mat, IR Sensor

HUDDLE SPACES

Huddle spaces have started to become popular in business environments and are now making their way into active learning spaces, driven by the BYOD trend so people can share, present and collaborate on content. Huddle spaces are smaller than traditional conference rooms and often center around a single table with a display and connections for network activity. In active learning, huddle spaces are where students can meet beyond the classroom to continue collaboration.

As instructional pedagogy shifts from a focus on the lecture as the prominent way to deliver curriculum to a focus on collaborative and active learning, huddle spaces are becoming the go-to places for students to meet together, work through collaborative assignments, grasp new concepts and refine their understanding of the content. Libraries, student centers, residence halls, study spaces, and other common areas on campus are becoming the new homes for these spaces. Although designed for group collaborative work, they often serve double-duty as spaces for tutoring sessions, faculty-student meetings, and as a semester-long home-base for study groups.

Huddle spaces are not always referred to as **"huddle"**

- Active learning environments
- Teaming tables
- Media tables
- Lounges
- Hublets
- Coves
- Team gardens
- Learning suites
- Learnlabs
- Collaborative learning environments
- Study rooms

HUDDLE SPACE AV OPTIONS	
AV TECHNOLOGY	FOUNDATIONAL AV
High definition, pan-tilt-zoom **cameras** with a wide angle field of view, capturing the participants at the near-end and far-end	**AV Furniture** that houses equipment necessary to collaborate in small groups
Wired or wireless **microphones**	**Control interface** to power on and off as well as switch from input source devices or for simple, fixed control of all AV devices in one location
Large format **display** for viewing lecture content and far-end participants	Network infrastructure to support internet **connectivity** for web streaming and sharing
	AV devices, **power** and **connectivity** housed inside a rack or mobile tech-enabled furniture
	Compact Surge Device to power and protect the huddle space display and other equipment, when space is at a premium
	Secure mounting system to support display technologies

Chief

1. Short-Throw Projector Mount
2. Camera Shelf
3. Under Table Storage Panel

Da-Lite

4. IDEA Screen

MAP

5. Hub Collaboration Furniture

Vaddio

6. ConferenceSHOT FX Camera
7. EasyMic Table MicPOD

Other Recommended Products

- Fusion Display Mount
- Proximity Series Sliding Mounting Plate
- C2G Adapters & Converters
- Compact Surge

BEST PRACTICES FOR DESIGN AND **INTEGRATION OF AV INFRASTRUCTURE**

New active learning spaces require a multitude of audiovisual connectivity, presentation, control, power, storage and furniture upgrades to meet today's learning needs. Designing these spaces will require accommodation for the tools of today and flexibility for the devices and techniques of the future. Let's take a look at the baseline design considerations that will help to ensure success.

DESIGN FOR **TECHNOLOGY INTEGRATION**

With so much technology required in today's learning spaces, it's important to include it in the design right from the start. From the cabling backbone that connects all the selected technology equipment (see 'AV Cabling Distance Limitations' section of this guide for important connectivity considerations in installs) to the room layout and furniture choices planned to store, protect and provide access to the equipment (see 'The Finishing Touch' section of this guide to also factor in furniture design elements), every aspect must be considered to encourage technology integration into the curriculum and allow students and teachers alike to embrace active learning.

Lecterns, like the L5 Series shown here, come with casters for added mobility and flexibility required in active learning spaces.

To optimize a room for collaborative learning, tables are commonly sized to fit six to nine students each. The active learning space trend has evolved rapidly toward the establishment of an efficient design, and most rooms now feature U-shaped tables, as these enable collaboration and provide a flat end for a free-standing or wall-mounted display. Another standard design pushes smaller tables together into groupings or pods to advance subgroup activity, congregating them around centralized technology such as PCs or carts and stands with interactive displays. In either layout, the tables should be arranged in such a way as to comfortably allow all room users to face a central teaching lectern, display, or screen, if there is one.

More contemporary and effective furniture options include cable management, connectivity, power solutions, storage, video switching and audio hookups to take full advantage of equipment and ensure the best interaction with technology. With one of these pieces in place, equipment selection is simplified into endpoints.

Hub is a technology-ready, all-in-one furniture solution for collaboration spaces.

To further maximize space, there are also unconventional ways to conceal and interact with technology, including under-table rack mounts that are a great option in retrofit applications or any instance when space is limited.

These low-profile mounts enable the placement of presentation and control solutions right where they are needed and offer the security features necessary to limit access in a classroom setting.

Another option houses and organizes technology in plenum-approved ceiling enclosures that can securely suspend projectors while keeping restricted equipment or devices out of the reach of students and teachers.

Chief's CSPH Component Storage Panel provides storage underneath room tables and desks while eliminating the mess of components and cables.

The Wiremold® Evolution Series Ceiling Box for discreet small device mounting shown has an optional projector mount as well as smart power control.

AV CABLING DISTANCE LIMITATIONS

The length of the cabling system is an important consideration of any AV cable install. If the distance from the source device to the display is longer than the limitation of the cabling signal, then a signal booster may be required. Below is a list of common AV signal types and their length limitations.

C2G® boasts an unmatched variety of cabling and connectivity that distributes, extends, converts and amplifies AV signals, with extensive lines of HDMI, USB and everything in between.

Official length limitations: These standards have been defined by industry associations.

DisplayPort — 33 ft. (10 m)
*NOTE: C2G through Middle Atlantic offers active DisplayPort extension solutions up to 328 ft. (100m)

DVI digital — 16.5 ft. (5 m)

Ethernet (CAT 5e/6/6a) — 328 ft. (100 m)

USB 1.1/2.0 – 16.5 ft. (5 m)
*NOTE: Vaddio and C2G through Middle Atlantic offer active USB 1.1/2.0 extension solutions up to 328 ft. (100m)

USB 3.0 — 13 ft. (4 m)
*NOTE: Vaddio offers active USB 3.0 extension solutions up to 98 ft. (30m) and C2G through Middle Atlantic offers extension solutions up to 328 ft. (100m)

USB 3.1 — 3 ft. (1 m)

Unofficial length limitations: The maximum lengths of these signaling methods have not been formally defined but are based on common real-world experience. Use these as a guideline – your application may allow for a longer cable run, or may call for a shorter distance.

Check with your equipment manufacturer — they may specify a maximum cable length. The best advice for these types of cables is to use the shortest length possible.

*NOTE: C2G through Middle Atlantic offers active HDMI extension solutions up to 1,000 ft. (304.8m)

HDMI — Passive implementation, Standard Speed – 50 ft. (15 m), Hi Speed – 25 ft. (8 m)

Audio (line level) — 150 ft. (46 m)

Audio (speaker level) — 500 ft. (152.4 m) (use lower gauge wire as distance increases)

Audio (S/PDIF digital coax) — 50 ft. (15 m)

Audio (TosLINK digital optical) — 16.5 ft. (5.03 m)

Ethernet (@1GBase application, MultiMode Fiber only) —
OM1 902 ft. (275 m)
OM2 1,804 ft. (550 m)
OM3 1,804 (550 m)

Keyboard (PS/2) — 25 ft. (8 m)

Modulated RF (CATV, SATV) — 150 ft. (46 m) (use RG-6 coaxial wire)

Mouse (PS/2) — 25 ft. (8 m) without a booster

Serial (RS232) — 50 ft. (15 m) @ 19200 baud, up to 3000 ft.@ 2400 baud

VGA (analog HD15 interface) — up to 100 ft. (30 m) without a booster/amplifier, depending on identified acceptable losses

THE FINISHING TOUCH

When dealing with furniture, architects and interior designers will have very specific material and finish preferences.

THERMOLAMINATE

Thermolaminates are comprised of multiple material layers assembled together by one of a number of treatments, including heat, pressure, welding or adhesives, giving the resulting surface greater strength and stability.

Slightly more flexible and durable than traditional laminates, decorative thermolaminates are heat-sealed to furniture in one continuous piece, eliminating edges that might chip or peel and locking out moisture and bacteria.

Low-pressure laminates are often less expensive than high-pressure laminates. But they are both flame retardant and include antibacterial properties.

HIGH PRESSURE LAMINATE

High Pressure Laminates (HPL) boast durability and may be used for both vertical and horizontal surfaces, and have a low initial cost and a lifespan of five to 15 years.

High Pressure Laminate with T-Molding

HPL is also available in hundreds of designs and multiple finishes. Because HPL is generally laminated only to the flat sections of the furniture, there is a need to cover the edges of the wood.

VENEER

Veneer is actually a thin layer of hardwood, usually thinner than 1/8 of an inch, that is bonded to a less expensive wood or particleboard underneath. Veneer can be sanded along the grain, painted and stained, presenting the richness and beauty of real wood.

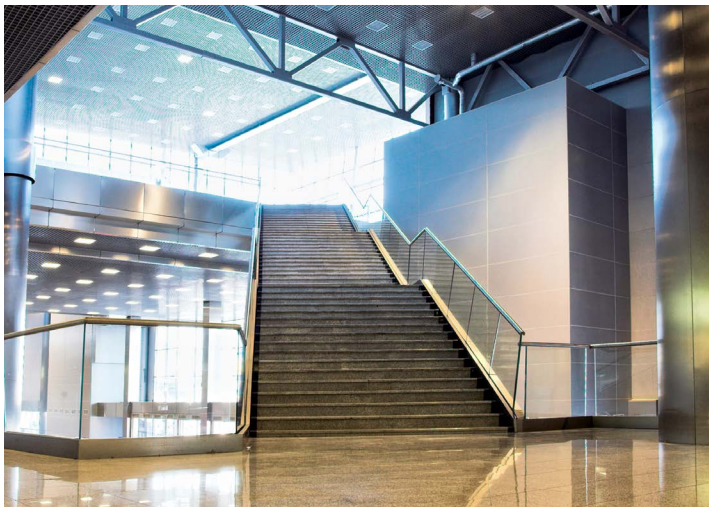
COMPARING WOOD FINISHES

	Price	Lead Time	Durability	Wood-Like Appearance	Designer Preferred
Veneer	$$$$	○	○	●	●
HPL	$$$	◓	●	◓	●
Thermolaminate	$	●	◓	◓	○

Key ○ Less Favorable ◓ Favorable ● Very Favorable

DESIGN FOR **TOMORROW**

Virtually every audiovisual installation or project comes with a parameter that is almost never mentioned in the specifications or bid packages; often is not defined in the design stages; is likely an assumed attribute by the school; and is never fully guaranteed in the creation of the system. That parameter is the true, useful life of the foundational AV and technology products. Exactly how long will that AV investment last, and when should the university be thinking about their next investment in upgrades and changes? The right upfront decisions can help ready a design for the future.



Here is an exercise: Ask how long a project is intended to survive without updates or major modification. If it is a simple projector installation in a room with a suspended ceiling and easy access, and where only one room is involved, the answer might be "one or two years." In a more typical project with wiring run behind drywall or in conduit, the answer might be "ten years" or even more. Then look at the connectivity associated with the project and determine if its functionality will be compromised by the changing of transmission or source technologies. If it will, rethink your cabling or connectivity solution. To ensure usefulness beyond the current supported technology, install a **"transition minimized differential signaling" (TMDS)*** compatible connectivity solution. For example, HDMI® is capable of transmitting DVI-D, and DisplayPort™ can typically be adapted to HDMI. Therefore, inclusion of HDMI cabling, or installation of UTP (unshielded twisted pair) for use with HDMI conversion products such as HDBaseT™, is one way to provide adaptable, dependable performance now and in the future.

Though, even with careful planning, the reality is that many educational institutions lack the budget for a complete overhaul that would eliminate any remaining legacy connections such as VGA. Compound that with the fact that even if you do standardize on TMDS compatible connectivity solutions, there are a multitude of digital connections on the connected devices—HDMI, DisplayPort and throw in USB. Thus, adapters and converters are still required in many projects, especially in higher education where professors rotate rooms and a variety of laptops and mobile devices will be used.

Yes, signal and connection decisions are crucial when anticipating future needs, but do not limit consideration to connections alone. In general, it is best to equip with the latest in technology and AV support solutions, understanding that it may be several years until replacements or upgrades. Take the projector example again. If we average the aforementioned lifespan of projectors, upgrades should occur at intervals of approximately every three to six years in higher education learning spaces. The screen, however, could become a relic of the modified space as it may live on, and oftentimes does due to budget constraints, for 15 to even 20 years! 4K resolution, and all the latest specifications that surround it, is the trend of today, but we've already skipped to talking about "what's next!" in 8K and beyond. There are screens out there right now with the capability to support 16K resolutions along with screen housings that allow you to update surfaces later without disturbing the construction above the ceiling. So, equip the room(s) with a screen that can accommodate today's technology as well as these future expectations—this will drive investment protection.

Da-Lite Wireline Advantage Series Screens are designed to accommodate today's technology.

Transition Minimized Differential Signaling (TMDS): The algorithm that underlies both DVI and HDMI digital video interfaces, and is an output option in DisplayPort ++ (dual mode DisplayPort, aka DisplayPort 1.2) enabled devices.

DESIGN FOR **FLEXIBILITY**

Flexibility remains a key concern as schools must continually adjust to meet the needs of students. For example, what is a traditional classroom today may be converted into a lab next semester.

Also, the school may decide that it wants to add digital signage throughout the building to communicate important news and announcements in real-time. All of these changes impact the cabling infrastructure of the school and can determine the difference between a major renovation project and a simple upgrade process.

When determining the appropriate type of cabling for a classroom, an adaptable option to consider is a modular, "rapid run" solution. Modular cables allow for a simple one-time cable pull that can fit through even the tightest of conduit spaces with the flying leads and wall plate options connected after the pull. Moreover, with enough bandwidth supported in the runner cable, multiple signals can potentially be carried over one cable and/or the break-away ends can be swapped out for newer flying leads and wall plates, keeping the install current with ever-changing technology.

Shown here, RapidRun Optical extends 4K up to 1,000 feet over a modular cabling system.

For larger rooms or auditoriums where PTZ cameras are desired, camera extension systems are available. These camera interfaces extend high definition video, power, control and network over a single CAT cable, extending installation distance for PTZ cameras up to 328 feet/100 m.

For the flexibility to retrofit existing classroom infrastructure or even completely convert another room to an active learning space, certain cable management systems can be utilized. Where the cabling pathway is limited or non-existent, raceway can be affixed to classroom walls or run across floors. Many sizes of raceway are available, making it easy to accommodate various cables. Many systems install over existing floor coverings and are tamper-resistant, making them ideal for relocatable or permanent installations where access through floors and ceilings is not an option. For education installations, check that any over-floor raceways are ADA compliant. (See more on ADA regulations in the 'Design for Everyone' section of this guide.)

Flexibility in design extends past connectivity and cable management. Mobile or portable AV systems in schools, such as carts, provide just this along with new options for mounting displays and interactive flat panels (IFPs) as well as other system components, while ensuring unimpeded, up close display interaction. Look for carts with a narrow profile and plenty of on-board, lockable storage. Then build on the flexibility with accessories and customization for specific educational applications. For classrooms that utilize pods or huddle spaces, smaller displays, IFPs, or monitors supported by table stands may also be necessary.

Chief Fusion Dynamic Height Adjustable Mobile Cart creates better accessibility to technology in any learning space.

DESIGN FOR **INTERACTIVITY**

The electronic whiteboards present in nearly every classroom are already designed for modern connectivity. USB is used to connect back to the personal device to interpret user inputs, carry audio information to speakers attached to the side of interactive whiteboards, and power the board without the need for an external power adapter through the inherent 5 volts of DC power in USB 1.1 and 2.0 specifications. The new USB 3.1, Gen 2 spec increases power levels from existing USB standards up to 20 volts, 5 amps, and 100 watts for power and charging.

Although USB has great benefits for today's classroom installation, there is one drawback. A typical USB connection has a maximum distance of approximately 16 feet (five meters). Since the computer used for the interactive board is often located near the instructor's desk, it is out of reach from USB's maximum range.

To overcome the length limitations of USB technology, there are two solutions. First, active extension cables can extend a USB connection anywhere from 56 feet (17 meters) to 117 feet (36 meters) away. They accomplish this by using the 5 volts of DC power to help regenerate weakened signals. Up to three extensions can be chained together to achieve distances up to 36 meters total. This solution is best for high bandwidth applications such as whiteboards with attached speakers. With these active extension solutions though, the larger physical size of the USB connectors can present challenges when installing in confined spaces such as conduit and raceway.

For longer cable runs, USB can be converted using a transmitter and receiver unit to allow transmission over standard network cabling such as Cat5e or Cat6. This type of solution is referred to as a "USB over Cat5 solution" and provides connectivity up to 150 feet (45 meters) when using solutions with the USB 1.1 spec or up to 328 feet (100 meters) away in the instance of USB 2.0 and some USB 3.1 solutions. The use of category cabling allows it to fit in very small spaces such as conduit and raceway.

THE LATEST IN USB

USB 3.1 is the latest USB specification. This powerful new USB performance level is alternately known as USB SuperSpeed Plus, USB Gen 2, and USB Enhanced SuperSpeed. It's made a number of improvements over the previous versions including:

- A new, symmetrical high bandwidth connector called USB Type-C
- Data transfer rates that are twice the speed of existing USB technology (up to 10Gbit/s)
- Enhanced power delivery of up to 20 volts, 5 amps, and 100 watts for power and charging
- Built-in support for DisplayPort video and four channel audio (speaker and microphone)

USB 3.1 will become ubiquitous as manufacturers start to integrate it into their devices, revolutionizing the way we connect tomorrow. Adapters can allow devices to still be used with legacy and modern systems.

Interactive projectors and displays are seeing a rise in use compared to electronic whiteboards. To provide the best experience with these projectors, the design needs a surface solution such as the Da-Lite IDEA™ screen that can act as a dry-erase board and interactive projection screen. Interactive displays can be positioned in front of existing whiteboards without damaging structures using modern mounting solutions. This approach is particularly useful in older buildings to avoid cutting in to walls where asbestos may be present.

**Interactive projectors and displays are also options that facilitate content interfacing and group collaboration. These, too, would also require USB to enable the interactive technology.*

Chief OB1U - Over-the-Whiteboard Interactive Display Mount allows for easy installation over existing chalkboards and whiteboards.

DESIGN FOR **SAFETY**

The Evolution Series Poke-Thru devices from Wiremold® provide safe access to AV, power and data and include a 2-hour fire rating.

Educational environments are built to strict codes such as those regulated through UL standards. UL listings and UL fire classified safety standards are applicable to cabling and all products that house cabling. If managing power, AV and communications connectivity via in-wall boxes, or floor poke-throughs or boxes, the units should be rated to these standards and provide fully recessed activations to safeguard services and ensure device protection and longevity.

Strict codes also extend to portable AV equipment. Look for strength and safety ratings when selecting mobile AV carts, and consider options where the wheels are recessed so professors and students can safely interact with a display. To ensure safety compliance, manufacturers conduct tip tests for carts to prove capacity to move around buildings, up ramps, and over entranceways.

Outside of connectivity and cabling storage, other foundational AV solutions such as display and projector mounts should be UL listed, specifically to UL 2442. This is the UL standard for safety for wall- and ceiling-mounts and accessories, which also apply to shelves, brackets and similar devices that provide support for the mounting of AV equipment.

GREENGUARD and GREENGUARD Gold certification is a part of UL that provides standards for manufacturers to abide in order to produce projection screen surfaces or furniture finishes that emit low thresholds of chemicals, thus improving indoor air quality. All GREENGUARD Certified products can be found in the UL SPOT Sustainable Product Database.

DESIGN FOR **SECURITY**

While surveillance and monitoring equipment is important and may be a requirement of the school, it's important to bear in mind that the traditional idea of security may be extended to include network security and adequate access for BYOD and other equipment.

Ensure the network can handle surveillance measures from a bandwidth standpoint and keep it protected. But also remember physical protection measures can be taken to secure the technology integrated throughout learning spaces. Reduce theft or risk of harm to those working with equipment by placing it in a locked rack within an equipment closet or even in the classroom. For higher investment purchases like PTZ cameras, look for mounting options that fully retract the camera into the ceiling or within a full enclosure recessed in the wall. Projector mounts with integrated key and lock security measures as well as guard accessories help protect your investment. Provide multiple layers of security with separated rack sections that are keyed differently from the front door of the unit, for added security such as pivoting, sectional wall cabinets. It is important to ask the question: who needs access to this? Remember that things can be keyed differently for instructors than facility managers.

Alternatively, flush-mounted tilt-out racks provide an extremely low profile to keep equipment and students safe. They can often be locked, making them ideal for small sound systems, paging or patching applications.

With video cameras present in the learning spaces, access to live video streams should be password-protected or managed by the facility managers to prevent unauthorized access to classroom video feeds.

Middle Atlantic offers a wide range of wall rack solutions including enclosed models that provide security to protect equipment from tampering, dust and other hazards.

Equipped with laminated safety glass, Vaddio RoboSHOT IW Smart Glass PTZ Camera changes from frosted opaque when the camera is off to a transparent clear glass when the camera is powered on.

DESIGN FOR **BUDGET**

With growing awareness and need for active learning and technology-aided education, a major concern is how to fund educational technology in the classroom. Administrators want to ensure the best return on their investment. A phased approach to install scheduling can assist the schools in updating their AV systems without overloading their yearly budget. As the cycles of funding come to fruition, a rolling install can occur either building by building or even room by room if a certain school subject lends itself to an advanced technological atmosphere. This also equates to re-occurring revenue to the integrator, whereby a job is guaranteed for a longer period of time. Once the phased approach is complete, it may be time again for updates.

Certain AV costs are meant to last over time. While projectors are switched out every few years, projection screens designed for higher resolutions can last longer. Universal mounting solutions provide flexibility in projectors and displays as well as allow upgrades for future technologies. Well-designed mounting solutions also save on installation time and costs over large rollouts.
To further assist in budget concerns, be prepared with a selection of good, better, best solutions. Go back to the needs assessment to determine the school's priorities, as you may need to consider cost-effective options that are designed for the needed functionality without the associated costs of the "best" option. A perfect example of this is the need for centralized control over a room's AV devices. Instead of a complex touch panel solution, examine a simple button controller that still consolidates control of devices including powering projectors, controlling drop screens or blinds, switching between inputs, and even toggling volume controls.

When purchasing video solutions for the active learning space, be sure that cost-effective equipment options will not rapidly become obsolete and outdated for the length of time allotted in your equipment plan. With inexpensive options, you will get lower quality video that may require a replacement sooner as technology rapidly evolves.

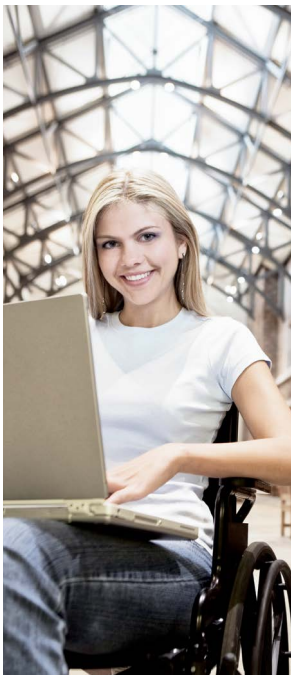
ConferenceSHOT FX

RoboSHOT 12

RoboSHOT 20 UHD

GOOD BETTER BEST

DESIGN FOR **EVERYONE**



Successful active learning is only achieved when everyone is capable of interacting with each other and the technology. Design the space to allow just this. In some instances, it's not a nice-to-have but a requirement. Students using mobility aids and students with visual or hearing impairments should be addressed in AV room design. Visual and hearing impairments should also be addressed in AV room design. Comply with ADA (Americans with Disabilities Act) requirements, specifically ADA Chapter 2: Scoping Requirements, Section 221 Assembly Areas, to guarantee a seamless education experience for everyone. Every facility should be designed with ADA compliance as a given.

So, what exactly does this all mean? The key issue is the line of sight for an individual in a wheelchair.

Follow this simple exercise: Divide the classroom into four equal parts from front to back and again from side to side. In the figure to the right, you will see four shaded squares clustered in the center. Together, these shaded squares represent the center of the classroom. This is where a person in a wheelchair must sit to meet the requirements of 221.2.3 Lines of Sight, ensuring an accessible classroom. Additionally, the classroom entrance door must be accessible for both entry and exit. There must be an accessible route with a clear width of 36 inches (91 cm) from the entrance door to the wheelchair space. Finally, the person in the wheelchair must be able to back out from his or her desk, turn around and move to the door all within a 5 foot (1.5 meters) diameter circle.

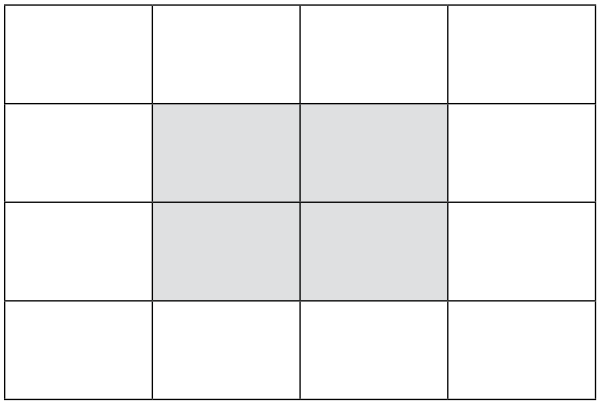


Figure 1: Diagram of an accessible classroom

The person in the wheelchair cannot sit in the front row, back row or at the end of a side row and be ADA compliant. These requirements also apply to school theater seating.

Reach ranges should be considered when adding interactive technology to the classroom. Height adjustable mounts lower interactive displays to the ADA prescribed reachable zone – no lower than 15 inches (38 cm) and no higher than 48 inches (122 cm) for unobstructed front reach.

When building huddle spaces, be aware of knee clearance and toe clearance requirements. If storing AV equipment under the table, be sure it is back far enough from the edge to provide adequate clearance.

ADA compliance is not limited to students; the conversation must be extended to include faculty members as well. Teaching aids such as presentation furniture or height-adjustable lecterns should also meet the height and reach requirements outlined by the ADA as well as the clearance space underneath for wheelchair accessibility. ADA aside,

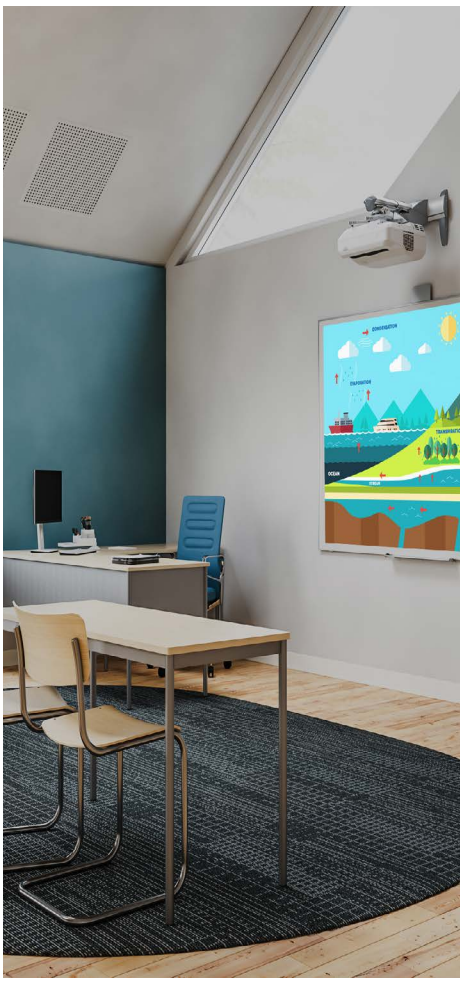
the difference in the average height of men and women is 6 inches (152 mm). A height adjustable solution that enables all users to effectively engage with the technology as well as the audience—no matter the stature or the individual or whether they are standing or seated—maximizes the flexibility of the classroom as well as the utility for everyone.

Lastly, account for cable management when designing to ADA requirements. Cables should not be exposed on the floor. If the application requires connectivity running along the floor, cover it up with an over floor raceway system. Ensure it is ADA compliant with a small, low, narrow profile.

Contact your Regional ADA Center to determine specific compliance requirements for your particular situation.

The Wiremold OFR Series reaceway accomodates open space needs in the lowest, sleekest ADA (Americans with Disabilities Act) compatible profile around.

CONCLUSION



With the shift in the education experience to active learning models, spaces must also change to facilitate and bolster interaction with adopted technology and equipment pursuant to the new paradigm of teaching. In order to integrate the pedagogy with the experience, remember to consider these design elements:

- How students and teachers will interact with technology
- Tomorrow's advancements or needs
- Flexibility in solutions to easily adapt to new technology or new room arrangements
- Embracing interactive displays, projectors, or whiteboards
- Safety for all in the room
- Security of the equipment
- Budget constraints
- Aesthetics
- Forethought of everyone who will be in the room

These design best practices are relevant in collaborative classrooms, digital lecture halls, huddle spaces or both the local and remote locations of distance learning rooms. Elicit the needs analysis and requirements of these spaces in the schools, then recommend, design and integrate a successful experience where instructors leverage technology to educate, and students interact and retain the lesson.

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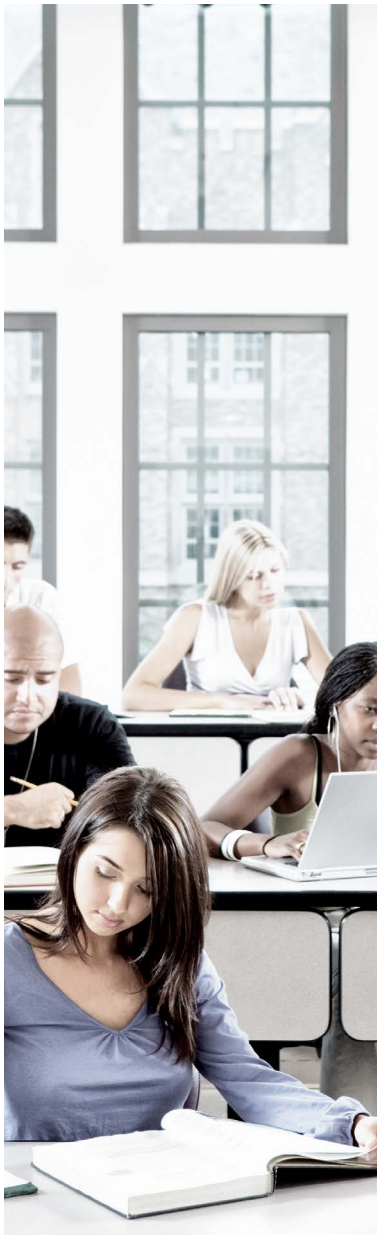

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