

# LEARNING STARTS WITH AUDIO

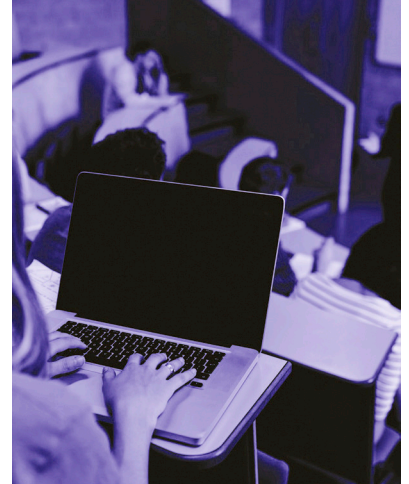
## How to ensure successful audio communication in live and remote lecture applications

Universities compete fiercely for local and international students, all of who expect immense value for their costly tuition. To be considered world-class institutions that deliver on this promise, universities must deploy technology that meets high standards of innovation and classroom rigor. They must take advantage of the evolution and advancement of classroom technology – the systems used by teachers and students for presentation, collaboration, and study – to ensure that every lesson, whether live or captured for viewing later is delivered with the highest quality. This is especially important when it comes to audio.

Audio quality plays a critical role in facilitating communication with students, and it is essential to effective teaching and engagement. If students are constantly in a state of confusion during class, either because they didn't hear what was said or because the audio has become garbled, the entire learning experience breaks down.

Organizations must consider the audio for voice lift and increasingly for lecture capture applications. Designed to make the presenter audible at all times, voice lift uses microphones to amplify the speaker's voice and is key in ensuring clear communications in the classroom. A powerful recruitment tool, lecture capture is a value-add for both physical and remote students, providing flexible access to not only classroom lectures but also supplemental lectures from other experts, demonstrations, animations, and other visual elements. For the university, lecture capture increases the learning opportunities it may extend to international and working students.

Educators must be well supported by audio technology in the classroom. This means they must be able to walk into any teaching space and trust that this technology will be easy to use and reliable – whether it's a voice lift system or part of a lecture capture system used to make presentations and course materials available to students beyond the classroom or class schedule. Given the variety of teaching spaces, styles, and subjects taught at a university, as well as the practical factors that must be addressed, this is no small task.



## COMMON CHALLENGES TO ENSURING HIGH AUDIO QUALITY

To ensure that students hear every word of a lecture or classroom discussion, most universities deploy microphone systems in dozens of classrooms and lecture halls across campus. The sheer size of such a deployment, as well as the diversity of microphone solutions within it, can make maintenance and operational troubleshooting a burden for the AV support team.

Selecting the right microphone or microphones for the space is a primary concern. If the teaching space seats, for example, 50 or 60 students and is integrated with a lectern and a projector, it may be easy to get an audio feed from a fixed microphone at the lectern. However, this only covers a lecturer who is comfortable only presenting right at the lectern. In addition, there's no microphone to cover vital information during Q&A sessions. In smaller rooms without a large-scale AV installation that can support a fixed microphone or for educators that tend to roam, wearable mics are a flexible option and can prevent the audio drop-off that occurs when a presenter moves away from a fixed mic.

While wireless mics offer more flexibility than fixed mics and are indispensable in capturing the presenter's voice, wearable mics can present their own challenges. Lecturers may struggle to keep older microphones' large and bulky battery packs attached and in place, or they may simply find them uncomfortable and distracting. At times, they forget to turn off microphones at the conclusion of class, quickly draining batteries. Battery packs that constantly need replacement can result in lecture failures, with precious lecture time spent replacing batteries. Similarly, disruptive interruptions to the classroom experience occur when mic components cannot be swapped out easily and quickly in the event of a failure.

Seamless integration of microphone systems with existing recording system can be a further challenge, as it must be performed without changing microphones or adding steps for the lecturer. In addition, interference caused by other equipment within the room and audio bleeds from equipment in other rooms can compromise the clarity of audio, cause confusion, and disrupt students' (and lecturers') focus.

As a result of these problems, an AV team can spend an inordinate amount of time managing the system. With lecture rooms located all over the campus, it often is challenging for AV team members to physically make it to the room and to troubleshoot audio issues or replace batteries before students stop paying attention and consider the class a fail.



**Gooseneck microphones, usually in 6- and 12-inch sizes, are an ideal choice for podiums and stage tables where speakers won't be moving around the room. Their polar response enables clear, superior audio quality.**

If the educational institution can overcome the overarching challenge of choosing and deploying the right technology for the task at hand, it can address most of these day-to-day difficulties and, in turn, deliver the audio quality that students today expect and demand as part of their educational experience.

## IMPLEMENTING EFFECTIVE VOICE LIFT AND RECORDING CAMPUS-WIDE

Voice lift solutions allow educational institutions to support even the most soft-spoken presenters or instructors, and they also play a key role in facilitating



**Wearable microphones are a flexible solution for lecturers that tend to move about the room as they speak. The mic can be positioned exactly where it needs to while wireless options eliminate the bulky battery packs that constantly require new batteries.**



assistive hearing in the classroom. Neither of these valuable enhancements to a class or lecture is possible without one or more microphones in the room.

Although universities once installed microphones only in rooms with 100 or more students, many now insist on voice lift in rooms with 30 to 40 or more seats. With reinforcement by a speaker system, presenters needn't shout or strain their voices, a benefit that improves intelligibility and helps to protect against the voice damage that can result from hours of speaking on a near-daily basis.

At the same time, the audio captured via mics used for voice lift can be fed directly into any number of lecture capture systems. In either case, audio quality will depend on whether the right mics are positioned in the right place at the right time.

### **GENERAL MICROPHONE REQUIREMENTS**

The type, style, and configuration of microphone systems naturally must be top considerations in selecting equipment for voice life and lecture capture, but it also is important to evaluate how easily particular systems can be deployed, operated, and maintained. Ease of use may be the most important characteristic if a system is to provide reliable and predictable performance from day to day.

In auditoriums and lecture halls where the voice of a presenter must be easily heard and understood by audiences from small to large, a simple, flexible solution is best. When a single type of system or specific microphone model can be deployed in each room, regardless of the room size, faculty and staff enjoy a consistent user experience from room to room. A presenter should be able to put on a wearable microphone or walk up to a fixed mic and just start talking; the mic and installed equipment should provide students with crystal clear audio reproduction that overcomes any acoustic issues present in the room.

When the wearable mic system is compact, discreet, and comfortable to wear and use, the presenter is free to focus on the lecture rather than on technical and practical distractions. The system also must have a long battery life that offers convenient charging without disrupting the room schedule to recharge the system, and that eliminates the constant task of replacing batteries. Equally important is that the presenter be confident that the mic is effectively capturing audio for voice reinforcement or recording.

Finally, sophisticated audio processing ensures that audiences hear the rich intonation of the human voice and understand the speaker with clarity. The clear, natural sound captured by the mic system and optimized through digital signal processing (DSP) can be leveraged well beyond the walls of the auditorium or lecture hall. When audio from multiple microphones is combined with an installed AV system, remote audiences can hear the recorded presentation as clearly as people listening live in the room.

### **TYPICAL CONFIGURATIONS**

To present all speakers clearly and at the same volume, DSP must be used to process the audio feeds to compensate for the size and shape of the room and the environment that impact the audio quality, including reverberation, acoustics, and where people are positioned. The DSP capabilities required are dependent on the type of microphone – wearable, handheld, directional, gooseneck, and

omnidirectional – because each type has a different pickup pattern and range. DSP technology can further reduce the noise floor and boost intelligibility, but there are limits to what it can do. The best way to capture clear audio is to place mics equidistant from the people who are speaking. The closer a mic is to a person, the less likely it is to pick up unwanted noise.

For voice lift, microphone configurations are determined more by the size of the audience and type of student-instructor engagement than by the size of the room. Whatever the size of the room, the presenter likely will use a wearable wired or wireless mic.

Covering the audience is a bit more complex. In a larger environment, perhaps with 100 or 200 students in a lecture theater, it may be necessary to implement voice lift for individual students as they contribute to the discussion. Often, such rooms will have a hand-held mic that the presenter can give to students to ensure that both the question and the answer are captured at a sufficiently high quality. Another alternative is to position fixed mics on stands in the aisle, which requires students to get up and go to the mic to ask the question. While most academics are trained to repeat student questions so that they can be heard by all and recorded by the lecture capture system, in some cases, it is worth the additional cost and complexity to place additional mics throughout the room.

Larger lecture theaters and other premium spaces at a university may opt for eight-channel or 16-channel microphone systems to support panel discussions or so that they can be rented out for other purposes during holidays and other down times. In this case, the larger system gives users the flexibility to adapt the mic configuration to different types of events and presentations.

## **MICROPHONE SYSTEM STYLES AND FEATURES**

Though there is no one-size-fits-all solution for audio capture, one- and two-channel systems are the norm for voice lift and lecture capture within the classroom environment. Wearable lapel microphones are popular because they allow the presenter to move freely about the room and to interact naturally with the audience. Gooseneck microphones, usually in 6- and 12-inch sizes, are often used on podiums and stage tables.

Wireless microphones with superior HD audio quality and a small form factor make life a lot easier for an AV department and for teaching faculty and staff. The mics can be stored right on the lectern, ready to go. The user just selects one, clips it on, and unmutes it (wireless mics are typically configured to be on mute when removed from the charging stand). A wireless design eliminates the risk of users tripping over cables on the floor, and also simplifies setup for novice users. In addition, a multiple-mic charging base makes it easy to offer presenters a selection of different microphone styles while keeping fully charged microphones always available in reserve.

Built on DECT technology, these mic solutions are low-emitting systems that solve crossover or “audio bleed” issues present in RF mic systems even when employed across numerous teaching spaces. Crossover occurs with analog RF mics that transmit on adjacent or the same frequencies. DECT is digital and segregates slots for individual mics, and the systems can automatically move into different slots if other mics are transmitting in the same slot. Because they’re digital rather than analog, users won’t hear any channel conflict; DECT protocols take care of that. RF mic systems, on the other hand, can pick up audio from nearby sources that are operating on or near the same frequency, and users will hear additional audio within their frequency any time a new microphone is added. Adding to RF mic issues, countries are selling off RF spectrum, not only causing older systems to become obsolete but requiring users of new RF systems to manually select the open channel when setting it up. DECT operates on an unlicensed spectrum that won’t be sold off. Eliminating reliance on available UHF frequency spectrum, these mics can be used extensively within university buildings, and because these mics tend to be more affordable, deployments can easily be scaled up as needed.



**The biggest obstacle facing AV or tech departments is audio quality and the burden and interruption of battery replacements. Wireless microphones built on DECT technology reliably deliver superior HD audio quality without interference, and with a small form factor, they can be stored and charged right on the lectern, ready to go for every class.**

A high-quality wearable mic can deliver better audio quality than a traditional wired USB boundary mics. Academics tend to move about the room as they speak, and boundary mics can cause audio quality to drop off if they stray too far away. A wearable mic, on the other hand, stays positioned where it best captures high-quality audio: on the presenter.

A new class of USB wireless wearable microphone systems is giving educational institutions an excellent option for the many classrooms that require voice lift but lack full installed AV systems. In addition to providing a native USB cable that plugs the base unit straight into a laptop (which is plugged into an HDMI or other wall connection), these mic systems offer USB audio without requiring the speaker to wear a headset or bulky transmitter. Their wireless design allows the instructor to move freely around the room to interact with displays and other presentation tools, making presentations more engaging and collaborative.

## MICROPHONE SYSTEM DEPLOYMENT

Universities typically have multiple buildings, often distributed across multiple sites, so the time and cost savings of centralizing control over a network can be significant. Though most spaces only require two microphones, management of all these devices can be daunting when voice lift is instituted across hundreds of classrooms. For this reason, mic systems that integrate with a remote management system allow AV administrators to monitor them and perform simple troubleshooting from anywhere, saving significant time and resources.

Ideally, the mic system also integrates easily with room control systems and other room solutions such as amplifiers and loop-back suppressors. A plug-and-play system that operates smoothly with other systems can deliver high

## SUMMARY

High-quality audio is a critical factor for ensuring every student – near and far – hears every word and has a successful learning experience. This means academic institutions and universities must be selective in the microphone systems they integrate within each space. As discussed, the right microphone for the space:

- Covers anyone who may be speaking in the room and supports a multi-mic environment.
- Is easy to use; whether it's a wearable mic or wired, the presenter should be able to talk right away.
- Ensures natural, clear audio by preferentially capturing the speaker's voice over noise.
- Seamlessly integrates with lecture capture systems.
- Eliminates the burden of replacing batteries.
- Can be managed remotely.
- Solves spectrum and interference challenges.

performance right out of the box. When equipped with onboard remote monitoring capabilities, mic systems facilitate ongoing status monitoring and ensure that the AV staff members are alerted to issues as they happen. With these tools, technical teams can perform preventative maintenance and quickly and efficiently address device issues or failures.

Of course, this model works best when classrooms and lecture theaters rely on a common platform. With mic systems standardized across teaching spaces, university AV staff can more effectively monitor, manage, and maintain mic systems. Faculty and staff can more effectively use those systems to provide a consistent experience for their students.



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