# Sound Systems for the 21st-Century Classroom

by Barbara Freedman

Playback of prerecorded music in the classroom is a ubiquitous necessity for music educators. Whether listening to prerecorded examples to study and learn about music or to evaluate recorded solo or ensemble performances as formative or summative assessment, each requires some form of playback of recorded music. Given that prerecorded music comes in a variety of formats and is played back on a variety of devices, music teachers could benefit from reconsidering the use of consumer-level devices, often mere stereo systems, and learn some tricks from the world of professional audio engineers. I offer the following as one way teachers can create a sound system to suit a variety of needs within a modest budget.

## Speakers

Generally speaking, low-cost consumer-level products labeled as computer speakers, bookshelf speakers, Bluetooth speakers, or stereo-system speakers do not produce the same quality of sound as today's studio monitors. Studio monitors seek to reproduce as close to a "flat" response with as little influence in the low or high ends of the sonic spectrum as possible. Powered or "active" studio monitors have the needed amplifier built into them so they do not require a separate amplifier, but each will also need to be plugged into an electrical outlet. Not all studio monitors are created equal—they range from low- to high-end in quality and price.

## Size Matters

The debate about speaker size as it relates to room size, along with the mathematical equations for determining optimal speaker placement, can be found with an Internet search, but those requirements aren't necessary or practical for most classroom situations (or for the teacher on a cart). Speaker size refers to the diameter of the speaker cone, not the overall size of the speaker cabinet. For the average classroom with a 10'–12' room height, a 5" speaker should be the minimal speaker size, with an 8" speaker being preferable. For ensemble teachers or those in large rooms, an 8" or 12" speaker is probably a better choice.

## Installation of Speakers

Take some time to test the best placement around your room for your classroom configuration and your class size. When you test, be sure to sit or stand at the typical height of your students to emulate how they will hear the sound. A professional installer should use the manufacturer's recommended wall bracket for permanent installation of speakers. Speaker stands can be cumbersome and dangerous as they can topple over. If a bracket cannot be used, attaching a shelf the size of the speaker to the wall may be safer than using a speaker stand, but be sure to secure the shelf to the wall bracket and the speaker to the shelf.

## Choosing and Using a Mixer

While it is sometimes possible to cable your speakers directly to the device (a computer or phone), it is preferable to cable the speakers into a small mixing board. This way you can control volume and put a few things into the mixing board to get sound from them out of the speakers. Mixing boards appropriate for classroom use can cost as little as $50, and for $100–$150 you


can get much more versatility or sound effects. Understanding simple signal flow is the key to choosing the right mixer and knowing how to use it. Basically a mixer takes signal IN from a device (your computer, phone, a microphone, etc.) and routes the signal OUT to various devices (speakers, recording devices, other mixers, etc.). Just remember:

*IN* = What is the source of my sound? (What are we listening to?)

*OUT* = How do I want them to hear it?

### Cabling

Details about cables, shielded and unshielded, balanced and unbalanced, are beyond the scope of this article. Some cables come monophonic (TS, or tip-sleeve) and can be used for a single (mono) IN or the left side of a stereo IN to get a single (mono) OUT. Other cables come stereophonic (TRS, or tip-ring-sleeve). Some cables combine the two monophonic (TS) on one end to a single stereo (TRS) on the other. Cables come in a multitude of male and female ends, in a variety of end types, including RCA, 1/4", 1/8", XLR. The length of any cable depends on the distance between the two things they will connect. In general, go for something a little longer and you can always use a cable or Velcro tie to keep things wrapped neatly.

### Common Cables for the Classroom

- XLR (microphone) cables are balanced, mono cables. They are good for microphones and for use as speaker cables from your mixing board out to powered speakers.
- 1/4" male to 1/4" male come in both stereo and mono. Although they may look the same, there is a difference between mono instrument and mono speaker cables. Instrument cables are unbalanced cables that are used for an electric guitar or bass to amplifiers. Speaker cables are also unbalanced but are generally thicker and can carry the heavier electrical current from an amplifier more efficiently than an instrument cable. If you use the wrong cable from an amplifier to a speaker (an unbalanced instrument cable), you can damage your equipment or, at the least, have noise or hum out of your speakers. Using a balanced speaker cable, like an XLR or a TRS 1/4" cable, helps with unwanted noise or hum that can occur along a line to your speaker.
- "Y" cables or stereo breakout, insert cables, splitters, and adapters come in a vast variety of configurations. Try to get the exact configuration of cabling you need and avoid converting one kind of cable to another with an adapter if you can.

### One Possible Setup

Aesthetics and experience dictate that different people will recommend different products. In general, whenever you can, upgrade. There is a reason some products cost more than others as there is usually a difference in quality of construction that influences durability, flexibility, or sound quality. The system described below is what I consider minimally acceptable and should cost less than $500, and a few tweaks could save you a little. Understand that these products are what I have chosen to use, and I offer them as an example. There are a myriad of approaches, products, and brands out there for your consideration as you explore how to better your sound system.

### Speakers

PreSonus Eris E5 (5" studio monitor) for about $150 each are sold separately, so buy two. They can be adjusted in the back of the speaker to favor or reduce lows as appropriate for speaker placement or personal reference. I use the E5 in classrooms, in the mixing studio, and on my office desk. The 5" will serve most medium to large music classrooms well. If you have been using computer speakers or a Bluetooth speaker you will surely notice the difference. For very large or ensemble classrooms, you should consider an 8" version.

### Mixing Board

A small Yamaha mixer MG06 (about $100) will suffice for most classrooms. Remember, you can switch out devices with the change of cable. If you want the ability to leave more devices plugged IN and just switch between them at the mixer, the MG10 will give you more IN, including RCA. Yamaha makes the UX model that is the same line of mixers as the MG but includes the ability to

add effects to the OUT, the MG06UX and the MG10UX. If you are using your mixing board for double duty for a PA, it could be worth the extra $50 or so for this model. If the mixing board is just for classroom use, the effects may be superfluous. *All models will allow you to plug in a microphone.*

### Cabling: Speakers

Use the XLR OUT of the Yamaha mixing board MG06 or MG10 to the Eris speakers. There is a place for the 1/4", but the XLR cables will give you the proper balance, and you won't have to worry about whether you have the correct 1/4" cable. This also gives you the ability to have the remaining 1/4" OUT on the mixer for something else, should you choose to expand in the future. The length of either cable choice will depend on how far away your speakers are from your mixing board.

### Cabling: Computer and Phone to Mixer

A computer or phone, iPad, iPod, or other device with a 1/8" or 3.5 mm stereo standard headphone out will require a Y cable or stereo breakout cable. I recommend a 1/8" (3.5 mm) male TRS to 2-1/4" male TS stereo breakout cable. If you get two of these, you can plug your computer and phone into the mixing board separately. If you're using this cable, keep the phone and computer relatively close to the mixer (10' or less) to avoid picking up hums and buzzes. Always remember to turn the computer or device volume all the way up before setting your mixer levels.

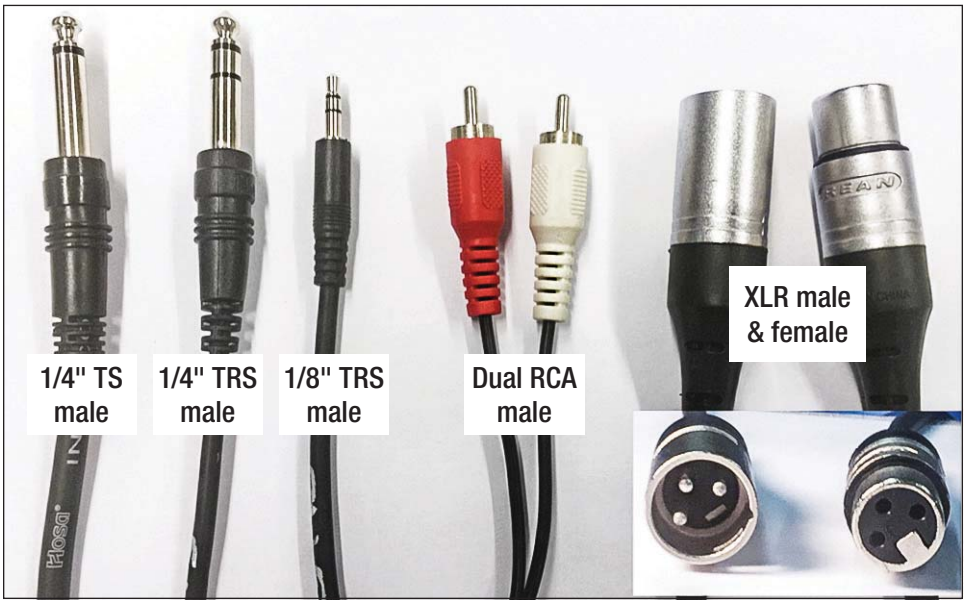
**We expect our students and ourselves to produce characteristic, refined sounds, and we understand the importance of playing on a high-quality instrument. Why have students listen to music on equipment that doesn't faithfully reproduce the sound?**

### Cabling: DJ and Other RCA OUT Equipment

Some DJ and other equipment use an RCA cable, which have the red or white ends that you use in old-fashioned stereos. The MG06 mixer does not have RCA IN so you'll need an interconnect cable RCA to 1/4" mono (TS). If you have the MG10 or mixers with RCA IN, RCA to RCA stereo interconnect cables can be used.

### Budget Concerns

Budget considerations are critical no matter what funding is like in your district. Even if a district is generously funding classroom needs, there is always a certain point when one needs restraint. You can always get bigger and better if you have the money. Unfortunately, all too often I have seen teachers reach for the least expensive device just because it's the least expensive. I understand and sympathize with financial concerns; however, I urge you to reach a little higher in some instances as it will yield a better-sounding, more efficient product that might last longer and save money over time. When possible, purchase equipment from professional vendors as they are more likely to be able to offer advice and reliable support.




Consider this—we spend a lifetime honing our craft as musicians, and as educators we work toward engaging students to the highest possible levels of artistry. We expect our students and ourselves to produce characteristic, refined sounds, and we understand the importance of playing on a high-quality instrument. The same applies to sound recording and reproduction. Why have students listen to music on equipment that doesn't faithfully reproduce the sound?

Students will not be able to hear the subtleties of good performance and good sound unless we expose them to it. Unless you have a minimum of decent professional quality equipment, you won't have an opportunity to expose students to acceptable sound quality.

*How can you know if the sound system you have is adequate?* A good test is to preview the recorded music with a good pair of headphones. If it sounds good in the headphones and bad with your speakers, then you may need to consider a better system.

### Step Into the 21st Century!

Even if you have that old cassette deck or CD player, you can plug them into your new mixing board and hear them through the active studio monitors. Teachers wishing to use a variety of devices, computers, phones, iPads, and other digital or analog devices for music playback in the classroom can step into the world of high quality studio sound and power with a little knowledge, a little budget, and a shift in thinking.

*For direct links to the recommendations given in this article, visit www.musicedtech.com.*

---

Barbara Freedman has been teaching music technology and music composition since 2001 at Greenwich HS in Greenwich, Conn. Freedman is a 2017 TMEA College Division Featured Clinician.