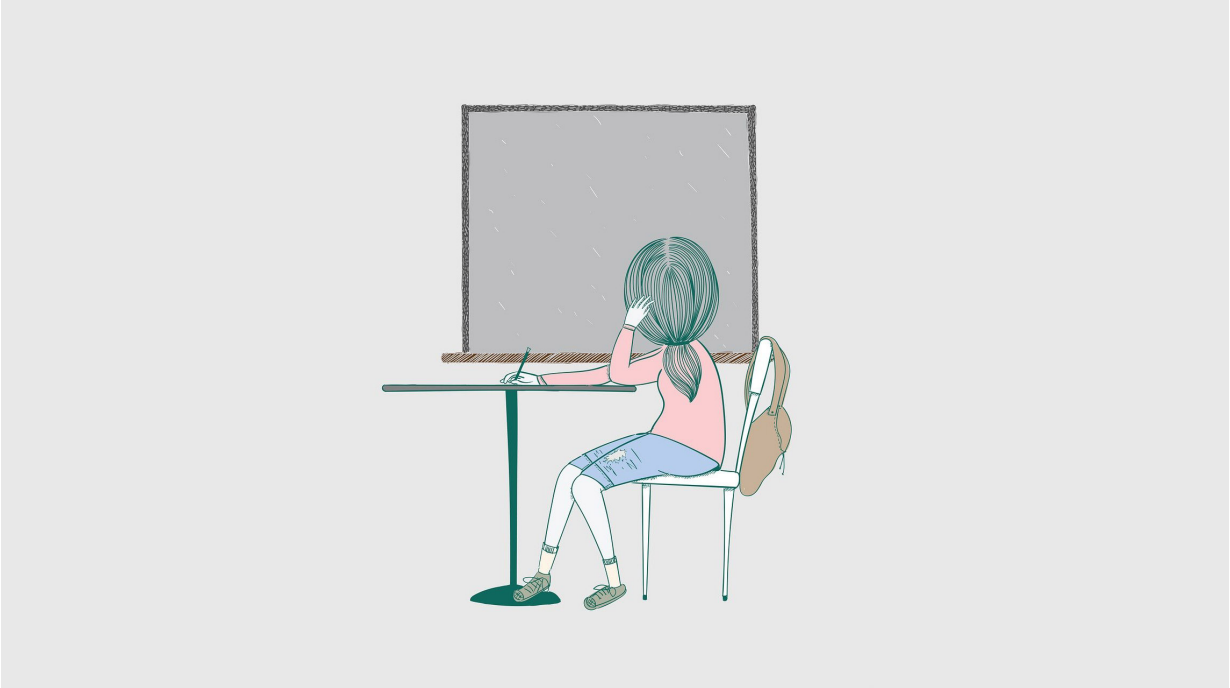
Canadian Audiologist
The Official Publication of the Canadian Academy of Audiology

Revisiting Streaming Technologies for Classroom Use: Are Personal FM Systems Obsolete?

Published January 15th, 2025

Pam Millett, PhD, Reg CASLPO



(Note: I am using the term personal "FM" systems in this article, realizing that these systems no longer use frequency modulation technology. For simplicity, I will use the term personal FM system to represent systems used in education, consisting of a teacher worn transmitter and a student-worn receiver as an interface to connect the transmitter signal to hearing aids, CIs or BAHAs. I will use the term "remote microphone" to represent the small wireless microphones (typically Bluetooth) generally intended for consumers for home or work use that would be specific to the brand of the hearing device.

In 2018, I wrote a column entitled Can Streaming Technologies Replace Personal "FM" Systems in the Classroom. I talked about the potential for traditional personal FM systems to be replaced by simpler, less expensive Bluetooth remote microphones in the classroom. It's been more than 6 years since that column, and technology continues to evolve, most recently with the development of Auracast, so it seems relevant to revisit the question. Are personal FM systems obsolete?

Let's revisit the criteria I outlined in 2018 that provide a framework for comparing the efficiency and user-friendliness of personal FM systems versus Bluetooth remote microphones for classroom use.

Spoiler alert: I continue to conclude that FM systems remain the best choice for students in classrooms for various reasons related to reliability and flexibility. To that end, it's crucial that hearing devices fit on children can connect to a personal FM system, whether via internal receivers, audio shoes with a universal FM receiver or even an old-fashioned telecoil.

To be fair, my critiques of Bluetooth remote microphones for classrooms are not related to problems with the technology per se, but more that they were designed for a different population and for different use cases. I think it is fair to say that most Bluetooth remote microphones were developed for adults, who can effectively determine that the technology is working and has good sound quality, and who would be able to report problems effectively. Adults might use remote microphones for a meeting with a co-worker, over dinner in a restaurant, or to watch television in the evenings. They are likely not using their remote microphone constantly from 9 am to 3:30 pm, and one remote microphone serves all their needs.

Criterion 1: Systems must be reliable and easy to use

Ease of use and need for training

Bluetooth remote microphones can be less complicated to use than personal FM systems but mostly because they are simpler technology – they may only have an on/off, a mute and a pairing button. A student who requires only one simple teacher transmitter might find a remote microphone sufficient. I have worked with high school students who were perfectly content with the remote microphone for their hearing aids; they found it to be easy for teachers to use and didn't feel they needed any additional features or functionality.

However, in education, the listening and learning environment can change dramatically from one year to another or from one semester to the next in middle or high school. A student who did very well with a single, simple teacher transmitter this term might find themselves in a class next term that has a lot of small group work, or where the teacher has an interactive whiteboard with poor-quality audio speakers. As an educational audiologist, I feel most comfortable knowing that I can offer choices when accessibility needs change.

Using all the functionality offered by personal FM systems in one classroom (for example, with the addition of pass-around microphones and separate audio connection devices) can be a lot of technology for a teacher to learn and use effectively; this is why we need educational audiologists and teachers of the deaf. There is nothing inherently wrong with a parent sending in their home remote microphone and telling the teacher to clip it on and push the on button – the student will hear better than having no teacher microphone at all. However, educational audiologists and teachers of the deaf know that we can do better for our deaf and hard-of-hearing students.

Reliability of the streaming connection

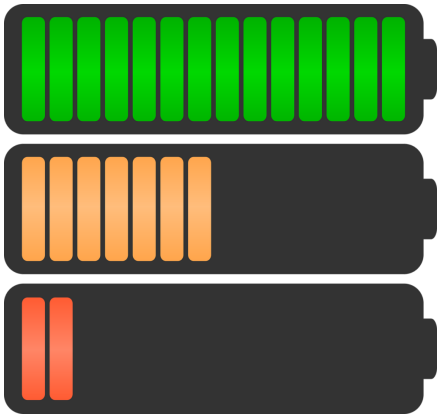
Classrooms are very busy places and teachers are very busy people, so we rely on a stable transmission from the teacher to the student at all times during the day. Connection reliability with Bluetooth microphones continues to be an issue when these devices are used at school. Again, to be fair, this is not a criticism of the technology, but more of the way that Bluetooth microphones need to operate in classrooms versus their intended use for adults. Random disconnection of remote microphones can occur when the devices are within range; however, the connection is reliably lost when the remote mic is out of range for more than a few minutes. An adult using their remote microphone on a phone call, or at a restaurant will never be out of range.

On the other hand, students are often gone from the classroom for a period of time long enough for the remote microphone to discontinue streaming (going to the bathroom, at recess, or over lunch). This requires them to reinitiate Bluetooth streaming many times during the school day – some students can manage this, some cannot. Teachers have a lot on their plates – they cannot constantly check to see that the signal from their microphone is still streaming at all times during the day.

Hardware Reliability

The reliability of something as simple as the tiny plastic piece that clips the remote mic on to a teacher's shirt can make or break use in the classroom. Many decades of personal FM system use in classrooms have taught educational audiologists, teachers of the deaf, and manufacturers the value of hardware reliability, the ability to swap out broken parts (such as a clip) onsite, user-friendliness, and comprehensive extended warranties. Teachers and students can be hard on equipment – pieces get dropped on the floor, stuffed into drawers or backpacks, passed between multiple users, etc., so durability is an important consideration.

Criterion 2. Batteries must last the entire school day



Bluetooth remote microphones still entail significant battery drain – not an issue for an adult using it to watch television, but a significant problem for a student whose technology dies halfway through a school day. In addition, they are charged every weekday and require a full day's use. Bluetooth remote microphones sometimes have a limited number of charges after which they will no longer charge, while we need personal FM systems to charge and work reliability for several years.

Criterion 3. Systems must be flexible enough to accommodate a variety of classroom scenarios

A primary disadvantage of Bluetooth remote microphones in the classroom is that there can only be one. We cannot add passaround microphones, conference microphones or audio streaming devices for better accessibility. Access to peer input and classroom audio is a universal problem in the classroom, so not having this option means potentially poorer learning for students.

Teachers would need to wear multiple microphones if there is another student in the room with a different remote microphone. In theory, remote microphones can interface with a personal FM system if they have a port for a universal FM receiver to be plugged in. In practice, this setup has the teacher wear the personal FM system transmitter, with the student wearing the remote microphone/FM receiver on his/her body. All wearing options (clipped to the child's shirt or waistband or worn in a pocket) are recipes for loss. In this respect, wearability options have not improved since 2018.

There is no option for a lapel or boom microphone into a remote microphone if educational audiologists or teachers of the deaf wish to use these options (for example, for a teacher with neck pain who is not comfortable wearing something around their neck).

Surprisingly, the old-fashioned telecoil can still be a role in education. In my experience, high school and postsecondary students have sometimes chosen a neckloop with telecoil as the receiver for their personal FM system. This setup provides the advantage of a volume control and an on/off switch, with more flexibility and independence for the student. I have had university students who appreciated being able to come to class early and give the transmitter (already turned on) to the professor to put on. No need for the student to stress about the professor remembering to mute/unmute or for the student to listen to background noise through an open microphone until class started – they could simply turn the neckloop off or down until the professor started class.

While technology continues to evolve, classroom listening and learning environments have not really changed and noise levels have certainly not improved; the challenges we faced in 2018

continue to exist in 2025. Educational audiologists and teachers of the deaf are excited to see what the future brings - for example, how might Auracast work in a classroom? However, our primary goal in classrooms is to provide the best possibility accessibility for all activities happening in classrooms, and in 2025, personal FM systems continue to be the best way to accomplish this for most students.