Sound Field Systems in New Brunswick Classrooms: Let's Enhance Their Use!

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> "I know that you believe you understand what you think I said, but I'm not sure you realize that what you heard is not what I meant." R. McCloskey

Chances are that misunderstandings such as the one referred to above can have an impact on student success as "most classroom learning involves oral communication and the intelligibility of spoken words is obviously very important for a successful learning environment" (Yang & Bradley, 2009, p.3). As practitioners in the fields of audiology and second language education, we believe that hearing, listening and understanding are crucial to literacy development and this belief is supported by research (e.g., Millet, 2009; Crandell, Smaldino & Flexer, 2005). In the following sections, we outline the barriers to effective classroom communication and we provide an account of how sound field systems have become more prevalent in New Brunswick (NB) schools. We conclude by suggesting a way forward to ensure effective and sustained use of these devices in this province.

What are the barriers to effective communication and which learners are the least able to cope?

In its broadest sense, a communication loop consists of a speaker and a listener who reverse roles in a back-and-forth process of exchanging ideas through emitting a message and providing verbal or non-verbal feedback. The speaker's ability to transmit a clear message is influenced by factors, such as, being hoarse, stumbling on words, or raising one's voice. The following three external factors also have an impact on the quality of the sound signal: noise, echo and distance. Simply put, the location of the school in the community or the classroom within the building can affect noise levels. Echo distorts the sound signal and as the distance from the speaker increases, the amount of sound signal available to the listener decreases.

Consequently, the students who are located furthest from the origin of the sound signal are at an increased disadvantage in a classroom. The listener's ability to decipher the message correctly is also influenced by several factors, some of which include: transient or permanent hearing impairments, age (Millet, 2009), listening strategies and prior knowledge (Vandergrift, n.d.). Further to this, children who are

especially at risk of not being able to fill in the missing words include: children in learning environments that are not their first language, first nations students, children with learning disabilities, children with behavioural, attention or auditory processing difficulties (Millet, 2009). According to Bradley, in a typical grade 1 class where students are listening attentively, "the average grade 1 student will not understand about 1 in 6 simple, clearly spoken words" (2005, p.2). All children and many adolescents are less equipped to process auditory information than adults, especially in adverse listening conditions (Millet, 2009).

Sound field systems: What are they and how did they find their way to NB classrooms?

The most expedient way to ensure that all leaners hear a clean as possible signal is to use a sound field system. Simply put, speech is picked up by a tiny microphone at the teacher's mouth and transmitted with mild amplification to speakers in the classroom to produce a clean surround sound environment. Speech coming out of the system is not louder; it is cleaner and thus more intelligible. Students can use pass-around microphones to transmit their response to complete the communicative loop.

In 1997, we placed the first sound field system in a French Immersion classroom at a school in our neighbourhood, in an attempt to help a young learner with a severe permanent hearing loss. As one of our family members was also a student in this class, we were able to witness and partake in the initiative from multiple perspectives. CBC NB television news reported on this experience and as the word spread, other schools began to purchase the systems through fundraising and private donations. In the years that followed, a cross-disciplinary team from the professions of speech language pathology, nursing, education and audiology conducted a study in 60 kindergarten to grade 3 classrooms in NB and found, "that students focused better and exhibited fewer distracting communicative behaviours when they could hear the teacher clearly" (Rubin, Flagg-Williams, Aquino-Russell & Lushington, 2011, p. 344). Shortly afterwards, an entire school district completely outfitted every classroom with sound field systems. Other districts increased the amount of classrooms they had equipped with the technology, which was in accordance with recommendations made in a recent report on inclusion in schools and policy documents issued by the NB Department of Education and Early Childhood Development.

Why do we need to collaborate in order to ensure the sustainability and universality of sound field systems?

In the past fifteen years, nearly 4000 sound field systems have been placed in New Brunswick schools; yet, the impact of this measure has been diminished due to the inexistence of a provincial plan to ensure proper installation and maintenance of equipment and end-user training. From an audiology perspective, we have documented issues such as speakers aiming at incorrect places in the classroom, improper volume control set-ups, obstruction of speakers by clipboards and fish tanks, and so on. Some unused devices, which were deemed "broken" by teachers, only required a battery change. In other cases, teachers were using improper channel set-ups, resulting in

crossover sound interference within the classroom or the school. From the personal experience as the sole user of a sound field system amongst a staff over 100 teachers, incredulous colleagues questioned their relevance. They based their arguments on myths, such as the devices would make their students "lazy listeners" or supported the efficacy of teaching with a raised voice, a practice that in fact distorts the quality of the sound signal. The Rubin et al. report supports our anecdotal observations; "School personnel need to be aware of the many components involved in creating optimal classroom listening environments including characteristics of the students, room acoustics, and the benefits of using sound field amplification" (2011, p.357).

Notwithstanding the benefits for teachers such as vocal health, the reduction of fatigue and decreased sick time (Millet, 2009), we believe sound field systems are a means to ensure more equity in New Brunswick schools for all learners in an inclusive educational setting. Further to this, in order for clarity of sound to become part of the workplace norm, teachers' associations and pre-service education training institutions have an important role to play in modeling and promoting the use of sound field systems. In the absence of a comprehensive provincial plan, we advocate for grassroots collaboration between healthcare professionals, educators, the private sector, parents and community interest groups. As Millet suggests, these devices "are an outstanding example of how universal design principles can benefit everyone" (2009, p.4) and we believe this is possible if we all work together.

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