



Does the Classroom Assist or Impede the Learning Process?

INTRODUCTION

Hearing and understanding spoken language in the classroom is a fundamental mechanism of learning for most children. If students have trouble hearing the words spoken to them, they may not comprehend their lessons, or may misinterpret instructions. As adults, we often take oral communication for granted, because it comes so naturally. However, young children hear differently than adults. Moderate levels of noise that disrupt young children's comprehension of normal speech do not affect adult's understanding.

There are many sources of interfering noise in schools and classrooms. Some examples include neighbourhood traffic, people talking in hallways, musical instruments, and radiators. Minimizing interfering noise and paying attention to classroom acoustics is one of the simplest ways to ensure everyone can accurately hear and learn in their classrooms.

CONSEQUENCES OF TOO MUCH NOISE

- In a typical grade one classroom, the average student will not understand 1 in 6 simple, familiar, and clearly spoken words. Many students will understand fewer words. In quieter conditions they can understand almost all of these words.
- Excessive noise negatively affects the development of reading skills.
- English language learners and children with hearing impairments have more difficulty recognizing spoken words, which may impact language and literacy development.
- Teachers have a higher than average rate of voice impairment due to their prolonged use of higher voice levels. Many teachers talk significantly louder than in normal conversation in order to be heard above classroom noise.

SOURCES OF POOR ACOUSTICS AND NOISE

- Open concept schools, where no walls are built between groups of classrooms, can impede the learning process. In an open concept classroom the voice of teachers and classroom-noise easily spills over into adjacent classrooms. The speech noise from neighbouring classrooms is more distracting and detrimental to understanding than equivalent levels of neutral noise (e.g., heating, ventilation, and air conditioning).
- Outside noise, such as traffic, a siren, or trash collection, is a problem in high density urban areas.
- Internal noises, such as student groups moving from one location to another, noise from gym or music classrooms, as well as noise from heating and ventilating systems, and audiovisual equipment occurs in all schools.
- Noise energy from student activity is commonly 10 times greater than optimum. Higher levels of student activity noise are acceptable during many, but not all, classroom activities.

ROOM ACOUSTICS

In practice, Canadian classrooms generally have acceptable room acoustics. Cost concerns usually dictate that the classrooms are not too large (less than about 250 m³) and conventional (inexpensive) construction usually leads to a suspended acoustically absorbing ceiling. With the added absorption of students, teacher, and furnishings, most classrooms tend to have reasonable reverberation times.

During new school construction, building classrooms with superior room acoustics is a simple and cost-efficient method of supporting children's learning.

SIMPLE CHANGES TO OPTIMIZE CLASSROOM ACOUSTICS

- Talk to an acoustical consultant and obtain a copy of ANSI S12.60 to learn about acoustic guidelines and standards.
- In the primary and junior years the noise level in quiet classrooms should not exceed 35 decibels. Keeping classroom noise below these levels will support typically developing children. Children with hearing impairments or non-native listeners will benefit from even lower levels of classroom noise.
- Minimizing building noise requires quiet heating and ventilating systems. Using ducted ventilation systems and placing fans (and any other noise producing components) outside of the classroom is preferred. Minimize outdoor and hallway noise by closing windows and doors during critical lessons. Reduced noise from mechanical sources will lead to reduced levels of student chatter.
- Control student activity noise when accurate speech communication is critical (e.g., giving instructions or teaching new concepts). Noise levels of students during a teaching activity can be 5 to 10 decibels louder than the noise levels found in the unoccupied room.

CONCLUSIONS

There are many factors that can interfere with a child's academic development. Many of these may be difficult to control. However, acoustical conditions in classrooms are completely under the control of teachers and school authorities and can be optimized to maximally support accurate speech communication in the classroom. Being able to understand the words of the teacher's explanation must be an essential first step towards understanding the message too.

REFERENCES

ANSI S12.60-2002, "Acoustical Performance Criteria, Design Requirements and Guidelines For Schools", American National Standards Institute. (Available free from http://asa.aip.org/map_publications.html#5T)

Peggy Nelson, "Classroom Acoustics II: Acoustical Barriers to Learning", Acoustical Society of America publication.

Sato, H. and Bradley, J.S., "Evaluation of acoustical conditions for speech communication in active elementary school classrooms", *Proceedings 18th International Congress on Acoustics*, Kyoto, April 2004.

Bradley, J.S. and Sato, H., "Speech intelligibility test results for grades 1, 3 and 6 children in real classrooms", *Proceedings 18th International Congress on Acoustics*, Kyoto, April 2004.

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