The signal to noise ratio in a school from Brazil: implications and necessities

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Introduction

For a more effective learning process in the classroom, it is very important that the information transmitted is clear. The acoustic environment and noise ratio signal has an essential role in this process.

According to the School Planning and Management (2005), students are unable to understand 25-30% of what teachers say because of excessive noise and reverberation in classrooms.

One of the most critical issues to understand the acoustic environment and its influence on the hearing ability of students is the signal to noise ratio (SNR). The signal to noise ratio is characterized by the intensity of the teacher's voice over other sounds of the classroom. The more intense the environmental noise and the longer the reverberation time, the worse the signal to noise ratio is.

It is recommended that the SNR should not be < 15dB for students without hearing disabilities (ASHA, 2005).

Methods

Eleven classrooms from a particular school in Santana de Parnaíba, São Paulo, Brazil were selected. This school was selected because it is participating in an awareness program on school noise. Of all classrooms, 4 were classrooms from Elementary, 4 from Middle and 3 from High School.

The recording was made during a lecture with student participation. Teachers and students received guidance to lead the class as usual, without any modification due to the recording.

The recording was carried out for 5 minutes in the center of the classroom (Svantek dosimeter). The recordings were analyzed using the Audacity software, with the Canadian program E-Ramp-Inc. (Web Accessibility and Special Accommodations).

Results

The results obtained with the recordings showed that the signal ranged from 18.3 to 38.4 (28.76) dB. Moreover, noise had a much smaller range: 18.2 to 22.1 (19.8) dB, as shown in Table 1.

Table 1. SNR expressed in dB.

<table>
<thead>
<tr>
<th>School</th>
<th>Elements</th>
<th>Signal</th>
<th>Noise</th>
<th>SNR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary</td>
<td>1st</td>
<td>24.3</td>
<td>18.5</td>
<td>7.8</td>
</tr>
<tr>
<td></td>
<td>2nd</td>
<td>30.2</td>
<td>20.4</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td>3rd</td>
<td>27.2</td>
<td>19.4</td>
<td>8.6</td>
</tr>
<tr>
<td></td>
<td>4th</td>
<td>18.3</td>
<td>18.0</td>
<td>2.3</td>
</tr>
<tr>
<td>Middle</td>
<td>1st</td>
<td>26.3</td>
<td>19.8</td>
<td>6.5</td>
</tr>
<tr>
<td></td>
<td>2nd</td>
<td>27.2</td>
<td>19.4</td>
<td>7.8</td>
</tr>
<tr>
<td></td>
<td>3rd</td>
<td>18.3</td>
<td>18.0</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td>4th</td>
<td>27.2</td>
<td>20.1</td>
<td>7.4</td>
</tr>
<tr>
<td>High</td>
<td>1st</td>
<td>38.4</td>
<td>20.1</td>
<td>18.4</td>
</tr>
<tr>
<td></td>
<td>2nd</td>
<td>38.2</td>
<td>22.1</td>
<td>16.1</td>
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<tr>
<td></td>
<td>3rd</td>
<td>38.2</td>
<td>22.1</td>
<td>16.1</td>
</tr>
</tbody>
</table>

When analyzed the SNR, it can be seen that the majority of the classes were less than 15dB. Only the class of the fourth year of Middle School and third year of High School achieved higher SNR to 15dB, as shown in Figure 2.

Finally, we observed that all years from elementary school failed in the signal to noise ratio recommendations (Figure 3).

Discussion and Conclusions

The results showed that SNR in most classrooms was not adequate to an effective teaching-learning process.

The noise levels did not vary as much as the values obtained respecting the signal. From a qualitative point of view of this analysis, we can reflect on a school program facing the vocal projection of the teachers, and class dynamics (how the teachers conduct their classrooms).

The value of SNR was worse in the early series (Elementary school). In these years, students are still immature in their auditory processing mainly in the figure-ground skills. This condition closure, which leads us to consider a greater need for intervention programs on awareness of school noise and acoustic issues in the elementary years.

After recording, the audio were shown to the students and teachers. It was important to note that both teachers and students were surprised on how hard it is to understand the recording of the class. Raised discussions about the teacher’s voice, the dynamics of every teacher to try to contain the noise in the classroom and the importance of awareness among students regarding the noise that they generate themselves during class, contributing to background noise.

The results also show the importance of a school noise program involving health and educational actions for students and without hearing disabilities, considering the acoustics in the classroom for a better speech intelligibility and its impact on learning. It is important to produce buildings and environments that are inherently accessible to BOTH people with and without learning disabilities. It can help to think of the possibilities to use different methods of accommodation in classroom acoustics (Smallindo and Flexer, 2012).

It is evident that issues relating to acoustics in schools should be taken more into consideration and the considerations and analyses obtained in this study can serve as guiding aspects for future researchers and health and educational initiatives in school programs.

References

HOWARD ET AL, Listening effort of signal-to-noise ratio that are typical of the school classroom. International Journal of Audiology 2013.


