This issue is relevant because there are many schools with open concept areas where noise levels can reach potentially dangerous levels and can impact on both student's success and teachers' physical health.

Noise in Classrooms: Its Impact on Students and How to Cost Effectively Manage It

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Abstract

Noise in the classroom has been found to have a negative impact on students. However, what can be done to lessen the impact of noise on student performance? How do students perceive noise in the classroom? How do students feel noise impacts on their ability to pay attention and learn in a classroom environment? My previous action project suggested that noise has a negative impact on student performance (Lapp, 2018). This action project was geared to determine whether cost effective baffolds found in Cawthra Park Secondary School's library could lessen the noise levels. It was also geared to understand how students perceived noise and its effects in a classroom environment. The results suggested that the use of baffolds had a positive impact on lessening noise. It was also noteworthy that students tended to underestimate the noise levels in their classrooms. However, those that perceived the noise as being louder were more aware of its negative impacts than those who perceived the noise as being quieter.

Introduction

The effects of noise on students and teachers in a classroom environment has been of interest to me since being diagnosed with Central Auditory Processing Disorder (CAPD), which is a disorder that makes it difficult for me to hear in loud environments. After receiving the CAPD diagnosis, I received accommodations including the use of an FM system to allow me to hear my teachers while minimizing my exposure to background noise. This accommodation resulted in a significant improvement in my school performance. In Grade 11, I was assigned a STEM project as part of my Physics class. I chose to study the

effects of noise in the classroom on student performance. Based on this study, preliminary data suggested a possible correlation between noise and student achievement at Cawthra Park Secondary School (Lapp, 2018). This study also found that some classrooms registered noise levels between 80 dBA and 100 dBA with an average of 90 dBA. In Ontario, according to the Government of Canada's Occupational Health and Safety website, the maximum permitted exposure level to noise for an 8-hour period is 87 dBA. This is of concern in relation to the exposure teachers are facing during a working day.

Having my first STEM project published in the JASTE magazine encouraged me to continue studying STEM and to consider pursuing a career in teaching. As a result, I completed further studies related to noise in the classroom in Grade 12 and my first year of University.

Faced with the knowledge that there were potential health risks related to noise in certain classrooms (particularly those in the open concept area of Cawthra Park Secondary School), I decided to study the effect of placing cost effective baffolds between the classrooms.

Noise barriers such as portable soundproofing walls such as baffolds act as another medium (other than air) for sound to travel through. Another property of waves is that when they travel through a medium, some of the wave is reflected while the other portion is refracted. When this occurs in a sound barrier, some of the sound energy is converted into thermal energy through friction. This results in a reduction of sound energy or dBAs.

Another important area I wanted to study was the notion of noise with respect to the students in the classrooms. We can define noise as unwanted to excess sound in one's environment. However, the notion of noise is different from person to person. What one might define as noise might be considered as sound to another. As such, it is important to understand the perception of sound on the students in the classroom.

My Study

The purpose of the first portion of this study was to determine the effectiveness of using a portable soundproofing wall (i.e., baffolds) to address noise in classrooms. This study focused only on classrooms in the "open concept" area at Cawthra Park Secondary School. The decibel reader was once again used to determine the average noise level in the classrooms without and with the soundproofing wall. It is noted that these readings were completed at the same time.

Collecting this data was interesting but lacked the scope that I would have liked to have studied. With more resources and time, I would have been able to study other schools with a variety of classroom settings to see if the results were consistent.

Consequently, any assessed difference in noise level could be attributed to the use of the soundproofing wall and not to some other extraneous condition.

The sound barrier wall was placed on different sides of the specific classroom being evaluated and readings were taken. With this information, it was possible to calculate the noise reduction coefficient (insert citation). Calculating this constant makes it possible to evaluate how effective the portable soundproofing wall was in reducing noise levels inside and outside of the classroom.

As noise is perceived differently by different individuals, I felt it was important to examine how the students viewed the noise in their classroom and their perceived ability to pay attention, concentrate and learn during the class. The second portion of this study involved assessing actual noise levels in the classrooms and comparing these to how the students perceived the levels and the effects of the classroom noise on their learning. After determining the actual noise levels in the classroom with a decibel reader, the students were asked to answer the following questions:

1. On a scale of 1 to 10, please rate your learning in today’s class (circle the number that best describes your learning level)

12345678910

LowMediumHigh
2. On a scale of 1 to 10, please rate your ability to concentrate in today’s class (circle the number that best describes your learning level)

12345678910

LowMediumHigh
3. How would you rate the noise level in today’s class (circle the number that corresponds to the best descriptor)?

123456678910

Descriptors:
1 – Soft whisper; 2 – Quiet residence (night); 3 – Quiet residence (day); 4 – Light traffic; 5 – Vacuum cleaner; 6 – Factory environment; 7 – Orchestral concert; 8 – Lawnmower; 9 – Thunder (close); 10 – Rock concert

Data Analysis and Interpretation

The results of the first portion of this study involving the use of baffolds were as follows:

Table 1: Noise level without the wall and noise with the wall

Classroom #	Placement of wall in the classroom	Noise level without the wall	Noise level with the wall
211	Next to room 214	60.0-80.0 dBA	50.0-70.0 dBA
211	Next to hallway	60.0-80.0 dBA	50.0-60.0 dBA
212	Next to room 211	70.0-75.0 dBA	40.0-50.0 dBA
214	Next to room 211	60.0-80.0 dBA	40.0-50.0 dBA
215	Next to room 216	70.0-75.0 dBA	40.0-60.0 dBA
216	Next to room 217	80.0-100.0 dBA	75.0 dBA
216	Next to hallway	80.0-100.0 dBA	75.0-80.0 dBA
217	Next to 216	75.0 dBA	50.0-60.0 dBA
218	Next to room 217	75.0-80.0 dBA	50.0-60.0 dBA

Table 2: The noise reduction coefficient for some of the rooms:

Classroom #	Placement of wall in the classroom	Noise reduction coefficient
211	Next to room 214	0.683
211	Next to hallway	0.900
212	Next to room 211	0.944
214	Next to room 211	0.968
215	Next to room 216	0.822
216	Next to room 217	0.943
216	Next to hallway	0.900
217	Next to 216	0.822
218	Next to room 217	0.900
Average		0.880

The average noise reduction coefficient for this experiment is 0.880. As such, we can conclude that the baffolds were successful in reducing noise in classrooms. This would provide a cost-effective way of lessening noise in classrooms, particularly in schools where there is an open-concept area. The results of the second portion of this study suggested that most students underestimated the noise levels in their classrooms. The students that rated the noise levels on the higher end of the range were more likely to indicate that they felt their ability to pay attention, concentrate and learn was reduced. Conversely, students who rated the noise level on the lower end of the range were more likely to indicate there they felt that they did not experience any difficulty with respect to attention, concentration and learning. It may be that the latter students are unaware of the potential deleterious effect of noise in their classroom on their ability to learn. This warrants further investigation.

Student Reflections:

We need to target school boards and the Ministry of Education to make them aware that some classrooms in schools have noise levels above those outlined by Occupational Health and Safety. We need to also make them aware that there are cost effective ways of lessening this impact. We also need to make students and teachers aware of the noise levels in their classrooms and its potential deleterious effects so that they can advocate for themselves.

Did you know that since my studies have been completed, the noisiest classroom at Cawthra Park Secondary School is only rarely being used as a classroom?

Taking Action

In order to make people more aware of the impact of noise, I presented my study results at University of Toronto's Physics Fair. I also was asked to speak at the Science Education for Civic Action Symposium at OISE – University of Toronto – in May, 2019.

This study started as a Grade 11 project that I had to complete. However, it blossomed into providing me with a career path and a passion for understanding others and how they learn, including those who learn differently. I am hoping to continue to study the effects of noise in the classroom as I work toward a career in education.

Figure 1 Student STSE Action Fair, Cawthra Park Secondary School

References

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