

LEARNING AND INTERACTING IN NOISY CLASSROOMS: TEACHER PERCEPTIONS OF THE CHALLENGES FOR STUDENTS WHO ARE HARD OF HEARING

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Résumé

Le but de cette étude exploratoire était d'étudier l'impact du bruit de fond sur les expériences scolaires quotidiennes des enfants sourds et malentendants (SM) à l'école primaire. Les observations effectuées dans 11 salles de classe du primaire dans une ville de l'Ouest canadienne ont permis de constater que les élèves et les enseignants participaient à quatre types d'activités en classe (travail de siège individuel, enseignement direct par l'enseignant, activités en petits groupes et transition). Les activités non structurées, les vastes salles de classe et les niveaux élevés de bruit de fond ont constitué le défi le plus difficile pour les étudiants SM en termes d'apprentissage et d'interactions sociales. Seize enseignants en classe et spécialistes ont été interrogés pour connaître leur perception de l'expérience de leurs 11 étudiants SM, qui apprenaient et interagissaient dans des salles de classe bruyantes. Toutes les entrevues ont été analysées selon une approche d'analyse de contenu. Les enseignants ont estimé que les bruits de fond avaient eu de graves effets négatifs sur les élèves, tant sur le plan scolaire que social. Les implications pour la théorie, la pratique et la politique sont discutées.

Mots clefs: sourd, malentendant, acoustique des salles de classe, bruit de fond

Abstract

The purpose of this exploratory study was to investigate the impact of background noise on the daily school experiences of deaf and hard-of-hearing (DHH) children in elementary school. Through observations in 11 elementary classrooms in a western Canadian city, students and teachers were found to participate in four types of classroom activities (seatwork, direct teacher instruction, small group activities, and transitions). Unstructured activities, large classroom space, and high levels of background noise caused the most challenge for DHH students in terms of learning and peer interactions. Sixteen classroom and specialist teachers of the DHH were interviewed to learn their perceptions of their 11 DHH students' experience learning and interacting in noisy classrooms, and all interviews were analyzed through a content analysis approach. The teachers perceived that the students experienced serious negative impacts from background noise both academically and socially. Implications for theory, practice, and policy are discussed.

Keywords: deaf, hard of hearing, classroom acoustics, background noise

1 Introduction

For children to succeed in academic settings, the ability to hear the teacher and each other is critical. However, it has long been noted that poor classroom acoustics can impede learning because of high levels of background noise, which negatively impact children's ability to listen and concentrate, and subsequently their academic performance. For example, chronic exposure to background noise in their classrooms reduced the academic attainment of a group of 7- to 11-year-old children in the U.K., across the subject areas of reading, mathematics, and science [1]. Similar findings have been reported in secondary schools, where interfering background noise had a detrimental effect on the performance of 11- to 15-year-old students in reading, numeracy, and memory tasks [2]. Thus, poor classroom acoustics have been shown to have a negative impact on

academic performance across grade levels, subject areas, and cognitive skills.

An especially important finding concerns children at the elementary school-age level with additional learning needs, whose academic performance has been shown to be more severely affected by background noise than that of their typically developing peers [3]. More specifically, a growing body of research over the past two decades has investigated and confirmed the negative impact of poor classroom acoustics on children with hearing loss [4-6]. The focus of these studies has been primarily on speech perception in noisy classroom conditions; this is particularly salient because language access may be challenging for students with hearing loss even in optimal listening conditions.

Overall, the focus on the impact of poor classroom acoustics on the academic attainment of children with hearing loss is timely and relevant because of the current widespread educational placement of most deaf and hard-of-hearing (DHH) children into inclusive (i.e., general education) classrooms alongside their hearing peers, where

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spoken language is the primary mode of communication [7, 8]. Given the absence of legislation concerning standards for acoustics in Canadian classrooms, it seems reasonable to assume that most children with hearing loss are receiving their education in noisy classroom settings. Classroom activities undoubtedly contribute to high levels of background noise. Contemporary approaches to teaching and learning in elementary school settings (i.e., kindergarten-Grade 12) emphasize increasing student engagement through such approaches as the flexible use of learning spaces and collaborative learning experiences, as is evident in British Columbia's new curriculum [9], for example. These approaches suggest a range of types of classroom activities, including group work and peer communication, that are associated with elevated levels of background noise.

For DHH students who spend the entire school day in inclusive classrooms, it is important to understand the impact of noisy classrooms on not only their academic performance but also their social interaction with peers – that is, on the *entirety* of their daily school experience. This is particularly critical in the case of the youngest learners, who may not yet be aware of and/or have the skills to articulate the impact of challenging listening conditions on learning and socializing.

The purpose of this exploratory study was to investigate the experience of learning and interacting in noisy classrooms for DHH children in elementary school. The Canadian province of British Columbia (B.C.) was judged to be an apposite location to undertake this research, as the majority of students with hearing loss in B.C. are placed in inclusive educational settings, and there is no government policy for classroom acoustic standards. The students are supported not only by their classroom teachers but also by itinerant teachers of the DHH, who provide regular (usually weekly) specialized one-to-one support to the students and their classroom teachers. Because some of the children involved in the study were as young as kindergarten age (i.e., 5 years old), their classroom and specialist teachers served as knowledgeable informants.

This study was guided by the following overall research question: According to teacher perceptions, what is the impact of noisy classrooms on the learning and social interactions of DHH students in inclusive classroom settings?

- a) What are the types of classroom activities in which the students engage, and what are the acoustic demands of these activities?
- b) How does background noise impact the students' learning experience? What are the challenges they experience?
- c) How does background noise impact students' social interactions? What are the challenges students experience?

2 Method

2.1 Participants

Students

Eleven hard-of-hearing children, all students in a suburban school district in B.C., were nominated for inclusion in the study by the three district itinerant teachers of the DHH. All students met the following criteria: they attended elementary school (i.e., between kindergarten and Grade 7); had permanent moderate to severe bilateral hearing loss; had no additional special needs; used spoken English to communicate at school; and had full-time educational placement in their respective classrooms. All students wore hearing aids and all classrooms were equipped with sound field systems, which the classroom teachers were expected to use but some of which were used only intermittently or inconsistently, according to the itinerant teachers of the DHH. Three students were in kindergarten-Grade 2, four were in Grades 3-4, and four were in Grades 5-7. Five of the children were boys and six were girls.

Teachers

The teacher participants were 11 classroom teachers, representing one teacher for each of the 11 students; two Special Education Assistants (SEAs), who provided additional educational support for the entire class in two of the classrooms; and the three district itinerant teachers of the DHH. (Each student received specialized support from one of the three itinerant teachers.)

2.2 Procedure and analysis

Observations of types of classroom activities

The first two authors, both with experience in education and the education of students with hearing loss, developed a list of types of academic classroom activities, based on teacher education literature and their own classroom observations. They discussed and revised the list until it exhaustively accounted for all academic activities observed in a pilot observation in an elementary school classroom in B.C. The final list resulted in four general categories: direct teacher instruction (directed either individually to the hard-of-hearing student or to the whole class); individual seat work (in which students completed work individually at their desks); small group work (in which students worked together in groups of two or more); and transitions (in which students were directed to and moved on to another activity). These were used to track academic activities in the 11 classrooms.

During the observations, a researcher seated unobtrusively at the back of the class tracked the time of the start of each of the four classroom activities. An activity was assumed to continue until the onset of another one. Two researchers completed the activity tracking. To ensure inter-observer reliability, both researchers independently coded the first classroom observation. An 80% inter-observer agreement was obtained, and the disagreements were

resolved through discussion. The observers then conducted the remaining observations individually.

Teachers' interviews on the experience of learning and interacting with peers and teachers in noisy classrooms

All teachers participated in individual semi-structured interviews conducted by a graduate research assistant, who had experience as both a general education teacher and a teacher of the DHH. The focus of all interviews was the teachers' perceptions of their DHH students' learning and social interaction experiences in their classrooms. Among the questions posed was one concerning the professional's opinion of any difficulties students experienced in the classroom. The teachers all provided expanded information on this topic throughout the rest of their respective interviews.

All interviews were transcribed. The first author then extracted all comments pertaining in any way to acoustic/listening conditions or activities in which the DHH students experienced difficulty. The first author and a second graduate research assistant, both with experience in general education and the education of students with hearing loss, individually read and re-read the extracted comments. A content analysis approach [10] was used to provide a rich description of the data set of teachers' comments within each activity category. The two coders jointly coded all comments for codes, themes, and sub-themes.

3 Results

3.1 How does background noise impact the students' learning experience?

The types of academic activities in which the students engaged across the 11 classrooms, and the proportion of time spent in each activity type, are shown in Table 1.

We identified four main themes concerning the impact of background noise on the DHH students' learning experiences, namely: the most challenging academic activity types; DHH students' emotional responses to missing information; DHH students' strategies when missing information; and teachers' strategies for supporting their DHH students when they miss information.

Theme 1: The most challenging academic activity types

All teachers listed two specific activity types as the most challenging for their students with hearing loss. The first was accessing teacher instructions, which tended to occur during direct teacher instruction and transitions from one activity to another. Although collectively direct teacher instruction and transitions occurred only 27.7% of the time, it was during these times that instructions about the next activity were provided. When students with hearing loss missed those directives, they were often lost in subsequent seatwork. As one teacher remarked: *I think it takes her a little bit longer to catch onto things because she maybe doesn't hear what I say to her or she misses things because of the background noise.* (Teacher M1)

The second activity type that all teachers mentioned as problematic for their DHH students was group work, such as small group work in the younger grades and group discussions in the upper grades. One teacher stated: *Group instructions/discussions when there is peripheral noise are difficult for him and he doesn't get much in those situations.* (Teacher CH1)

In addition, several teachers cited the difficulty their hard-of-hearing students encountered in participating in any type of activity, whether structured or unstructured, in large spaces, where acoustics were especially challenging. This included, but was not limited to, large classrooms, gymnasiums, and music rooms, all of which were characterized by high levels of reverberation, as well as the school playground. This was echoed in the following two teacher statements: *In an unstructured situation, it falls apart very rapidly and she sort of misses what's going on. Gym has been a challenge for her, the acoustics in the room, following what's going on.* (Teacher CC1-HRT)

He's really affected by background noise. In unstructured situations, it's hard for him, the reverberation around him confuses him. (Teacher DL2-HRT)

Theme 2: DHH students' emotional responses to missing information

Many teachers described three types of strong emotional responses from their DHH students when they missed information or instructions or were unable to follow group discussions: frustration, anger, and/or disruptive behavior; confusion; and/or apparent self-consciousness about peer reactions and resistance to request or accept support.

Table 1: Activity types by overall time across classrooms (in %)

Activity type	% time	Activity characteristics
Seatwork	48.5	Students work individually at their desks; highly structured activity; quiet discussion with neighbouring peers or teacher; moderate levels of background noise
Small group work	23.8	Simultaneous activity/discussion in many small groups throughout the classroom; much less structured activity than seatwork; high levels of background noise
Direct teacher instruction	19.6	Teacher is the only speaker; topic is well defined and the activity is highly structured; moderate levels of background noise from the classroom (e.g., HVAC) and student "shuffling" in seats
Transition	8.1	Teacher may be speaking, students moving to new activity and possibly chatting with each other; unstructured interval; high levels of background noise

In the words of one teacher: *Put him in a gym, a music class, he is off the wall. He can't figure out what's going on, he's trying to visualize it, his voice gets louder and louder, his behaviour gets worse, and he's often told to sit out, to sit down, to calm down.* (Teacher P1-HRT)

Theme 3: DHH students' strategies when missing information

When DHH students missed information or instructions in the classroom, they reverted to following what their peers were doing and/or "social bluffing" (i.e., pretending to have understood missed instructions or conversation). As one teacher said: *She's afraid to make herself look different, she doesn't want to appear that she's misheard. So she'd rather go and fake it, than she would do something about it and reveal herself.* (Teacher DL1-HRT)

It is noteworthy that none of the teachers mentioned the strategy of a student request for assistance. It seems that students' coping strategies were determined in large part by their emotional responses and their determination to hide the negative impact that high levels of background noise had on them, but not on their typically hearing peers. Not requesting assistance, it appeared, was part of a student strategy to hide the difficulty.

Theme 4: Teachers' strategies for supporting their DHH students when they missed information

Many teachers described their own instructional strategies when they were aware that their DHH students had missed instructions or important information. These strategies included a one-on-one check with the student for comprehension, repeating instructions for the student, or breaking instructions into chunks. *There are many times where, if there's instruction happening or there's just a discussion going on, she will only get part of it and a lot of it is...having to have things broken down into smaller chunks in order for her to understand or to needing that extra repetition.* (Teacher CC1-HRT)

Paradoxically, although from the teacher's perspective these strategies were designed to provide additional, needed support, from the student's viewpoint they may have conflicted with students' desire to hide their difficulty.

It is also worth noting that some teachers described how students' hearing aids might have actually contributed to their DHH students' communication difficulties. For example: *It's hard for them [DHH students] to stay focused because they pick up all the background noise from their hearing aids and so they're distracted very easily.* (Teacher DL4)

In fact, none of the teachers mentioned any benefits of hearing aids or classroom sound field systems.

3.2 How does background noise impact peer interaction and socialization?

Three main themes were uncovered pertaining to the impact of background noise on DHH students' interaction and socialization with peers, namely: the most challenging

social activities; DHH students' emotional responses to social challenges; and DHH students' strategies when confronted with social difficulties with peers.

Theme 1: The most challenging social activities

The activities that the teachers reported as most challenging socially to their DHH students were any interactions that occurred in unstructured locations, such as on the playground (recess), at lunch, or in side social conversations during class. The students with hearing loss tended to miss auditory-based social cues that were available to their typically hearing peers. As one teacher described: *He misses a lot of social cues, he does not hear parts of conversation, unless he's looking directly at them and so he misses a lot of stuff.* (Teacher P1)

Theme 2: DHH students' emotional responses to social challenges

Many teachers described two types of emotional responses from their students when they missed social cues or information because of background noise. The first was being self-conscious around peers sometimes to the point of distress. One teacher described this: *If she's misheard instructions or misheard her peers on the playground, it became a major deal for her and she becomes very emotional and in the earlier years she would actually break down and cry to the point that she had to be removed from the classroom in order to recover and it would take her sometimes an hour to recover. So it has affected her behaviour, she doesn't act out, she doesn't instigate anything, but it's more how she internalizes what's going on....* (Teacher DL1-HRT)

The second was reacting toward peers in frustration or anger, as described by one teacher:

Well, definitely in small groups when you're playing games and things, she gets frustrated because they'll say she didn't follow the rules or didn't do this or that and she won't quite understand what she's done wrong. (Teacher DL4)

Theme 3: DHH students' strategies when confronted with social difficulties with peers

Just as their teachers described that their DHH students preferred to bluff in the classroom rather than admit to not having heard instructions, they also reported that their students preferred bluffing in social interactions. *With the other kids, socially, he'll tend to compensate; he'll follow along, copy what the others are doing, pretend he knows what people said.* (Teacher CH1-SEA)

The teachers also noted that students with hearing loss tended to withdraw socially or wait for social invitations rather than initiate interactions, as described here: *She was very hesitant to even get talking to the other kids in the class...and I noticed at the beginning of the year, she'd go outside and she'd stand and she'd wait for someone to approach her [at recess].* (Teacher M1)

4 Discussion

The first research question concerned the types of classroom activities in which DHH students participate alongside their typically hearing peers, and the acoustic demands of these activities. Four broad activities accounted exhaustively for the classroom time: seatwork, small group work, direct teacher instructions, and transitions. A prerequisite to student success, or at least on-task performance, in individual seatwork was hearing the teacher's instructions, which tended to be delivered during direct teacher instruction or class transitions from one activity to another. According to the teachers' perceptions, even during direct teacher instruction, when the teacher was usually the only person speaking, background noise from the typical "shuffling" of other students, internal noises such as the heating and ventilation system, and external noises from the hallway or outside often interfered with the DHH students' hearing and/or understanding the instructions. DHH students also experienced difficulties understanding instructions delivered during transitions, which were both unstructured and usually contextualized in high levels of background noise from student movement and occasional side conversations. Small group work, which accounted collectively for 23.8% of classroom activities and was characterized by high levels of background noise, posed a particular concern. All teachers reported that DHH students experienced considerable difficulties in following or contributing to discussions in these situations. This is a serious, ongoing issue for students with hearing loss, as contemporary approaches to teaching and learning involve an emphasis on peer/collaborative learning in small group activities [e.g., 9].

Overall, then, DHH students spent almost three-quarters of their time in classroom activities in which background noise jeopardized their successful performance or participation through inconsistent access to the teachers' instructions and/or student discussions. This was true for both structured (e.g., seatwork) and less structured (e.g., small group work) activities, although unstructured activities with high levels of background noise (e.g., small group work) were the most problematic.

The second and third research questions concerned the challenges background noise imposed on DHH students' learning experiences and social interactions, respectively. According to their teachers, DHH students paid a high price for not understanding teachers or peers in background noise. Whether communication breakdowns occurred academic activities or social interactions, DHH students tended to react with frustration, which often led to anger, when unable to follow instructions or conversations. This is consistent with students' predominant reaction was social bluffing, in which they pretended to understand, and then copying their peers' actions, as a way to "hide" their difficulty following the conversation. This parallels the findings of Israelite, Ower, and Goldstein [11], who found that secondary students with hearing loss preferred to conceal their hearing loss from their hearing peers, at least initially. It is not surprising that many teachers reported that their DHH

students displayed the extremes of either disruptive or withdrawal behavior when communication was not easily accessible to them. The latter reaction is consistent with Wauters and Knoors [12], who found that children with hearing loss who were in inclusive educational settings scored higher than their hearing peers on socially withdrawn behaviour.

The teachers perceived that these reactions were at least partially due to or complicated by the communication barriers of background noise, which were most apparent in large spaces and unstructured activities. Taken together, the overall findings of the study emphasize that the negative impacts of moderate to high levels of background noise permeate the both academic and social experiences of DHH children's daily lives at school.

The findings are consistent with previous calls for the urgent application of acoustic standards in public schools, such as the ANSI Standard S12.60 for Classroom Acoustics [13] as has been advocated by more than 20 national and provincial organizations in Canada representing children with hearing and/or language exceptionalities [14]. Given that classrooms typically contain 20-30 students and that contemporary teaching-learning approaches involve student engagement through interaction, classrooms do – and should – have at least moderate levels of background noise. However, when background noise becomes an accessibility barrier for any group of students – in this case, students with hearing loss – it is incumbent upon governments to ensure that publicly funded education spaces support the learning of all students.

The findings also underscore the important role that classroom teachers play in supporting their students with hearing loss. The teachers described several strategies to ensure these students' comprehension during class activities, including consistent use of classroom sound field systems, frequent checks for comprehension (a strategy described by several teachers), and classroom management strategies to provide a balance between structured and unstructured activities.

There were several limitations of this research, including the small number of student and teacher participants and the fact that the study was conducted in only one geographic location. At the same time, it should be emphasized that the teachers were highly knowledgeable informants about their DHH students' daily lives at school. Furthermore, several checks increased trustworthiness and credibility, including development of exhaustive classroom activity categories, audio recorded interviews, and joint coding of the interviews.

The findings underscore of the importance of future research on the social and academic impact of background noise on the daily lives of DHH children at school. The findings also raise several questions, most notably: What is the impact of background noise on the academic and social experiences of DHH students in classrooms designed with evidence-based acoustic standards? Is the impact different than in a non-acoustically treated classroom? Future research on this topic would be strengthened by broadening the participant base in terms of numbers of students and

teachers, as well as including a broad range of geographic locations.

5 Conclusion

This study broke new ground by exploring both academic and social impacts of background noise on this vulnerable group of children, and by involving teacher informants, who were very knowledgeable about both the classroom setting and their DHH students. The overall findings of the study underscore the negative pervasive effect of moderate and high levels of background noise on the DHH students' daily experiences in school, at the elementary school level. Negative impacts were most strongly perceived in large spaces, unstructured activities, and in conditions of high levels of background noise. Difficulty in understanding teacher instructions; participating in noisy group activities; and joining in easily accessible, reciprocal conversations with peers were among the most serious challenges to DHH students' academic and social experiences. Students responded to communication barriers from background noise with frustration, anger, and often with social withdrawal. All of these reactions resulted in negative impacts on their academic performance and social interactions with peers. The findings emphasize the pressing need for acoustic standards in elementary school classrooms.

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