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Management of classroom acoustics by teachers at two special needs schools in Johannesburg, South Africa

Ben Sebothoma , Victor de Andrade  and Nabeelah Galvaan 

Department of Speech Pathology and Audiology, School of Human and Community Development, Faculty of Humanities, University of the Witwatersrand, Johannesburg, South Africa
ben.sebothoma@wits.ac.za

In South Africa, education is considered a basic right and our constitution calls for accessible educational contexts which ought to be conducive for learning. Even though schools are meant to be places in which learning can occur, poor classroom acoustics may threaten that basic right to education. The aim of this study was, therefore, to explore and understand how teachers in special needs schools managed classroom acoustics in their efforts to enhance learning. We report on a qualitative study using semi-structured face-to-face interviews with teachers from 2 special needs schools in Johannesburg in the Gauteng province of South Africa. A non-probability purposive sampling strategy was used to recruit participants. The results of this study confirm that classrooms in special needs schools may not be acoustically sound spaces which teachers feel may compromise effective learning. As a result, teachers reported using a variety of active and passive strategies to manage classroom acoustics in order to enhance learning. The results of this study contribute to existing knowledge on the importance of the strategies used by teachers in managing classroom acoustics. Further research is required to determine the efficacy of these and other strategies used by teachers in special needs schools.

Keywords: acoustics management; classroom acoustics; South Africa; special needs schools; teachers

Introduction

Poor classroom acoustics remain a major barrier for learning, particularly in low- and middle-income countries (LMICs) due to infrastructural challenges and the location of schools (Amsterdam, 2010). For example, some of the schools are situated close to airports (Seabi, 2013) and highways (Santika, Indrawati, Suyatno & Yahya, 2017; Sundaravadhanan, Selvarajan & McPherson, 2017), while other schools generally have poor infrastructure (Amsterdam, 2010). In addition, some schools have crowded classrooms, which hold serious implications for learning (Marais, 2016). As a result, teachers are expected to implement effective strategies for communication to ensure that learning occurs despite these challenges. However, information about the strategies that teachers use to manage poor classroom acoustics in special needs schools in South Africa is sparse.

Literature Review

Sources of classroom noise can be external or internal. External noise is transferred into the classroom through the building envelope such as the roof, windows, floors, and doors. The main causes of external noise, particularly in built-up areas, are often road traffic, building services, and noise occurring from individuals outside of the school (Shield & Dockrell, 2003). Noise may also be generated from internal noise sources such as the learners themselves when they talk or move around as well as other elements such as projectors, fans, and computers (Shield & Dockrell, 2003). Many activities that facilitate learning in the classroom involve listening to speech and verbal instructions individually and in groups. If learners are unable to hear voices clearly and comprehend what their teachers are saying, the learning process may then become compromised and this difficulty may be exacerbated for learners with special needs (Bradley, 2005). For example, research has shown that reading comprehension, long-term memory, motivation of learners (Dockrell & Shield, 2006), and cognitive performance (Klatte, Hellbrück, Seidel & Leistner, 2010) may be affected. Some learners have indicated that they have difficulty concentrating in classrooms due to background noise (Servilha & Delatti, 2014; Wayne, Magnusson, Fredriksson & Croy, 2015). A longitudinal study conducted by Seabi, Cockcroft, Goldschagg and Greyling (2015) in South Africa on 732 learners between the ages of 9 and 14 years of age revealed that exposure to excessive noise may have a lasting negative impact on reading comprehension. The impacts of poor classroom acoustics can be more severe in children with special needs, including those with hearing impairments and learning difficulties (Dockrell & Shield, 2006), notwithstanding any amplification in the form of hearing aids, since the noise and acoustics would still be heard through the hearing aid.

Furthermore, Otto-Meyer, Krizman, White-Schwoch and Kraus (2018) indicate that children with autism spectrum disorder (ASD) have delayed neural timing and poorer tracking of changing pitch compared with typically developing children which suggests that in situations of poor classroom acoustics, they may experience even greater learning difficulties. Children with dyslexia were also shown to have inconsistent neural responses to sound (Hornickel & Kraus, 2013). These compromised neural systems may be exacerbated in the presence of excessive/intrusive background noise and affect the ability to perceive speech (White-Schwoch, Davies, Thompson, Carr, Nicol, Bradlow & Kraus, 2015). A systematic review conducted by Van Reenen and Karusseit (2017) revealed that noise was a major barrier for learners with sensory, language and learning impairments, such as found in special needs classrooms. Despite these aforementioned challenges, teachers are expected and

required to provide a supportive environment that caters for children's needs (Johnson & Seaton, 2012). Davis, Florian and Ainscow (2004) explored various strategies that may be used by teachers when working with learners with special needs within ideal contexts and resourceful settings. For example, Davis et al. (2004) suggest strategies such as integrative tutoring in all elements of reading – phonological, semantic, and syntactic – and that reading tasks should be combined with reading and writing. However, the value of these strategies may be limited in contexts of compromised classroom acoustics.

Furthermore, poor classroom acoustics can also affect teachers as evidenced by Klatte et al. (2010) who report that 75% of teachers indicated that noise levels in classrooms were major contributors to stress. Durup, Shield, Dance, Sullivan and Gomez-Agustina (2015) found a strong correlation between poor classroom acoustics and vocal problems in teachers while Rentala, Hakala, Holmqvist and Sala (2015) found that teachers who worked in classrooms with poor acoustics often spoke more loudly than teachers who worked in classrooms with good acoustics. Pillay and Vieira (2020) found that South African teachers experienced similar challenges and reported physical, functional, and emotional impacts due to excessive noise in classrooms.

Despite existing guidelines to mitigate for noise in classrooms, noise levels in classrooms have been a challenge in South Africa. As Berglund, Lindvall and Schwela (1999) report, the World Health Organization (WHO) recommends that background noise levels in a classroom should not exceed 35dBA and the South African Schools Act 84 of 1996 notice of 2009, in the Architectural Norms and Standards section, recommends that background noise be between 40dBA to 50dBA (Department of Education, 2009). However, in South Africa, research has found that the average noise levels in classrooms was 69dBA (Van Tonder, Woite, Strydom, Mahomed & Swanepoel, 2015). Moreover, Ramma (2007) found that South African classrooms may be acoustically poor for optimal learning. Furthermore, these insufficiencies may be compounded by infrastructural challenges that may be exacerbated by inequitable distribution of resources (Sedibe, 2011) and zoning (Hollander & De Andrade, 2014), especially developing contexts such as ours in South Africa. It was found that children in our country may experience challenges related to noise where, for example, their auditory processing (Hollander & De Andrade, 2014) and reading comprehension (Seabi et al., 2015) may be affected if children are consistently exposed to noise.

Conceptual Framework

We adopted a human rights approach to explore an often-overlooked component of education and learning which may impact on learners' human right to education. The human rights approach acknowledges that individuals with disabilities ought to be afforded equal opportunity, equal participation, and inclusion (Broberg & Sano, 2018). Furthermore, this approach upholds values related to people's inherent dignity and individual autonomy, allowing for a sense of independence, irrespective of challenges (Broberg & Sano, 2018). Although the South African constitution enshrines the right to education, "progressive human rights-based policies and programmes for persons with disabilities exist on paper, but are honoured in the breach, without adequate infrastructures to ensure their effective implementation and enforcement" (Groce, Kett, Lang & Trani, 2011:1495). Moreover, by working within a human rights approach, there is an opportunity for addressing failures in communication, inclusion, and representation (Petriwskyj, Gibson & Webby, 2014), which may not always be afforded to learners with special needs, especially with regard to their learning environments. Therefore, because there appears to be limited research on strategies used to manage classroom acoustics in special needs schools in South Africa, in this study we used a human rights approach to explore how teachers at special needs schools in South Africa managed classroom acoustics, especially because there is the need to accord learners, and their educators, the human dignity and value to be recognised and acknowledged. Furthermore, the focus ought to be directed to "underpinning values such as democratisation, service user empowerment, and the redistribution of unequal power relations" (Petriwskyj et al., 2014:119), which may be compromised for learners with special needs and their educators, so as to empower them to foster participation within their contexts (Petriwskyj et al., 2014). It, therefore, seems necessary to honour learners' rights by affording them opportunities for maximal learning, including those learners with learning difficulties, so that no one is left behind.

Method

A qualitative approach was selected since Bricki and Green (2007) report that qualitative research allows the researcher to obtain information about the why and the how of phenomena and in order to gain an understanding of the phenomenon being studied (Bhattacharjee, 2012). In this instance, to understand how teachers manage noise levels and acoustics in classrooms at the special needs schools.

Context

This study was conducted at two special needs schools in Johannesburg, Gauteng. The schools were not identified on the basis of their noise profile but on their categorisation as special needs schools in order to gauge the strategies of the teachers who offered schooling for children with specific learning difficulties or learning differences that require adapted teaching and learning opportunities because the learners struggled in mainstream schools due to these difficulties. The classes included children of various learning abilities and ages. Teachers at the schools were interviewed in order to garner insight into their strategies for managing classroom acoustics.

Sampling

Purposive sampling was deemed appropriate to invite participants as it allowed for the selection of participants who exhibited the characteristics that were important and useful for the study (Leedy & Ormrod, 2013), that is, they were teachers of children with special needs. To garner an understanding of how teachers managed classroom acoustics in special needs schools, two special needs schools near the university were purposively selected. Inclusion criteria included: employment at a special needs school, the appropriate qualification to teach at special needs schools, a minimum of one year of experience in teaching at a special needs school. Through this sampling procedure, the teachers as described in Table 1 participated in this study.

Participants

Table 1 Participants and demographics

Participant	Age	Years of experience	Number of pupils with special needs	Classroom capacity
Participant 1	50	30	7	8
Participant 2	46	3.5	12	12
Participant 3	47	24	12	12
Participant 4	67	36	10	8
Participant 5	53	19	11	12

Data Collection

Before data were collected, clearance to conduct the study was obtained from the Human Research Ethics Committee (Non-Medical) of the University of the Witwatersrand (Protocol number STA_2019_16). Permission to conduct the study was obtained from the principals of the two special needs schools. Teachers were invited to participate via an email which was sent by the school secretary. The email detailed the nature and purpose of the study, and it contained the information sheet. Teachers who consented to participate provided their details to the school secretary. We then contacted the teachers who had agreed to participate and discussed possible days and times for the interview. Thereafter, we arranged 2 days during which the interviews were to be conducted.

Data were collected through semi-structured, face-to-face interviews (Leedy & Ormrod, 2013). The questions used in the semi-structured interviews were developed through a review of the literature and previous studies. In summary, they enquired about the teachers' management of acoustics and noise levels in existing special needs classrooms. Before its administration, the interview guide was piloted with one teacher who met the inclusion criteria for the study to determine the feasibility and appropriateness of the data instrument (Van Teijlingen & Hundley, 2002). The pilot study provided us with important information about the interview guide, including its feasibility, appropriateness, and the time taken to conduct the

interview. The interview guide was administered after reflection on the pilot study.

The interviews were conducted privately in the teachers' classrooms with the door closed. Consent for participation was sought from the participants and the consent form was signed. All interviews were audio recorded with the teachers' permission.

Data Analysis

The qualitative semi-structured interview transcripts underwent thematic analysis (TA) (Braun & Clarke, 2013) by the same person who conducted the interviews in order to keep the transcription and analysis as close to the data as possible. Themes were generated according to six phases of TA (Braun & Clarke, 2013). This type of analysis allowed the researcher to devise a general topic and then gather information to develop a hypothesis. The transcriptions were read for familiarisation and then underwent inductive and deductive TA allowing themes to emerge while also addressing the aims of the study and to understand the meaning of the themes observable within the data (Marks & Yardley, 2004).

In qualitative studies, like this one, "the primary concern appears to be with the description and interpretation of what is happening in a specific setting" (Lacey & Luff, 2009:17), that is, the teachers' strategies for managing acoustics within special needs classrooms. Because this study describes particular teachers' strategies at particular schools, the findings may not be generalisable.

However, the results of this study highlight considerations which are useful and insightful for acoustic considerations in classrooms and the management of such. Credibility and trustworthiness (Shenton, 2004) were purposely addressed by close member-checking and confirmation of themes.

Results

The findings of this study reveal that the participant teachers felt that poor classroom acoustics were problematic in special needs schools. In an attempt to ameliorate the impact of poor classroom acoustics, teachers employed various strategies to improve learning. Consequently, five themes, which are detailed hereafter, emerged from the study.

Participants reported that they felt that noise impeded and intruded on learning opportunities. They felt that there was more noise occurring outside than inside the classroom. Much of the noise from the outside was transmitted through the windows, doors, and walls, while some noise was generated within the classroom. External noise sources reported by the participants were traffic, gardening and cleaning, building, birds, the school gate, and children generating noise outside class – specifically while some classes were moving to other classrooms while some learners remained in class.

We've got traffic down (Name of a very busy main road in Johannesburg), you've got traffic ... (Teacher 1).

... and that's because of the traffic. ... The minute they hear a car going past and they are very attracted to uh fancy cars. So, the minute they hear that vroom-vroom all their heads are out there yah (Teacher 5).

Outside it's definitely gardening or uhm when they hose down, and cleaning - general cleaning because the, the hosepipe where they actually get the water from is right here at our class uhm the bin where they clean up is right at our class uhm when they do cutting of grass on the playground. (Teacher 2)

... and the children outside themselves, the ADHD [attention deficit hyperactive] children changing classes and autistic children are inappropriate so they loud and they don't realize they're being loud, you actually have to say to them, stop making a noise because, not just stop making a noise, they've gotta have a reason otherwise they ask why and then they start with the why. (Teacher 1)

Specific noise reduction and sound absorption strategies were reported for some of the internal noise, especially for children with special needs who may be restless in their chairs or who speak very loudly, as exemplified by Teacher 3's suggestion:

... I also have little pillows and so that makes the chairs comfortable so they don't have to squirm so much in and then of course having the carpet... And so that's also then we teach the children. We have

an inside voice. We have a classroom voice. We have a whisper voice.

All the teachers reported that they engaged in particular activities with their learners in order to reduce the noise levels. Moreover, positive reinforcement strategies to manage noise in classroom were proffered:

... we play uhm sleeping statues, just something like that so they calm down ... (Teacher 1).

And then sometimes when it's overbearing then I kind of play a game with them to say let's see who keeps quiet the longest and then they're going to get a sticker (Teacher 5).

... And then I have a system with balls in the jar that I use ... and then when their jar is full, they're rewarded with a little surprise ... (Teacher 4).

Furthermore, all the participants described using active listening strategies as a mechanism to reduce the noise levels in their respective classrooms and to increase listening within these compromised settings.

... then I'll give them an instruction and the first thing I'll say to them is, 'Are your ears on?' And then they hold their ears and then I can give instructions so that's the way to get the children to focus on you, they've calmed down and then you give them a couple of seconds and then you give the next instruction ... or I just touch them on the shoulder or I just tap the desk to bring them back to focus. (Teacher 1)

... and sometimes a countdown when they're sitting and doing the work say 'One, two, three ...', and then it will work (Teacher 5).

Two of the participants reported that they set noise boundaries that the learners ought not exceed.

Actively we have our classroom rules, if I can say that, when we do carpet work, we move our work to the carpet. That's where it's loud but it's controlled. It's not like we loud or we make a noise, we are busy with activities. So it is, well, noisy, but not noisy to the point where it's chaotic. So, there is a controlled noise level. And we speak with our classroom voices. So, we teach children how to alternate voices speaking, uhm that is actively. (Teacher 3)

Three participants reported that they made use of behaviour modification strategies for the children with special needs and that they structured activities so that the noise impact was less and opportunities for effective listening were created. For example, Teacher 2 reported as follows:

As soon as one child makes a noise the teacher has to stop teaching, uh regulate that problem, and then go back to what she what she was doing, and again some children in this school are impulsive so you actually have to teach them that when it's their turn to speak, it's their turn to speak and it's inappropriate because other people want to have a turn you're chipping in so you've got to give them all the cues as well. (Teacher 1)

We start one at a time and ... it somehow reduces the noise level because now they need to focus to listen and not just scream out, basically including them in reading and the participation in reading so you actually do two things at the same time, you

get them to read and to reduce the noise and get them to focus because when they not focused that's when the noise levels go up. (Teacher 2)

Discussion

This study revealed the experience of particular teachers' management of classroom acoustics at two special needs schools in Johannesburg. Teachers acknowledged that there were high levels of distracting and potentially disturbing noise that originated from outside of the classroom and that seemed to be out of their control. They also described noise from within the classroom for which they made suggestions to reduce the noise. For learners attending special needs schools there appeared to be a need to manage classroom acoustics in order to enhance learning especially because, as Parsonson (2012) argues, reducing the level of noise in classrooms may assist in enabling a successful learning environment.

Teachers who participated in this study indicated that they used positive reinforcement, active listening, behaviour modification, noise boundaries, and noise-reduction strategies to reduce noise in their respective classrooms. Literature suggests that such strategies can be beneficially implemented by teachers to guide behaviour within classrooms (Kinyanjui, Aloka, Mutisya, Ndeke & Nyang'ara, 2015). Westen (1999) reports that any behaviour followed by pleasant stimuli is likely to be repeated. Therefore, the inclusion application of the operant conditioning theory may be helpful in managing classroom acoustics and reduce the frustrations that teachers experience during class activities due to noise (Seetha, Karmegam, Ismail, Sapuan, Ismail & Moli, 2008; Shield & Dockrell, 2003). Furthermore, the active reduction of internal classroom noise such as the suggestion by one participant to use pillows as sound absorption strategy can go a long way towards enhancing classroom noise levels, especially for children with special needs who may have less inhibition.

Although the aim of this study was not to measure noise levels, it does reflect that teachers are experiencing similar consequences of classroom noise as reported in earlier studies. This study seemed to reflect similar contexts as other studies where noise had been identified as problematic and had the potential to impact on learning (Hollander & De Andrade, 2014; Seabi et al., 2015; Shield & Dockrell, 2003). Valente, Plevinsky, Franco, Heinrichs-Graham and Lewis (2012) emphasise that learning with favourable acoustics is imperative for learning and that small changes can effect large improvements (De Villiers, 2003).

Conclusion

This study revealed that teachers of children with special needs who faced particular obstacles with classroom acoustics and potential challenges to

teaching, used various strategies to manage classroom acoustics. This study seems to confirm teachers' adaptability and reinforces the idea that teachers may be attempting to implement meaningful and tailored learning opportunities for their learners with special educational needs but that these attempts may be compromised in situations of poor classroom acoustics. Nonetheless, teachers are implementing strategies to offer children with special needs the rights and the learning opportunities to which they are entitled which, otherwise, may be denied them because of the noisy environments in which they try to learn.

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Authors' Contributions

VA, BS, and NG conceptualised the manuscript. NG collected data from the two special needs schools. VA, BS, and NG contributed to the analysis of the data and the drafting of this manuscript. All the authors reviewed the final manuscript.

Notes

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