



An Evaluation of Educational Practices Concerning Noise Level and Noise Control in Nursery School: An Action Research *

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Abstract

Children are more vulnerable to noise than adults. Because their ability to select and control the acoustic environment is very limited. Today it is known that noisy environments negatively affect especially pre-school children who have incomplete hearing and language development. The aim of this Research is to determine noise levels in nursery classes and to evaluate educational practices for controlling noise. The research is an action research that is conducted with 23 students who are 5-6 years old in a nursery class in a nursery school. The main data of the study are generated from measurements made by decibel meter, observations and interviews. The first measurements established that the noise level at the nursery class was [83.79 dB(A)], which is significantly above the standards. At the end of the education program for reducing noise in nursery school, measurements made with a decibel meter [74.52 dB(A)] indicated that there was almost 10 dB(A) decrease in noise levels. Both interview and observation results also show that noise awareness and sensitivity had some positive influence on student attitudes and behavior changes about noise pollution. In the light of these findings, in order to create tranquil learning environment in schools, it is recommended that noise awareness and sensitivity training should be provided, starting from preschool. Promotion and dissemination of noise educational practices in the nursery school are discussed.

Keywords

Learning environment
Nursery school
Noise pollution in school
Noise control

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Introduction

Noise pollution is an important environmental problem in developed countries (Environmental Protection Agency [EPA], 2016). In Turkey, legislation that specifies noise limits for various areas is included in regulations through European Union harmonization laws (Regulation on Assessment and Management of Environmental Noise [ÇGDYY], 2010). Based on the regulations, the upper limit of indoor noise when classrooms in educational facilities are empty (i.e., indoor noise resulting from the environment) is 35 dB when the windows are closed and 45 dB when they are open, whereas it is 55 dB in cafeterias (ÇGDYY, 2010). Decibel (dB) is a logarithmic and dimensionless unit that is typically used for sound intensity, which specifies the ratio to a specific reference power or amount level. dB (A) specifies the A weighted level (the volume that the human ear will perceive) used for sound pressure level measurement in accordance with international standards (IEC 61672: 2003). In other words, dB is a general measure of sound, dB (A) is the sound that the human ear will hear (Morfeý, 2001). Many researchers suggest that the noise level should not exceed 50 dB in an appropriate learning environment when students are in the classroom (American Speech-Language-Hearing Association [ASHA], 2005; Crandell, Smaldino, & Flexer, 2004; Berg, Blair, & Benson, 1996). However, research shows that the noise level is much higher than that in schools in Turkey. For example, in a study of primary school students carried out in 2011, Tamer-Bayazit et al. found that the students were exposed to noise levels ranging from 76 to 89 dBA during breaks in 84% of the schools. In the study conducted in the state and private primary school, the students found that the level of noise during recess was very high. This measurement is confirmed by measurements made with decibel meters. During recess noise in public school was measured as 82.18 dB (A), and 74.56 dB (A) in private schools (Bulunuz, Bulunuz, Orbak, Mutlu, & Tavşanlı, 2017). In another study (Polat & Buluş Kırıkkaya, 2004), in-class noise levels were found to be 70.8-72.5 dB in primary schools and secondary schools. This level of noise during breaks, which are intended to be rest periods for students, is quite high.

Signal-to-noise ratio is an important measure of understandability of speech in classrooms. This ratio refers to the difference between the level of the signal of a message and the level of background noise (Crandell et al., 2004). A signal-to-noise ratio of +10 to +15 dB is recommended for students to correctly recognize the speech of teachers (Choi & McPherson, 2005). For example, the speech-to-noise ratio is +10 dB for a speech level of 80 dB and a background noise level of 70 dB. In other words, in a classroom with a background noise level of 70 dB, the speech level of a teacher must be 80-85 dB so that his/her speech can be recognized. High noise levels in classrooms both compromise the perception of teachers' speech and adversely affect their vocal cords and teaching performance (Crandell et al., 2004; Choi & McPherson, 2005).

Noise pollution refers to various high level or high frequency sounds in a physical environment that hamper the ability to hear and understand what others say, cause discomfort and distraction and adversely affect physiological and psychological health (Arı & Saban, 1999; Polat & Buluş Kırıkkaya, 2004; Schlittmeier, Hellbrück, & Klätte, 2008). Noise is a problem with various dimensions that cause disturbance and annoyance. Loudness is a component of noise annoyance directly related to acoustics. Furthermore, other factors such as individuals' attitudes toward a noise source, subjective sensitivity to noise, personal beliefs and lifestyle are also important (Babisch, Schulz, Seiwert, & Conrad, 2012; World Health Organization [WHO], n.d.). Noise obstructs the everyday activities of individuals, such as conversation, as well as reducing the quality of life and leading to various disorders. Among the potential health effects are hearing impairment; damage to the digestive, endocrine, and circulatory systems; and other neurological and psychological disorders such as stress-related illnesses and sleep disruption. In addition, exposure to noise may lead to reduced productivity and the emergence of antisocial and violent behavior (Prasher, 2000; WHO, 2003, n.d.). These issues are serious health problems that most of the time can be easily ignored.

Since children and adolescents have not yet completed their development, noise has a greater negative impact on them than on adults and the elderly (Özcan, 2012; Maraş & Maraş, 2012). Children are especially open and vulnerable to the dangers of noise, as they do not know how to protect themselves from it (Babisch et al., 2012). They are not aware of dangerous noise sources and the potential

problems that could be associated with exposure to noise (Christidou, Dimitriou, Barkas, Papadopoulou, & Grammenos, 2015; Persson-Waye, van Kamp, & Dellve, 2013), and they even tend to underestimate the effects of noise on their personal health (West, 2012). According to Cüceloğlu (2016), awareness is the essence of life, and only people with awareness can make choices among the things of which they are aware. Children's and adolescents' ability to choose and control their acoustic environment is restricted (Babisch et al., 2012; Özcan, 2012). Therefore, they are considered to be a special risk group in regard to noise compared to the general population (Babisch et al., 2012). Long-term exposure to noisy environments can affect children's cognitive development and functions related to long-term memory, academic success and learning. It can also cause inability to concentrate, comprehend and communicate (Prasher, 2000; Shield & Dockrell, 2008). Thus, the responsibility of protecting children from noise-related dangers rests upon the shoulders of families and teachers (Babisch et al., 2012; WHO, n.d.).

Many studies have been conducted outside of Turkey on preschool-aged children's exposure to indoor and outdoor noise and on the effects of noise. For instance, Grebennikov (2006) reported that about half of 25 full-time preschool teachers in western Sydney were exposed to a noise level of approximately 85 dB (A), which was the upper limit for Australia. High levels of noise were evident when preschool students were located in confined areas or when they were involved in rough play, and continuous exposure to such a level of noise was considered to be potentially dangerous. Maxwell and Evans (1999) examined the effects of noise in child care centers and reported that chronic exposure to noise adversely affected the children's ability to use language skills, in particular in reading. In the study, the language and expression skills of a group that was exposed to an average noise level of 76 dB and of another group that was exposed to a noise level of 5 dB in a noise-free environment were compared longitudinally over a period of 1 year. The pre-reading, understanding and expression skills of the group exposed to less noise were found to be significantly higher than those of the other group. Noise diminishes the performance of teachers as well as adversely affecting students (Crandell et al., 2004). In Greece, an educational scenario was implemented to improve preschool children's awareness of noise (Christidou et al., 2015). The results of the study indicated improvement in children's noise awareness in regard to acknowledging everyday noises, understanding the annoyance and subjectivity of noise, adopting negative attitudes towards noise and acknowledging its health effects.

Research conducted in primary education institutions also revealed that the level of noise in the school is high. For example, a study conducted in 142 schools in London reported that the background noise levels were above the average levels, which disrupted the acoustic environment of the classrooms (Dockrell & Shield, 2004). The study also suggested that such high noise levels can cause children to have difficulty in learning and concentrating. Another study conducted in 47 elementary schools in Hong Kong reported that the mean noise level in occupied classrooms was 60.74 dB (A) (Choi & McPherson, 2005), which exceeds the recommended upper noise limit of 50 dB (A) in occupied classrooms. In the study, the mean unamplified and amplified speech-to-noise ratios of teachers were found to be 13.53 dB and 18.45 dB, respectively. The vast majority of classes have been found to have inadequate acoustical improvements to reduce noise. The study also found that most of the classrooms exhibited insufficient acoustical treatments to provide significant noise reduction. Another study revealed that children taking tests did significantly worse in noisy classrooms than under quiet conditions (Schick, Meis, & Reckhardt, 2000).

Noise pollution in schools is a neglected and overlooked issue in science education (Treagust & Kam, 1985). Studies of science education focus mostly on the ideas of students regarding matter, energy, movement forces, temperature and electricity (Eshach, 2014; Huang, 2009; Lautrey & Mazens, 2004). Similarly, studies of environmental education focus mostly on the issues of air, water and soil pollution. The number of studies conducted on sound and noise pollution is limited (Akman, Ketenoğlu, Evren, Kurt, & Düzenli, 2000; Güney, 1998; Houle & Barnett, 2008; Yücel & Altunkasa, 1999). Experimental studies of sound concentrate mostly on sound formation, the propagation of sound waves and the physical properties of sound (Butts, Hofman, & Anderson, 1994; Driver, Squires, Rushworth, & Wood-Robinson, 1994; Eshach, 2014; Hernandez, Couso, & Pinto, 2012; Huang, 2009; Houle & Barnett, 2008;

Lautrey & Mazens, 2004; Sozen & Bolat, 2011). The results of these studies revealed that, although students brought to school many experiences about sound, their prior knowledge and experience were not sufficient to enable them to understand the properties of sound. Not being able to understand sound in real-life context and developing noise awareness may be the root cause of many noisy learning environments in schools. According to the Turkish Preschool Curriculum renewed in 2012, preschool education settings must be carefully designed to allow for effective student learning. However, the studies show that noise levels in Turkish elementary schools are much higher than the average level specified in the regulations (ÇGDYY, 2010; Bilal, 2009; Özbıçakçı, Çapık, Aydoğdu, Ersin, & Kıssal, 2012; Polat & Buluş Kırıkkaya, 2007; Tamer Bayazıt, Küçükçifçi, & Şan, 2011; Tüzel, 2013). Ambient noise in a classroom originates mainly from three sources: external noise, internal noise and noise generated within the classroom itself. External noise refers to noise from nearby traffic, construction sites, industrial areas, entertainment venues and bazaars. Internal noise refers to the noise generated within the school building but outside the classroom, such as the noise originating from the cafeteria, gymnasium, music room and ventilation system. Finally, classroom noise originates within a classroom, such as students' talking, yelling, screaming, running, and sliding of tables and chairs (Choi & McPherson, 2005). The first reason for noise pollution in schools is poor acoustical design and equipment of schools and classrooms, while the other is the inappropriate behaviors of students, such as talking loudly, yelling, screaming, running and moving tables and chairs in confined areas. This study aims to determine the noise levels in nursery school classes and to examine the reasons for and effects of noise as well as to evaluate educational practices concerning noise control. The research questions are as follows:

1. What is the acoustic environment of the nursery school class? What is the noise level of the classroom?
2. How do educational practices for reducing noise affect the noise level and the attitudes and behaviors of the students?

Method

Research Model

Action research was chosen as the research model for this study. "Action research" refers to the process by which groups of people identify a problem, attempt to resolve it, see how successful their efforts were, and, if not satisfied, try again. In other words, it refers to learning by experience (O'Brien, 2003). Since teachers experience the problem of noise pollution every day in their classes, this study aimed to critically evaluate the school's educational practices to identify the reasons for this problem and to determine the measures required to control it and improve the situation (Karasar, 1999).

Participants

This study was conducted with the participation of three nursery school teachers, who were working on their master's degrees, under the supervision of an expert researcher involved in a project on noise pollution and its control in schools. One of the researchers was a teaching intern in the nursery school studied and thus had the opportunity to observe and gain experience in the dimensions of noise pollution in nursery schools. The aim was to obtain results based on practical experiences that would guide researchers, administrators and teachers (Reason & Bradbury, 2001). The other two researchers, who taught in other nursery schools, assisted in the data collection and analysis stages.

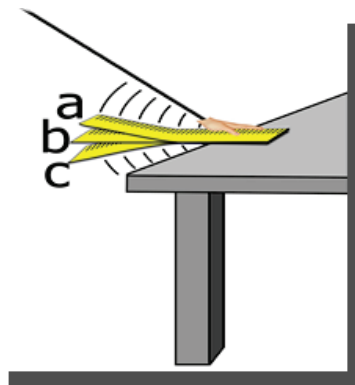
This study was conducted in an independent nursery school in the Nilüfer district of Bursa city in the spring term of the 2015-2016 academic year. Independent nursery schools are for children aged 36 to 66 months and operate under the Ministry of National Education. The study sample consisted of 23 students aged 60 to 66 months. Twelve students were female, and 11 were male. There were two teachers in the nursery school; one was the teacher of that school, and the other was the researcher (teaching intern). The teaching intern taught from morning to noon three days a week. In the nursery school, students attend a full-day program from 8:00 am to 5:00 pm.

Preschool Educational Practices for Noise Control

Within the scope of the noise pollution project Power Point presentations enriched with visuals and animations were presented interactively to the students. Then, we explained simply and clearly what the concepts of sound, noise and noise pollution are and how they are measured. We asked the students why the first things that come to mind when we hear the words “environmental pollutant” are air, soil and water pollution but not noise pollution. Then, we illustrated, using images and an animated cartoon, that noise pollution cannot be seen or smelled and does not pollute soil and water and thus is perceived to be innocent, but that it is actually a dangerous type of pollution that proceeds slowly and mischievously. The animated cartoon was actually about occupational safety; however, it was adapted to make it appropriate for classroom use. For example, the suicide scene of a person who is socially isolated due to hearing loss in the video has been removed in order to ensure that the viewing of children of this age is not appropriate. We watched the cartoon with the students and held a discussion session by afterwards by making connection to the school noise (for the animated cartoon, see [bknz.https://www.youtube.com/results?search_query=napo+stop+that+noise](https://www.youtube.com/results?search_query=napo+stop+that+noise)). We also talked about the effects of noise on health and explained that overexposure to noise could lead to temporary or permanent hearing impairment, recurrent otitis media, unhappiness, weakness, fatigue, stress, attention deficit and poor thinking skills.

Ten activities for noise control were implemented. Seven activities were selected from the project (for a more detailed information, see web page of the project Noise Pollution in School: Causes, Effects and its Control, 2015). Three activities were adapted from the study by Christidou et al. (2015). For more information about the educational material, see the web page Noiseaware (2014). First seven activities from the project and then the three activities adapted from the the study by Christidou et al. (2015) are described briefly in the following paragraphs.

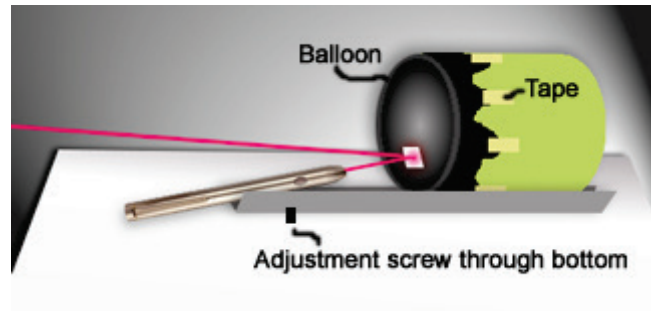
First, the plastic ruler activity was implemented to teach the students the concepts of high and low sounds. This activity was designed for the students to discover that there is a relationship between loudness and the force applied to the ruler. The volume of the sound heard was high when a large force was applied to the free edge of the ruler and lower when a small force was applied. The students were asked to compare the sounds they heard. At the end of the activity, the students were asked, “How should you vibrate your vocal cords if you want to make yourself heard by someone inside or outside the school?” The activity aimed to help the students understand that they must speak to someone nearby in a low voice or in a whisper.



Picture 1. High Level or Low Level Sounds

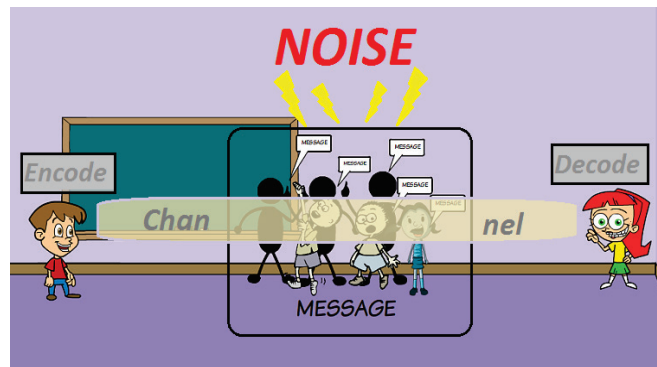
In the second activity, a Slinky toy was used to show the students that sound moves in waves and applies some pressure. A stretched spring on the ground was released to demonstrate that sound travels in waves. Two students stretched the spring, and one of them released it so that the other one felt the pressure when the released end of the spring hit his/her hand. The aim was to show that a similar amount of pressure is applied to the eardrum when the sound volume is high.

The third activity aimed to help the students experience sound waves and vibration patterns in a concrete way. An example was developed for the visualization of sound waves by using a ruler, a laser pointer, two open-ended cylinders, a balloon and a mirror. We ensured that the oncoming light fell onto the small mirror placed on the balloon and was reflected. When the students spoke or sang through one end of the cylinder while pressing the button of the laser pointer, the vibration pattern produced when the balloon was vibrated by the sound waves was reflected on the wall; thus, students were able to clearly see the pattern. As the balloon vibrated with the effect of the sound waves, so did the small mirror on the balloon, creating different vibration patterns on the wall. To make this activity more efficient, it was implemented in a darkened environment, and all students watched it with excitement.



Picture 2. Sound Visualizer

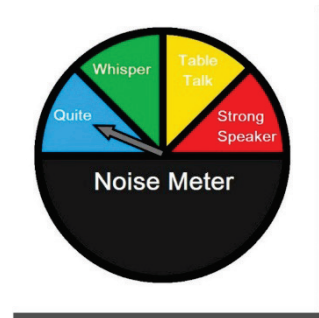
The fourth activity was the noise-themed drama. The class was divided into three groups: the right, middle and left. The group on the right was called “the sender”, the group in the middle was called “the noisemaker” and the group on the left was called “the receiver”. The students alternately took part in the sender, noisemaker and receiver groups. Before moving into another group, the students were asked whether they had been able to deliver the messages and how they had felt at that time. They were also encouraged to reflect on their feelings and thoughts.



Picture 3. Noise-Themed Drama

As part of the fifth activity, four books about noise were read to the students in an interactive way. Among the books, “Shouty Arthur” (Morgan, 2015) and “Uyurgezer Fil” (The Sleepwalking Elephant) (Ak, 2016) were for raising awareness of noise and noise pollution. “Have You Filled a Bucket Today?” (McCloud, 2016) and “How Full Is Your Bucket?” (Rath & Reckmeyer, 2016) were for teaching kindness and empathy. After the latter two were read, a love bucket was made, and the names of the students who were nice to their friends and talked to them in a normal tone of voice were written on paper and collected in the bucket. Towards the weekend, the names in the bucket and the good deeds they had done were read, and those students were rewarded by positive reinforcement. As part of the sixth activity, posters designed to create visual perception and awareness of the negative impact of noise among the students were hung on the classroom walls. See sample posters at Appendix 1.

The seventh activity involved the use of a visual tool, i.e., a noise meter, to control the sound level inside the classroom. The noise meter has four different sound levels designed to help students control their voices throughout the day. The aim was to create awareness among the students by changing the indicator of the noise meter during each activity.



Picture 4. Noise Meter

The first activity adapted from the study by Christidou et al. (2015) involved making interactive measurements using a decibel meter application installed on a smart phone and talking about the data obtained from this application. The traffic lights in the decibel meter helped the students control their voice levels more easily. “Red light” indicates high volume, “yellow light” indicates increasing volume and “green light” indicates normal volume. The students found this activity interesting due to its interactive nature (Christidou et al., 2015).

The second activity involved predicting and describing various recorded sounds. The students were asked to define what they heard and to predict its level. Then, they were asked to find the image related to the sound they had heard and to record their measurement on a “sound thermometer” that had been prepared beforehand (Christidou et al., 2015). On the thermometer image, loud sounds appear at the top, and soft sounds appear at the bottom. The students placed sounds such as crying, screaming and sirens at the top and described them as “loud” sounds, which indicated that they understood the concept. They described sounds such as lullabies, birdsong and the sounds of various musical instruments as “soft” sounds and said that they sounded nicer. To make the students understand their noise levels, their voices were recorded. Then, they listened to the recordings and were truly amazed. It was obvious that they did not expect that much noise to have come from them, but they clearly understood what noise was.

As part of the final activity, the students were given comics about noise with blank speech bubbles and asked to examine the images, interpret them and predict the sentences in the blank bubbles. The sentences they predicted were written in the blank bubbles. The students were then asked to take these comics to their homes and talk with their families about this activity (Christidou et al., 2015). See samples of cartoons at Appendix 2.

Data Collection Tools

Both qualitative and quantitative data collection tools were used in this study. As a quantitative data collection tool, a decibel meter was used to measure the noise level in the classroom. Average noise levels were measured by using Hand-Held Analyzer Brüel & Kjaer Type 2250 in the classroom and cafeteria before and after the implementation of the educational practices for noise control. Interviews and observations were used as means of qualitative data collection. Semi-structured interviews were held to obtain detailed information about the opinions of teachers and students on noise. To this end, a semi-structured interview form consisting of 9 questions was prepared for both the teacher and the students. These open-ended questions were based on the studies in the literature of noise and prevention of in-class noise as well as the dimensions of noise on which those studies focused. The questions were submitted to experts for review, and the form was put into its final version. The interviews were recorded after informing the students and obtaining their consent. The questions were administered to 23 students and a teacher in the Nursery School during the free activity time. The

interviews with the students took approximately 10 to 15 minutes, and the interview with the teacher took approximately 25 to 30 minutes. Conducting the interviews during the free activity time helped the students give more direct answers about the level of noise. During the interviews, the students were asked about the in-class noise level, the effects of noise and their attitudes toward and responses to noisy behaviors. A noise observation form (Appendix 3) was used to collect data about the general physical structure of the school, teachers' attitudes toward noise and how students interacted with each other.

Data Analysis

As part of the quantitative analysis, noise levels were measured using a decibel meter at the beginning and end of the semester. In this study, the qualitative and quantitative data obtained from the students were addressed within the framework of the research problem. The data obtained through interviews were presented based on the titles used in the interview form and adopting a descriptive analysis approach, which is a qualitative research method. Direct quotations were used in the descriptive analysis to reflect the opinions of the research participants expressed during an interview or observed in a striking manner (Yıldırım & Şimşek, 2013). The names of the students were noted by initials. Noise measurements and interview data were analyzed together before and after the implementation of the educational practices for noise control. Records of the interviews with the teacher and the students were transcribed into written form. All conversation was transcribed into written form word for word, with attention given to protecting the sentence structures and dialects. The findings were interpreted based on the opinions of the teacher and the students under titles prepared from the research questions. During the analysis of the interviews, a table consisting of the interview questions and answers was prepared to facilitate the reading of the answers to each question. The data obtained from the interviews with the students were documented question by question. The next step involved reading and making sense of each student's answers to each question, thinking over the similarities and differences and underlining the keywords considered to be worthy of incorporating into the report. Keywords were noted for each question, and then these keywords and important answers were transferred directly into the report. In other words, the answers of all students to the 1st question were read. Then, inferences from these answers were written based on the similarities and differences. The answers of all students to the 2nd question were read, and the inferences from the answers were written based on the similarities and differences. The whole analysis was carried out in this way. This analysis was repeated by two different investigators in terms of process reliability. In addition, validity of the study were provided by triangulation quantitative and qualitative measurements such as decibel meters, observation, interviews.

Results

Noise Level and Acoustic Environment of the Nursery School

The findings regarding the noise level and acoustic environment of the nursery school include the measurements of the noise level, the observation report and the analysis of data obtained from the interviews with the teacher and the students. The in-class noise level was found to be 83.79 dB (A) during the first measurements made with a decibel meter at the beginning of the spring semester. The findings recorded in the observation form regarding the acoustic features of the school are as follows: The school's ceilings and walls are painted plaster. There are no suspended ceilings in the classrooms and halls. The classroom floors are covered with laminate flooring, and the hall and cafeteria floors are covered with floor tiles. The noise level in the halls is high since the in-class noise level is high during the time that the students are in the classroom. The noise in the classroom is heard in the halls. It was observed that all students run together inside the building to go to the playgrounds or cafeteria instead of walking slowly. The first observations showed that even when students were involved in quieter activities, such as playing with LEGO bricks, doing puzzles and painting during the free activity time, they talked loudly when communicating with each other. In addition, the teachers reacted to the noise inside the classroom by talking loudly and yelling. The researcher who serves as a teaching intern at this nursery school indicated that it was quite difficult to make herself heard and to sustain effective

communication at the beginning of the semester. Therefore, she had difficulty in teaching and indicated that the class was always noisy.

The findings obtained from the interviews with the teacher and the students are follows: The teacher and almost all of the students answered "yes" to the question "Do you think the classroom is noisy? If yes, what do you think the level of noise is?" Among the students, ZEG answered, "*Yes it is noisy. A high noise.*", while EZ expressed how the in-class noise affected them by answering, "*Of course it is. Enough to give me a headache!*". Similarly, the teacher answered, "*Yes, we can talk about the existence of noise pollution in my classroom. At a high level.*" Lunch break and free activity time were defined as the periods during which the noise was at its peak. Among the students, AE indicated, "*I think it is at its peak during the free activity time, because all students talk to themselves while cutting and pasting things.*" About the noise level in the dining hall, UK indicated, "*There may be too much noise in the dining hall. Nobody eats their food, everybody talks about 'survivor'. Thus our teacher gets angry with us.*"

To the question "Do you think the in-class noise prevents you from hearing your teacher?", some answered, "*I can hear the teacher when he/she talks loudly.*", while some others answered, "*I cannot hear due to the noise*". Among the students, AÖ answered, "*I can hear the teacher when he/she talks loud. It is not a big deal for me.*", while GG answered, "*Nope. Even now I can barely hear you. How can I hear you when there is noise in the classroom?*" To the question "How well can you hear your friends during the free activity time?" The students answered that they had difficulty in hearing their friends. Among the students, PD answered, "*I can hear well sometimes, but not all times. But now, I cannot hear you well.*", while ED answered, "*Sometimes I can hear well when we are playing games. But of course I cannot hear while we are talking!*"

The data reveal that the in-class noise was found to be at a high enough level to disrupt communication in the classroom. Following the interviews, some educational practices were implemented to reduce the noise level in the classrooms. Then, the noise level was measured and the interviews were held with the teacher and the students again.

The Effects of Educational Practices for Reducing Noise Level In-Class

To determine the effects of educational practices in controlling in-class noise, we analyzed the data obtained from noise measurements, interviews and observations at the beginning and the end of the semester. The in-class noise level was found to be 83.79 dB at the beginning of the semester and had been reduced to 78.83 dB by the end of the semester. However, the in-class noise level alone was not sufficient to determine the effects of noise control, because the noise level may change every hour depending on the activity. Therefore, a determination of the general noise level can be valid and reliable only if the opinions and observations of the partners in the school are included in the assessment. For such a variation in noise level to be considered significant, it is necessary to conduct a comparative analysis of the interviews held at the beginning and end of the semester to determine the effects of educational practices for noise control on the knowledge, awareness, sensitivity and attitudes of the students. The data obtained from the interviews with the teacher and the students and the observations of the researcher follow. In the first interview, the students defined noise as "*loud sounds or things that disturb them*". For instance, İSG defined noise as "*what gives us a headache*". AK indicated that "*noise means talking a lot and yelling! As it is now*". In the last interview, differing from their previous definitions, they defined noise as "*something that disturbs the others*". For instance, İSG expressed that "*I think noise means disturbing the others. It means you perpetually yell at me.*" In the first interview, the students were asked whether their classroom was noisy, and if yes, what the noise level was. It was observed that they defined the noise level as "*very loud sounds*". In the last interview, the students indicated that the noise level increased as the classroom size increased, adding that some students were noisier than the others. Among the students, KB and NLA explained the situation as follows:

"There is still noise in the classroom. But the noise level is low now, because there are very few people in the classroom." KB.

"The class is noisy; E, U, Y and E did not show up today. Therefore, it is quieter. Everyone can hear each other while playing games." NLA

The students were asked whether the in-class noise disturbed them and how they were affected by the noise. In the first interview, most of the students indicated that they had physical complaints such as headache and sore throat due to the noise. For instance, ED indicated, "When someone yells, it is as if the whole class echoes. When it echoes, I cannot hear anything. It gives me a headache.". The students' answers in the last interview show that the students are having more fun and playing games more easily in a quiet environment. Among the students, DK stated, "We play games more easily when the classroom is quiet." MCK also indicated, "The classroom is not noisy today. I will play with the blocks before everyone shows up."

In the first interview, the students listed the most important reasons for in-class noise as the high number of students, gender, influence of their peers, teacher's tolerance for setting the students free during the free activity time. Examples are given below:

"There are too many people in the classroom. We sometimes cannot fit at the tables. I think it is the reason of the noise". DJÖ

"Male students talk so loudly. It creates noise in the classroom. Look behind you, don't you think the same thing is happening again." YKE

"It is because we like talking and yelling. All the girls in the classroom are talking. I should talk too!" MEŞ

"It is play time now. Our teacher does not intervene with us. Because we can play games freely and nobody intervenes with our voice too much. I think it is because of it that so many students are making noise." KB

In the last interview, the students were again asked about the reasons for the in-class noise. This time, they told that they made noise to prevent the existing noise. For instance, MEŞ indicated, "You told us to warn our friends who make noise, so I warn them. But the others do not. Therefore their names cannot be put in the love bucket." Such answers are indicators of awareness among the students. Knowing to warn their friends when they make noise and turning this behavior into a habit both indicate such awareness. In the first interview, students answered, "gets angry", "warns with a high voice" or "gives punishment" to the question "How do you think your teacher reacts to noisy behaviors." Below are some examples of the answers:

"When we make noise, our teacher gets angry with us and tells us that he/she is angry." AÖ

"When we make noise, our teacher gets angry and even yells a little. But I think nothing changes in the classroom." UK

"I think we are making noise, because our teacher kicks those making noise out of the activity and yells at us." ABÇ

The last interview shows that the behaviors of the teacher have not changed much. However, the students indicated the difference in the behaviors of the class teacher and the intern teacher who made activities to reduce the noise level in the classroom. Such difference can be seen in the following examples:

"We start singing a song when there is noise. For example, we call Uzaylı Sakız. We did these with the intern teacher who did the activities for reducing noise. The other teacher gets angry with us." YEÇ

"Our teacher gets angry with us. She says that her throat hurts and she does not want to yell at us anymore. When you come, we play finger games, sing nursery rhymes, therefore everyone shuts up. Sometimes they don't. The names of those making noise are not written and put into the love bucket." DJÖ

In the first interview, the students said they had difficulty hearing the teacher due to the in-class noise. For instance, GG expressed, *"Nope. Even now I can hardly hear you. How can I hear you when there is noise?"* The last interview revealed that they could still not hear the teacher due to the noise but were striving to solve this problem. The solutions were mostly in the form of reacting to those making noise and warning them to be quiet. Behaviors such as warning their friends to be quiet in the classroom might be considered an important step in noise control. Some examples from the interviews follow:

"When the classroom is noisy, I cannot hear my teacher. When İrem talks too much, I say 'shut up' to her. Am I doing right? Because, if she talks, I cannot understand you." ZEG

"When the classroom is noisy, I scold my friends to hear the teacher. Because they annoy me." EZ

In the first interview, launch time and free activity time were defined as the periods where the noise was at its peak. In the last interview, the students indicated that the noise level reached its peak when they were in the dining hall. Among the students, EA described noise as follows: *"It happens most in the dining hall; because there are a lot of people in the dining hall."*

The students were asked whether it was possible to reduce the noise level in the school. In the first interview, they told it was not possible since the classrooms were crowded. Below are some examples:

"No, it is impossible to reduce it. If we are fewer in number, it may be possible. But it is impossible now."(BK)

"Do you think it is possible? My mom's school is also crowded, just like ours, the schools are always noisy!" (GG)

In the last interview, most of the students thought that the in-class noise level could be reduced, indicating that the classroom was less noisy when there were fewer students and they started to warn their friends to be quiet. For instance, PK said, *"Yes, it is possible, everyone must talk in whispers. It cannot be achieved any other way."* On the other hand, some of the students said, *"I think they did not understand what you told. Therefore, there is still noise"* (AZ), while some others told that they warned their friends to be quiet, but they did not listen. For example, KB stated, *"I tell them to be quiet, but they are not."*

In the last interview, the students were asked to tell what they remember from the activities they did throughout the semester. The students stated that they remembered the love bucket and noise visualization activities and the noise games. The findings show that especially the "love bucket" and drama activities which are intended for developing empathy are effective on the students.

"You carried out many activities in the classroom. But I like the love bucket activity most. We also made a box at home with my mom. When my dad helps my mom, we write his name and put it in the box. Hmm... You also showed us sound. My voice seems very pretty when I scream." (YKE)

"I like the noise game most, because we were allowed to scream as much as we want. But when it was my turn, I could not hear anything due to the noise. I felt angry with everyone. Noise is a bad thing..." (KK)

"The love bucket! But I was not able to get the first place, it was so close. I may also be rewarded this week. Because making noise and disturbing the others is a bad thing. We should whisper, shouldn't we? It is better when we whisper. When we were playing the noise game, I got a terrible headache. If we speak in a whisper, we do not get a headache" (NLA)

Below is the analysis of the interview held with the teacher at the beginning and end of the semester about the reasons of noise pollution in the school and the control of noise. In the first interview, the teacher (ETY) defined noise as "loud sound mostly of environmental origin". "Noise is loud sound,

various sounds coming from outside such as horns, construction sounds etc." As can be seen, this definition does not include man-made noise. The same teacher stated the following in the last interview:

"Noise is sound produced by humans unnecessarily or by vehicles which are technically operated necessarily or unnecessarily. To me, noise pollution is a cluster of sounds that affect humans and other living creatures in the nature."

Different from the definition made in the first interview, this definition includes man-made noise and its negative impacts on the nature and humans. In both interviews, the teacher defined the lunch break and free activity time as the periods where the noise was at its peak. The teacher used the following statement, especially for the period when all 26 students were in the classroom:

"...free activity time may turn into a total noise time." In the last interview, he/she indicated its reasons as follows: "...since we do not intervene with the students' game and leave them to play creative games, the noise level is too high during the free activity time."

The teacher was also asked how noise affected him/her. In both interviews, he/she indicated that noise adversely affected his/her performance and physical and psychological well-being. He/she said, "After a while, I have a headache and tinnitus. This noise drains my energy. When I get home, I feel tired. Sometimes, I become intolerant towards those around me it makes me really upset."

In the first interview, the teacher reported the following as the most important source of noise: "I think high ceilings in the classrooms are the most important sources of noise, as they cause the sound to echo and get even bigger. Besides, the toys can also be regarded as the sources of noise." In brief, the architectural design of the school and the sounds from the toys were considered as noise sources. In the last interview, in addition to the architectural design of the school, the teacher defined the noise coming from the students as follows: "...In addition to these, the students talk in a loud voice, even when speaking to their friends nearby. This might also be derived from their families."

In the first interview, the teacher stated that he/she resorted to various methods such as warning them in a loud voice or playing games such as Freeze to silence the noise.

"...Sometimes I verbally warn them. Sometimes I resort to games such as Freeze to silence the noise. But this method is not effective at all times. When they cannot hear even me due to the noise, I warn them loudly in a way to make myself heard. It is only this way that they shut up."

In the last interview, the teacher indicated that he/she was impressed by the educational practices carried out throughout the term and he/she may try these practices in the following terms to maintain a quiet classroom. He/she said the following:

"Thanks to these practices, I had an experience of different activities. I was informed and gained insight... I found some of the activities very impressive and I am thinking to use them in my classroom next year. I couldn't imagine that the love bucket would be so effective..."

To the question about how restricting some behaviors such as talking loudly, singing and running to certain areas inside the school and the school yard affects noise control, the students gave similar answers in the first and last interview.

"I have already told you. We do not have a green yard for the students to run and play. A sand box was made this year, but I think there should be more materials and toys in a nursery school yard. The yard should catch the attention of children, so that they can get rid of the excess energy. We have a room for activities in the upstairs."

But when children run or make noise there, the whole noise echoes down the other floors. It also echoes in the room. Thus, the physical conditions fall short of preventing the noise." It was stated that insufficient physical conditions increased noise pollution in the school.

In the first interview, the teacher was asked whether the in-class noise could be reduced or not. He/she was observed to hesitate a little due to the physical conditions. He/she stated the following: "I

think the noise can be reduced if we take certain measures. However, with such small and crowded classrooms, I am not sure how we can overcome this problem." In the last interview, the same question was asked to the teacher again. His/her assessment in line with the education practices implemented is given below:

"I got a copy of the educational practices. Effective and entertaining activities have been conducted this term. Especially the love bucket activity was very helpful for me and the students. Even I learned a new activity in this way. Such training may also be provided to the teachers before the students, since we can also make mistakes. I realized that I sometimes raise my voice too much. As children get used to the volume of my voice, it becomes harder and harder to catch their attention. We serve as role models for the students. They may have involuntarily learned this behavior from me. To me, there are lots of factors for this to happen, but the children learned what noise is at the end of the semester and gained awareness. If these activities were extended throughout the year, they could have been more effective.... With these activities, the in-class noise has been reduced, even if just a little. I cannot say that it is totally absent. There are various reasons for this. The classroom is small and there are a lot of students. However, I realized that some students warn their friends when they make noise. It makes me really happy."

The teacher wanted to get a copy of the activities, requested for such training to be provided to the teachers, criticized himself/herself, reflected on the changes in student behaviors, and stated that the in-class noise level reduced to a certain extent. They all indicate the progress made as a result of the activities conducted within the scope of this study.

Discussion, Conclusion and Suggestions

Evaluation of the Acoustic Environment and Noise Level of the Nursery School

Noise measurements, observations and the interviews held with the teacher and the students about the acoustic environment of the nursery school showed that the noise level is high. In the first measurement, the average noise levels of the classroom and cafeteria were found to be 83.70 dB and 78.83 dB, respectively. This finding conforms with the findings of other studies that report high noise levels in Turkish elementary schools (Bulunuz, 2014; Bulunuz et al., 2017; Tamer Bayazit et al., 2011; Özbıçakçı et al., 2012; Polat & Buluş Kırıkaya, 2007; Şentürk & SaĖnak, 2012). In addition, these values are far above the upper limits specified for empty classrooms in the regulations (ÇGDYY, 2010). They are also above the noise level of 50 dB suggested by researchers for occupied classrooms (ASHA, 2005; Berg et al., 1996; Crandell et al., 2004). In a classroom where the noise level is approximately 80 dB, the teacher must talk at 90-95 dB to be heard, based on the speech-to-noise ratio (Crandell et al., 2004; Choi & McPherson, 2005). This means that the teacher must speak loudly. It is inevitable that the teacher will suffer from fatigue and health problems related to the throat and vocal cords. Subjective evaluations of the interviews with the teacher and the students also revealed that the in-class noise level is high. The students and teachers indicated that the classrooms are usually noisy, especially during the free activity time and lunch break. They stated that they could hear their teacher and friends only when they talk loudly. This finding conforms with the findings of the study reporting that the noise level increases especially when the nursery school students are in a confined space (Grebennikov, 2006). The observations also showed that the materials used in the floors, ceilings and walls of the nursery school are not sound-absorbing. This finding agrees with the findings of the study by Choi and McPherson (2005), which reports the need for acoustic improvements to reduce noise in elementary schools in Hong Kong. The inappropriate behaviors of students, such as talking loudly, yelling, screaming, running and sliding tables and chairs in confined areas with poor acoustical designs increases the noise level even more. Therefore, acoustic improvement is an urgent and important requirement for noise reduction in nursery school buildings.

Noise measurements were made during the free activity time and lunch break. In the interviews, the students and teachers indicated that there was more noise during the free activity time. The observations revealed that the children talk loudly to their friends even when they are involved in

quiet activities such as playing with LEGO bricks or doing puzzles during the free activity time. We think the teacher's misperception that the free activity time is the period during which children are set free without any intervention might have an effect on the increased noise levels during the free activity time. During the free activity time, the children are given the opportunity to choose any activity. However, the free activity time should not be a period during which children do not abide by the classroom rules and behave as they please. Teachers' failure to intervene in the noisy behaviors of the students during the free activity time triggers the man-made noise. Some examples of the answers given by the teacher and the students follow:

I think the noise made during lunch hours is at a very high level. Because we don't interfere with the childrens plays during their spare time activities and also we let them be free so that they can play more creatively. Teacher

Now is the play time. Our teacher doesn't interfere with us. We can play freely and our teacher doesn't warn our voice level. For this reason, I think many people are making noise. KB

High noise levels in nursery schools disrupt in-class communication, causing the partners to have difficulty hearing and to have physical discomfort. Action must be taken to protect children, who are in a special risk group with regard to noise (Babisch et al., 2012; WHO, n.d.). Free activity time and noise pollution awareness should be integrated into the syllabus of the class management course offered in education courses. It was observed that talking loudly and yelling at the students to warn them when they exhibited noisy behaviors were effective in maintaining a quiet classroom. Teachers could be provided with in-service training about noise, and educational practices for reducing in-class noise caused by students could be useful for both teachers and students. The second research question involves an evaluation of such educational practices.

Evaluation of the Educational Practices Implemented to Reduce the Noise Level in the Nursery School

The in-class noise level was found to be 83.79 dB at the beginning of the semester and had been reduced to 74.52 dB by the end of the semester. The level found in the last measurement is still far above the upper limit of 60 dB for the noise level of an occupied classroom (Berg et al., 1996). However, since the measurements were done on a logarithmic scale, a decrease of approximately 10 dB (A) means an 8.453-fold decrease in the pressure level that causes noise. This is an important finding; however, the noise level may change every hour in a nursery school. Therefore, the reduced noise level alone cannot be considered an indicator of improvement. The general noise level must be assessed with the opinions of the teachers and students in the school and the observations of the researcher. The measured noise level and the analysis of the first interviews revealed that the in-class noise was high enough to disrupt communication in the classroom. In the first interview, the students defined noise using such words as "loud sound", "yelling", "screaming" and "headache", while they added the dimension of "disturbing the others" in the last interview. The students' expressions about the damage or disturbance caused by noise are an indicator of empathy development. This development might be explained by the integration of noise awareness with the educational practices for empathy development, because both the students and the teacher mentioned the activities of the love bucket and the noise-themed drama, which were integrated with interactive book reading intended for empathy development. To reduce the noise in schools caused by students, teachers should carry out educational practices that will contribute to empathy development, especially regarding noise.

At the beginning of the semester, the students listed the sources of noise as gender, the crowd in the classroom settings and behaviors such as talking loudly and yelling. In the interview held at the end of the semester, they gave more detailed answers about noise sources. For instance, they indicated that some students made more noise in the classroom and that it was quieter when certain students were not in school. In the last interview, when the students were asked about the noise sources in the classroom, they mostly talked about what they did to prevent their friends from making noise.

Behaviors such as being disturbed by the noise, complaining to their teacher about the noise and warning their friends to be quiet are all indicators of awareness and behavior change. Now the students are aware of the disturbance caused by the noise and warn their friends instead of turning a blind eye to the noise. These changes indicate that educational practices for noise reduction achieved success in improving the knowledge, awareness, sensitivity and attitudes of the teachers and students about noise. The findings of this study agree with the findings of Christidou et al. (2015). A group of noisy students who always talk loudly and yell can influence other students, leading to the spread of noisy behaviors in the classroom. Therefore, starting from the beginning of the semester, teachers must pay special attention to students who tend to exhibit noisy behaviors and must ensure that the classroom rules are understood and followed by the students.

The students stated that noise reduced their motivation to play games and adversely affected their concentration and play skills, preventing them from enjoying the games. This finding is important. It was observed that the students adapted more easily to games and activities and stayed focused for a longer period when there was no noise. This finding conforms with the studies reporting that noise causes inability to concentrate, comprehend and communicate (Prasher, 2000; Dockrell & Shield, 2004; Shield & Dockrell, 2008). The students said that they did not want to stay in the classroom when it was noisy and were able to play better and with more care when it was not. These findings indicate the need to reduce noise pollution in schools and classrooms in order to increase the efficiency of preschool education.

The students were asked how their teacher reacted to the in-class noise. Their answers indicated a difference between the behaviors of their teacher and the teaching intern. While the intern teacher was trying to calm the students by means of certain games, nursery rhymes and the love box activity, the class teacher was observed to control the students by scolding and yelling. Behaviors such as yelling, scolding and punishing are quick fixes, or short-term solutions, for in-class noise. Practices integrated with games and educational activities are more effective for sustainable noise control. This result was consistent with the research results of Christidou et al. (2015). The students were observed to warn the noisemakers by yelling at them, as they took their teacher for a role model when she yelled at the students to suppress the noise in the classroom. The interviews showed that the teacher behaved in that way to manage the class. However, it did not help the students to develop a behavior of keeping quiet. Such reactions by the teachers reinforced students' behaviors such as talking loudly and created a barrier to the practices implemented to reduce the in-class noise level. A teacher who wants to create a quiet classroom atmosphere must first change such behaviors as talking loudly and yelling and then must try to be a good role model. This finding indicates the need to provide training for the teachers about the reasons for and effects of noise in schools and its control. The teacher's lack of knowledge of how to behave in order to control noise pollution in schools reflected badly on the effect of educational practices. In contrast, the activities carried out by the researcher in the classroom, especially the love bucket activity integrated with book reading, were extremely influential.

The students mentioned the love bucket activity in the last interview, which indicated that they had developed empathy and reinforced the behavior of keeping quiet. The love bucket was a follow-up of the story activity and strongly attracted the students' attention. Observations and interviews showed that this activity contributed to the development of empathetic behaviors such as being kind to other students, behaving well, not disturbing the others and not making too much noise. For example, we observed that the students warned their friends when they did something wrong or used polite words such as "thank you", "good morning", "may I do/may I take?" The students were asked about the activities carried out throughout the term. They remembered and listed these activities, which is an indicator of the progress they had made in understanding the concept of noise pollution.

In the last interview, most of the students indicated that noise could be reduced, adding that they warned their friends to be quiet and to talk in whispers. Such statements indicate an important

development. For instance, they included such statements as "" or "". They indicate that the activities carried out for noise reduction had an impact on the students. Furthermore, in the first interview, lunch break and free activity time were defined as the periods during which the noise was at its peak. In contrast, the students talked mostly about the cafeteria in the last interview, which might be an indicator of an improvement in the in-class noise level. These findings show that awareness and sensitivity of noise pollution can be created among nursery school students by means of targeted activities and that development of a quiet school culture must be commenced in the preschool years.

We observed an important change in the statements of the class teacher between the first and last interviews. In the first interview, the teacher attributed noise to the sounds coming from outside and the acoustic design of the school, but in the last interview, she indicated that the noise produced by students was another important source of noise. The teacher explained this as follows: "...". Therefore, another study should be conducted to reduce in-class noise pollution with the cooperation of the students' families. The teacher also touched upon the noisy toys used in the school and the lack of suspended ceilings. As emphasized in other studies, acoustic improvements must be made in schools (Choi & McPherson, 2005), and less noisy toys must be chosen (Grebennikov, 2006). In both interviews, the teacher talked about the negative impacts of noise on her performance and psychological well-being. This finding conforms with other studies' findings that high noise levels in classrooms may diminish teaching performance (Crandell et al., 2004; Choi & McPherson, 2005). It is understood that the teachers' failure to intervening in the noisy behaviors of the students during the free activity time especially triggers the noise in the classroom. This finding reveals that teachers must change their understanding that free activity time is a period during which students are allowed to make noise and behave as they please. Free activity time must be turned into a time during which students are free to choose any activity they like but are not allowed to exhibit noisy behaviors.

In the first interview, the teacher stated that he/she resorted to verbal warnings or games such as Freeze to silence the students but had to yell at them when he/she could find no other way to control them. This behavior is an indicator that the class teacher does not have sufficient knowledge and experience to maintain a quiet classroom. Indeed, he/she admitted in the first interview that he/she did not know how to overcome the problem of in-class noise in a small and crowded classroom. However, in the last interview, the teacher stated that he/she had experienced different activities, had been informed and had gained insight, adding that he/she had found the activities impressive and hoped to use them in his/her classroom the following year. The teacher also expressed self-critically that he/she sometimes talks unnecessarily loudly, which makes it even harder to attract the attention of the students, and unintentionally serves as a bad role model. She thinks that the in-class noise has been reduced, even if just a little, as a result of the activities carried out to help the students learn and increase their awareness of the concept of noise. The teacher suggested such activities should be initiated at the beginning of the academic year in order to be more effective. Seeing the students warning their friends to be quiet had brought the teacher the most happiness. This finding can be regarded as proof that noise education in the school may help students achieve knowledge, attitudes and behaviors similar to those of their teachers. Better acoustic design and physical improvements are highly important in keeping the noise pollution at optimal values in nursery schools. However, students must be informed about the concept of noise, its impact on physiological and psychological well-being and how to be safe from noise. When they are not aware of the noise, the students and teachers might suffer damage. When they are aware of the noise pollution, they can develop avoidance behavior and take measures to prevent noise in the classroom.

Suggestions

The findings reveal that the efficiency of educational practices will increase if they are implemented over a longer period and if the class teacher is more conscious. In this frame teachers and teaching interns should be provided with in-service training for increasing awareness of and sensitivity to noise pollution. The following suggestions are based on the findings of this study:

1. Educational practices implemented within the framework of the project for increasing awareness of and sensitivity to in-class noise pollution among students and teachers and for motivating students to change their behaviors should be carried out with great care. A noise warning light can be used to make the educational practices more effective. For an example, see https://www.youtube.com/watch?v=G_3uBYIixac&feature=share.

2. The ceilings of classrooms and halls should be covered with materials of varying sound-absorbing densities ($\alpha=0.75-1$)

3. The floors of areas such as classrooms, cafeterias, halls and multi-purpose areas should be covered with impact-reducing materials such as linoleum (to reduce the noise level of activities such as the sliding of tables and desks, running, or hitting).

4. All doors should be furnished with a door seal to reduce the noise of slamming. In addition, the gap at the bottom must be sealed to reduce the noise coming from the halls.

Children are vulnerable to the dangers of noise because they are not sufficiently developed to understand its harmful effects. It is not realistic to expect children to become aware of the negative impacts of such an insidious environmental pollutant as noise on their own and to behave accordingly. Therefore, noise pollution should be taught to students explicitly in a way that includes supporting activities. Noise prevention activities should be incorporated into the curriculum of preschool education. Given the critical importance of this educational period, in which the foundations of the cognitive, emotional, social and behavioral development of preschool children are laid, awareness of noise pollution should be raised among children beginning at an early age. In this way, the behavior of keeping quiet in confined areas can be sustained and a noise-free school culture can be achieved. This study is limited to a class in the independent kindergarten. There is a need to conduct research that tests the effects and generalizability of more quantitative work by providing more student and teacher participation in the work.

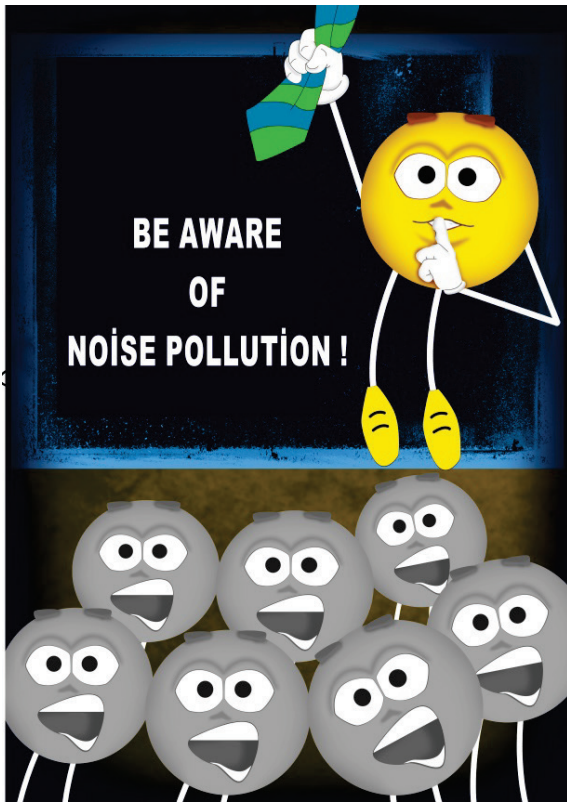
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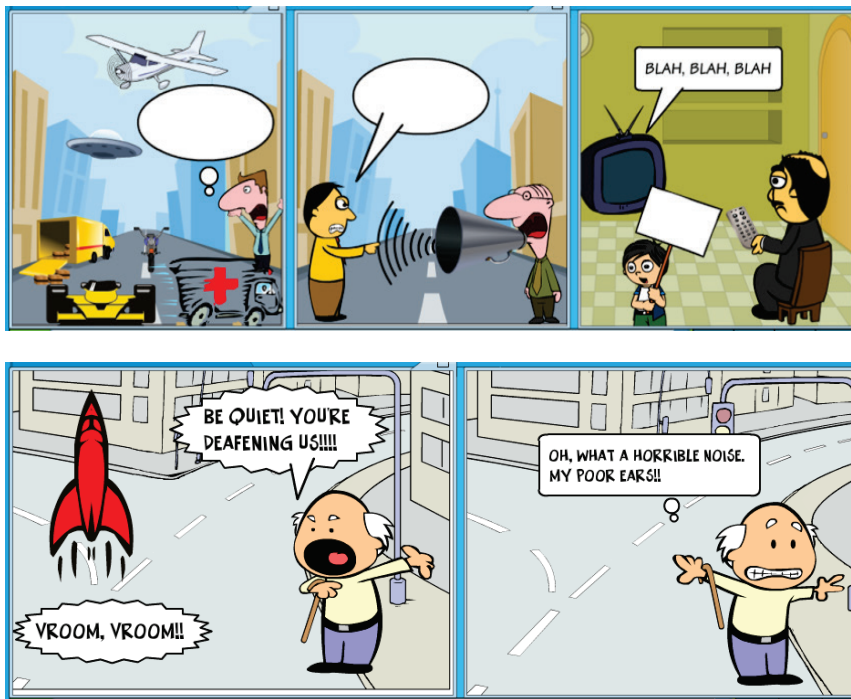
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Appendix 1. Samles of Posters



Appendix 2. Samples of Cartoon



Appendix 3. School Noise Observation Form

The purpose of this form is to reveal the acoustical situation of the school, the noisy behaviors of children, communication styles, attitudes and behaviors of teachers towards such behaviors.

1. **Physical conditions of school buildings:** Acoustic design, construction materials in terms of sound-absorbing properties (high ceilings, corridors and class walls covered with sound absorbing materials, etc.).
2. **Student behaviors and modes of communication:** The behavior of students in the building (walking down the corridors, walking and communicating (low / loud speaking, shouting, screaming) will be observed.
3. **Teachers' attitudes and behaviors towards noisy behavior:** Noisy student behaviors (excitation, ignorance, indifference etc.)?
4. **Teacher's communication style:** (Teacher speaking low / loud)?