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Noise Pollution in Turkish Elementary Schools: Evaluation of Noise Pollution Awareness and Sensitivity Training

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Аннотация

This study investigates noise pollution levels in two elementary schools. Also, “noise level awareness and sensitivity training” was given for reducing noise pollution, and the effects and results of this training were evaluated. ‘Sensitivity’ training was given to 611 students and 48 teachers in a private and a public school. Questionnaires, sound meter observations, and the reflections of the student teachers participating in the study were used for collecting data. The findings showed that noise levels measured in both schools were much higher than national and international upper limits. The data obtained through the first questionnaire indicated that students and teachers had little knowledge, understanding, sensitivity, and awareness of noise pollution. Sound meter measurements recorded after training showed no decrease in the noise levels of the schools. However, post-training observations, questionnaires, and reflections of the pre-service teachers demonstrated that the awareness and sensitivity of students and teachers about noise pollution in schools increased. A decrease occurred in their following perception: “that noise pollution in schools cannot be prevented”. Teacher reflections showed that positive change in the awareness and sensitivity about noise pollution manifested itself in the behaviors of the students and the teachers considerably. It was concluded that teachers and administrators must display sensitive behaviors in regard to the noise in particular, this issue should be emphasized during lessons and the training in schools should be given to students as of early ages.

Ключевые слова: awareness, Noise pollution in schools, and noise control training, sensitivity

Introduction

In 1910, a Nobel Prize winning German bacteriologist stated, "A day will come when man will have to fight merciless noise as the worst enemy of health". According to Dr. Koch, "noise, like smog, is a slow agent of death" (Robert Koch, 1910 cited in Vijayalakshmi, 2003). Unfortunately, the forecast provided by Dr. Koch one hundred years ago has come true at the present time. Review of international literature shows that there are many studies mapping the noise pollution in such heavy traffic areas in cities as airports, train stations, and factories and stating corrective measures to be taken in this matter (Tang & Tong, 2004; Thomson, Ogren, & Kropp, 2004; Williams & McCrae, 1995). Apart from that, there are many studies measuring noise pollution in and around schools (Choi & McPherson, 2005; Ikenberrgy, 1974; Grebenniko, 2006; Shield & Dockrell, 2004:2009), suggesting the use of noise-attenuating acoustic structure designs and sound absorbing materials in schools (Ikenberrgy, 1974; Sterner, 2005), and examining noise pollution and the effects of noise pollution on the school success of students (Skarlatos & Manatakis, 2003; Shield & Dockrell, 2008; Jewell, 1980). In Turkey, research on noise pollution mostly focuses on determining the noise pollution levels in cities and factories, as well as its negative effects on the environment (Uslu & Yiicel, 1997; Kumbur, Ozsoy, & Ozer, 2003). However, even though schools are one of the places where noise pollution is experienced most intensely, the Turkish Academic Network and Information Centre contains a very limited number of studies dealing with the dimensions and effects of noise pollution in schools in Turkey (Tamer-Bayazit, Kiiciikciftci & §an, 2011; Ozbicakci & Capik, 2012; Polat & Buliis-Kirikkaya. 2007).

Noise pollution is generally defined as the unwanted and disturbing sound which is higher than the normal level of sound comfortable to the human ear and has a negative effect on people and society (World Health Organization [WHO], 2001). Polat and Bulu§-Kinkkaya (2007) have made a technical definition of noise saying that it is the overlap of anarchic sound waves. Noise pollution is different from other environmental pollutants. Noise pollution is invisible and odorless. It does not have any residuals and does not pollute soil and water. However, its effects take place slightly and in small steps (Lumpur, 1984). The effects of noise pollution, on human health, can be categorized into three groups: auditory, physiological,

and psychological. The effects of loudness on hearing function are noise-dependent hearing losses. The intensity of sound is associated with the mechanical stress reaching the tympanum directly, and is measured by decibel (dB) units. Briauucourt (1991, cited in Polat & Buliis-Kirikkaya. 2007) classified the effects of different sound level ranges on human health as follows: a) 0-35 dB, non-destructive; b) 36-65 dB, annoying and likely to disrupt sleep and rest; c) 66-85 dB, annoying, mentally destructive, and leading to hearing function disorders; d) 86-115 dB, psychologically and physically destructive, and leading to psychosomatic illnesses; e) 116-130 dB, leading to dangerous deafness and similar critical cases; and f) 131-150 dB, very dangerous and unbearable without a protective equipment.

Previous research conducted in Turkey's big city schools has demonstrated that loudness is quite high. The Regulation on the Evaluation and Management of Environmental Noise in Turkey (REMENT, 2008) has set the indoor noise upper limit as 45 dB in classrooms in educational facilities, 40 dB in theatre halls, and 55 dB in dining halls. Tamer-Bayazit, Kiiciikciftci and §an (2011) carried out a study in primary and secondary schools located in Istanbul. They found that equivalent noise levels in schools during course hours ranged between 51 and 83.3 dB, and were 72.48 dB in average. In addition, they determined that the noise levels exposed to during break times, in which students were expected to "have a rest'', varied between 76 and 89 dB in 84% of schools. They also stated that teachers generally thought that the noise generated in schools could not be prevented. Similarly, Ozbiqakqi and Capik (2012) conducted a study in Izmir, and found that the loudness in the school during a course hour was 50 dB, and the loudness in the corridors before and after the course hours varied between 80.75 dB and 87.25 dB.

The American Speech Language-Hearing Association [ASHA] (2005) suggests that the most appropriate noise level for learning should be in the range of 30 to 40 dB for an empty classroom in which there is no student, and should not exceed 50 dB for a classroom containing students. In their study, Kocaeli, Polat, and Bulu§-Kinkkaya (2007) determined that in-class noise level averaged 70 dB during teaching activities in many schools. The Governorship of Ankara Provincial Editorial Directorate (2010) sent an official letter including an '"important'' note to all provincial and district directorates of national education. The letter reported that the residents of neighborhoods, old and ill people and babies were the first groups to be affected and annoyed by high levels of noise

resulting from schools, and ordered all schools to comply with the regulation concerning environmental pollution. The fact that the noise emerging from schools reaches a level annoying the residents of neighborhoods indicates that students and teachers in the schools are exposed to alarming levels of noise, and that noise pollution in our schools is so severe that it annoys the residents of neighborhoods by going beyond school buildings and gardens. That points to an alarming situation for our primary and secondary schools. It is hard to achieve effective learning and teaching in such a noisy environment because noise has critical negative effects on physiological and mental health of people. Those noise levels which are measured during course hours and break times may lead to psychosomatic illnesses and hearing function disorders by harming human health both psychologically and physically (Briauucourt, 1991, cited in Polat & Bulu§-Kmkkaya, 2007). Noise makes it difficult for children to concentrate on lessons by preventing verbal communication and decreasing the learning experiences and problem-solving skills of children in general (Dockrell & Shield, 2006). Many studies conducted abroad on noise pollution in schools have revealed the negative effects of noise on learning and teaching (Choi & McPherson, 2005; Grebennikov, 2006; Jewell, 1980; Skarlatos & Manatakis, 2003; Shield & Dockrell, 2008).

Treagust and Kam (1985) emphasize that noise pollution in schools is ignored in science curricula and suggest that the noise pollution in schools should be covered within the scope of the subject of auditory sense in biology courses and the subject of sound in physics courses as an environmental problem. It has been reported that if the noise pollution in schools is treated and taught as an environmental problem, the awareness and sensitivity of students in this matter may be improved (Treagust & Kam, 1985). The same study has suggested 10 activities aimed at providing students with sensitivity about noise pollution in schools. The review of primary education and secondary education science curricula and course books employed in Turkey shows that the intensity of sound (in decibels) is measured only in the 8th grade. Sound recording higher than 60 dB is called noise. Hearing impairments may be experienced if one stays in environments with a noise level of 60 to 120 dB for a long period (Ministry of Education [ME], 2005). Examples that have been focused on include aircraft, automobiles, and road drills have (ME, 2005). However, no reference has been made to the causes of the noise pollution in schools or to the physiological and psychological effects of hours-on-end, continuous noise pollution on both students

and teachers. In this regard, issues raised by Treagust and Kam 28 years ago in regard to science curriculum and noise pollution in schools is still true for Turkish science curriculum and textbooks. Moreover, it is an important deficiency that the current science curricula and textbooks emphasize only the impacts of noise pollution on hearing health, but focus no attention on its effects on the learning and school success of students.

The causes of the observed noise pollution in schools are many: including but not limited to the poorness of the acoustic designs of the buildings, failure to use sound absorbing materials (Bayazit, KiiQiikQifQi, & §an, 2011), and overcrowded classrooms (Polat & Buliis-Kirikkaya. 2007). On the other hand, the most important determinant of this noise pollution in schools is the awareness, sensitivity, and consciousness levels of administrators, students, teachers, and families in this matter. Noise pollution in a factory may be diminished to an acceptable level by using various sound absorbing and insulating materials. However, the only way of controlling noise pollution in a school is providing all stakeholders of the school with training that may improve their awareness and sensitivity about noise pollution to guide behavior change. For that, sensitivity and awareness about the negative effects of noise pollution on human health should be introduced to teachers and students as of the pre-school period. In his book titled The Selfish Gene, Richard Dawkins (1995) states that two things in the world can match or copy themselves continuously: “genes” and “culture”. Thus, to enhance teaching and learning, all stakeholders of a school should make an effort at creating a "noiseless" school culture. The main purpose of this study was to determine the noise pollution levels of two central elementary schools (one private school and one public school) located in Bursa to give students and teachers training in developing awareness and sensitivity on the subject of noise pollution in their schools and to test the effectiveness of this training. This study answers the following questions:

- What are the levels of noise pollution in a private and a public school in Bursa?
- What are the effects of the school noise reduction training program on actual noise levels in the selected schools?

Method

Participants

This study was conducted in one public and one private school in Bursa province. Participants were 26 teachers and 263 2nd to 7th grade (students aged 7 to 13 years olds) students from the private school, and 22 teachers and 348 6th, 7th, and 8thgrade students (aged 11 to 13 years olds) from the public school. The reason for including the private school in the study was to compare the causes of the noise pollution in schools with differing management processes and operational approaches. In general, private schools are considered more advantageous than public schools in terms of classroom size, physical conditions, and the socio-economic structures of families. The private school was also included in the study in order to assess whether such advantages had an effect on the noise level in the school. The study was carried out within the scope of the course titled "community service practices'', which was compulsory for the 3rd year student teachers of the Department of Primary School Teaching Department at Uludag University. Eighteen preservice teachers receiving the above-mentioned course voluntarily took part in the school noise pollution project. Half of the preservice teachers worked in the public and the other half worked in the private school during this research. Generally, the preservice teachers have participated in: a) conducting surveys and questionnaires for students and the teachers, b) carrying out the noise pollution training for students at the schools and helping to the author, and c) making observations and interviews and with the teachers about noise pollution at the schools.

Research Design

The convenience sampling method was used for selecting the samples in the study. Convenience sampling method was defined as a statistical method of drawing representative data by selecting people because of the ease of their volunteering or selecting units because of their availability or easy access (Buyukoztiirk, Kilic Cakmak. Akgiin, Karadeniz, & Demirel, 2011; Karasar, 1995). Comparative matched group post-test” model (Karasar, 1998) was adapted for the present study. In that process, the following steps were taken respectively: a) Two schools with unknown similarities were selected

in the beginning; b) Noise levels were measured in the selected schools; c) Noise pollution questionnaires were administered to teachers and students; d) A training programme was created by bringing together the data obtained through the noise level measurements and the answers given by the teachers and students to the questionnaires. The said programme was converted into seminary format and presented to the teachers and the students of both schools on different days; e) The noise measurements were carried out for the second time in the order to understand whether any change occurred in the noise levels of the schools as a result of the training programme, and the questionnaires were administered to the teachers and the students for the second time; f) The written feedbacks provided for the researcher by the voluntary pre-service teachers, practicing in the above-mentioned schools, concerning the awareness, attitudes, and behaviors of the teachers and students regarding noise, which were detected via the comprehensive observations conducted by them before and after the noise training, were evaluated qualitatively. All in all, multiple data were collected both quantitatively and qualitatively by means of different methods and approaches employed in the said two schools. Thus, the "mixed-method approach'' (Qepni, 2010) was implemented in the present study.

Noise Pollution Awareness and Sensitivity Training

The present study aimed at revealing the dimensions of noise pollution in elementary schools, implementing a training program to create an awareness and sensitivity on this subject among both teachers and students, and reducing (if necessary) the noise pollution in schools to an acceptable level. To this end, the content of education seminars organized for students and teachers focused on the following issues: a) the meaning and measurement of noise pollution; b) the effects of noise on hearing health, physiological health, and mental health; c) the effects of noise on the learning performances and successes of students; and d) the ways of reducing the noise in schools. Noise awareness and sensitivity training was given to the teachers after the noise levels measured in schools were combined with questionnaire data and the information gathered in regard to the effects of noise pollution on human health. After teachers received their education seminars, seminars were adapted to the levels of students by making age-appropriate changes. Within the scope of these education seminars, training, involving active participation and brainstorming that focused on the meaning and

measurement of noise pollution and its effects on human health and education-teaching in schools, was given for 1 to 2 hours. Because adequate participation was not ensured in the first education seminar on noise pollution in the public school, the seminar was repeated. The second seminar witnessed participation of a large majority of the teachers with the inducement of school administrators. Each seminar took approximately 2 to 3 hours depending on how actively teachers participated. The seminar was conducted in the private school in a single session with the participation of the majority of the teachers at the weekend. Noise committees were formed by teachers in both schools after completion of seminars. The task of these committees was to conduct the training aimed at preventing noise pollution effectively and efficiently by working in co-ordination with university instructors and the pre-service teachers taking part in the project. In this regard, the training was given to all grades (except not the 1^{st} grade students in the private school and to the 6^{th}, 7^{th}, and 8^{th} grade afternoon students in the public school) in co-operation with the teachers included in the noise pollution committee. In addition, a "noise pollution" bulletin board was placed in the ground floor of each school in order to help make the training on this subject sustainable. Besides the noise pollution board, teachers in the public school also posted many noise warning posters on the key points where they could be easily seen by students along all corridors of the school.

Data Collection

Noise levels in school buildings was measured with a Svan 957 sound level meter and analyzer which is a device measuring the noise level in an environment for five minutes and showing the average noise level for that period. In this way, valid and reliable noise measurements were performed without being affected by instantaneous noise levels. In addition, all of the measurements were made by a specialist on noise pollution mapping from environmental engineering department. The noise levels in school corridors were measured when the students in the public school and in the private school were in classes and when they were in break time. Furthermore, noise levels were measured in the dining hall in the private school. They were measured in the public school while an event was being held in the performance hall and while morning and afternoon students were going in and out.

After noise level measurements had been completed, the pre-training "Noise Pollution Questionnaire" for students and teachers was implemented. The first questionnaire administered to students contained 4 multiple-choice questions trying to determine whether there was any "noise" in the schools, whether the students were annoyed by the noise, and whether their teachers warned them when they made noise. The first noise questionnaire administered to teachers tried to reveal teachers' opinions about whether there was any noise pollution in the schools, what noise pollution referred to, how teachers were psychologically and physiologically affected by noise, and whether the noise pollution in schools could be prevented. After the noise pollution awareness and sensitivity training had been given to the teachers and the students, the questionnaires were given to them again with the addition of new questions. Teachers were asked whether they perceived any decrease in noise pollution thanks to the training given and whether they would be willing to participate in the studies on noise level/ pollution in schools to be conducted in the future. Additionally, the following questions were added to the last questionnaires to be administered to teachers and students: What range of sound intensity can the human ear hear comfortably? What range of sound intensity is excessively annoying? Did the training create an awareness and sensitivity about noise among teachers and students? The instrument measuring opinions on intensity of noise was also given to students.

The author and the student teachers constantly have made observations in the school area whenever they visited the schools. More specifically, observations by both the author and the preservice teachers were done: a) during the pre data collection (while teachers and the students filling up the questionnaires) ; b) during the training ; and c) during the post data collection. The preservice teachers gave their written feedbacks to the author. The author had not interview to them. Then, these written feedbacks of pre service teachers were analyzed.

Data Analysis

The sound levels measured were evaluated by taking into consideration the indoor noise limits in the classrooms in educational facilities set in the regulation on environmental noise (REMENT, 2008) and the effects of different sound level ranges on human health described by Briauucourt (1991, cited in Polat & Bulu§-Kmkkaya, 2007). The results of the first and last questionnaires

about noise pollution were analyzed through descriptive statistics and comparative tables were formed. Reflections written by the pre-service teachers on their observations before and after the implementation of the training aimed at preventing noise pollution also were subjected to content analysis. Preservice teachers' reflections were analyzed using constant comparative analysis (Glaser & Strauss, 1967). In this analysis, the researcher read the participants' answers and grouped them with examples.

Reliability and Validity

Reliability is defined as the stability between the independent measurements of something measured and as obtaining the same results in the measurements carried out (Karasar, 1998). The same Svan 957 sound level meter was used in the noise measurements conducted in both schools. The noise measurements carried out in the schools had a high-level reliability because the noise measurement tool employed was a physical one, and the same tool was used in both schools. Validity is defined as the possibility of measurement of something that is intended to be measured without comparison with other things (Karasar, 1998). Because the noise level in school was a quantity that can be measured via sound level meter directly, the measurements performed had a high-level validity.

Triangulation was defined as one of the strategies that ensures internal validity with which data will be collected through multiple sources such as, interviews, observations, and document analyses (Creswell, 2003). Similarly, to ensure reliability and validity in the present study, the noise data obtained via sound level meter, the data obtained from the noise questionnaires, and the reflections of the pre-service teachers (i.e. a great variety of data groups) were subjected to triangulation (Lincoln & Guba, 1985). For example, the measurements of the noise level in school conducted via sound level meter demonstrated that it was 60 dB and over during the lesson in the corridor and 85 dB and over during break time in both schools. According to the student questionnaires, approximately 70% of the private school students and nearly 90% of the public school students stated that the schools were noisy. The teacher questionnaires also pointed out that there was a high level of noise in the schools. The reflections written by the pre-service teachers concerning the activities aimed at reducing the noise pollution in school indicated that there was high level of noise in the schools and the teachers

were annoyed of it. The following sections show, in detail, how the research data support one another.

Results

Noise Levels Measured in the Private and in the Public Elementary School

Table 1 presents sound level measurement data related for the private elementary school. As is seen in the table, the noise level in the school was measured to be approximately 60 dB in corridors when classroom doors were closed during lessons with the noise level recording over 80 dB during dining and break times - a rise of 20 dB. Table 2 presents the measurement data related to the public elementary school.

Table 1. Noise Level Data Collected From the Private School

	Noise Levels,(dB)						
Place	During Lessons		Break Times		Meal Times	Lunch Hours	
	First Measure	Last Measure	First Measure	Last Measure		First Measure	Last Measure
Ground floor	62.5	63	81.0	82.6			
1st Floor	59.6	60.2	86.2	85.5			
Stairs (Ground floor)					82.2		
Stairs (1.st floor)					86.2		
Dining Hall	59.1	63.3				81.3	90.4

Table 2 .Noise Level Data Collected From the Public School

	Noise Levels (dB)						
Time	During Lessons		Students' Exists and Entrance Hours		Break Times		During Students' Performance
Place	First Measure	Last Measure	First Measure	Last Measure	First Measure	Last Measure	
Ground Floor	62.4	65.3	93.0	93.0	79.0	90.8	
1.st Floor	58.5	64.8	86.0	87.0	87.6	89.8	
Multi Purpose Hall							84.4

The noise level in the corridors during lessons in the public elementary school was found to be approximately 60 dB. However,

the noise level rose to 90 dB during break time. The above-mentioned values measured in both schools were greater than the indoor noise upper limits determined by REMENT (2008) for such areas as classrooms, gymnasiums, and the dining halls of educational facilities.

The Results of the Noise Pollution in Schools Questionnaires Administered to the Teachers and Students

Besides the noise level measurements noise pollution questionnaires were administered to the teachers and the students. Table 3 presents the descriptive statistical analyses obtained from the noise questionnaire administered to the students.

Table 3. Noise Pollution Student Surveys: Common Questions Asked for Pre and Post-Tests

Questions	Answer Choices	Private School				Public School			
		Pre-Test (N=263)		Post-Test (N=263)		Pre-Test (N=348)		Post-Test (N=557)	
		f	%	f	%	f	%	f	%
Is there any	Yes, there is.	183	69.3	186	70.7	291	83.9	510	91.6
noise pollution	Normal level.	67	25.4	60	22.8	53	15.2	31	5.6
at your school?	No, there isn't.	9	3.4	8	3.0	3	9	16	2.9
If you have noise pollution	Yes, it is.	193	73.1	203	77.2	289	83	515	92.5
at your school, is it	No, it isn't.	65	24.6	51	19,4	59	17	41	7,4

annoying?									
When your friend makes	Yes, I do.	221	83.7	218	82.9	312	89.7	482	86.5
noise, do you warn him/her?	No, I don't.	33	12.5	36	13.7	36	10.3	75	13.5
When you	Yes, always.	111	42	151	57.4	171	49.1	425	76.3
make noise, does your	Sometimes	107	40.5	91	34.6	142	40.8	108	19.4
teacher warn you?	Never	42	15.9	12	4.6	35	10.1	24	4.3

As is seen in the table 3, approximately 25% of the students stated in the first questionnaire that there was a "normal level'' of or "no" noise in the public elementary school and in the private elementary school. While the ratio of the students stating that there was a "normal level" or "no" noise did not change in the private school after training on noise pollution was given, the ratio fell to 10% (from 25%) in the public school after training. It was seen in the first test that over 70% of the students in the public elementary school and in the private elementary school were annoyed by noise in their schools. In the last test, the ratio of those students who were annoyed by noise exceeded 90% in the public school. In both school types, over 80% of the students stated that they warned their friends by showing "Hush" sign with their pointer fingers when they made noise. In pre questionnaire, over 50% of the students in the private school and in the public school stated that they were "sometimes'' or "never" warned by their teachers when they made noise in the school. This finding shows that teachers are split in terms of warning

their students when they make too much noise in the school. In the post questionnaire, 76.3% of the public school students and 57.4% of the private school students told that they were "always" warned by their teachers when they made noise. This finding shows that students were warned by their teachers more after the education seminar was held. This result suggests that awareness of excessive noise among teachers can be raised with the education seminars.

The following questions were added to the last questionnaires to be administered to the students: Which device measures the loudness? What range of sound intensity can people hear comfortably? What range of sound intensity is excessively annoying? Table 4 provides the descriptive statistical results related to these questions.

Table 4. Last Student Survey: Extra Questions

Questions	Answer choices	Private School (N=263)		Public School (N=557)	
		f	%	f	%
Which of the following measures the magnitude of noise pollution?	Microphone	21	8.4	62	11.1
	Sonometer	222	88.4	470	84.4
	Manometer	8	3.2	25	4.5
What range of sound intensity can human ear hear comfortably?	5-10 dB	112	44.8	179	32.1
	40-60 dB	83	33.2	231	41.5
	60-90 dB	55	22	147	26.4
	90 dB and above	185	72.5	439	78.8
What range of sound intensity is excessively annoying?	40-60 dB	12	4.7	25	4.5
	60-90 dB	58	22.7	93	16.7

As is seen in the table above, nearly 90% of the students said after the training on noise that the noise would be measured in dB, 33 to 41% of the students correctly mentioned the intensity of sound that could be heard by ear comfortably, and over 70% of the students correctly stated the noise level that would excessively annoy. These results suggest that children can acquire knowledge about noise during their education in elementary schools.

The questionnaire data measuring the effects of the training about noise levels in schools, reducing noise pollution, and introducing awareness and sensitivity in this matter from the perspective of teachers were analyzed through descriptive statistics. Table 5 presents the analysis results for the common questions asked in the pre and post questionnaires administered to the teachers.

As is seen in Table 5, approximately 10% of the private school teachers gave the answer, "no" to the question, "is there noise pollution in the school" asked in the first questionnaire, while 50% of the private school teachers said that there was a "normal level" of noise pollution in the school. In the public school, only 13.6% of the teachers said that there was a "normal level" of noise pollution in the school.

Table 5. Common Questions Asked for Pre and Post Teacher Surveys

Questions	Answer Choices	Private School				Public School			
		Pre-Test (N=23)		Post-Test (N=26)		Pre-Test (N=22)		Post-Test (N=23)	
		f	%	f	%	f	%	f	%
	Yes, there is.	10	43.4	16	61.5	19	86.3	23	100
Is there any noise pollution	Normal level.	11	47.8	10	38.5	3	13.6	0	0
at your school?	No, there isn't.	2	8.7	0	0	0	0	0	0
What is the	Able to define	7	30.4	14	53.8	6	27.3	18	78.3
meaning of noise pollution?	Unable to define	16	69.6	6	23.1	16	72.7	5	21.7

Can noise pollution be pre-	Yes, it can be prevented.	17	73.9	24	92.3	19	86.4	19	82.6
vented at school?	No, No it can't be prevented.	5	21.7	2	7.7	3	13.6	4	17.4

After the education seminars on noise pollution had been completed, the percentage of those who gave the answer that there was a "normal level of noise'' fell to 0 in the public school, and to 38.5% in the private school. This finding shows that it was understood by most of the teachers that the noise levels in their schools exceeded normal limits. The analysis of the answers given by the teachers to the question, "what is noise pollution?" demonstrated that approximately 70% of both the private school and the public school teachers had difficulty in defining noise pollution in the first questionnaire, but over 50% of the private school teachers and over 70% of the public school teachers could define the noise pollution after the education seminar. This result shows that a majority of teachers had difficulty in making a distinction between noise and noise pollution prior to the education seminars. Approximately 74% of the private school teachers and nearly 86% of the public school teachers gave a positive answer in the pre questionnaire to the question that the noise pollution in schools could be reduced. Over 92% of the private school teachers and 83% (a slight decrease) of the public school teachers stated in the last questionnaire that the noise could be reduced. These survey data indicate that an increase occurred in the belief, that "the noise in schools cannot be prevented", which was at a very low level among the private school teachers while the ratio of those who believed in the above-mentioned statement remained the same among the public school teachers. This finding suggest that the education training seminar may change, in a positive direction, the belief that noise pollution in schools can be reduced to enhance teaching and learning.

The post questionnaire administered to teachers following the education seminar on noise pollution provided for teachers addressed questions about human ear and noise intensity ranges as

well as the psychological and physiological impacts of noise pollution. Table 6 presents the descriptive statistical results concerning these questions.

As is seen in the Table 6, 53.8% of the private school teachers and 91.3% of the public school teachers gave correct answers to the questions about the sound intensity ranges that could be heard by the human ear comfortably and the sound ranges that excessively annoyed. Over 80% of the teachers from both schools gave positive answers to the question about whether activities about noise pollution created awareness and sensitivity among teachers.

Table 6. Additional Questions Asked to the Teachers about Noise Pollution

Questions	Answer Choices	Private School (N=26)		Public School (N=23)	
		f	%	f	%
Which one of the following is the range	5-10 dB	11	42.3	2	8.7
of sound intensity that the human ear	40-60 dB	14	53.8	21	91.3
might comfortably detect?	60-90 dB	0	0	0	0
Which one of the following is the range of sound intensity that extremely bothers	90 dB and above	11	42.3	7	30.4
human ear?	40-60 dB	0	0	2	8.7
	60-90 dB	14	53.8	14	60.9
Do you think that noise pollution studies drew the attention of the teachers and improved their awareness and sensitivity	Yes, it did.	21	80.8	19	82.6

to this issue at this school?	No, it didn't.	1	3.8	4	17.4
Do you think that noise pollution studies drew the attention of the students and	Yes, it did.	1	3.8	4	17.4
improved their awareness and sensitivity	Yes, somewhat	11	42.3	13	56.5
to this issue at this school?	No, it didn't.	12	46.2	6	26.1
Do you think that the level of noise pol-	Yes, it decreased.	1	3.8	1	4.3
lution decreased after noise pollution studies at this school?	Yes, somewhat. No, it didn't decrease.	11 13	42.3 50	13 9	56.5 39.1
Does noise pollution affect you physiologically?	Yes, it affects. No, it does not	18	78.3	19	86.4
	affect.	3	13	2	9.1
Does noise pollution affect you psycho-	Yes, it affects.	16	69.6	21	95.5
logically? Would you like to participate volunteer	No, it does not affect.	3	13	0	0

	Yes T would like				
work to prevent noise pollution in your school?	to.	15	57.7	19	82.6

The question concerning the effect of these activities on creating awareness and sensitivity among students was answered with: "yes, they affected'' by 3.8% of the private school teachers; "yes, they affected somewhat" by 42.3% of the private school teachers; "yes, they affected" by 17.4% of the public school teachers; and "yes, they affected somewhat" by 56.5% of the public school teachers. This result demonstrates that approximately 50% of the private school and the public school teachers think that the education seminar on noise pollution creates awareness and sensitivity among students in this matter. The question asking whether the activities about noise pollution led to any decrease in the noise pollution in schools was answered with a positive response by 45% of the private school teachers and by 60% of the public school teachers. This finding indicates that providing students with training for controlling the noise in schools is an important parameter for controlling such noise. In regard to the effects of noise pollution on the teachers, 70-80% of the private school teachers and 90-95% of the public school teachers responded in the post questionnaire that they were affected physiologically and psychologically by the noise in schools. This finding reveals that teachers are affected by the noise pollution in schools quite negatively.

Analysis of Researcher Observations and Feedback

Table 1 and 2 indicate that most pre and post sound levels remained almost constant; decibel changes would hardly be noticeable within a one or two dB range. Hallway noise increased: during lessons by a noticeable amount around 30 dB and during lunch by a doubling of perceived noise level. Because the main focus of this study is public schools that are very common throughout the country, the responses that will be presented in the following sections were only taken from the public school. The private school was included in the study to measure noise levels in different school contexts and to compare in this study.

During the first visit for noise measurement, it was observed that a large majority of the students did not notice the researchers performing measurements in the corridors with the decibel recorder, while those who noticed them asked such questions as, "What is that?” and "is that a microphone?” by pointing to the sound meter. Similarly, it was seen that the teachers went to their rooms directly, without noticing the researcher performing measurements during break time. Teachers on duty were observed to walk along the corridor without warning and telling students shouting, screaming, and running in the corridor to be silent. It was observed that most of the teachers said to the researcher making preparations for seminar activities in the teachers' room that the noise pollution in schools could not be prevented.

It was observed that while final measurements were being performed following the training seminars, the students addressed such questions as, "Are you measuring the noise?” and "How much noise is there?” and warned one another to be silent by saying "Hush!” in the corridors. During the measurement with the sound meter the following dialog took place:

> Student: "How much is the noise pollution?” (12 years old 6^{th} grade) Researcher: "87 dB”
> Student: "Oh! It is too high.”

It was determined that "fatigue” and "unhappiness” were the primary effects on teachers of the intense noise pollution in schools. At the end of the first seminar, one of the teachers wrote the following e-mail to the researcher, and expressed their trouble due to the noise in the school and their satisfaction with the fact that the problem was addressed:

> "I would like to thank you very much because you have dealt with such an important problem and made an effort to solve it. It is an important issue for me. I have been negatively affected by and suffered from this problem since I began to work in this school. My efforts fell short. My biggest sorrow was that I thought my friends were not aware of the situation as much as I was. There is no silent comer in our school. There is noise everywhere every time. Listening requires consuming much energy, and understanding and being understood are not possible in a place where there is no listening”. [RD]

It was observed that the teachers on duty warned their students to be silent, while the students warned one another during the last measurements. Even the teacher who did not participate in any seminar came to the researcher and asked whether he was measuring the noise. In the teachers' room, some teachers asked to see the results of measurements recorded. The questions, curiosity, and interest of the teachers in this matter imply that the issue is discussed in the relevant schools. In the teachers' room, the teachers made evaluations and put forward various recommendations in regard to the activities aimed at reducing noise, now being recognized as "pollution". For example, some teachers reminded us, "Important things are framed" in regard to the posters hung in the corridors in order to attract attention to the noise, and they emphasized that those posters should be framed and made larger in size. Some teachers stated that the slogans written on the posters should contain the desirable behaviors, but not the undesirable behaviors. In other words, they recommended writing "Let's be silent!" instead of "Do not make noise!" on the posters. All of these indicate that the teachers have started to think and generate solutions for solving the problem.

While there was no poster and writing about noise on the boards and walls of both schools in the beginning of the study, it was seen during data collection at the last measurement stage that the board at the entrance of one of the above-mentioned schools contained 18 noise warning posters endowed with information and visuals about noise pollution (e.g. "Hush!" signs and the posters with "Be silent!" written on them).

The Observations and Feedback of the Pre-Service Teachers

It is possible that post training sound measurements occurred too soon after training and sensitization for teachers and students to internalize the messages and apply them to school culture change, thus explaining why improvement was not seen in the recorded sound levels. In the feedback they wrote after completing the project, the pre-service teachers stated that neither they nor the teachers believed, prior to the start of the study, that the project could be successful. However, their thoughts changed after starting the project. One of the pre-service teachers made the following comments in regard to the pre-study perceptions of themselves and the teachers:

> "Prior to the beginning of this study, I and my friends did not think it could be effective. The fact that some teachers in the school said, ‘noise pollution cannot be prevented' indicated that they did not trust in the project to be conducted. Nonparticipation of most of the teachers in the first group in the seminar was an absolute disappointment. However, the disappointment in the first group was replaced by happiness when the number of teachers in the second group came to be higher. ...Our opinions' changed when we saw how teachers and the principal interested in that project. The teachers in the second group were more interested in our project. They hung letters about noise pollution on walls and prepared handheld posters with "hush!" signs on them. The level of ringtone was lowered ...Thus, I am quite hopeful for this project. Even if the intended result is not absolutely achieved with the project, it will, in my opinion, take a positive course as long as it continues." [HM]

The above-mentioned statements show how the attitudes, values, and beliefs of people about a subject affect others. They demonstrate how influential the interest and participation of teachers and principals are in the strengthening the beliefs of the pre-service teachers.

The pre-service teachers stated that they and teachers noticed and acquired sensitivity and awareness about the noise pollution problem in schools after they received training; and, in parallel with that, started to make practical efforts in order to solve the problem.

That is clearly understood from the following statement:

> "Teachers in the school were annoyed by noise very much. However, nobody made an effort to improve the situation. They were really excited when we brought it forward. This is because noise affected their entire life, actually. Now, our teachers are aware of the danger and make an effort to silence the students. When there was noise, nobody warned students in the past. We enabled our teachers to start to move again in that matter. The principal hung posters along the corridors to ensure silence even before we prepared the board in order to prevent pollution. It indicated the importance attached by them to the subject. Our teachers started to warn the students through "hush!'' signs''. [FBM]

It is clear from pre-service teachers' reflections that the seminars for students, besides the education seminars for teachers, created awareness and sensitivity about pollution among the students. For example, a 3rd grade female student said to the pre-service teacher at the end of presentation on noise [HB]: "I made noise in the past. However, I will not make any noise from now on as I have obtained such information." Another pre-service teacher stated the effect of noise training as follows: "... 'hush!' signs made by students instead of warning one another to be quiet after the presentation on noise are effective in finishing the noise" [EY], The higher sensitivity of students to the noise resulting from the physical education course is mentioned by teachers as follows: "The groups receiving physical education course no longer sit in front of the windows and make noise, or they become more careful and apologize when they are warned."[EB]

Another crucial factor for the solution of the problem is the importance attached by teachers to this matter, besides the acquisition of awareness and sensitivity about the noise pollution in schools. The most important indicator of this is that most of the teachers got the seminar presentation on noise pollution from the pre-service teachers and saved it in their computers. The feedback of a pre-service teacher on this subject is as follows:

> "Teachers helped us very much when we made a presentation about noise. They accompanied and supported us while we were making a presentation. When we went to the school to prepare the board, the teacher of the 3rd grade students received students' presentations from us and saved them in his/her computer. S/he said that s/he would share them with his/her students in the forthcoming year. S/he thanked us by saying that it was a nice project". [HB]

It was observed that after the teachers had participated in the noise project seminar, they developed various methods for preventing the noise in schools. Among those methods, the most important ones were making "hush!" signs by using the body language instead of warning loudly and showing handheld posters or posters with "be quiet!" written on them. "When I observe students in general, I see that they make 'hush!' signs to one another. The teachers prepared handheld posters with 'hush' signs on them,

which they lifted up when there was noise so that the students could see them.” [EY]

A pre-service teacher who did his/her internship in one of the schools where the project was conducted reflected how a teacher changed the method of ensuring silence in the classroom after the seminar as follows:

> "Before the project was carried out, the teachers preferred shouting to silence the students, but they failed. Although it was clear that they were annoyed by that situation, they did not feel the need of doing anything to improve it. When they were on duty during break times, they used to walk along the corridors. They did not warn the students running and shouting. The first change occurred in our teachers after the project started. They stated that they noticed the negative effect of the noise on their health. I attended a lesson in a classroom for my internship after the project. It was the first time that I finished my internship hour without having a headache. This is because; our teacher did not warn the students by saying, ‘do not talk', ‘shout up', etc. S/he silenced them only by making a ‘hush!' sign just like the one in the nurse's posters in the hospitals. When everybody stopped talking, but just one person continued talking, the teacher went to him/her and made a ‘hush!' sign to him/her. S/he ensured the order in the classroom in this way. By this means, the students did not get any negative reaction, and the teacher taught the subject without being tired. In addition, when the students did not listen to the teacher, s/he looked at them steadily without shouting. Thus, s/he enabled them to notice their mistakes. [OS]

The pre-service teachers emphasized that after the seminar was completed, some teachers formed in-class rotational noise teams based on the active participation of students and tried to ensure silence in the classroom through the class captain, besides implementing various other methods to reduce noise. The presidents dealing with noise were selected in some classrooms, and the students were informed that those presidents would change every week. In this way, all students warned one another, and the group president ticked those who made noise and removed the ticks of those who were silent. In addition, the comments of the teachers

about the negative effects of noise on them are thought-provoking: “The primary school teacher [S] said, ‘after you made this presentation, I started to feel the accumulation of the tiredness over the years'." [§S] “The fact that s/he said, ‘Now, when I go home, I look at the eyes of my baby so that s/he does not cry' upset and surprised us very much." [HM]

Another remarkable point in the feedback of the pre-service teachers is the importance of giving noise pollution awareness and sensitivity training based on scientific data at early ages. For instance, a pre-service teacher expressed that situation as follows:

> “When I entered the classroom for the first time, I asked them whether they heard anything about the noise in schools in order to motivate them. They told me that their English teacher said to them that a noise measurement was being performed in the school and the results of measurement showed high noise levels. One of the students told figures close to the noise level measured in his/her school. Even though these values were not exactly the same as our measurements, it was seen that the teachers took the issue seriously and talked about it with the students".[EY]

This quotation shows the effect of adopting a teaching approach based on scientific data, instead of imposing bans and warning them by saying “do not make noise!" loudly, while raising the awareness of the students concerning the noise in schools on the learning of students.

In addition to the positive feedback provided above, another pre-service teacher explained the negative experience s/he experienced with final year students, the difficulties encountered by them in silencing the students, and how the students associated violence with noise as follows:

> “The class 8-A was an environment of absolute noise. Although we had a teacher, there was an endless noise in the classroom. I think the presentation did not have any effect on that classroom. Here, the most interesting thing for me was the question, “How many decibels does a gun have?" asked by a student. That shows that violence has left a mark in the minds of students. [HM]

The fact that the pre-service teachers tried to solve a problem existing in the school where they worked within the scope of a project provided them with various benefits. The evaluations of the pre-service teachers demonstrated that the noise project enabled the teachers to allocate more time forthemselves and the relationships between teachers improved. For example, a pre-service teacher [HB] said, "...we received a limited number of feedback from the teachers prior to the start of this project'' while another pre-service teacher [§S] said, "...thanks to the project, we came to be closer with the teachers, and we socialized with them.” Additionally, the pre-service teachers stated that they gained important benefits such as dealing with a problem in the school scientifically and developing a solution to a problem in the school thanks to this project as follows: "... We have gained many acquisitions thanks to this project, too. We have learned how to conduct a research project. Apart from that, we have learned how to express ourselves in the society.” [S§]

Discussion and Conclusion

The purpose of this study was to determine the noise pollution levels in two elementary schools, to determine if they rose to the level of "pollution", to give students and teachers training for providing them with an awareness and sensitivity on the subject of the noise pollution in schools, and to test the effectiveness of this training. To this end, in-building noise levels were measured with a sound meter during lessons, break times, students' exit and entrance hours, and mealtimes. The noise level was found to be 90 dB during the entrances and exits of morning and afternoon students, in the school corridors and on the stairs, during break times and mealtimes in the dining halls, and during shows in the multi-purpose hall. It is seen that the noise levels measured in both schools are over the indoor noise level upper limit determined by £GDYY (2008) to be 45 dB for such areas of educational facilities as classroom, gymnasium, and dining hall. A noise level of 90dB is quite high for educational facilities and health-threatening for students and teachers. These findings are in parallel with the studies measuring noise levels in the schools located in different cities across Turkey (Bayazit, Kiiciikciftci & §an; Ozbicakci & Capik, 2012; Polat & Bulu§-Kmkkaya, 2007).

No change occurred in the values obtained through the noise measurements performed before and after the education seminars on noise. In the last measurement, just like in the first measurement, in-building noise level was found to be 80 to 90 dB - quite a high

level - during the students' entrance and exit times and break times. This finding shows parallelism with the study carried out by Ozbiqakqi and Capik (2012). These results are not surprising. This is because; it is quite difficult to lower the noise level in the conventionally noisy school culture, which has formed over a long time, to an acceptable level in a short time. One of the most important reasons for this is that noise is not perceived by school administrators and teachers as an environmental pollutant. Another important reason is that noise is not treated as an environmental pollutant and the noise pollution in schools is not included in teacher preparation or school children's curricula. The present study and the previous research demonstrate that students and teachers receive no training concerning noise pollution in school and its control (Bayazit, Kiiqukqiftqi & §an; Ozbicakci & Capik. 2012; Polat & Buliis-Kirikkaya. 2007). In addition, the fact that the application of acoustic design and the use of noise-eliminating materials in the construction of educational facilities are not regarded as compulsory parameters (Bayazit, Kiiqukqifqi & §an, 2011) causing the noise level in schools to be maximized.

This study of noise levels in the private and public schools shows that there is no difference between such schools. Even the first questionnaire and the last questionnaire data indicate that the private school teachers had lower levels of awareness and sensitivity about noise pollution compared to the public school teachers. For instance, in the first questionnaire, more than half of the private school teachers marked the choice, "there is no noise pollution in the school” or the choice, "there is a normal level of noise in the school”, however almost half of the
students attending the same school stated that their teachers "never'’ or only "sometimes” warned them when they made excessive noise. The fact that although noise pollution was the same in both schools, almost half of the private school teachers regarded the high noise level in the school as "normal” may partially result from pressure on the teachers, due to the commercial enterprise nature of this school. This is because; almost all of the teachers complained in the education seminar video records that there was a high level of noise in the school. All these findings reveal that fighting against noise pollution in schools should start with students, teachers, and administrators, but the awareness of families should be raised in this matter, too. The fact that teachers have not enough knowledge, consciousness, and sensitivity about noise pollution in schools prevents them from displaying a collective and consistent attitude

towards noise. An increase was observed in the numbers of the teachers marking the choice, "there is noise pollution in the school" and the students marking the choice, "my teacher always warns me when I make noise" in the last questionnaire. One of the pre-service teachers [EB] expressed their observation supporting this finding as follows:

> "...we had made the presentation on the noise pollution in schools to the teachers. However, we had not made the presentation to the students yet. Nevertheless, the students had already started to become conscious about the noise pollution in schools through the information provided by their teachers. There was a theatre show in the multi-purpose hall on that day. The students started to run towards the door to go to the theatre in a noisy manner. Upon seeing this situation, the elementary school teacher told them to sit on their seats straightforward.- Students were told to 'Go out of this door in order and without making any noise, which is the right behavior pattern for you, as we have talked beforehand.' Then, the students went to theatre by going out of the door silently. [EB]

All findings show that awareness and sensitivity about noise pollution were created among the students and the teachers after the education seminar on the nature and effects of noise pollution. The fact that most of the teachers (in the post questionnaire) were able to mention the name of the noise-measuring tool and make a distinction between the sound range that could be heard comfortably and the noise range that would annoy the human ear was hope-inspiring in terms of training on, and the control of, noise pollution in schools. Additionally, the results of the post questionnaire show that the number of the students accepting the existence of noise in the school and being annoyed by such noise increased after the education seminar. Based on the reflections of the pre-service teachers, it is seen that the fact that the students warned one another to be silent by using body language instead of making verbal warnings and starting to be more careful when they were warned about making excessive noise implies that the training on noise pollution may bring about behavioral changes among the students and by implication, enhance learning and teaching.

The first findings obtained from the study, observations, questionnaire data, and the reflections of the pre-service teachers

showed that most of the teachers did not believe in the beginning, that the noise in schools could be prevented. It is understood from the reflections that the belief that "the noise in schools cannot be prevented” emerged among the pre-service teachers included in the project in the 1 to 2 month period during which they did their internships. This finding supports the opinion of Tamer-Bayazit, Kiiciikciftci. and §an (2011) that teachers widely believe that noise cannot be reduced. However, the findings obtained in the project indicate that the belief that "the noise pollution in schools cannot be prevented” -common among the preservice teachers and the teachers - can be changed in the positive direction. Undoubtedly, the beliefs of teachers about noise pollution in schools may be one of the most critical parameters in the fight against this problem. Since the beliefs of people about a subject are based on deductions obtained from experiences within a particular period, it is not easy to change them directly.

However, the training based on data integrated with theoretical information provided within the scope of the present study had quite a big effect on reducing the belief that "the noise pollution in schools cannot be prevented’’, which was common among the teachers. While ‘noise training' was being provided in both schools, the measured noise levels were indicated and the negative effects of noise on education and human health were explained. The fact that the beliefs of the teachers concerning the control of the noise pollution in schools changed in the positive direction and they started to have more sensitive attitudes in that matter is hope-inspiring for the future studies and projects.

Finally, an experienced teacher explained to a pre-service teacher participating in the study [§S] the need for the inclusion of pre-service teachers in these kinds of important projects aimed at solving the problems encountered in schools when they were just a faculty of education student as follows: "The conduct of this kind of a project will provide many benefits for you in particular. We are too late on this subject. However, you will start your job with an awareness of this problem. You will feel annoyed in this matter, and you will be able to train your students more consciously.” Although this teacher thinks that it is too late for them as current (old) teachers to make changes to how they control harmful noise in the classroom, the preservice teachers were agreed that it was not true.

Implications

There is a need for long-term studies measuring the effect of noise pollution awareness and sensitivity training on the noise pollution in schools. Within the scope of these studies, large posters advising and teaching students to be quiet in the buildings may be hung in certain areas of the school. Moreover, noise training should be integrated into the curricula of courses such as science, music, and visual arts, and should be taken seriously by teachers and administrators, which is really a key point. The negative effects of noise on health should be mentioned to students at every reasonable opportunity but with care to no cause resistance. For instance, noise pollution and its effects may be focused on in science courses while the difference between music and noise may be covered in the music course. In the visual arts course, students may be requested to carry out cartoon and poster activities regarding noise. Such cartoons and posters may be exhibited prominently on school corridors and classrooms. The section making the lowest level of noise in a year or in an academic period may be selected at the end of the year or the academic period. This section may be honored and awarded by the school administration before the school. This kind of an approach may motivate other sections in the school to make less noise and reduce noise pollution. It should be kept in mind that when teachers and administrators consider the concept of noise pollution and make an effort to reduce it, students will be careful and sensitive in this matter, too.

The present study had two limitations. First limitation was that the noise pollution training at both schools was held in couple of months. The whole study was carried out in a semester. Therefore, there is a need for longitudinal studies to evaluate the effects of noise pollution training provided in order to reduce noise pollution at schools. Another limitation was that only two schools (one public and one private) were used for this study. More than two schools could definitely be used for the follow up studies in future. There is a need to have more school participation to improve the generalizability of the results of the present study.

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