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Noise Map of My School: A Case Study

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ABSTRACT

Noise - sound waves with high energy - is a significant element influencing the school climate today. The research took place in two primary schools in Bursa in the 2016-2017 academic year. Pre-service teachers were instructed about the process, who conducted the "Noise Map" activity with 4th-grade students in primary schools. The purpose is to describe the condition regarding noise by students, teachers and pre-service teachers through their experiences and views. Data collection tools consisted of participant journals, observation forms, teacher and student interview forms and noise maps. Case study and 'holistic single-unit design' were used as qualitative research methods. The 7E Model, a constructivist education

approach, was used to analyse the data descriptively. Findings show that teachers, students and pre-service teachers developed an awareness of noise, gave suggestions to prevent it and experienced a scientific study. One remarkable result of the study is that due to the activity, students learned to associate noise with other disciplines and daily life. The scope of the activity can be extended to include research out of class, and learning with social experiments. Awareness can be transformed into permanent behaviour through periodic repetition and diversifying materials.

Key Words: Noise, noise pollution in school.

Okulumun Gürültü Haritası: Bir Durum Çalışması

ÖZET

Gürültü, günümüzde okul iklimini etkileyen önemli unsurlardan biri olup, yüksek enerjiye sahip ses dalgaları olarak adlandırılmaktadır. Araştırma 2016-2017 Eğitim-Öğretim yılında Bursa'da iki ilkokulda yürütülmüştür. Bu çalışma kapsamında oluşturulan etkinlik hakkında öğretmen adayları bilgilendirilmiş ve ilköğretim okullarına giderek 4. sınıf öğrencilerine "Gürültü Haritası" etkinliğini uygulamışlardır. Araştırmada gürültüye maruz kalan paydaşların deneyim ve görüşleriyle, gürültüye ilişkin durumun öğrenci, öğretmen, öğretmen adayları tarafından betimlenmesi amaçlanmaktadır. Katılımcı günlüğü, gözlem formu, öğretmen ve öğrenci görüşme formu ile gürültü haritaları veri toplama araçları olarak kullanılmıştır. Araştırmada nitel araştırma yöntemlerinden durum çalışması ve 'bütüncül tek durum deseni' kullanılmış, veriler betimsel olarak analiz edilmiş ve analize yön veren kuramsal çerçevede yapılandırmacı yaklaşımın öğretim modellerinden biri olan 7E Modeli kullanılmıştır. Bulgular öğretmen, öğrenci ve öğretmen adaylarında gürültü farkındalığı oluştuğunu, gürültüye önlem alma noktasında önerilerde bulunup, bilimsel çalışma deneyimi yaşadıklarını göstermektedir. Öğrencilerin etkinlik yoluyla gürültüyü diğer disiplinler ve günlük yaşam ile ilişkilendirmesi araştırmanın dikkat çekici sonuçları arasındadır. Ders dışında da araştırmaya yönlendirme ve sosyal deney şeklinde öğrenmeye öncülük etmesi açısından, etkinliğin kapsamı geliştirilerek uygulanabilir. Farkındalıkların kalıcı davranışlara dönüşebilmesi için belirli dönemlerde tekrarlanarak, materyal değişiklikleri ile etkinlik güçlendirilebilir.

Anahtar Kelimeler: Gürültü, okulda gürültü kirliliği.

INTRODUCTION

Various definitions of noise exist in studies on noise and noise pollution. For instance, Merriam Webster (2018) defines noise as "loud and unpleasant sound", where authors of studies on this issue describe it as "disturbing, distracting, physically and mentally unhealthy sounds that

inhibit the desired sounds from being heard." (Schlittmeier, Hellbrück & Klatte, 2008). Noise has negative impacts on human health and life quality, such as headaches, hearing disorders, cardiac arrhythmia, ulcer, insomnia, stress, irritability and depression (Hunashal & Patil, 2012, p. 449). Noise pollution is defined as disturbing, health-threatening loud sounds caused by vehicles such ast cars and planes or by people (Merriam Webster, 2018). According to the World Health Organization (2016), children are unaware of noise sources and unable to understand the risks of noise. Children and youngsters are considered the most vulnerable group to noise within society because they do not know how to protect themselves from it (Babisch et al., 2012). In this context, in order to detect, define and control the adverse effects of noise on life, necessary steps should be taken in schools where individuals are shaped beginning from childhood.

An intricate issue in school: noise pollution

Factors determining education quality include physical structure of schools, teacher quality, student population, curriculum, syllabus and course materials. There is, however, another, often underrated factor that influences education quality: school climate. All elements affecting student and teacher attitude and behaviours are referred to as the school climate (Çelik, 2002). Today, noise is one of the substantial issues influencing the school climate. In Turkey, noise limits in terms of dB within educational institutions have been specified in the legislation on noise as part of Harmonization Laws of the EU (Environmental Noise Directive [END], 2010). According to this directive, noise limits in schools are as follows: in class, windows closed, 35 dB, windows open 45 dB; in gym, windows open 65 dB; in refectory, windows open 55 dB (END, 2010). 0-50 dB is considered as silent, 50-60 dB as noisy, 70-80 dB as very noisy. A person can endure sound levels up to 120 dB (Yokuş-Sevük, 2013). High noise levels in schools affect the behaviours of teachers and students and therefore the class climate negatively. Students and teachers adapt to the climate in the educational environment and develop attitudes and behaviour accordingly (Şentürk & Sağnak, 2012). Engin, Özen and Bayoğlu (2009) stated that noise lowers comprehension, which is a crucial component of the learning process, by inhibiting the desired sounds from being heard. They indicated that individuals exposed to noise within the learning environment have difficulties in concentrating and exhibit undesired behaviours. A similar study conducted both in noisy (79 dB A) and silent, sound-insulated (36 dB A) classrooms revealed that noise influences 5th-graders' comprehension and memory negatively and impairs learning (Tüzel, 2013). One of the most substantial elements in increasing education quality is to ensure a silent

school climate from pre-school until university. Therefore, studies focusing on factors affecting education negatively, and noise and noise pollution in schools, in particular, are becoming more prominent each day. Related literature shows that the issue has a double-sided but interactional structure.

Studies conducted on "noise" and "noise pollution" in educational institutions mainly focus on the harmful effects of noise on stakeholders, and the physical and mechanical reasons for it. Studies are available within international literature, showing that noise influences basic skills (Klatte, Bergström & Lachmann, 2013) and academic success (Choi & McPherson, 2005) of students negatively. The experimental study of Klatte, Bergström and Lachmann (2013) conducted with students exposed to noise concluded that noise influences comprehension, speaking and listening skills negatively. The study of Choi and McPherson (2005) performed in primary schools in Hong Kong showed that the acoustic environment affected student success negatively. This study reveals that the lack of sound insulation in schools caused concentration problems leading to failure. In addition to international studies on students, studies focusing on teacher awareness levels are also available. Studies indicated that teachers are less aware of noise caused by mechanical systems than caused by students (Jaramillo, 2014; Jaramillo, Ermann, & Miller, 2013).

Literature in Turkey includes studies on the mechanical reasons for noise conducted with a decibel meter in various educational institutions. Noise during recess was measured 82.18 dB(A) in public schools and 74.56 dB(A) in private schools (Bulunuz, Bulunuz, Orbak, Mutlu & Tavşanlı, 2017). Other studies showed that schools were physically quite noisy (Bulunuz, 2014; Polat & Buluş-Kırıkkaya, 2007). Moreover, noise levels were higher than the limit of national and international norms, and much higher in areas with dense population and heavy vehicular traffic (Şahin, Şahin & Bağcı, 2014). Along with studies discussing mechanical reasons for noise in schools, experimental studies on noise control are also available. Bulunuz, Bulunuz, Ovalı, İri-Çıkrıkçı and Mutlu (2017) stated that education programs help create awareness of, sensitivity and positive behavioural changes towards noise pollution in teachers and students. Taş (2010) indicated that school without bells not only prevents noise pollution but also contributes to developing responsibility and self-discipline, concentration and auto-control in students. Studies on noise control in schools also offer suggestions for building specifications: for example, applying sound insulation to all flooring, wall and façade elements when designing the school-building; and controlling devices that cause noise (Grebennikov, 2006; Klatte, Lachmann, Schlittmeier & Hellbrück 2010; Roy, 2011; Tüzel

2013; Özgüven, 2015). In one study where noise levels were evaluated by administrators and teachers in acoustically improved schools, the results of measurements showed that noise levels had decreased (Bulunuz, Bulunuz & Kelmendi-Tuncal, 2017; Bulunuz & Güner, 2017). Noise was not an issue in classrooms facing the playground, but the noise in the classrooms facing the road was a disturbance since it interfered with the comprehension of in-class voices (Başar, 2014).

Problem statement

A general review of the literature reveals that there are studies which have defined noise pollution in schools as an institutional climate problem through measurements and mechanical reasons. Other studies have focused on the negative effects of this issue on stakeholders. Studies on controlling the issue have shown that the solutions include acoustical improvements and education. National and international literature usually involves experimental studies primarily focusing on generation, spreading and physical properties of sound (Atasoy, Tekbıyık & Gülay, 2013; Eshach, 2014; Hernandez, Couso & Pinto, 2012; Houle & Barnett, 2008; Sözen & Bolat, 2011; Teker, Kurt & Karamustafaoğlu, 2017). To date, there has been no research on how to resolve the issue with educational conditions and primary school books lack adequate content on noise. Thus, it is important to conduct studies involving sample education cases which reveal the experiences and perceptions of stakeholders exposed to noise.

Purpose of the study

The concept of noise pollution is discussed in the 2018 Science Curriculum at 4th-grade level, within the unit "Lighting and Sound Technologies", under the topic "Sound Pollution". The program lists its outcomes as follows: 1) Examining reasons for sound pollution; 2) Explaining negative effects of sound pollution on human health and environment; and 3) Producing solutions to reduce sound pollution. An activity planned according to these achievements can contribute to the solution of the issue if integrated into lessons through educational applications. The base element of the current study is specified as an activity where the stakeholders have a shared experience. The purpose of the study is to describe the phenomenon related to noise with a contextual manner through the experiences and views of stakeholders exposed to noise at school with a participant diversity consisting of students, teachers and pre-service teacher.

1. What is the noise level perception of primary school students during class and recess in various locations at school?

2. Regarding an activity for exploring the perceptions of primary school students about noise pollution at school, how can it be:

a. planned?

b. implemented?

c. evaluated? and

d. What objectives of Science lessons can it achieve?

METHODOLOGY

Essential principles of qualitative research method were adopted. Qualitative research aims to interpret the experiences of people and how they perceive these experiences. The current research implements Creswell's interpretive approach, which he describes within the general perspectives of qualitative research (Creswell, 2013, p. 42). Qualitative research adopts a research process that flows from philosophical presuppositions to an interpretive framework, and to procedures involving social problems. This approach focuses on determining the interpretations of the participants on the problem and identifying the complex interactions of various factors. The current study applies the qualitative research approach 'holistic single-unit design', in which a case and its related themes are described (Yin, 2014). Case studies may be limited to a single phenomenon, incident, person or school. In this study, "implementation of the noise pollution map activity in school" is examined as a case.

Case study activity: noise map of my school

The Science Lesson Curriculum intends to show the relationships among technology, society and environment and to make the students feel responsible for solving social problems (MEB, 2018). The purpose of the curriculum includes that the students develop interest, attitude and curiosity towards their environment, and that they use scientific knowledge and experience to solve daily problems. The teacher leads the way, and the student explains the source of knowledge and transfers it within the learning process. The teacher is a guide encouraging the students to develop research spirit. In order to make the acquired knowledge permanent, the 2018 curriculum utilizes research-inquiry-based learning strategies which benefit from informal (schoolyard etc.) as well as in-class and out of school learning environments. The teacher is expected to create student-friendly

environments enabling the students to express their opinions, and students are expected to do the activities with their peers.

The aim of the current study was to determine students' perceptions of noise at school through their experiences and to describe it multi-dimensionally with the views of stakeholder using a student-centred activity. The Noise Map Activity was planned in accordance with the learning field of physical events, content and achievements of the Science Lesson Curriculum. The aim is that the students scientifically observe the places and occasions with intense noise. At the beginning of the activity tables shown in Table 1 are distributed among the students where they are supposed to mark the noise levels of different locations in the school.

Table 1. Noise map table

	Noise Level		
Location	**Low**	**Moderate**	**High**
Hallway			
Classroom			
School Yard			
Refectory			
Gym			
……..			

Students were asked to keep a record of noise levels based on observations during class and recess. Low level of noise was marked in green, moderate level yellow and high level red, or "X" or "✓" are inserted in the relevant row and column on the table. Students who created their school's Noise Map were then asked to explain their map, and the questions below in Table 2 were discussed in the class.

Table 2. Noise map discussion questions

Noise Map Discussion Questions
1- Which areas in your school are noisier? What could be the reasons?
2- Which areas in your school are quieter? What could be the reasons?
3- How does the noise in your school affect you?
4- What can be done to reduce noise at school?

On the one hand, the Noise Map gives students responsibilities by channelling them to higher cognitive levels such as questioning and comparing. On the other hand, it contributes to developing permanent awareness by providing experience-based learning. It is an activity that helps students to think thoroughly when facing a problem, to make decisions during action and to develop consciousness afterwards.

Participants

The research took place in two primary schools (one public, one private) in Bursa in the spring semester of 2016-2017 academic year. Participants consist of 7 class teachers of these schools, 12 pre-service teachers and 7 4^{th} -graders in order to typically describe the case (Patton, 2014, p. 236). Noise Maps were gathered from the 162 students from these schools. Permissions for the institutions and participants to voluntarily take part in data gathering were provided prior to the process.

Data collection process and procedures

The data collection process was planned based on the case formed by the Noise Map Activity. The aim of the activity was to understand the students' perceptions of noise. The data set of the observations of students and teachers and interviews with seven students was supported by the quantitative data obtained from the 162 maps. Table 3 shows the longitudinal process during preparation, data collection during and after activity.

Table 3. Roles of participants during the activity and the data collection process

Definition and number of participants	Roles in the case	Roles in data collecting process
Class teacher (7) Responsible for the class where activity took place	1-Briefed about activity. 2-Assisted executive teacher during activity.	1-Did structured observations during class. 2-Filled participant journals after class. 3-Answered teacher interview questions post activity.
Executive teacher(6) Pre-service teacher responsible for executing the activity	1-Briefed about activity. 2-Trained by a qualitative research specialist regarding observation and interviews. 3-Communicated with teachers at schools. 4-Guided the activity.	1-Answered teacher interview questions post activity.
Observer teacher(6) Pre-service teacher assisting executive teacher and collecting data.	1-Briefed about activity. 2-Trained by a qualitative research specialist regarding observation and interviews. 3-Communicated with teachers at schools.	1-Did structured observations during class. 2-Filled participant journals after class. 3-Interviewed class teacher, executive teacher and students after class.
Activity group students (7) The students that were interviewed	1-Briefed about activity. 2-Filled noise map in various locations at school. 3-Answered noise map discussion questions.	1-Answered interview questions post activity.
Students (162) The students in the class where activity took place	1-Briefed about activity. 2-Filled noise map in various locations at school. 3-Answered noise map discussion questions.	1-Provided quantitative data for noise map.

Given that the current research was a case study, and given the need to research multi-dimensionally and longitudinally, special emphasis was placed on data triangulation. Hence, data source triangulation and data collection tools triangulation were conducted. The data collection tools are presented below:

Document analysis: Every object in qualitative research collected from institutions or individuals in order to describe or explore the cases or experiences regarding social or physical context. According to Yıldırım and Şimşek (2016, p. 190) education-related documents are formal documents like homework, schedules, student's or teacher's books; as well as journals and private correspondence. Collected, archived and analysed documents in this research are as follows:

a. Participant Journal: Journals are qualitative data collection tools in which participants or researchers convey the cases subject to the research with expressions reflecting their experiences. As to save time and effort, a semi-structured journal form was prepared. The form includes three open-ended questions. 1) What happened in the "noise" themed activity today? What did you see? 2) What were the student achievements of today's activity in your view? 3) What did you feel as a noise researcher?

b. Noise Maps: Materials designed to describe the case in which students grade noise levels in different areas of the school as low, moderate or high. (Table 4).

Structured observation: Merriam (2013, p. 114) mentions that the physical setting, participants, activities and interactions are essential elements during an observation. These are the items regarded during observations in order to describe the case: 1.How is the atmosphere when the maps are presented in the classroom? How is the teacher-student behaviour? How is their communication? What are they saying? 2. How do the students approach the questions? 3. How do they describe the places they deem noisy? 4. How do they describe the places they consider quiet?

Interview: In the current study, interviews were prepared according to participant type. They were structured in compliance with Patton's (2014, p. 348) standardized open-ended interviews. Teachers were asked questions to reveal their experience and behaviours, whereas students were asked questions to reveal their emotions.

a. Teacher Interview Form: Class teachers and assisting teachers were directed three semi-structured questions: 1. Please explain the activity from beginning to end. 2. What measures can be taken to engage the students to take part in the process more actively? 3. As a teacher, what further activity suggestions could you give to create awareness of noise pollution?

b. Student Interview Form: Students were asked one semi-structured question: What did you feel while filling the noise map form?

Data analysis process

Qualitative research uses methods such as thematic, descriptive, narrative and discourse analysis. Descriptive analysis was preferred for this research as the activity was to review a single case based on experience and opinions throughout the teaching process. Descriptive analysis interprets data according to pre-designated themes, or questions of interview and observation processes. (Yıldırım & Şimşek, 2016, p. 239) Direct quotation of views is essential. Descriptive analysis consists of four steps. The first step is to construct a framework. A framework is built based upon the conceptual framework of the research or the questions. The second step processes data according to the thematic framework; data are selected and organised where some data may be left out. Describing findings is the third step where data is described clearly, avoiding unnecessary repetition. In the final step (Interpreting Findings), the cause and effect relationship of the findings is interpreted and explained. Given that the current research is a case study and that it is fundamental for the case to be described, steps of descriptive analysis gathered from international literature were utilized.

The 7E Model is a model of constructivist approach used to design the education process of a lesson and was used to guide the descriptive analysis in this research. Eisenkraft (2003) developed this model by expanding the 5E Model. This model aims to activate the students based on the fundamentals of constructivist approach. The 7E Model uses a cyclical process where the existing knowledge is first revealed then questioned and elaborated by explanations so that students can explore new solutions and concepts. The 7E Model has 7 phases within the education process: 1) Elicit, 2) Explore, 3) Explain, 4) Elaborate, 5) Extend, 6) Exchange and 7) Evaluate.

Improving the quality

Validity-reliability in qualitative research is provided through credibility, transferability, dependability and confirmability methods. Güler, Halıcıoğlu and Taşğın's (2013, p. 331-355) instructions to improve the quality of the research were taken into consideration.

Triangulation of the researchers and methodology: Triangulation of the researchers was provided by employing four researchers for qualitative data analysis and constantly controlling the coding, reaching sub-themes and parent themes processes. The data collection tools observation, interview and documents were used to understand the case multi dimensionally. The case

was described by the view and observation data of students, class teachers, executive and observer teachers who constitute the social context.

Transferability (Generalization): Analytic generalization is preferred in qualitative research over statistical generalization. A detailed analysis is presented in this study so that the reader can make inferences about different areas. Direct quotations in the findings section increase credibility.

Dependability: Observation, interview and documents as data collecting tools are presented clearly under this section. This clear presentation is helpful to achieve similar outcomes in case the research is repeated. The roles and characteristics of the study group are shown in a table. The data collection process, the analysis approach, sample visuals of maps and the noise map frequency table are also presented within the results section.

Confirmability: By presenting the results objectively, with positive and negative samples, and by data showing similarity or contrast, possible mistakes are reduced and confirmability is provided. Another way followed to ascertain confirmability was to ensure appropriate and consistent methods in terms of preparing data collection tools according to the research purpose and questions. Therefore, the Noise Maps were prepared suitable for the students' cognitive levels and the physical setting. Moreover, the observation and interview forms were prepared not only to gather quantitative data but also to comprehend students' awareness and experiences.

RESULTS

All findings of this research obtained through descriptive analysis using the theoretical framework of the 7E Model, are presented in seven themes, regarding the whole data set of the analysis, using direct quotations, quantitative data and documents.

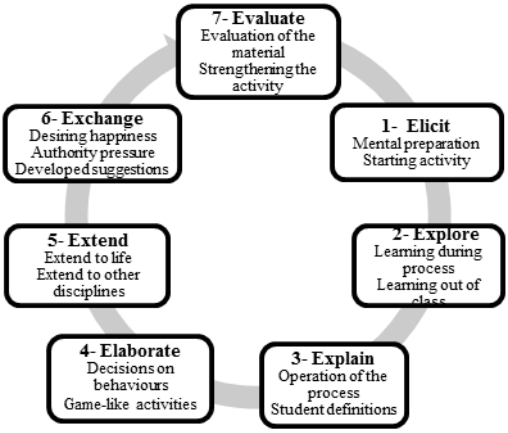

Figure 1. Themes and sub-themes

Eliciting the activity

Mental preparation is the process where the teacher uses association to previous activities. Nazan stated "First, the significance of noise was remarked by reminding the noise of last week's story activity and asking 'Where is intense noise in the school?'" (Executive teacher Nazan, interview p. 2)

Starting activity defines activities done to elicit. Teachers use motivation and question answer methods. The statement "Students were happy and interested when we explained the activity" (Observer teacher Murat, observation, p. 7) can be an example of motivation and the statement "Q&A technique was a prologue to noise." (Class teacher Selin, interview, p. 11) is an example of question answer.

Exploring noise

Learning during process includes examples where students hypothesize and question through comparisons. "Before filling the maps, hypotheses were created saying the quietest place is the classroom." (Observer teacher Murat, observation, p. 7) is an example for hypothesizing. On many maps, just like Merve's Noise Map, hallways, classrooms and refectory were marked as intensely noisy. Begüm showed an example of questioning with her statement "We questioned the reasons of noise at school." (Student Begüm, interview, p. 6).

Table 4. Merve's noise map

	Noise Level		
Location	**Low**	**Moderate**	**High**
Hallway			
Classroom			
School Yard			
Refectory			
Gym			

The sub-theme learning out of class includes off-process exploring activities such as encouraging research and learning through social experiments. "Students may be asked to present their research on the topic." (Class teacher Nehir, interview, p. 10) is an example of encouraging research. The suggestion "Students can be made aware of how they should act in society without any supervision." (Class teacher Yağmur, interview, p. 2) indicates learning through social experiments.

Explaining noise maps

Operation of the process includes examples of students discussing and deciding. "Discussion lead to the decision that noise is highest in the hallways. (Executive teacher Bora, interview, p. 2) shows that students contribute to the activity by discussions. Table 5 shows that 102 of 162 students specified the hallways as the noisiest places during recess. The statement "The noisiest place during recess is identified as the hallway, the quietest place as the classroom." (Class teacher Selin, interview, p. 11) indicates an attempt of students deciding on the noisiest location.

Based upon the statements of students on noise, codes such as reacting to noise with noise, disliking noise, noise obligation, health complaints and reasons for growing apart from school were identified in the sub-theme student definitions. "Students claimed that they make noise because they get angry with students fighting and screaming in the yard." (Executive teacher İrem, interview, p. 8) shows that students react to noise with noise. "They chose the hallway to be the noisiest location and said they didn't like it" (Observer teacher Seher, participant journal, p. 3) is an example of students disliking noise. "We shout to understand each other when there is noise, which causes more noise." (Student Eylül, interview, p. 9) is a good example on how students perceive noise as an obligation. "We get headaches and don't want to come to school because everybody is running and shouting in the hallways" (Student Mete, interview, p. 2) can be

interpreted that students grow apart from school because of noise. “Students stated they get tinnitus when they get home due to the noise at school.” (Executive teacher Bora, interview, p. 2) is one of the health complaints.

Table 5. Noise levels in various locations of the school during recess and class

	Low (Green) (f)		Moderate (Yellow) (f)		High (Red) (f)	
Location	**Class**	**Recess**	**Class**	**Recess**	**Class**	**Recess**
Hallway	153	3	7	57	2	102
Class	98	15	59	19	5	128
School yard	142	11	19	52	1	99
Refectory	121	7	36	46	5	109
Gym	103	4	57	117	2	41

Elaborating the activity

The sub-theme decisions on behaviours shows that when elaborating the activity, students make decisions such as thinking positively, desiring to learn listening, approaching everyone equally and freedom of thought. “We don’t need to shout if we think positively” (Student Aysun, interview, p. 1) is an example for positive thinking. “If we stay calm and listen, we can understand our friend and don’t make noise. This is taught in Human Rights lesson.” (Student Doğa, interview, p. 7) shows the desire to learn listening. The statement “We need to be patient towards the people we dislike and mustn’t shout at them.” (Student Ilgın, interview, p. 5) is striking as a code for approaching everyone equally. “We need to be tolerant and silent towards people we dislike. Children rights are important.” (Student Begüm, interview, p. 6) indicates freedom of thought.

Game-like activities was handled in two codes; application examples and teachers being role models. “Students are attracted to theatre. Empathy may be developed through acting activities.” (Class teacher Yağmur, interview, p. 2) is a suggestion for application examples. Neslihan’s statement “Teachers should speak quietly. Students are louder when the teacher yells.’’ (Class teacher Neslihan, interview, p. 5) is an indication on how the teachers are supposed to be role models.

Extending

Extending to life includes the codes realizing and accepting. Eylül showed that she is aware of noise by answering the question "What did you feel filling the noise map?" as "I realized we are living in a noisy city" (Student Eylül, interview, p. 9). Tuğçe accepted that she is making noise by saying "We make too much noise." (Student Tuğçe, interview, p. 9).

About extending to other disciplines, students emphasized the harms of noise. Tuna reported that the question "How does noise at school affect you?" was answered by the students as follows: "We don't feel stressed, tired, experience hearing loss, get headaches in quiet places." (Executive teacher Tuna, interview, p. 9) According to the answers, health was determined to be the single code in this sub-theme.

Exchange on noise

Desiring happiness is the sub-theme where health, relaxation, improving communication quality and the preciousness of the rare were emphasized in the stage of changing the acquired and restructured knowledge of the students. "Students expressed that the quietest place was the classroom during lesson; that their throat and ears wouldn't hurt if they remained silent." (Observer teacher Esin, observation, p. 11) can be interpreted as an emphasis on health. Students realized they experienced relaxation in quiet environments as can be deduced from the statement "Students said they could relax and think better in quiet places." (Observer teacher Murat, observation, p. 7) "The first condition to communicate with our friend is to understand him/her; in order to understand we need to listen carefully." (Student Tuğçe, interview, p. 9). This data shows that students share the idea of improving communication quality. A striking example for the preciousness of the rare came from Gül. "Students say there are few quiet places and they can hear each other easily in these places." (Executive teacher Gül, interview, p. 3).

Authority pressure shows that the fear of authority keeps the students quiet. "How do they describe the locations they characterise as quiet?" was answered: "The students said that the principal's office is quiet because they are afraid of him/her." (Observer teacher Seher, observation, p. 1). This is an example of fear factor.

Developed suggestions are presented as peer education, variation of research and motivation. "What measures can be taken to engage the students to take part in the process more actively?" was answered by Cansu regarding peer education as: "They can make their friends to do the activity."

(Class teacher Cansu, interview, p. 4). Moreover, suggestions for variation of research were developed to be used in the exchange phase. “Noise levels in various locations can be measured quantitatively over long periods of time.” (Class teacher Yağmur, interview, p. 2) can be evaluated as a suggestion to elaborate the activity. The statement “We could make them paint noise and have them prepare crosswords about noise. I suggest activities helping to find elements evoking noise.” (Class teacher Arda, interview, p. 10) is to motivate students to exchange on the issue.

Evaluating noise

Evaluating the material: “The activity is salient, the questions were appropriate for the level.” (Class teacher Gönül, interview, p. 5) expresses views on sufficiency of the activity. The sub-theme strengthening the activity includes answers on how the teachers and pre-service teachers evaluate the activity process and what suggestions they make. “The students were eager to participate. They were competing to express their thoughts.” (Observer teacher Yasemin, interview, p. 12) is an example for active participation of the student. “It is effective at that moment, but they fail to develop proper behaviour.” (Class teacher Nehir, interview p. 10) is presented as an example for failing to develop behaviour. “The process can be made more entertaining. I don’t think it’s internalized.” (Class teacher Arda, interview p. 10) reveals the necessity of adaptation according to level. As an example for the code strengthening the presentation “We need to explain in an attractive way.” (Class teacher Yağmur, interview, p. 2) can be given. “Quiet ones can be given presents.’’(Observer teacher Ferhan, observation, p. 1) indicates the code praise. The question “As a teacher, what further activity suggestions could you give to create awareness of noise pollution?” was answered: “I would make the students sit in a quiet place and listen to the noise they make during recess. They may develop positive behaviour once they witness what they do.” (Class teacher Nehir, interview p. 10). This is an example for empathy. İrem’s suggestion is significant in terms of linguistic intelligence: “People can be interviewed in noisy places such as train stations.” (Executive teacher İrem, interview p. 8). “Educating animations but entertaining at the same time should be provided, if not available children should make their own.” (Executive teacher Tuna, interview p. 9) is an example for using humour.

DISCUSSION

Integrating the activity into science lesson

The report of WHO (2016) expresses that children are unable to assess the dangers of noise. The Noise Map in this research is developed in order to create awareness of noise perception among primary school students. As the activity takes places within a lesson, the process is consecutive. The introduction to activity stage involves introduction activities such as motivating the students for the activity, providing their physical and mental participation and creating interest. Creating association with previous experiences for mental preparation through question-answer and motivation is important. This complies with the strategy of Science Lesson to contribute to permanent learning through experiences.

Within the context of planning and implementing the education process, the implementation process of the activity includes the exploration, explanation, elaboration, extending and evaluation phases. These phases are in accordance with the constructivist approach (Eisenkraft, 2003) on which the 2018 Science Lesson Curriculum is based. The purpose of asking intriguing questions and having students creating hypotheses is to reveal the existing knowledge of the students. In this exploration phase, the teacher serves as a guide encouraging students to develop their exploratory spirit. This role complies with the leading role of teachers specified in the 2018 Science Lesson Curriculum. Students were expected to evaluate various locations of the school in terms of noise and to learn based on experiences and life. Besides learning during the process, the students experienced cooperation and observation outside of class. This phase also helps reaching the "questioning reasons for noise pollution" achievement highlighted in the 4th grade plan of science lesson. By being helpful to reach achievements, the Noise Map Activity proves to be appropriate to be integrated into the Science Curriculum. This result is similar to the conclusion of Bulunuz, Bulunuz, Ovalı, İri-Çıkrıkçı and Mutlu (2017) where they express that education activities help create awareness of, sensitivity and positive behavioural changes towards noise pollution in teachers and students. Students were guided in the explanation step to describe the issues by group discussions. Students (128) choosing the "class" as the noisiest location during recess and the expressions they used in the interviews, indicates employing decision making processes. Moreover, they made explanations regarding noise while answering the discussion questions of the Noise Map. What was achieved in this phase is significant in terms of involving the aim "To explain the negative effects of noise pollution on human health and

environment." of the 4th grade Science Curriculum. The students researched the concepts that they previously described and used these concepts to create new questions and solutions in the elaboration phase. The integration of the activity in this step is possible since it comprises the achievement "Develops solutions to reduce noise pollution." of the program. The activities in the elaboration phase are similar to the experimental study of Taş (2010) in which noise control was aimed through the school without bells project. Students referred to concepts such as positive thinking, equality and freedom of thought in the extending phase which shows that they are making associations between the Science lesson and the Human Rights, Citizenship and Democracy lesson. The fact that the students were emphasizing health issues while associating noise with other disciplines is of much importance. These results resemble the ones Hunashal and Patil (2012) reached in their study. The findings show that students first realize they are living in a noisy city and then admit that they are making noise. These reflections of the students may imply that the activity provides extending to daily life. In the exchange phase students collaborated by group discussions as suggested in the 2018 Science Curriculum. The phase revealed that students felt relaxed, healthy and communicated better in quiet environments. In addition to these views, they deemed silence as a "desire for happiness" since quiet places are "rare". Students remaining silent due to fear may also be associated with authority pressure.

Teachers investigated the reasons of the behaviour and opinion changes of the students and made a general evaluation of the process in the last phase of the activity. In this process, students were expected to explain the evidence they obtained from their experiences so that their awareness and perception level could be understood. The evaluation exhibits that the students developed awareness of noise and turned thoughts into action by constructing solutions. The noise perception of the students can be described as admitting making noise and feeling responsible for it. The Noise Map allowed students to actively participate in the process, gave them opportunity to take part in a scientific study, helped them develop positive thinking, respect to others, skills to express themselves, to discuss and to make decisions. Similarly, the Science Lesson Curriculum (MEB, 2018) encourages students to comprehend the relationship of technology, society and environment, and to feel responsible for finding solutions to social problems.

RECOMMENDATIONS

The Noise Map Activity has been described as a case from different aspects and with the views of the participants. The activity contributed to developing social skills such as positive thinking and freedom of thought; intellectual skills such as comparison, self-criticism, decision making and problem-solving; individual awareness of health and environmental protection. This activity, which promotes these skills and raises awareness, should be conducted meticulously encouraging all students to participate. The scope of the activity can be extended in order to motivate for research out of the class and learning with social experiment. Regarding transforming awareness into permanent behaviour, the activity can be strengthened through periodic repetition and diversifying the material. The practices planned to enrich the activity are better developed by employing the constructivist education phases such as eliciting, exploring and exchange. This activity involves consecutive stages like preparation, implementation and evaluation. Therefore, developing the activity in a holistic manner, considering its interactive structure which allows the student to be active and its consecutive stages, may contribute to developing permanent behaviours.

It will be more effective to adapt the activity according to the class level and to rearrange it to attract the students. Primary school level activities may involve games and scissor skills, where in the secondary school, metaphors to use metacognitive skills and association to ideas on noise may be utilized. Teachers in the research suggest humour containing activities focusing on developing linguistic intelligence. Humour may be used as e technique within the phases of the activity or each phase can be strengthened through the Theory of Multiple Intelligence. Aside from these suggestions, students can act like teachers by peer education and teachers can encourage the students more to think about noise by diversifying the activity.

Considering the results of this research, in order to improve noise perception in students, the Noise Map Activity can be implemented efficiently by class teachers in primary schools and by science teachers in secondary schools. Administrators and teachers need to take the necessary steps and be consistent so that they can prevent students from running in hallways and classrooms, speaking loudly with each other, screaming, slamming the doors, moving the desks and chairs loudly. It should be the duty of all stakeholders to teach students that noise pollution has negative effects on human health just as other pollutions and to create permanent noise awareness.

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GENİŞ ÖZET

Gürültü, günümüzde okul iklimini etkileyen önemli unsurlardan biri olup, yüksek enerjiye sahip ses dalgaları olarak adlandırılmaktadır. Gürültünün yaşamdaki olumsuz etkilerinin tespiti, tanımlanması ve kontrolü hususunda gerekli adımlar, bireylerin çocukluktan itibaren topluma kazandırıldığı eğitim kurumlarında atılmalıdır. Gürültüye maruz kalan paydaşların deneyim ve algılarının ortaya çıkarıldığı örnek eğitim durumlarının araştırmalara konu olması önemli bir durum olarak nitelendirilebilir. Bu çalışmada "okulda gürültü kirliliği haritası etkinliğinin uygulanması" bir durum olarak araştırılmaktadır. Araştırmanın okulda gürültü algısını öğrencilerin deneyimleriyle belirlemek ve paydaşların görüşleriyle çok boyutlu biçimde betimleyebilmek amaçları doğrultusunda, programın öğrenciyi deneyimler yoluyla merkeze alan yapılandırmacı yapısına uygun bir etkinlik planlanmıştır. Araştırma 2016-2017 Eğitim-Öğretim yılında Bursa'da iki ilkokulda yürütülmüştür. Bu çalışma kapsamında oluşturulan etkinlik hakkında öğretmen adayları bilgilendirilmiş ve ilköğretim okullarına giderek 4. sınıf öğrencilerine "Gürültü Haritası" etkinliğini uygulamışlardır. Araştırmada gürültüye maruz kalan paydaşların deneyim ve görüşleriyle, gürültüye ilişkin durumun, öğrenci, öğretmen, öğretmen adayları tarafından betimlenmesi amaçlanmaktadır. Araştırmada, veri kaynağı çeşitlemesi ve veri toplama araçlarında çeşitleme uygulanmıştır. Katılımcı günlüğü, gözlem formu, öğretmen ve öğrenci görüşme formu ile gürültü haritaları veri toplama araçları olarak kullanılmıştır. Araştırmada nitel araştırma yöntemlerinden durum çalışması ve 'bütüncül tek durum deseni' kullanılmış, veriler betimsel olarak analiz edilmiş ve analize yön veren kuramsal çerçevede yapılandırmacı yaklaşımın öğretim modellerinden biri olan 7E Modeli kullanılmıştır. Bulgular öğretmen, öğrenci ve öğretmen adaylarında gürültü farkındalığı oluştuğunu, gürültüye önlem alma noktasında önerilerde bulunup, bilimsel çalışma deneyimi yaşadıklarını göstermektedir. Öğrencilerin etkinlik yoluyla gürültüyü diğer disiplinler ve günlük yaşam ile ilişkilendirmesi araştırmanın dikkat çekici sonuçları arasındadır. Ders dışında da araştırmaya yönlendirme ve sosyal deney şeklinde öğrenmeye öncülük etmesi açısından, etkinliğin kapsamı geliştirilerek uygulanabilir. Araştırmaya konu olan etkinlik, ortaokul öğrencilerinin üstbilişsel becerileri kullanabilecekleri metaforlar kullanarak ya da gürültü göstergelerinin çağrışımlarından yararlanarak uygulanabilir. Ek olarak gürültü haritası etkinliği farkındalıkların kalıcı davranışlara dönüşebilmesi için belirli dönemlerde tekrarlanarak, materyal değişiklikleri ile etkinlik güçlendirilebilir. Araştırmanın sonucunda, ders dışında da araştırmaya yönlendirme ve sosyal deney şeklinde öğrenmeye öncülük etmesi açısından, bu etkinliğin kapsamının geliştirilerek okullarda etkin biçimde uygulanması önerilmektedir.