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THE SCIENCE LEARNING ENVIRONMENT PRIMARY SCHOOL STUDENTS' IMAGINE

Demet Şahin Kalyon

Abstract. *This research explored dream science classrooms of primary school third- and fourth-grade students. Research is designed as a case study. The students were first asked to illustrate their dream science classroom and produce a short description of their drawings. Second, they were asked to write their expectations of their teachers, their classmates, and themselves in their science classes. Three hundred and twelve participants were identified using the convenience sampling method. The research evaluated the students' drawings and descriptions in the first step, and their expectations in the second step. Students, in their drawings, conveyed the following messages: Experiments (lab works) could be used in science education, and different classroom activities and science courses could be done outside the classroom. In addition, they expected their teachers to have them perform more experiments in the classes, to offer them interesting and intriguing knowledge, to encourage them to conduct research and projects, and ask questions. Their expectations of their classmates to follow the classroom rules, to work in collaboration, to share, and to appreciate them so that they can benefit from science classes more efficiently. They expected themselves to be successful in science classes.*

Keywords: *classroom environment, learning environment, science class, science teaching, student drawings.*

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Introduction

In recent years, it has attracted pretty much attention on how to teach science to students. The well-accepted view is not only to provide students with scientific concepts, but also to grow scientific literate individuals by engaging them in scientific inquiry process because science learning is characterized by conceptual understanding, as well as granting purposeful participation and, therefore, a sense of belonging of children in scientific practice (Caiman & Jakobson, 2019).In science classes, there is a need for practices allowing students to discover science instead of teaching ready-made scientific information. It is necessary to teach students how to do science. Science education is the teaching of science to non-scientists, including children, and it uses some attractive and surprising means around the children. It is the education of the food the children eat, the water they drink, the air they breathe, their bodies they are curious about, the animals they feed, the cars they get on, the electricity they use, the light, and the sun they benefit. With science education, students have the chance to know and interpret scientific explanations of the natural world they live in. In this sense, science education is a natural and concrete education that needs to be done through the appropriate methods, taking the children's interests and needs, the level of their developments, their wishes, and their environmental potentials into consideration (Balbag & Karaer, 2016).

Science education at the primary schools provides the opportunity for developing scientific ideas, challenging the nonscientific ideas that children are likely to form with no guidance. It gives children experience of scientific activity to inform the development of attitudes toward science (Harlen & Qualter, 2017).

The subjects and concepts taught in science classes naturally exist in our world. Science classes enable students to explore natural phenomena surrounding them and construct concepts toward them. Briefly, science classes should attract students as the way nature attracts people through different colors, sounds, flavors, smells, and textures. Science classes aim to teach students how to discover and use information instead of memorizing it. In addition, students should raise an idea about scientific methodology

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through science classes. The activities performed in these classes help students learn basic science concepts and develop skills to adapt their knowledge to daily life by working on everyday problems. As a consequence of the activities performed in the classrooms, students are expected to acquire the skills and to develop a positive attitude toward science classes. In this case, the effectiveness of science classes is shaped by the classroom environment, and attitudes of teachers and students toward the class. Therefore, the classroom environment, teacher practices, and student characteristics have the capability to shape the class overall.

Several studies have claimed that the students do not like science classes very much, although these classes have a robust relationship with daily life, and their interest in this class has been gradually decreasing (Murphy & Beggs, 2003; Murphy et al., 2004; Osborne et al., 2003; Scamp & Logan, 2005; Potvin et al., 2014). Besides, it is thought that one of the biggest challenges of this century is to inspire students for continuing their learning and achievement in science education (Bal-Taştan et al., 2018). The problem of declining interest in school science is international (not universal), and many reasons have been put forward to explain this, such as gender and grade level (Alexander et al., 2012; Cavas, 2011; Guvercin et al., 2010), primary school teachers' lack of confidence in teaching science and their insufficient subject matter knowledge, (Murphy & Beggs, 2003).

Student attitudes toward school subjects are shaped by the interaction of three variables: teacher characteristics, student characteristics, and the learning environment (Myers & Fouts, 1992). Therefore, the characteristics of the learning environment affect the interests and attitudes of students because teachers can include different activities in science classes as long as their knowledge and environmental conditions allow. Diverse activities deployed in the learning environment affect students' interests and attitudes toward the class positively.

What is a learning environment then? Imagine a traditional classroom. What are the class members doing? What tools (physical and mental) are they using to learn? With whom are the participants doing their work? What is the work like? What is the nature of communication among the participants? What purposes are you able to derive for the activity of the group? These are just a few of the variables determining the nature of learning environment (Magnusson & Sullivan-Palincsar, 1995).

A learning environment is characterized by a unique interactive combination of teacher activities, peer interactions, and teacher-to-student interactions that evolve within the classroom setting (Myers & Fouts, 1992). It has been found that the learning environment is reliably and strongly correlated with achievement and affective outcomes (Fraser, 1999). The expectations of students about the science classroom environment were favorably correlated with the student attitude toward science and the student's academic achievement in science (Bas, 2012; McRobbie & Fraser, 1993; Talton &Simpson, 1987).

The physical environment of the classroom, science classroom activities, and peer interactions are all significant issues that need to be considered when analyzing how individuals think about the science class (Talton &Simpson, 1987). For this reason, this research explored what kind of environment and with whom (students' expectations of their teachers and classmates) students would like to be taught in science classes. To serve this purpose, students were asked to draw a science class of their dreams, hence the data of the research were collected through these drawings. Drawings are used as a data-collection tool such as questionnaires, scales, observations, and interviews in educational research. Drawings were used as the data collection tool in educational research because they are considered one of the fun activities of children. Furthermore, drawing is not only a tool through which children can express themselves easily but also a process that can be combined with teaching areas such as science education (Balliel-Unal, 2017; P. Hudson & Hudson, 2001).

Children inherently develop a specific language to communicate with their environments during their infancy, which is how they communicate verbally. They are then taught to communicate through the written language. Children also develop a visual language acting as a link between verbal language and written language. Children from 12-18 months can realize that a pencil left marks and these marks can also be traced, which is considered a great discovery for them. Afterward, children combine lines and create new designs. As they grow, they master in drawing, and their shapes and signs can be used to portrait the world surrounding them. Their drawings develop from simple to complex with natural and orderly steps. This process provides children with means for visual communication (Nelson et al., 1998).

The study of Gomez-Arizaga et al. (2005) showed that the use of children's drawings is a helpful tool for researchers because drawings are one of the ways that children reveal their inner selves and worlds. The use of drawing and writing is one of the effective ways of identifying students' perception on an ideal classroom: role definition of their teachers, their expectations of their classmates, and the actual classroom arrangement (traditional versus nontraditional) (Ulker et al., 2013) inasmuch as even the most straightforward drawing extends exclusive

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opportunities for complementing expressions, and enable people to communicate what words cannot in many cases (Malchiodi, 2003, p. 1). Students make representations in their drawings to express their thoughts, feelings, and perceptions and show relationships and changes (Nelson & Chandler, 1999).

Drawings have been used as data collection tools in some studies in the field of science education; however, the purpose of these studies is mostly to illustrate a scientist or a science teacher image of students and teacher candidates (Akkus, 2013; Go & Kang, 2015; Oğuz-Ünver, 2010; Şahin, 2009; Thomas et al. 2001; Thomas & Pedersen, 2003; Yontar-Toğrol, 2000). The number of studies aiming to reveal thoughts about the learning environment through drawings is very limited (Yılmaz et al., 2008). Besides, the data are generally obtained through scales in studies to define the learning environment (Efe et al. 2007; den Brok et al. 2010; Welch et al. 2014). Such studies generally examined middle and high school students. This research aimed to fill a gap in the science education literature because thoughts of primary school students about their teachers, learning process, their classmates were obtained through their drawings. The research makes an important contribution to the concept of a science teacher and the science learning process.

In this research, primary school students were asked to depict their dream science classrooms. The research aimed to reveal how students dreamed of learning environment in their science classes. The research results and findings may be used as a guide for teachers and teacher candidates while conducting the science classes. While organizing science classes, it is helpful for teachers and teacher candidates to know their students' expectations to perform the lessons more effectively because research on the learning environment provides a well-established approach to explain and understand what is going on in classrooms.

Based on this idea, the research explored dream science classrooms of third- and fourth-grade students. The research had the following research questions:

1. What kind of science classrooms do the third- and fourth-grade students dream of?
2. What are the expectations of primary school students of their teachers in their science classrooms?
3. What are the expectations of primary school students of their classmates in the science classrooms?
4. What are the expectations of primary school students of themselves in their science classrooms?

Research Methodology

Research Design

In this research, third- and fourth-grade students illustrated their dream science classrooms through their drawings. This research is designed as a case study. Case study is considered one of the most widely used research in social sciences. It can explain phenomena that are difficult to understand through experimental studies and trying to define cases where they emerge (Buyukozturk et al., 2010; Yin, 2003). Bogdan and Biklen (1992, p.62) define case study as a detailed study of a subject, a formation, or a specific phenomenon through collected documents. The "case" specified in this design can be a person, an event, a social activity, a group, or an institution (Jupp, 2006, p. 20). The case examined in the research is the learning environment in which students want to be in their science classes. The students drew what kind of classroom they want to be in their science classes. In addition, they wrote their expectations of their teachers, themselves, and their classmates. In this way, the students' drawings about the learning environment in the science classes and their expectations of their teachers and classmates were analyzed, and multifaceted and in-depth implications were tried to be derived from their perceptions. To sum, the learning environment was examined in the context of the physical environment, the teacher, the student itself, and its classmates. Research data were collected in the first semester of the 2018-2019 academic year.

Participants

The convenience sampling method was used to select the study sample because it is a frequently used method in qualitative research and includes available and ready-to-use groups of people (Fraenkel & Wallen, 1990). In this research, data collection took approximately 40 minutes, which corresponds to one class hour, so that administration and teachers should voluntarily allocate 40 minutes to this research as an extracurricular activity. For this reason, the schools with teachers and students who could voluntarily participate in this research were determined. The reason for selecting these schools is that the researcher has had a close relationship with school administrators and teachers for a long time because candidate teachers enrolled in the university where the researcher is employed

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do their teaching practices in these schools. In addition, Tokat Gaziosmanpaşa University, where the researcher is employed, has a contract with these schools. Administrators and teachers in these schools are willing to contribute to scientific studies. Finally, studies were conducted with third- and fourth-grade students enrolled in two primary schools in Tokat, a city in Turkey. The number of students participating in the research is given in Table 1.

Table 1
Participants of the research

School	Grade		Gender		Total
	3	4	F	M	
School A	98	117	93	122	215
School B	64	72	69	67	136

A total of 351 students participated in the research, but as a result of the preliminary examination of the drawings, the drawings of 39 students were considered invalid.

Thus, the sample was composed of a total of 312 primary school students, of whom 156 were third graders, 156 were fourth graders. During the data collection process, the participants were told that their drawings and written expressions would not be used for any other purpose. Rather than their drawings, only some demographic information such as gender, school, and grade and the participants were not asked for further personal information. The required permissions were obtained from administrators and teachers during the data collection process.

Measures

In this research, the students' drawings and written expressions were used as data collection tools. In the data-collection stage, the students were first asked to draw their dream science classrooms and write a short description about what they drew. They were then asked to write down what they expected from their teachers, their classmates, and themselves. All the data were collected on a single sheet of paper. They drew on the front side of the paper and wrote the description of the drawing on the back side. Then, they were asked to answer the questions "What are your expectations of your teacher in the science class?", "What are your expectations of your classmates in the science class?" and "What are your expectations of yourself in the science class?." There was no restriction on the use of the pencil while drawing. The students were instructed that they could use only pastel, dry paint, or pencil. The students were given 40 minutes to draw, and there was no guidance on what to draw.

Data Analysis

A constant comparison procedure was utilized in this research. This procedure allows researchers to evaluate themes obtained from interviews, field notes, and other sources and to compare them with the same or another set of data (Merriam, 1998). The themes in this research were obtained from the analysis of the drawings and written expressions. The analysis was conducted in two steps: analysis of the students' drawings and analysis of the students' expectations. Drawings and their descriptions were evaluated in the first step, while the students' expectations were evaluated in the second step.

First Step: Students' Drawings

The content analysis method was utilized to examine the students' drawings. For the analysis, themes were identified and quantified by their frequencies (Figure 1). The drawings were evaluated only for the visual elements they contained, and no psychological analysis was conducted. The Draw-a-Scientist Test (DAST-C) (Chambers, 1983) and the Draw-a-Science-Teacher Test Checklist (DASTT-C) (Thomas et al., 2001) have been used in studies conducted on the data collected through drawings in the field of science. The DAST-C was not adopted by this research because it is an assessment tool created to reveal a scientist's image. The DASTT-C asks participants to

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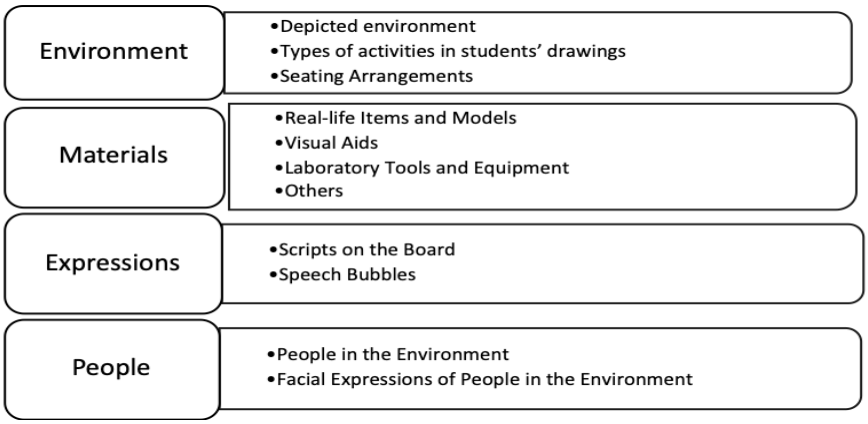
draw themselves as if they were a science teacher. Nevertheless, the purpose of this research was to reveal what kind of learning environment students would like to be in. Although the DASTT-C does not serve the purpose of the research, some headings in the DASTT-C score sheet still functioned as a source for the researcher in generating the main themes of this research.

Figure 1
Themes of the analysis



Student drawings were examined one by one, and all the drawing elements were transferred to the computer. The main themes and sub-themes were identified in this process. Accordingly, the student drawings were evaluated under the main themes of "environment, " "materials," "expressions," and "people. " Each theme consisted of some sub-themes, which were determined based on the frequency of the elements that the students drew. For example, there is the sub-theme titled "depicted environment" under the main theme of " environment. " It appeared that they often drew classroom, laboratory, and out-of-classroom environments, therefore, the "depicted environment" was identified as a sub-theme. Other sub-themes were similarly generated. After determining the main themes and sub-themes, an expert opinion was taken. Following the interviews with the experts it was concluded that this analysis framework was appropriate for the research.

Second Step: Students' Expectations

Student's expectations were analyzed in the same way. Themes were generated based on their expectations and identified and quantified by their frequencies. The main themes were identified as " expectations of teachers," "expectations of classmates," and "expectations of themselves. " For example, there is the sub-theme of "experimenting" under the main theme of "expectations of teachers." It was seen that the students mostly asked their teachers to have them do experiments. For this reason, the "experimenting" was identified as a sub-theme. Other sub-themes were created in the same way. After determining the main themes and sub-themes, the expert opinion was taken. Following the interviews with the experts it was concluded that this analysis framework was appropriate for the research.

Research Results

Students' Drawings

The drawings of the students were evaluated within four themes: environment, materials, expressions, and people. Each theme consisted of some sub-themes.

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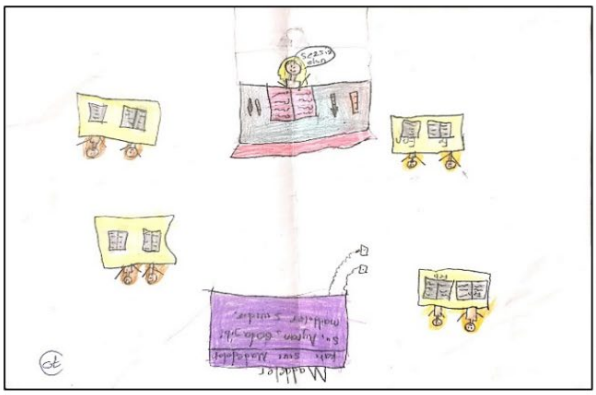
Environment

Depicted Environment

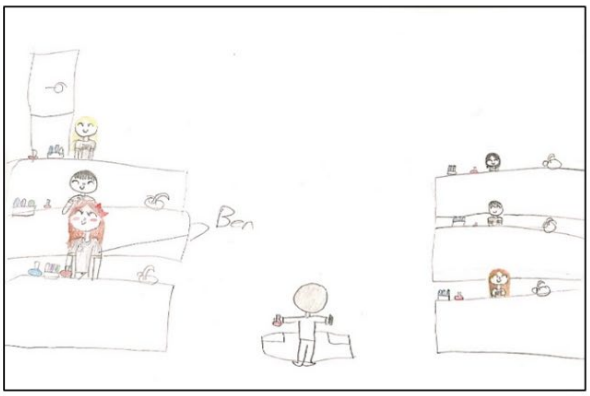
As Table 1 illustrates, most of the students (*n*=112) drew themselves in a classroom or a laboratory setting. Figures 2 and 3 show an example drawing and its description depicting students in a classroom or a laboratory setting.

Figure 2
An example of a classroom



4G70[1]: "Children open their books and are being taught solid and liquid materials."

Figure 3
An example of a laboratory



4G132: "I am explaining that I want to be taught science in the laboratory."

Table 2
The frequency distribution of environments in the students' drawings

Environments	Grade		
	3	4	Total
Classroom	68	44	112
Laboratory	53	59	112
Outdoor	8	31	39
Exclusive classroom	13	7	20
Library	-	1	1
Invalid	11	17	28

As Table 2 indicates, 39 students drew themselves in an out-of-classroom environment, while 20 of them drew themselves in an exclusive classroom. Figures 4 and 5 provide two examples of such drawings.

[1] 4G70: Number and letter (4G) represent grade. The last two or three numbers (70) represent the number of the student participating in the study.

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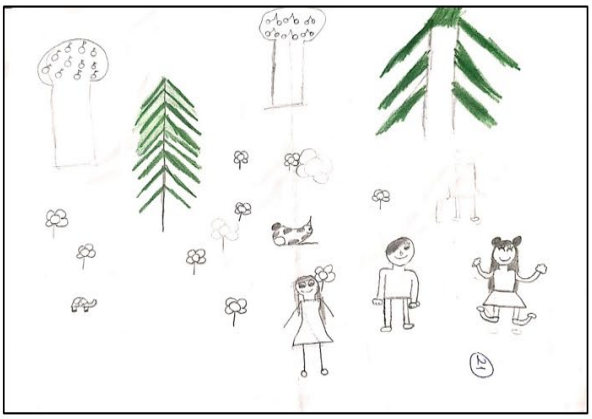
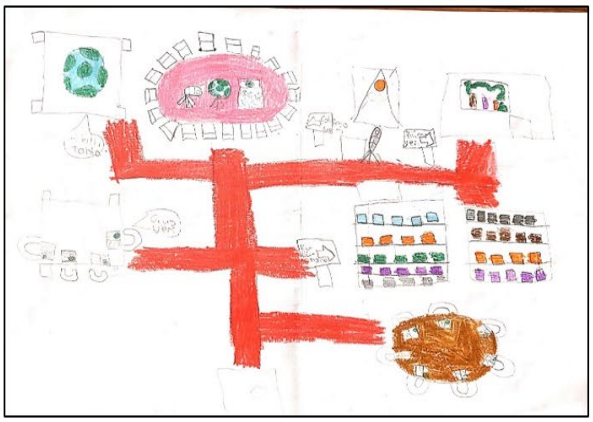
Figure 4
An example of outdoor environment



3G21: "We are learning our sense organs in a study rural area."

Figure 5
An example of an exclusive classroom



4G20: "A smartboard for students to see better, a place to understand what they see, a telescope to see outside - space -, a library, a place to do science to comprehend these potions, and a study place for a group of four."

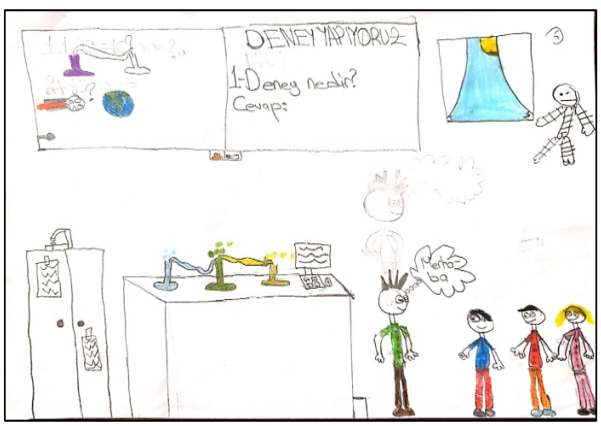
Types of Activities in Students' Drawings

Some of the participating students did not draw any activities even though they drew a classroom or a laboratory. Therefore, the number of activities in the drawings (n=109) was less than the environments drawn.

As Table 3 depicts, the majority of students drew the following science activities with a total of 127 activities: experiment 74, observation 45, research 4, discussion 2, and problem-solving activities 2.

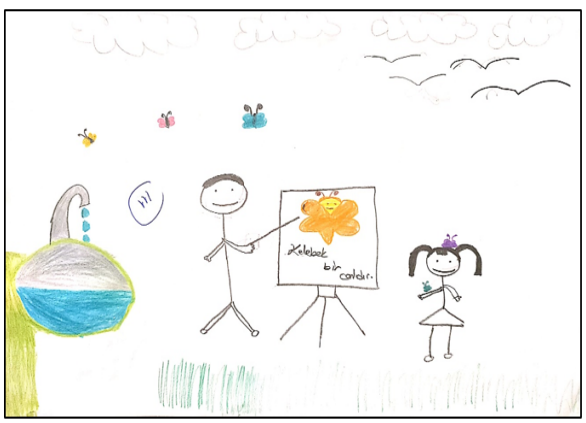
Figures 6 and 7 show some examples of such drawings.

Figure 6
An example of an experiment



4G5: "We are experimenting with our teacher."

Figure 7
An example of an observation



3G11: "We are observing beings in nature and listening to our teacher."

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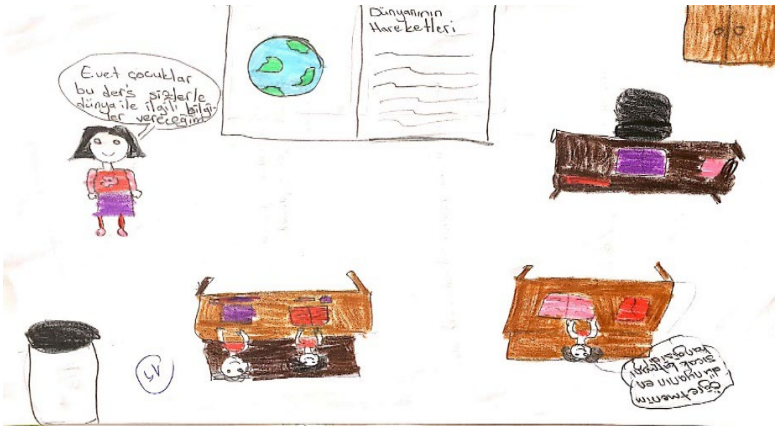
Table 3
Frequencies of types of activities in the students' drawings

Types of activities	Grade		
	3	4	Total
Experiment	37	37	74
Lecture	34	27	61
Observation	11	34	45
Research	2	2	4
Discussion	2	-	2
Problem-solving activities	2	-	2
Others	Demonstration, reading, activity, interview, drama, picnic, playing games	Demonstration (5), taking notes, explosion, watching videos	15
Invalid or no activity	60	49	109

Some students (*n*=61) drew themselves as if they had been lectured (Table 3). Lecture means that the teacher teaches the subject actively while students only sit at their desks and listen to the teacher passively. In such drawings, the teacher was illustrated as being in front of the board and talking, and students just sat at their desks. Figure 8 presents an example of such drawings.

Figure 8
An Example of a Lecture



4G15: "Teachers are explaining some facts about the world and students are listening to the lesson."

Seating Arrangements in Students' Drawings

Table 4 shows that the majority (*n*=95) of students drew themselves as sitting with a traditional-seating arrangement. Students in Turkey usually sit at their desks arranged according to the traditional seating concept. Students usually sit at their desks in pairs. Figure 9 presents an example of such a seating arrangement drawn by students.

Some students drew themselves in an individual (*n*=44) classroom-seating arrangement either in a lab or a classroom. Figures 10 and 11 present some examples of such drawings.

The number of students drawing a laboratory-seating arrangement (*n*=42) was less than those drawing traditional seating. Figure 12 shows an example of a laboratory-seating arrangement drawn by the students. In this arrangement, students work at the lab tables as groups.

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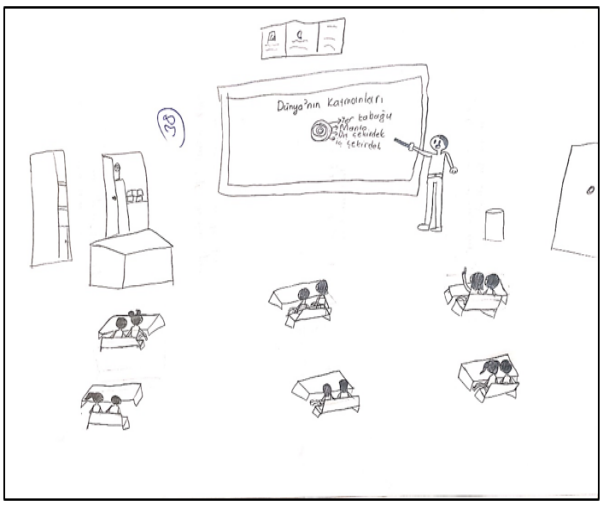
Some students designed their exclusive classrooms. These classrooms have an exclusive-seating arrangement (*n*=9). In the research, students were asked to draw their dream science classrooms. However, it is noteworthy that the number of the students drawing an exclusive-seating arrangement, and the students drawing different seating arrangements was low.

Table 4
The frequency of seating arrangements in students' drawings

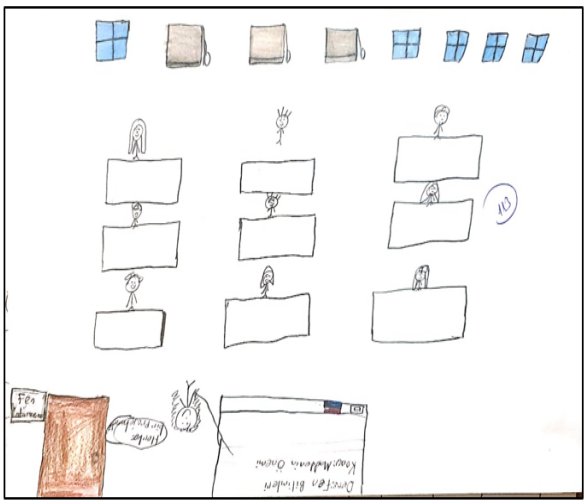
Seating Arrangements	Grade		
	3	4	Total
Traditional (pairs)	60	35	95
Individual	22	22	44
Laboratory seating	16	26	42
Exclusive	4	5	9
U shape	1	2	3
Square	-	2	2
Others	-	Circle	1
No seating arrangement	46	70	116

Figure 9
An example of a traditional (pairs) seating



3G38: "The teacher is talking about the layers of the Earth; all students are listening to the teacher."

Figure 10
An example of an individual seating in the class



3G113: "The teacher is explaining the importance of the matter and asks us to prepare a project."

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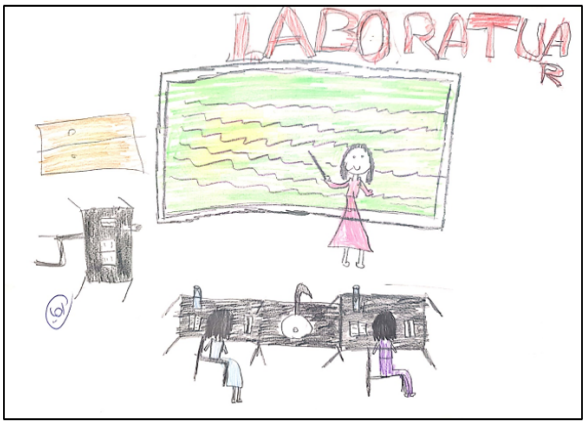
Figure 11
An example of an individual seating arrangement in the laboratory



3G105: "I have depicted that I want to do experiment in the lab."

Figure 12
An example of a laboratory seating arrangement

4G98: "We are doing experiments in the laboratory."

Materials

Real-life Items and Models

One-third of the participating students drew real-life items or models in their drawings. Models drawn by children were generally related to a human body, the Earth, or the Universe (Figure 13). More than half of these children drew a globe (*n*=45) (Table 5). Students drew rocks, mines, minerals, animals, and foods as real-life items.

Table 5
The Frequency of Real-life Items and Models in the Students' Drawings

Real-life Items and models	Grade		
	3	4	Total
World globe	5	40	45
Human skeleton model	2	11	13
Other models	3 (Sense organs)	The earth's crust (2), planets (4), human body (2), molecule (1)	12
Rocks-mines-minerals	-	11	11
Fossil	1	6	7
Others	Butterfly, water, leaf, powder, flower	Animals, microbes (2), fruits (2), substances in solid, liquid, and gas forms	11

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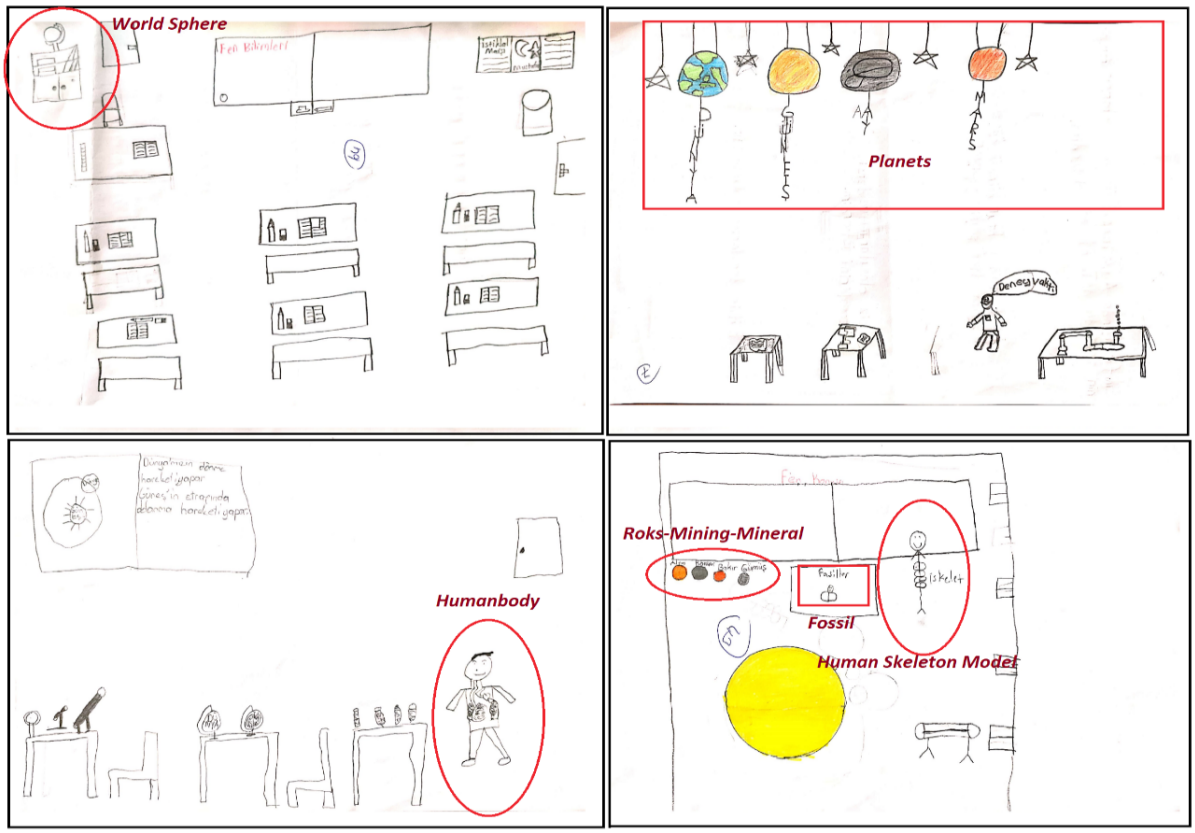
Figure 13
An example of models and real-life items



Visual Aids

The students mostly drew a board in their drawings (n=149). It was followed by books, computers, and pictures.

Table 6
The frequency of visual aids in the students' drawings

Visual aids	Grade		
	3	4	Total
Blackboard or interactive whiteboard	83	66	149
Book	50	48	98
Computer	2	21	23
Pictures		1	1

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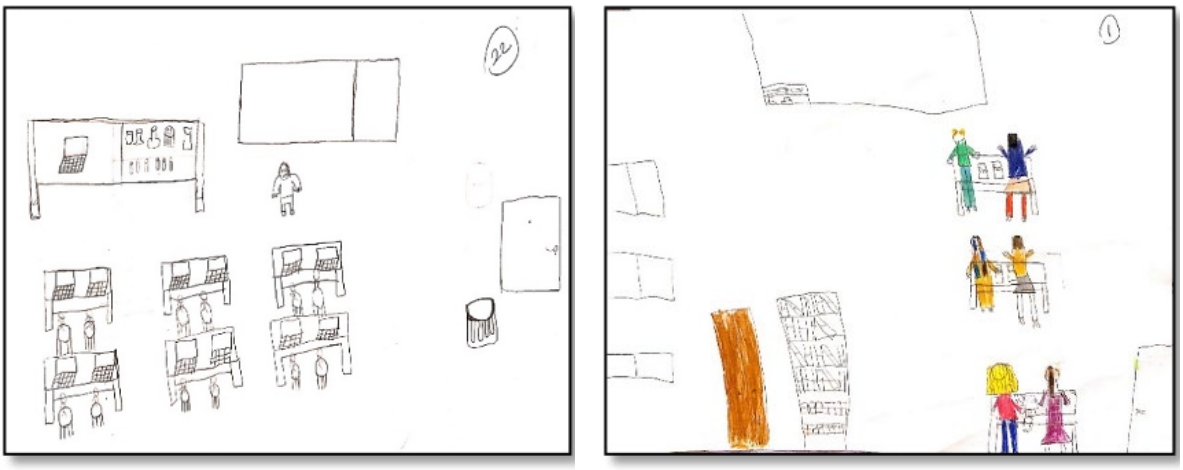
Figure 13
An example of visual aids



Laboratory Equipment

Students illustrated glassware more in their drawings ($n = 92$). In their drawings, thirty-six of them drew some glass materials that contain chemicals. There were also glassware, microscopes, and telescopes in their drawings. Figure 14 shows some examples of such drawings.

Table 7
The frequency of laboratory equipment in the students' drawings

Laboratory equipment	Grade		
	3	4	Total
Lab glassware	41	51	92
Chemicals	16	20	36
Microscope	5	29	34
Telescope	1	27	28
Others	Material storage cabinet, magnifier, lens, battery	Magnifier, chemical storage cabinet, gloves, glasses, lab coat, ruler, scissors, amperemeter, magnet, first aid kit	14

Expressions

Scripts on the Board

In the students' drawings, it was found that there was some subject-related information on the boards that were covered during the semester, in which this research was conducted (e.g., the earth's features, sense organs, states of matter, rocks, mines, and minerals). Only seven third graders wrote the steps of an experiment on the board in their drawings. The number of students who wrote questions or formulas on the board in their drawings was 10.

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Table 8
The frequency of scripts on the board in the students' drawings

Scripts on the board	Grade		
	3	4	Total
Earth's features	4	16	20
Class/subject	9	3	12
Making an experiment	7	-	7
A question	2	3	5
A formula	2	3	5
Sense organs	4	-	4
States of matter	-	4	4
Rocks-mines-minerals		3	3
A chemical bond	1	-	1

Figure 14
An example of laboratory equipment

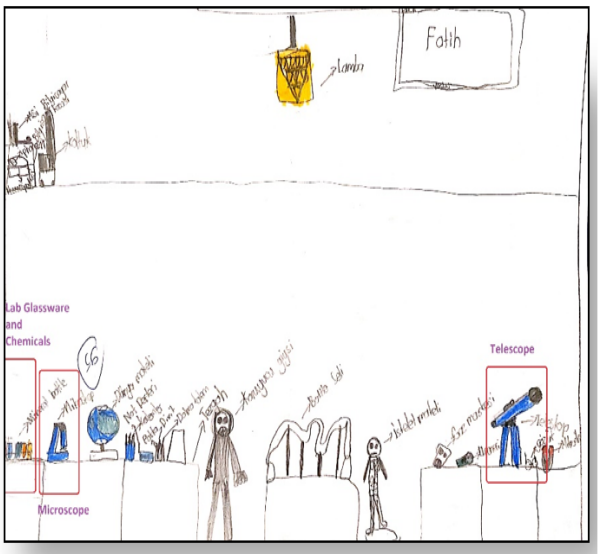
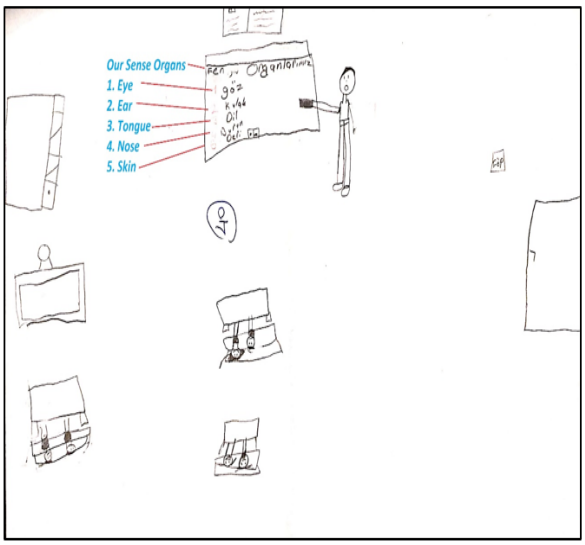


Figure 15
An example of sense organs



Speech Bubbles

The findings show that 24 students added some speech bubbles to their drawings. These speech bubbles usually contained speeches of teachers who were introducing lessons and subjects. Two students drew the moments when the teacher praised them (e.g., "you're fine". "don't stop"…). Three students used the bubbles to ask questions to the teacher.

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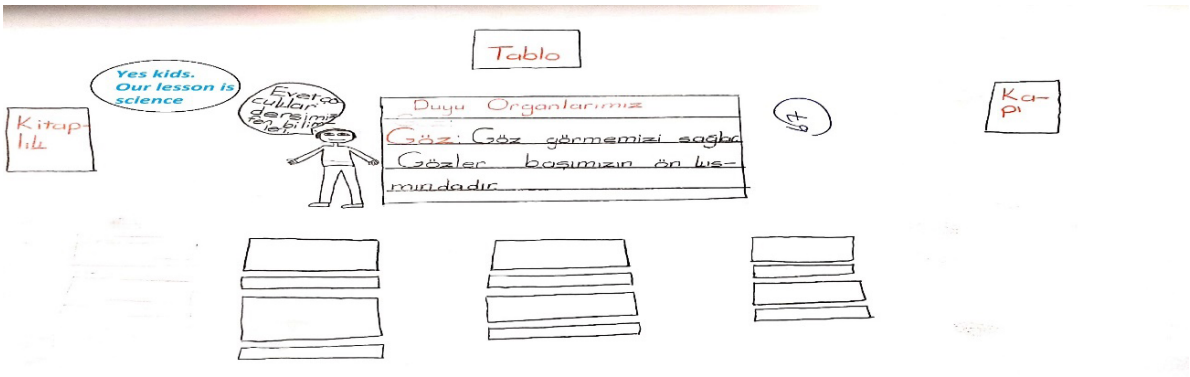
Figure 16
An example of a speech bubble



People

People in the Students' Drawings

The findings of the research revealed that teachers and students were usually illustrated with happy facial expressions in the students' dream science classrooms (Figures 10 and 14). Only one student drew scientists.

Table 9
People in the students' drawings

People in the Students' drawings	Grade		
	3.	4.	Total
Teacher	49	48	97
Student	66	75	133
Happy facial expression	67	75	142
Unhappy facial expression	3	2	5
Others	Al-Biruni, Galileo, Pythagoras, Magellan, Columbus	-	5

Students' Expectation

Students' Expectations of Their Teachers

Once students were asked what they expected from their teachers in science classes, they gave different answers (Table 10). One of the most frequent expectations of the participants ($n = 67$) was that they wish their teacher had them do experiments. Sample statements from the students for such an expectation are presented below:

3G105: "I want him/her to take us to the lab to do experiments."

4G109: "I want my teacher to have us do experiments and to teach how an experiment is done."

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Table 10
Third and fourth graders' expectations of their teachers in science classes

Students' expectations of the teacher	Grade		
	3	4	Total
Experimenting	32	35	67
Sound knowledge on subject matter	28	25	53
Meets expectations / no expectations	7	20	27
Negative image	5	13	18
Positive image	12	5	17
Activities	5	12	17
Entertainment	8	8	16
Appreciation	9	2	11
Pedagogical content knowledge	-	7	7
Asking questions	4	2	6
Utilizing materials	3	1	4
Others	-	Checking homework (2), conducting research (2), doing observation (2), having students write down (2), teaching with visual aids (2), supplying more materials, allowing group works	12

Another frequent expectation of students (*n*= 53) was addressed under the theme of subject matter knowledge of the teacher. In this sense, students generally expected their teachers to give them new and different scientific knowledge and different examples. Sample statements from the students for such expectations are presented below:

3G15: "I expect my teacher to explain everything completely."

4G107: "Of course, I expect my teacher to teach us new things. For example, I think we could learn more about the Earth's crust and its movements if we could go out."

Some students stated that their teachers met their expectations in science classes (*n*=27).

3G94: "Our teacher has the traits I appreciate."

4G28: "Our teacher does everything we expect."

Some students expressed their expectations through the poor personality traits of their teachers (*n*=18). Such statements were addressed within the theme of a negative image. In this regard, students often stated that they expected their teachers not to be angry.

3G87: "I expect our teacher to have eye contact with us and not to get angry."

4G5: "I expect my science teacher not to be angry."

On the other hand, some students expressed their expectations through the positive personality traits of their teachers (*n*=18). Such statements were addressed within the theme of a positive image. Therefore, students often expressed that they expected their teachers to be good-humored and good-hearted.

3G17: "I expect my teacher to be happy and good-humored."

4G39: "I expect my teacher to be lovely."

Some students stated that they expected their teachers to have them do different activities (*n*=17). The statements of the students addressed under this theme include only the word "activity, " but it is not known what kind of activities they were talking about. Only some students expressed their expectations using the words "activity" and "game. "

3G77: "I expect my teacher to have us write down a lot and do many activities."

4G127: "I wish the lessons have some more activities."

The participating students wanted their teachers to add fun to science classes (*n*=16). These students often desired the lessons to be fun through experiments.

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3G65: "I want my teacher to have us do fun experiments."

4G101: "I expect my teacher to entertain us."

Some students stated that they wanted their teacher to appreciate them (n=11).

3G41: "When I give the correct answer to my teacher question, I expect him/her to tell me, "Well done!"

4G29: "I expect my teacher to warn me when I do it wrong and to appreciate me when I do it right."

A few students emphasized that they expected their teachers to teach exceptionally. These expectations were addressed under the theme of pedagogical content knowledge (*n*=7).

3G8: "I expect my teacher to teach the science lesson very well."

4G78: "I would like him/her to teach us well."

Few students expressed that they expected their teachers to ask them questions (n=6).

3G5: "I expect my teacher to ask us questions and to teach something about science."

4G10: "I expect her/him to ask us questions."

Some students stated that they had expectations of their teachers, such as checking homework (2), conducting research (2), doing observation (2), having them write down (2), teaching with visual aids (2), supplying more materials, and allowing group works. Examples of students' expectations of their teachers are presented below.

3G47: "I would like him/her to have us write down a lot."

4G156: "I expect my teacher to allow us to go out to nature and study mines."

Students' Expectations of Their Classmates

Students had different expectations of their classmates in their science classes. The findings of the research revealed that these expectations were mostly related to classroom rules, such as following the rules and being quiet in the classroom.

Table 11
Third and fourth graders' expectations of their classmates in science classes

Students' expectations of their classmates	Grade		
	3	4	Total
Silence	33	66	99
Following the rules	7	36	43
Effective listening	24	3	27
Cooperation	19	5	24
Success	11	12	23
Solidarity	15	6	21
Respect	8	8	16
Positive personality traits	6	5	11
Sharing	3	4	7
Appreciation	3	1	4
Active participation in class	1	2	3
Not teasing	2	-	2
No expectations	-	10	10

As Table 11 indicates, students mostly expected their classmates to be quiet (*n*=99). Another expectation that students frequently repeated was that their classmates to follow classroom rules (f=43).

3G7: "I expect my classmates to be quiet and listen to the lesson."

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4G104: "I expect them to be quiet."

The expectations of the students for listening to the lessons were addressed within the theme of effective listening (n=27). The findings, in this regard, revealed that students often expected their classmates to listen to the lesson carefully and effectively.

3G29: "I expect my classmates to be quiet and listen to the lesson."

4G32: "I expect them to listen to the lesson quietly."

Some students stated that they wanted to do the activities in cooperation with their classmates (n=24).

3G60: "I would like to do experiments with my classmates."

4G144: "I expect to do teamwork to fulfill what the teacher wants."

Some students stated that they expected their classmates to be successful in science classes (n=23)

3G66: "I want my friends to be researchers, intelligent, and successful."

4G141: "I expect them to listen to the lesson well and succeed because their success affects class achievement."

The findings of the research depicted that some students asked their friends to help them with things they did not know.

3G63: "I expect to help each other."

4G87: "What I expect from my classmates is to be supportive."

Some students stated that their classmates should respect each other.

3G4: "I would like him/her to be respectful, honest, helpful, and sensitive to me."

4G57: "I expect them to be respectful and not to be quarrelsome."

Using words such as "tolerant, " "benevolent, " "honest, " and "sensitive," students stated that they expected their classmates to have positive personality traits.

3G25: " I expect them to be kind, compassionate, and tolerant."

4G72: "They should allow me to participate in the games during breaks, and they should be generous, helpful, and good-hearted."

A few students emphasized the word "sharing." These students expected their classmates to share knowledge and possessions. In addition, some students expected to be appreciated by their classmates. Not being teased was another expectation stated by the students.

3G61: "I would like my classmates to appreciate what I do."

4G46: "I would like them to share what they know."

Students' Expectations of Themselves

Their expectations of themselves were to focus on increasing academic achievement only. The number of students mentioning activities that support 21st-century skills, such as conducting research and designing a project, was only 10.

Table 12
Third and fourth graders' expectations of their themselves in the science class

Students' expectations of themselves	Grade		
	3	4	Total
Studying hard	20	13	33
Being successful	48	61	109
Active participation	52	50	102
Others	Invention, exploring a formula, conducting research, writing well (2), generating different ideas,	Conducting a project, writing well, doing experiments, conducting research	10

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Students stated that they mostly wanted to be successful and to participate in science classes actively. Another expectation was to study hard.

3G19: "I would like to study hard and to give correct answers to the questions."

3G53: "I always want to get the full mark from exams and to come in the first rank in the world."

3G48: "I would like to listen to the classes well and to be successful."

Discussion

This research explored third- and fourth-grade students' dream science classrooms. The research revealed the students' expectations of their teachers, their classmates, and themselves. Besides, students' dream science classrooms were depicted based on the results obtained.

The findings of the research revealed that primary school students portrayed their dream science classrooms as the classrooms with a traditional-seating arrangement or a laboratory. The reason why the number of students who drew a classical classroom environment for science classes is high could be that the lessons are taught in traditional classrooms instead of a laboratory setting. The study of Kaplan (2011) investigated the learning environment of the primary school students, asking them to draw their learning environment in science classes. The study found that none of the fourth-grade students drew a laboratory. The purpose of the science curriculum is to raise all individuals as science-literate; therefore, different methods and techniques have been adopted to achieve this goal. Classroom/school and out-of-school learning environments were designed according to the research-inquiry based learning strategy for students to acquire the knowledge meaningfully and permanently (Milli Eğitim Bakanlığı [MEB], 2018). Laboratory practices comply with the research-inquiry strategy. As a consequence of this fact, it is expected the laboratory practices to be performed to reach the objectives set in the curriculum. Nevertheless, some studies have claimed that there are negative situations regarding the use of laboratories in science classes (Ayvaci & Kucuk, 2005; Boyuk et al., 2010; Demir et al., 2011; Gunes et al., 2013).

The students mostly drew an out-of-class environment after laboratory. They made beautiful drawings illustrating how science subjects are taught in out-of-class environments. Outdoor education explains " where, " " how, " and " why" education is given in out-of-school environments (Ford, 1986). Outdoor education covers all activities outside the classroom in which all sense organs are used to enrich the educational content (Priest, 1986; Lappin, 1997). Language, arts, social studies, mathematics, science, and music are among the curricular areas often associated with outdoor education (Lappin, 1997). It is prudent to say that out-of-class environments are natural laboratories for science classes. In this case, it would be safe to say that out-of-class learning environments should be frequently applied within science classes. Students also reflected their dream science classes taught outside in their drawings to support the above-mentioned idea.

The studies showed that out-of-class learning environments for science classes positively affect students' learning levels, attitudes, and perspectives (Bowker & Tearle, 2007; Bozdogan & Yalcin, 2006; Kulaligil, 2016). Nevertheless, primary school teachers and teacher candidates do not have positive attitudes toward out-of-class environments (Bostan-Sarioglan & Kucukozer, 2017; Turkmen, 2015).

With parallels to the results of the studies of Gomez-Arizaga et al. (2015) and Balliel-Unal (2017), this research also revealed that the students, in their drawings, illustrated students doing experiments the most. Participants in both studies drew themselves, assuming that they were doing experiments. The number of students drawing fundamental skills required for a science class, such as observation, research, discussion, problem-solving activities, was less than the ones drawing experiments. Although the number of students drawing different activities was low, the number of them drawing student-centered activities was more. Gomez-Arizaga et al. (2015) reported that the children tended to draw pictures depicting themselves in student-centered activities.

Although the number of students who drew student-centered activities was high, there were also students drawing teacher-centered activities such as a lecture. It is thought-provoking that the participants portrayed students who carefully listen to a teacher standing in front of the board in their dream science classroom. This result implies that teachers do not include different activities, especially experimental activities, in science classes. Studies have argued that teachers do not prefer having their students do experiments due to teachers' perception that doing experiments has little effect on permanent learning (Ulucinar et al., 2008), lack of laboratories and equipment (Demir et al., 2011), teachers' lack of knowledge about laboratory equipment, and the supply of missing equipment (Taskin-Ekici et al., 2002). In a study examining the teachers' perception, it was shown that all

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participants emphasized that labwork was of critical importance in science education to understand theory and stimulation (Ottander & Grelsson, 2006). Although the teachers thought it was important, they could not conceive that the main purpose of the lab work was to make scientific inquiries. The findings of the same research, based on the teachers' interview, revealed that the main objective of lab work was to put the theory into practice, stimulate students' interests and enjoyment, and practice relevant skills and techniques (Ottander & Grelsson, 2006).

The fact that the students are seated in accordance with the teaching method, it can maintain educational activities effectively and make the learning activity more efficient (Sahin, 2019) Some studies found a relationship between seating arrangement in the classroom and various factors, such as achievement (Cinar, 2010; Perkins & Wiema, 2005), asking questions (Marx, Fuhrer, & Hartig, 1999; Moore & Glynn, 1984), communicating with peers during class (Granström, 1996), and learning motivation (Buyuksahin, 2019). The findings of this research revealed that the traditional seating arrangement was portrayed in the students' drawings more. The number of students who drew different arrangements having some advantages over row (traditional) arrangement was smaller. Students in Turkey usually sit at their desks in pairs with the traditional-seating arrangement. Such a fact might lead students to prefer this arrangement in their drawings. Should motivation and success be aimed in science classes, changing the seating arrangement can be useful. The fact that the students drew the row (traditional) arrangement in their drawings too much may indicate that this arrangement is preferred in their classrooms more.

Science classes can be more meaningful and useful when real-life items are used in the classes. Moreover, they are also suitable for the use of models. However, the findings of the research revealed that students include real-life items and models in their drawings, but the number of these students is insignificant. Students, in their illustrations, drew globes, human body models, skeletons, fossils, and rocks, mines, and minerals as real-life items and models.

Visual aids are teaching tools that are used to encourage students to learn and facilitate the learning process, as well as to motivate students. That is why science classes use visual aids, such as drawings, posters, and charts. Students, in their drawings, illustrated boards, interactive boards, books, and computers as visual aids. This may prove that they have previously experienced or seen these kinds of materials only.

Most of the children depictured themselves and other people, their teachers and classmates, with a happy face in their drawings. Studies have presented that children's drawings reflect their emotions and inner worlds (Golomb, 1994; Rosenblatt & Winner, 1988; Serin, 2003). Students' depiction of themselves as happy implies that they are happy in science classes. Gomez-Arizaga et al. (2016) examined the perceptions of third -grade students about science classes through their drawings. Their studies depicted that a clear majority of the children (76%) illustrated themselves with a happy face, while none of them illustrated themselves with an unhappy face.

The findings of the research showed that the participating students expected their teachers to have them do more experiments. Students can acquire knowledge by reading textbooks and doing the activities in these books. They stated that they wish their teachers to teach them what would attract their attention and raise their curiosity. Moreover, they expressed that they wanted to do different activities that would make science classes fun. Furthermore, it was noteworthy to emphasize that there were students expecting student-centered activities that were suitable for science classes, such as research, group work, and observation. Students' expectations of teachers may affect their attitudes toward school, and possibly their motivation to learn. Besides, students stressed their relationships with teachers more than do teachers. Students also academically invested in teachers when they perceived that the teachers cared about their learning enough to make additional efforts to enhance achievement (Rubie Davis et al., 2006). Moreover, the students expressed that they expected to be appreciated by their teachers. Researchers claimed that students' self-expectations, achievements, and behaviors change when they realize that their teachers care about them (Muller et al., 1999).

The students stated that they expected their classmates mostly to be quiet and follow the rules. Another expectation was that they expected from their classmates to listen to the lesson. They also expressed that they expected from their classmates to cooperate with their classmates and expected them to succeed in science classes, too. Moreover, they stated that they expected help from their classmates in subjects they were not good at. Expressing that they want to be appreciated by their classmates, the students stated that they expected their classmates to have positive personality traits by using words, such as tolerant, benevolent, honest, and sensitive.

The findings of the research revealed that academic achievement was what students expected most. As in every class, it is aimed to raise science-literate individuals with 21st-century skills in science classes. It is an interesting finding that students' expectations related to such skills were rare. This may be because the teachers' and even parents' expectations of students are directed toward academic achievement.

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Conclusions

The classroom is an essential element of the Turkish education system. Therefore, this research suggests that the physical environment of the classroom, science classroom activities and interactions with peers and teachers are all significant issues that need to be considered when analyzing how individuals think about the science class. This research reveals what kind of classroom the third- and fourth-grade students dream of in the science class, and what are their expectations of their teachers and classmates in the classroom.

The research is in the field of science education, we have information about the interactions in the classroom. As we improve our understanding of how students, teachers, and science function together in a learning environment, the quality of science education in Turkey will also increase. There is a need to create supportive, encouraging, and interesting environments where science subjects can be learned, positive attitudes toward science can be developed, and academic achievement is affected positively. It is thought that students should have a voice in the creation of such environments, and students' views on science classrooms are of importance.

Is there a science classroom that students prefer? The findings of the research reveal that the answer is "yes!". Briefly, science can be taught through experiments and different classroom activities. Classes can also be done in out-of-classroom environments. Science classes can involve student-centered practices, such as experiments, observation, research, and problem-solving activities. In addition, students expect their teachers to have them do more experiments in their classes, to provide interesting and intriguing scientific information, to encourage them to conduct research and projects, and ask questions, to be good-humored, and to appreciate them. Students expect their classmates to follow the classroom rules, to work in collaboration, to share, and to appreciate them to benefit from science classes more. Finally, they expect themselves to be successful in science classes.

This research examines the primary school students' views on their dream science classrooms through their drawings. Therefore, it serves as a guide in designing the learning environment for teachers and teacher candidates. The findings of this research can provide recommendations to Turkish teachers who are interested in creating more supportive and effective learning environments. This research is important because it was conducted with primary school students with their drawings and expressions rather than any learning environment questionnaire. The research can also be used as a guide for researchers who will conduct such a research at different grade levels. The research determines what kind of environment students would like to be in their science classes. In this research, certain control variables, such as gender and socioeconomic status, were not examined. Picking variables can be a limitation of the research, and therefore, future studies may obtain different results when they select more different variables than the variables used in this research.

Note

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