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CREATING THE SCIENCE LEARNING ENVIRONMENT OF SECONDARY SCHOOL STUDENTS' DREAMS

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ABSTRACT

The development of today's technology and science make it compulsory to adapt the teaching environment to the needs of the period. This research aims to determine what real actors of education students' dream of studying in a science learning environment. 266 5th grade secondary school students selected from metropolitan (N = 134) and rural (N = 132) areas were participants in the research designed in the descriptive survey study. Student drawings were used as a data collection tool. Chi-Square tests were applied in the comparison of the obtained data. In the light of the findings, the science learning environments of rural and metropolitan students' dreams are very different from the existing educational environments; they are related to the environment they live in, intertwined with nature, integrating fun and comfortable environments that meet the requirements of today's technology. Additionally, at the end of the research, an architect turned patterns consisting of student drawings into an ideal science learning environment design.

Keywords: Science learning environment, classroom designs, student drawings, middle school students

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INTRODUCTION

The dizzying development of scientific knowledge in the century we live in has led to the development of place technologies in many fields. We talk about colonizing the planet Mars, mapping the human genome, and supercomputers as small enough to carry in our pockets. We also talk about education at every opportunity. In the Modern Era, classes and schools that have gotten stuck in the 20th century are not very different from medieval schools. If we visualize, a teacher and students who listen to her/him carefully while take notes and ask questions from time to time reflect the basic classroom order. Of course, learning methods have changed, nowadays we use markers or smart boards instead of chalk, but the format has not improved much yet. When we look at the classrooms of today's modern schools, it is possible to notice some things that are overlooked. For example, nowadays students take their notes on tablets, not on papers, they automatically convert what they write into computer text and this information is stored in the "cloud". The students are often more competent than adults in the use of these technologies. Yet why are the ideas of these students not used in the design of educational environments? The aim of the study is to determine the science learning environments that they want to study in their dreams.

Today's Science Learning Environments

Adapting to the changing conditions in daily life, people have started to use technology as a consumption tool by internalizing the concept of "change". With the development of technology, devices that are subject to science fiction movies started to be used in many sectors such as software and robots at the beginning of the 20th century. This situation gave people more time for other things, saving physical power, and opening opportunities to use creative environments. At this point, the adaptation of science education to this development and change has been a problem worth examining. One of the problems for this research is the position of the science learning environment in the imaginary world and the way students will reveal how the science learning environments are compatible with today and students of this age. Current samples in science learning environment form Turkey and flexible classroom environments in general were presented in below.

Examples of Flexible Classroom Environments

Education is an ongoing process with many shareholders such as student, teacher, administrator, parents and teaching environment. A school-age child spends the most time in an educational environment. If the student profile of today is examined, a speed-focused profile is seen intertwined with technology. In this case, it is a necessity to design the environment in which students spend most of their time gathering relevant shareholders. Despite this development in science and technology, the goal of raising generations beyond the age in teaching environments with classroom environments behind the requirements of the age is a difficult goal to achieve. Cooper, Cowie, and Jones (2010) studied the effectively of The New Zealand Science Learning Hub [SLH]. The program is the collaboration between research organizations,

industries, science educators, and teachers that enabled the development of a resource that is dynamic, up-to-date and relevant, and that can be used to inform the teaching of science in New Zealand schools. The results showed that students are keen to engage with and actively explore the range of media within the SLH contexts.

The education systems of countries in the world are graded according to the results of international student assessments (PISA, TIMMS, etc.) that measure the academic success of students. Finland, which is among the most successful countries in PISA, has made radical changes in education (Sahlberg, 2018). In Figure 1, an image from the Finnish educational environment is included.

Figure 1. A Teaching Environment in Finland. Retrieved from https://indigodergisi.com/2016/12/finlandiya-egitim-sistemi/

Teachers from the shareholders of the above-mentioned education are obliged to do postgraduate education in their own fields. Technology and "flexible classroom environments" have been created in educational environments and supported with appropriate teaching programs.

Science learning environments in Turkey

The development of teaching environments and contents in our country has accelerated after the proclamation of the Republic. However, some basic thoughts have been maintained as a continuation of pre-Republican reform movements. It is known that Satı Bey established the rows that existed in today's learning environments during the Ottoman period (Akyüz, 2012). Considering the development of technological devices presented in Figure 2 from 150 years ago to present. The fact that the education environments of the students studying in the early 1900s and the education environments of the students studying today are in the same order clearly reveals that there is no change in the educational environments despite the fact that the realities of the century and the age have changed.

Figure 2. Technology from Past to Present Retrieved from http://www.yenigolcuk.com/yazar-balIklar-agaca-tIrmanamaz-1332.html

Comparing the predominance of agricultural issues in the 1927 science curriculum and the goals of raising individuals who are questioning science literate today, the objectives of these two curricula are different but the science learning environment seem almost the same. Here, we need to open a separate paragraph for the Village Institutes. The education mobilization that the country needs in education and training has been researched and established based on the philosophy of "the villager is the master of the nation", and the educational mobilization aimed at advancing the villages in fields such as agriculture, commerce, culture, and art has been initiated. Students studying in village institutes came from their villages without school environment and built their own schools. Teaching activities in these schools have been a move that facilitates village life and increases the quality of education. İsmail Hakkı Tonguç and Hasan Âli Yücel, whose efforts were paramount in the establishment of village institutes and in the creation of teaching environments, set off with a social goal ahead of the eras which are presented in Figure 3.

Figure 3. Village Institutes Classroom Environment. Retrieved from https://www.tarihtoplum.org/koy-enstituleri/

After the Village Institutes, training colleges, teacher high schools, and education faculties served as institutions that taught at different levels to train teachers who are the guides of the teaching environment. In today's classrooms, educational environments have been renewed with the Education Information Network (EBA) and the projects that make up its technological background. But including education faculties, no significant change has been observed in teaching environments. In Figure 4 below, we can see a comparison between a classroom environment taken in today 2000s and a picture taken in the 1950s on average 50 years ago.

Figure 4. Class Environments from Past to Present. Retrieved from (Picture on the left): http://kefad2.ahievran.edu.tr/archieve/pdfler/Cilt16Sayi3/JKEF_16_3_2015_87-104.pdf. Retrieved from (Picture on the right): https://www.fahriikiler.com/siyah-beyaz-kareler/

In brief, it is difficult to say that there is a change between the two environments, despite many teaching approaches changes, scientific and technological advances between these two terms. Although technology has been progressing at a dizzying pace, there has been no similar progress in classroom settings. When it comes to class environment, the settlement order comes to mind and this layout is classified into three categories: U layout, circle layout and traditional classroom layout (Figure 5).

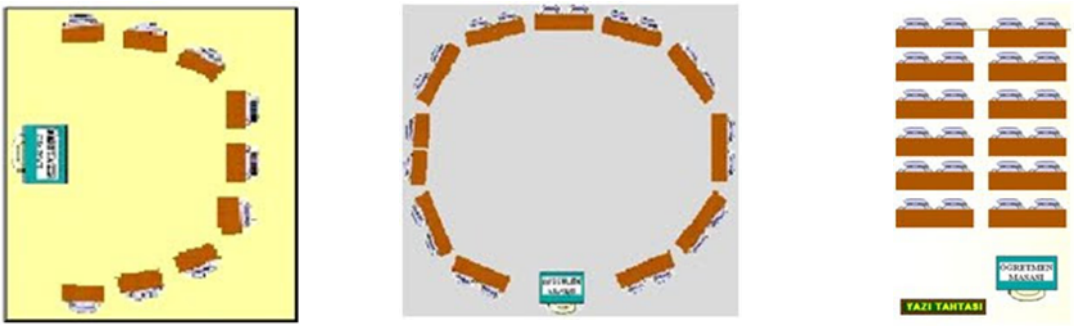


Figure 5. From left to right U, Circle, and Traditional Classroom Layouts. Retrieved from http://muteferel.blogspot.com/

Research on Learning Environments

When we talk about the learning environment, we see the climate of the classroom, student-teacher or student-student relationship, physical conditions of the classroom, factors affecting students' success, and attitudes. In relevant literature, some research stands out such as, using drawings for students' thoughts on any subject (Allen & Bowles, 2012; Asiyai, 2014; McHatton, Farmer, Dedrick Shaunessy, Ray, & Bessete, 2015), studies examining the images related to the learning environment (Burnett, 2002; Allen & Fraser, 2007; Elmas, Demirdöğen, & Geban, 2011; Özdemir & Akkaya, 2013; Radovan, & Markovec, 2015; Şahin Akyüz, 2016) and the studies examining the effect of the learning environment on academic variables (Yılmaz & Akkoyunlu, 2006; Brock, Nishida, Chiong, Grimm, & Rimm-Kaufman, 2008; Yener Köknel, Kutlu Güvenkaya, & Şener, 2009;Acat, Karadağ, & Kaplan, 2012; Feyzioğlu, Feyzioğlu, & Küçükçıngı, 2014; Al Şensoy, & Sağsöz, 2015).

In the study of Allen and Bowles (2012), they support four arrangements about students' belonging to school: adult support, positive belonging in peer groups, commitment to education, and school environment. In addition, the attitude of the teacher is very important for the interaction between the student and the teacher. The teacher, who gives negative feedback to students, negatively affects the students' perception of the school. In a study conducted by Burnett (2002), a student accustomed to receiving negative feedback has found that their relationship with their teacher was negatively affected.

In the school environment, besides facilitation serious actions such as teaching and learning activities, it should also give the student happiness (Freire, 2000). When we look at our studentship period, it is a fact that different activities such as extracurricular lesson activities and laboratory activities excite us and increase our motivation. Many variables can be effective and affect us like this kind of activity. Asiyai (2014) revealed the effective roles of learning environments in students' motivation and academic success. The sample of the research consisted of 800 students selected from public schools and private schools. According to the findings, the perceptions of private school students about their physical learning environments showed a significant difference compared to public school students. Investigating the perceptions of students and parents about the learning environment with the mixed pattern model, Allen, and Fraser (2007) stated that there is a relationship between the learning environment and especially the student attitude. Qualitative findings have revealed that students and parents generally find the classroom environment satisfactory, but students prefer more and more research while parents prefer more teacher support. Özdemir and Akkaya (2013) who was working with general high school students and teachers in their studies conducted a study in which they analyzed schools and ideal school perceptions by using metaphors. When the findings of the research were examined, it was seen that teachers and students in secondary education have a negative attitude towards school. The metaphor, which has the highest frequency in the findings, has been identified as a "prison". McHatton and the others (2014) conducted

research in the type of screening, where they examined the perceptions of secondary school students about learning environments through their own drawings. The findings show that secondary school students have different experiences in terms of education-based behavior management, interactions and teaching methods. It was emphasized that drawing as an applicable and innovative tool both enables informative and educational changes and enables the voices of all learners to be heard in the research. Radovan and Markovec (2015) conducted a study in which students examined the relationship between motivation and perceptions of learning environments. In the research, it underlined that lecturers in higher education have difficulty in deciding which teaching strategy may be effective and how to organize their lessons. Türkmen and Pedersen (2003) use The Constructivist Learning Environment Survey (CLS) to understand international students' perception of the learning environments in university science courses. Results stated that student perceptions of the learning environment influence learning behaviors and outcomes that in turn become part of the experienced learning environment of self and others.

Şahin Akyüz (2016) conducted a research to determine the images of eighth grade students towards real and ideal science learning environments. According to the findings of the study, it is seen that the students define the ideal science classroom environment as interactive boards, experiment tables and visuals, learning techniques based on multiple intelligences, and environments where group teaching is carried out. Yılmaz and Akkoyunlu (2006) examined the effects of different learning environments on permanence. In the study, attention was drawn to the changes in the cognitive, affective or neurophysiologic structures of the individual during the learning process. Yener Köknel, Kutlu Güvenkaya, and Şener (2009), in their research examining the illumination studies of primary education classrooms, revealed the mistakes made in the lighting conditions of the classrooms.

The place of drawings in education is also very important. Drawing is the method that illustrates how students imagine many different situations; frequently used to make sense of images acquired from different people such as teacher, principal and scientist. Studies using drawings as a data collection tool (Atasoy, Kadayıfçı, & Akkuş, 2007; Yörek, 2007; Köse, 2008; Aykaç, 2012; Yıldız Duban, 2013; Muthersbaugh, Kenn, & Charvoz, 2014; Özsoy, & Ahi, 2014; Rybska, Tunnicliffe, & Sajkowska, 2014) and studies on the image of the scientist (Chambers, 1983; Barman, 1997; Morseley, & Norris, 1999; Song, & Kim, 1999; Rubin, 2003; Buldu, 2006; Schibeci, 2006; oFralick, Kearn, & Thompson, 2009; Oğuz Ünver, 2010; Leblebicioğlu, Metin, Yardımcı, & Çetin, 2011; Bayrı, Köksal, & Ertekin, 2016) are a few examples in the educational literature in this area.

As a result, studies to examine learning environments generally cover current physical conditions, classroom culture or the main stakeholders of education, teachers, students, parents or administrators. Studies on students' expectations in the design of learning environments are limited (Acat, Karadağ, & Kaplan, 2012; Al Şensoy & Sağsöz, 2015; Asiyai, 2014; Bland Derek, 2009). This research aims to investigate the science-learning environment in which students' dream of studying instead of evaluating the current science learning environments. The issues examined in the research; what is the science-

learning environment that 5th grade students want to study like, and what are the similarities and differences between the science learning environments in the dreams of students studying in metropolitan and rural areas? In addition, what is the ideal science learning environment design in which students' dream of studying in light of the data collected?

METHOD

Research Model and Participants

This research has been designed to use the descriptive survey (Fraenkel & Wallen, 2009) method for revealing the science learning environments imagined by middle school students and evaluating the obtained data in terms of rural and metropolitan students.

Participants of the study were chosen from among rural and metropolitan students. Metropolitan cities are regions with higher trade volume and socioeconomic level compared to rural areas. A total 226 middle school students participated to research from 5th grade middle school students (N=134) of an institutional private school with different campuses in Izmir and 5th grade middle school students (N=132) from village schools in the central district of Muğla province. Convenience sampling methods has been made to determining the participants in order to make comparative research. (Patton, 1987)

Data Collection Tool

Drawings are an effective data collection tool by which children can have their voices heard because the participants of the study are children. (Mc Hatton et. al., 2014) In addition, children were asked to describe their drawings in writing so that the drawings could be analyzed better. When the studies on students' images in the literature (Barman, 1997; Bessette, 2008; Brock et al., 2008; Fralick et al., 2009; McHatton et al., 2014; Morseley & Norris, 1999; Muthersbaugh et al., 2014) were examined, it was concluded that drawings were used as data collection tools.

Before the research took place, a pilot study was conducted in order to predict the problems that could be compiled and to improve the catagories by testing the data collection tool. After determining the collection of pilot study data through drawings, studies were conducted to determine how to form the question to students who will draw their response. The question developed was: "We want to create an environment where we will conduct your science lessons for you. You will totally imagine this learning environment. We will set up this environment in line with your dreams. Draw your designs and tell me in writing" (see Appendix 1). After determining the issue to be directed to the students, the data collection process was planned, and the necessary environment was created for students to draw easily. While asking research questions to students, care was taken to not use the word "class" order to not affect the images they will reflect in their drawings. The researcher told the students that the drawings they made would not be

evaluated as good or bad and that this was not a competition, only the researcher would see their drawings. During the data collection process, dry crayons of different colors, 25x35 sized drawing paper and snacks that they enjoy while drawing were given to all students so they could draw their drawings in more detail. In order for the students to draw easily, it was ensured that there were no school administrators and teachers in the environment where the drawings are made.

Analysis of Data

While analyzing the data obtained from metropolitan and rural areas, markings were made to the checklist to determine the available-not available status of the codes. The numerical equivalents of the themes in the drawings are expressed as frequency. These frequencies have been prepared to be interpreted with a statistics program. The Chi-Square Test ($\chi 2$) was used to reveal the relationships between variables. The Chi-Square Test is based on comparing the observable frequencies of each variable with the frequencies expected to be obtained in the research. (Gay, Mills & Airasian, 2012).

While analyzing the collected data, researchers used a Science Learning Environment Checklist created by considering examples in the literature (see Appendix-2). While developing the checklist used in data analysis, expert opinion was received from 3 researchers who are experts in their field. In the Checklist, three main themes were determined; namely, the location of the science learning environment, the images of science and the order of the science learning environment, and the codes and sub-codes related to these themes. Codes based on the Location of the Science Learning Environment theme are determined as; indoor, outdoor and unusual place. Codes linked to Science Images are determined as; images related to equipment/experiment materials, images related to information, images related to technology tools and others. The codes related to the theme of Order of Science Learning Environment are determined as the position of the teacher and the position of the student. In the results section, these codes and sub-codes will be presented in detail with examples.

For the consistency of the study, two different researchers analyzed the data separately and Cohen's Kappa was found to be 0.82. According to Landis and Koch (1977), a kappa value of between 0.81-1.00 indicates an almost perfect consistency.

RESULTS

The findings obtained by the analysis of the collected data are presented with sample drawings and tables depending on the themes of the location of the science learning environment, science images and the layout of the science learning environment. Chi-square ($\chi 2$) and p significance values were used while interpreting the findings.

The Image of the Science Environment in the Minds of Rural and Metropolitan Middle School Students

The distribution of images related to the scientific learning environments in the minds of middle school rural and metropolitan students according to each theme, code and sub-codes are explained in Table 1. Accordingly, it is seen that 56.8% (N = 75) of rural students draw outdoor place as a science learning environment. But, this rate constitutes 20.9% (N = 28) of metropolitan students. When it comes to the inside, it is seen that 40.2% (N = 53) of the rural students and 42.5% (N = 57) of the students from the metropolitan area made interior drawings. The other sub-code was created for the environments that are outside the school environment such as conference hall, gym, and cinema and cannot be described as classroom or laboratory environments. Drawings that do not depict the outdoors or indoors are coded as unusual drawings. If a learning environment is designed against the laws of nature and physics, it is coded as a fantastic environment while the learning environments drawn in place are coded as universe centered. Conspicuously, this rate reaches 50 for metropolitan students while only 4 of the rural students dream of unusual places.

Table 1. Distribution of the Theme of the Science Education Environment by Rural and Metropolitan Students

	Indoor							Outdoor			Unusual Place					
	Classroom Environment		Laboratory		Other		∑(%)	Nature-centered		∑(%)	Universe-centered		Fantastic Environment		∑(%)	Final Total
	N	%	N	%	N	%		N	%		N	%	N	%		
Rural	22	8.27	22	8.27	9	3.38	19.92	75	28.20	28.20	0	0	4	1.50	1.50	49.62
Metropolitan	7	2.63	23	8.65	27	10.15	21,43	28	10.53	10.53	24	9.02	25	9.40	18.42	50.38
Final Total	29	10.90	45	16.92	36	13.53	41.35	103	38.73	38.73	24	9.02	29	10.90	19.92	100

Another finding that is commonly observed indoor, outdoor and in unusual places which are students imagine more spacious and wider environments than congested ones. If the sample drawings related to the "Classroom Environment" sub-code linked to the indoor code are analyzed, it is seen that a closed classical classroom environment looking at the drawing of MIMKB-34 made by a student from rural areas in Figure 6. The drawing has been associated with the code "Classroom Environment" because it creates a classical perception of class surrounded by walls. It is remarkable that in the drawn science-learning environment, the teacher's desk is positioned close to the middle and there is no window in the environment. On the other hand, while the corners of the walls are indicated with bold lines in the drawing, it is another remarkable element that the table and the desk where the students are located are dull.

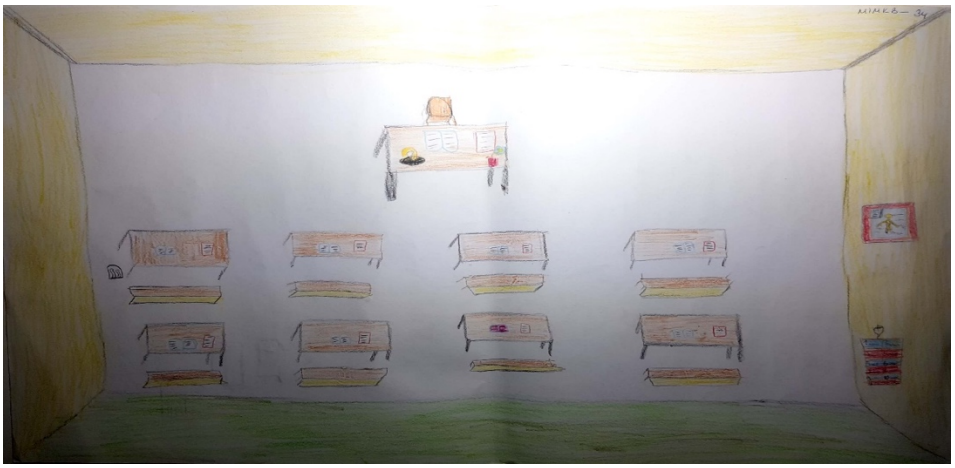


Figure 6. An example of "Classroom Environment" drawing by the student coded MIMKB-34 (rural).

Considering the science learning environment, it is inevitable to come across a design that can be directly associated with laboratories. In Figure 7, in the drawing by MIMKB-7, there is a laboratory and a specially designed experiment table with a cupboard. In this environment, some of the basic materials of the laboratories, the Erlenmeyer and the test tube stand, can be seen on the test table. The student drew him/herself while actively engaged in experimenting. In the drawing, it is seen that stools were preferred to sit around the table where the experiments were conducted.

Figure 7. An example of an interior drawing of the "Laboratory Environment" by the student coded MIMKB-7(rural).

An example of the "Other" sub-code in science learning environments indoors is the IBT-26 drawing presented in Figure 8. At first sight, it attracts attention with its different architecture. In this picture, the student drew the science learning environment as an Erlenmeyer. In this drawing, it is seen that there is a closed science learning environment with green stairs in which experiments were made. Again, cupboards for holding experimental materials and tables for experimenting are drawn in this picture. But, in addition it is also remarked “It is a fun environment”. If we look at the drawing, it is seen that fumes are coming out from the top of the building like a "factory chimney". The student who made the drawing wrote that she/he designed a fun factory where experiments were made.

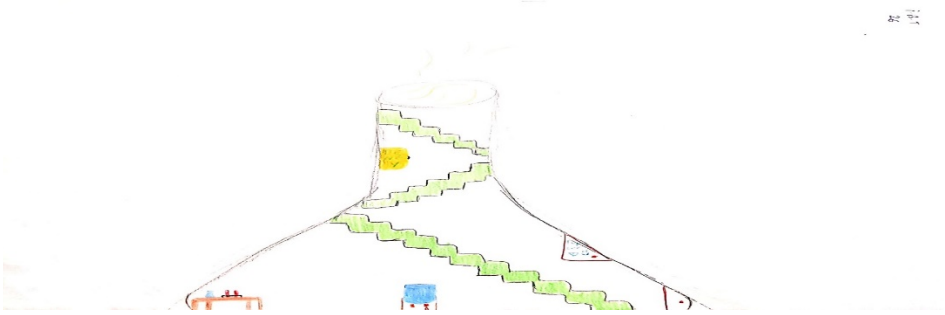


Figure 8. An example of “Other Environments” drawing by the student coded IBT-26 (metropolitan).

In Figure 9, the student coded IBT-53 designed the science learning environment as a house where comfort and coziness are in the foreground in the “other” sub-code. A multi-shelf bookcase, a bed and balloons are the highlights of the picture.

Figure 9. An example of the indoor place drawing of "Other Environments" by the student coded IBT-53 (metropolitan).

It has been observed that the students frequently draw the laboratory environment in the indoor drawings. "Other environments" is the second sub-code with the highest frequency out of the laboratory environment drawings. The "Classroom environment" drawings are the fewest science learning environment design by students.

Drawings made by students in the outdoor code have been examined under the "nature centered" sub-code. This sub-code includes all outdoor drawings such as forests, parks, gardens and seaside. It was seen that the drawings centered on nature were the second preference (38,73%) with the highest percentage according to the findings of the research. It was observed that students from rural areas (28,20%) drew more nature-centered drawings compared to metropolitan students (10,53%). In Figure 10, the student with the code of MIMKB-70 from the rural area drew an open area where the sun is positioned on the upper right of the paper. Into this open area, a tent, which is called the "student tent", is placed for class and accommodation needs. There is a green tree right next to the student tent. In the department where the lessons are taught in the science environment, it is seen that three desks are lined in opposite directions to the teacher's desk and towards the front of the teacher's desk. In addition, it is seen that the indoor environment is designed only for sheltering, whereas the education is drawn open air, wide and spacious.

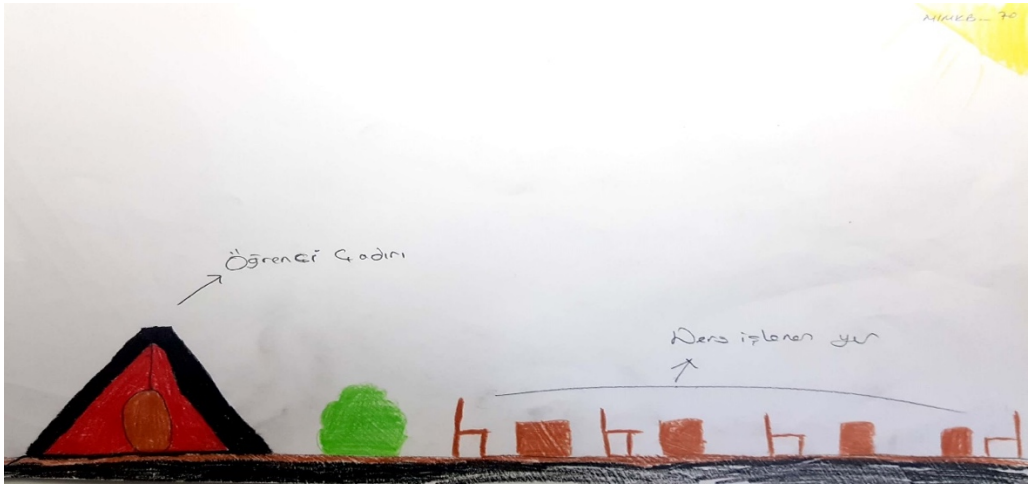


Figure 10. An example of "Nature Centered" drawing of the student with the code of MIMKB-70 (rural).

If we look at the IBR-12 drawing (Figure 11) from the metropolitan area, an open and spacious area with plenty of trees is seen by a stream. It is observed that in an environment decorated with small bushes and different flowers, teachers and students are happy.

Figure 11. An example of "Nature centered" drawing in outdoor place of IBR-12 coded student (metropolitan).

The unusual place drawings are grouped as "Universe Centered" and "Fantastic". It is seen that the Metropolitan IBT-3 coded student related to the "Universe Centered" sub-code, imagines a science learning environment with a planet view in place (Figure 12). Because of hosting of known universe images, the drawing is not considered a fantastic environment drawing. In addition, the student thought about the comfort of the environment by placing a pool and a bed in the science environment. The table she/he drew in the science learning environment only belongs to her/him and has all the materials she/he may need while teaching. Another noticeable finding in the drawing is that the student imagines the planets in the same plane.

Figure 12. An example of the "Universe Centered" drawing of the student coded IBT-3 in an unusual place (metropolitan).

One of the unusual pictures, if we examine the IBR-24 coded drawing presented in Figure 13, the student drew herself/himself flying over the clouds with wings. The environment is completely made up with

clouds and she/he has built a bridge out of a rainbow between two clouds. Again, the desk for the student to put her/his notebooks and pens are made of clouds. In this drawing, again, comfort, spaciousness, spaciousness, freedom, softness and fun elements are in the front plan.

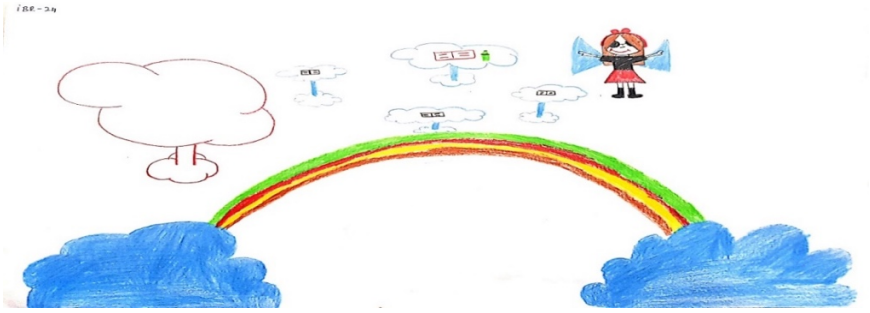


Figure 13. An example of the "Fantastic Environment" drawing of the student coded IBR-24 in an unusual place (metropolitan).

In another metropolitan data coded "Fantastic Environment", the cloud image and flying action emphasize that the environment the student dream if surprising and unusual. In Figure 14, the student coded IBR-1 used the expression "…the place where I study is above the clouds. There is a crazy scientist out there. Lots of test tubes…" in his/her written expression. The student drew the instructor as a crazy scientist. He/she has unified the science education environment and science fiction environments in his/her dreams.

Figure 14. An example of the "Fantastic Environment" drawing of the student coded IBR-1 in an unusual place (metropolitan).

Rural and metropolitan city participants with three sub-codes of the science learning environment and χ2(Chi-Square) and p (asymptotic significance) values which reveal the significant relationship and the region they joined are presented in Table 2. Significant difference of multiple comparison of rural and metropolitan students between Chi-Square test relationships was found (χ2= 59.78 >χ2critical=5.99, p<.05).

Table 2. Test Multiple Comparison of the Theme of the Location of the Science Learning Environment by Rural and Metropolitan Students and the Chi-Square Test

Location of the Science Learning Environment									
			Outdoor	**Indoor**	**Unusual Place**	**Total**	**χ^2**	**df**	**p**
School Region	Rural	f	75	53	4	132	59.788	2	.000
		%	%28.2	%19.9	%1.5	%49.7			
		PH	6.0	-.4	-6.8				
	Metropolitan	f	28	57	49	134			
		%	%10.5	%21.4	%18.4	%50.3			
		PH	-6.0	.4	6.8				
	Total	f	103	110	53	266			
		%	%38.7	%41.4	%19.9	%100.0			

The Image of the Equipment, Information and Technology in the Minds of Rural and Metropolitan Middle School Students

Other details in student drawings are observed under the following codes: images of equipment (experiment materials, stationery materials, school or classroom equipment's and not described); images of information (equations, scientific models, texts are not described) and images of technology (today's technology, advanced technology are not described). Tools and experiment materials in the drawings of rural and metropolitan students, the results of the observations of images related to information and technology are presented in Table 3, Table 4 and Table 5 respectively.

65.4% of the students reflected in their drawings both stationery and laboratory materials they frequently use in their daily life. When we look at the images related to the information, it was seen that 30.8% of the students drew equations, scientific models and captions.

Table 3. Distribution of the Theme of the Equipment by Rural and Metropolitan Students

	Described			Not described			Total		
	f	%	∑(%)	f	%	∑(%)	f	%	∑(%)
Rural	80	46.0	30.1	52	56.5	19.5	132	49.6	49.6
Metropolitan	94	54.0	35.3	40	43.5	15.0	134	50.4	50.4
Total	174	100	65.4	92	100	34.5	266	100	100

Table 4. Distribution of the Theme of the Information by Rural and Metropolitan Students

	Described			Not described			Total	
	f	%	∑(%)	f	%	∑(%)	f	∑(%)
Rural	23	28.0	8.6	109	59.2	41.0	132	49.6
Metropolitan	59	72.0	22.2	75	40.8	28.2	134	50.4
Total	82	100	30.8	184	100	69.2	266	100

Table 5. Distribution of the Theme of the Technological by Rural and Metropolitan Students

	Today's Technology			Advanced Technology			Not Described			Total	
	f	%	∑(%)	f	%	∑(%)	f	%	∑(%)	f	∑(%)
Rural	13	20	4.89	0	0	0	119	66.48	44.73	132	49.6
Metropolitan	52	80	19.54	22	100	8.27	60	33.52	22.56	134	50.4
Total	65	100	24.43	22	100	8.27	179	100	67.29	266	100

Accessible devices such as smart-phones, tablets, boards, projectors which are today's technology; devices such as holograms and teleportation units are considered advanced technology products. It was found that metropolitan students included images of technology tools, advanced (8.27%) and today's technology (19.54%) drawings were, while 44.73% of the rural students did not make any description in this field. In Figure 15, examples of students' drawings of science images are presented under the title of rural and metropolitan cities.

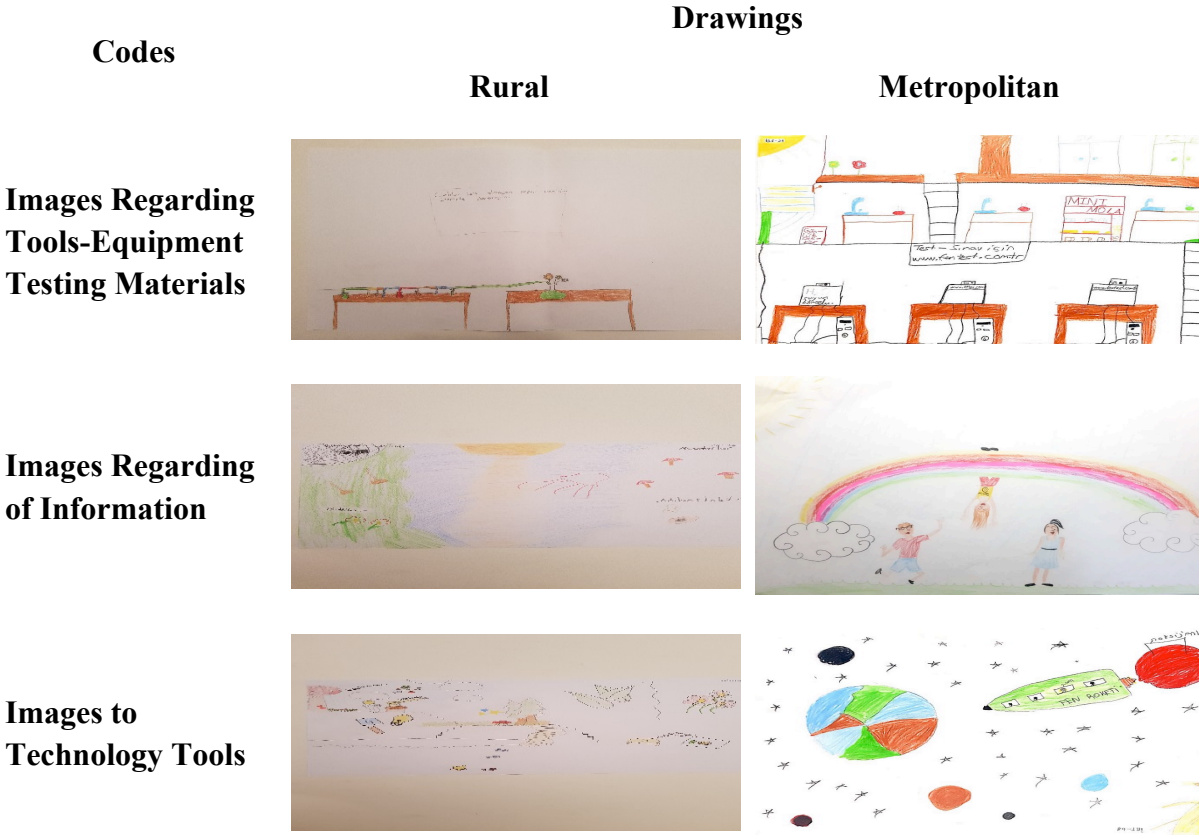


Figure 15. Examples of the "Equipment, Information and Technology" drawings of the rural and metropolitan students.

According to $\chi 2$ and p values which reveal a significant relationship between the regions they participated in, with the descriptions of the rural and metropolitan participants about the equipment and experimental materials, no significant relationship was found $\chi 2 = 2.677 < \chi 2$ critical $= 3.841$, $p > .05$. However, there is a significant relationship between the description of the images $\chi 2 = 22{,}074 > \chi 2$ critical $= 3.841$, $p < .05$ in the drawings. Lastly, it is seen that there is a significant relationship $\chi 2 = 64.83 > \chi 2$critical $= 5.991$, $p < .05$. between the images of technology tools for metropolitan students.

The Image of the Layout of the Science Learning Environment in the Minds of Rural and Metropolitan Middle School Students

The layout of the science learning environment in students' images were examined in two categories; the position of the teacher and the student. These categories are defined with sub-codes as "teacher centered", "student centered" and "not described". Among all the students, only 27.44% (N = 73) of the students

drew the layout of the science learning environment. Rural and the metropolitan students who drew instructors as teacher-centered are 54.16% (N=26) and 44.84% (N=22) respectively (see Table 6).

Table 6. Distribution of the Theme of the Layout of Science Learning Environment by Rural and Metropolitan Students

	Teacher Centered			Student Centered			Not Described			Total	
	f	%	∑(%)	f	%	∑(%)	f	%	∑(%)	f	∑(%)
Rural	26	54.16	9.77	9	36	3.38	97	50.26	36.47	132	49.6
Metropolitan	22	45.84	8.27	16	64	6.02	96	49.74	36.09	134	50.4
Total	48	100	18.04	25	100	9.40	193	100	72.56	266	100

In Figure 16, examples of teacher-centered and student-centered drawings of rural and metropolitan students in science learning environments are presented.

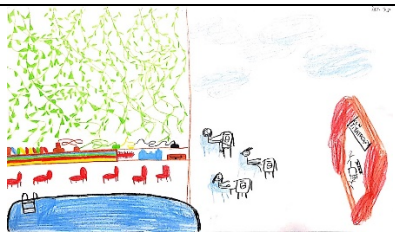
Codes	Drawings	
	Rural	Metropolitan
Teacher-centered		
Student-centered		

Figure 16. Examples of the "Layout of the Science Learning Environment" drawings of the rural and metropolitan students.

When we look at the difference between the regions regarding the position of the teacher and the student of rural and big city students, it is observed that there is no significant differences $\chi 2 = 2.284 < 2\text{critical} = 5.991$, $p > .05$.

DISCUSSION AND CONCLUSION

Learning environments should be able to be designed with the characteristics and needs of students in mind. According to the results of the research, the science learning environments in students' dreams are very different from today's science learning environments. According to the results of the research, the science learning environment in which only 10.90% of the students want to study in their dreams coincides with the existing classroom environments. Feire (2000) emphasized in her study that the school should give happiness to children. However, Al Şensoy and Sağsöz (2015) and Asiyai (2014) stated that almost all of the participants were not satisfied with the classical classroom order in their study, which investigated the effect of students' satisfaction with the spatial order and academic success. Another study Brock and the others (2008) determined that there is a significant relationship between students' perceptions of the learning environment and their social and academic achievements. Similarly, Türkmen and Pedersen (2003) emphasize that classroom environments are directly related to constructivist learning. Finally, in Radovan and Makovec's study (2015), it was concluded that students can easily demonstrate their personal goals in learning environments with strong communication based on collaboration and that their perception of the learning environment is positive.

Another finding of the study is that students imagine more and more spacious learning environments compared to congested learning environments, which is a common observation in indoor, outdoor and unusual place drawings. Similarly, Veltri, Banning, and Davies (2006) showed in their study that the factors that distract students (loud noise, wrong lighting, ineffective use of technological devices) disrupt the active learning environment and negatively affect the teaching environment. In addition, another remarkable result of the current research is that students want to attend science lessons in comfortable environments filled with fun and the comforts of home. The floor mats, large seats, and playground drawings of students are the proof of how much they care about this. Being in contact with friends and teachers in their drawings shows their movement and communication needs. It is an emphasis on the necessity for "school architecture for children" mentality that drives the designs of playgrounds and entertainment areas where students can easily run. There are many studies on how Finland succeeds which has made a name for itself with its success in PISA exams. Sahlberg (2018) examines the Finnish teaching model and emphasizes the importance of relaxation, comfort, regular breathing and physical activity for a sound learning experience in his book. In the current research, the expectations of comfort by the students in their drawings are significant considering the environments in which students take off their shoes and walk around comfortably in schools in Finland as well as at home. In the research, it was

observed that the number of students' drawing related to the nature-centered sub-code in the outdoor coded drawings was significantly different in the direction of the rural participants. On the other hand, the universe-centered and fantastic environment drawings connected to the unusual place code are significantly higher in the direction of metropolitan students in the research findings. This result shows us how much the students' science environment preferences are related to the environment in which they live, their experiences and even their culture. As a result, the student does not imagine an environment independent of her/his own culture and environment as an educational environment. The famous educator Prof. Dr. Selçuk Şirin, stated at every opportunity that the best school for the child should be the school in the neighborhood where she/he lives. Therefore, it is essential to standardize the quality of teaching for each region.

Similarly, in the current research students imagine interesting science learning environments parallel to their experiences such as rainbows, holograms etc. McHatton and the others (2014) defined students' thoughts about learning environments as the physical conditions of the classroom, students' perceptions in the learning environment and the placement of the teacher in the classroom. In their studies, it has been concluded that they define both highly gifted and formal education students considering the drawings of the students regarding the learning environment.

Another result of the current research is that the students used course and experiment materials in their drawings which integral parts of the scientific learning environment are not directly questioned. In their research Veltri and the others (2006) emphasize classroom materials and technological equipment have a very important place both between the students in the classroom and the distance education students and the teacher.

In the current research, 72.56% of the students did not specify the position of the instructor and the student in their drawings, the remaining rural (N = 26) and metropolitan (N = 22) students made teacher-centered drawings. Feyzioğlu and the others (2014) observed in their study in which they examined the mental models of pre-service teachers for science teaching that this situation evolved to a student-centered approach as the grade level increased. In his study, Aykaç (2012) who asked students, "What comes to your mind when we say teacher?", found that some students perceived teachers as a "flower" or "heart", some perceived them as a "human", and some perceived it as a leader like "Atatürk". McHatton and the others (2015) stated in their research that gifted students drew the teaching environment as student centered, active and competitive. However, it is said that the world is changing shape, on the way to becoming a science and technology society, but recent studies on the drawings of scientists (Fralick, Kearn, & Thompson, 2009; Oğuz Ünver, 2010; Akçay, 2011; Ağgül Yalçın, 2012, Kara, & Akarsu, 2013) show that students still depict them stereotypically. Although the current research is limited, the science teacher is also described or drawn in line with a certain stereotype.

As a result, rural and metropolitan students dream of a science learning environment that includes their own lives and culture, comfortable, in touch with nature but using the possibilities of technology. This situation is the proof that the science learning environment in the students' minds are far from today's classroom environment.

Using the results acquired from the data, a layout plan of the appropriate teaching environment was asked to be created by an architect in the form of plans. Accordingly, Figure 17, depicts a science learning environment design has emerged consisting of 5 different stages placed in a large area. Opportunities for activities such as research, teaching, sports and entertainment are provided to students in these stages. In addition, a pond surrounding the teaching environment and the stream connected to this pond refer to the nature theme in students' drawings. Also the thicket areas around the science environment campus are designed in response to the students' desire to interact with nature.

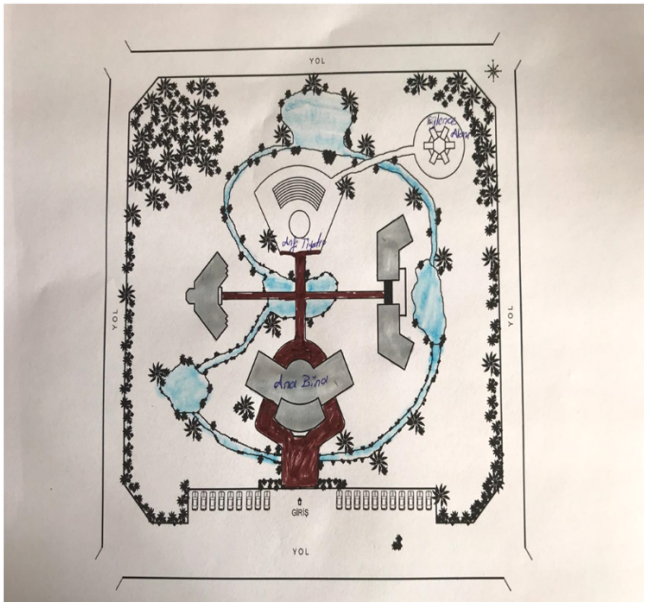


Figure 17. Architectural interpretation of the scientific environment according to student drawings.

Implication for Further Studies

In the light of the findings obtained from the drawings of the students participating in the study, the site plan of the science environment of the students' dreams was presented as a suggestion with the support of the architect. In addition, other recommendations determined according to the results of this research are listed below:

1. While creating science learning environments, the opinions of students who have always been neglected indispensable shareholders of education until today, should be taken.

2. Science learning environments should be integrated with nature. Therefore, science educators who have a voice in school management and instructors should definitely include out of school learning environments in their planning.

3. They should have place where the rainbow that touches and takes attention of students' dreams, advanced technologies, fantastic places and ideas exist in science learning environments.

4. Science learning environments should not be cold and dark in the classical laboratory understanding, but should be colorful, well-lit and comfortable.

5. They should design science environments that integrate the environment in which each student lives, not in a single prototype.

6. When designing science learning environments, the needs of students both now and in the future should be considered.

7. They should create student centered and supporting communication environments.

8. Science learning environments should definitely be supported with experiment sets, tools and technology equipment.

9. Regardless of whether it is a state-owned or private institution, an independent commission that will determine the designs of teaching environments and their suitability for the needs of students should investigate how appropriate the existing schools are to train future students.

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Appendix 1. Data Collection Tool

Draw your dream science environment

We want to create an environment for you to conduct your science lessons. You will completely imagine this learning environment. We will establish this environment in direction with your dreams. Draw your designs and write to me.

Appendix 2. Science Environment Drawings Checklist

Theme	Sub-code	f		%	
		Yes	No	Yes	No
Indoor	Classsroom Environment				
	Laboratory				
	Other				
Outdoor	Nature Centered				
Unusual Place	Universe Centered				
	Fantastic Centered				
Images Related to Tools-Equipment / Experiment Materials	Experiment Materials				
	Stationery Equipment				
	School/Class/ Equipments				
	Not described				
Informational Images	Equations				
	Course Tool Scientific Models				
	Captions				
	Not described				
Images Related to Technology Tools	Today's Technology				
	Advanced Technology				
	Not described				
Other	Other				
Location of Teacher	Teacher Centered				
	Student Centered				
	Not described				
Location of Student	Teacher Centered				
	Student Centered				
	Individual				
	Not described				