THE REFLECTION OF DIFFERENT TYPES OF SCHOOL ARCHITECTURE ON CHILDREN'S PERCEPTION: THE CASE OF KAGITHANE

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Abstract

School buildings are one of the first public spaces where children feel themselves safe, well-being and fulfil their social needs. In this context, secondary school buildings, which are currently used in our country, have been discussing qualitatively for many years. Therefore, the focus point of this study is about the relationship between the buildings of education and their place in children' perception. The question that constitutes the purpose of the study is as follows: What is the effect of school buildings' physical conditions on children perception? Within this scope, İstanbul Kagithane region was selected as a case study and secondary school buildings in different typologies were examined. The first one of these typologies is the schools which were built by the Ministry of National Education with the same characteristics. The other is the schools that designed by Uygur Architecture. These schools were planned to be prepared for the possible earthquake of Istanbul and to be reconstructed in the context of "Istanbul Seismic Risk Reduction and Emergency Preparedness Project". As a sample, Secondary School of Cengizhan was selected for the first typology and also Secondary School of Ahmet Cuhadaroglu was selected for the second typology. Selected schools were evaluated in terms of practice, user satisfaction and user perception. For this, questionnaire and mapping technique were applied as the method and the obtained data were interpreted over the selected evaluation criteria. The questionnaire and cognitive mapping study was conducted at the secondary schools with a total of 206 students aged 9 to 13 years. Cognitive maps were evaluated with projective, metric and imaginative space parameters. As a result, it is supported by cognitive mapping studies that spatial perceptions of students are directly related to the exterior and interior of building. Therefore, it is considered that the evaluation criteria and the obtained data from this study may be the support for the further research.

Keywords: Spatial Perception, Secondary Schools, Cognitive Development, Children Perception, School Architecture

Wordcount: 4.192

Introduction

Schools, one of the first public spaces the child comes across, have an important place in his/her development. They also contribute to comprise of and development of the child's spatial perception. Therefore, the focus of this study is spatial perception in the child.

Many spatial and perceptual properties such as spatial features of the material used, accessibility, possibility of physical activity, transportability, the character of the building, size-ratio-volume of the space, type-color-texture of used material are factors that take place in the child's spatial perception. In this study, determining the factors that affect the child's sensory perception both in the positive and negative direction; developing physical environment of schools according to these factors and so contributing to the child's perceptual-cognitive development were aimed. In this context, two types of schools in Istanbul / Kagithane region were chosen and a case study was

conducted with the total of 206 students in these schools. One of these examples is Cengizhan Secondary School (CSS) which is a standard and uniformly designed example and the other is Ahmet Cuhadaroglu Secondary School (AÇSS) which is designed originally by taking into account the urban context it is located. The positive and negative aspects of the two different types of schools were compared and an evaluation was made based on the children's spatial perception.

Child Spatial Perception and School Buildings

Childhood constitutes an important phase of biological and cognitive development of individual. This period is shaped by many different genetic and environmental factors. In particular, perception and behavior development play an important role in the child's future life. Therefore, it is important that set the environment variables correctly in childhood (Fawcett and Hay, 2004). Thus, development of the child is affected not only biological (inherited) factors but also physical and social variables such as level of income, school, family, etc. (Cüceloğlu, 2015). The child spends most of its time in places like home and school. So, it affects cognitive, behavioral and perceptual development of the child positively when these places are well planned.

Perception is the process that people get information about and from the environment, and when cognition and the reality unite on a purpose actively (Lang, 1987). Basically, perception is actively and consciously interpretation of sensory information. The development of individual perception skills begins with birth and are shaped by time. Especially in early childhood, transformation of the flow of information that individual is voluntarily and involuntarily exposed to perception has become meaningful through the proper management of various environmental factors (Piaget, 1964).

Some environmental organizations are involved in the proper management of environmental factors. For example, as one of perceptual psychology studies, "gestalt principles" has revealed some rules (figure-ground, closure, continuity, similarity, proximity) in the perception of this organization. It is found that these principles play an important role in the communication between sensor and perceived (Rock and Palmer, 1990). With these rules, environmental perception can be partially solved. Environmental perception can be considered together with periods of mental development in children.

According to Piaget, the child's mental development consists of four phases. These are, between 0-2 years sensory-motor period; between 2-7 years, preoperational period; between 7-11 years, concrete operational period and between 11-14 years, formal operational period (Pulaski, 1971). Within the scope of this study, the early adolescence period (10-14) which corresponds to the secondary school period was discussed. In this range, information is obtained through words and concepts, and the child begins to think and interpret rather than concrete thoughts based on experiential (Pulaski, 1971). In the process of formal operational period, the child's mind goes through a clearer process of external influences. So, with physical condition, the child starts to perceive environment more consciously. In this period, concepts such as number, time, space, dimension, conservation, volume, distance start to settle in the child's mind. The child can organize with groupings such as classification, sorting, and the ability to establish a system develops (Yavuzer, 2003). In fact, all elements that work together in the socio-physical environment affect the cognitive development (Şener, 2001). In this context, all environmental factors affecting perception of children have effects on perceptual and cognitive development process. For the children in the selected age group, spatial responses of this developmental process are also important.

Spatial perception of the child is shaped by the child's awareness of his / her existence and the connection between himself / herself and space (Dewey, 2004). The pioneering condition for this development is the child's perception of his or her own body parts, postures and movements, and physical location. Just after, the child has motion sensation and begins to create his/her own movement area during this period (Cüceloğlu, 2015). Up to this point, home environment is one of the spaces that enables the child to discover environment and to realize learning process. However, the spatial perception of the child continues to shape until this turn. In conjunction with, perceptual development is closely related not only with the home, but also with the school (Read et al., 1999).

Schools, as are all over the world, are structures that are aimed at a particular purpose and addressed to a specific group of users. Physical aspects of school include closed or open-planned classes, meeting halls, laboratories, and playgrounds. Architectural and spatial differences of schools reflect the political, technological and social development of the community. The interaction between human behaviors and spatial views is related to the long-term and effective use of buildings (Ünlü, 1998). David and Weinstein (1987) argue that the built environment influences the child development both directly and symbolically. School ownership, which is the place where the child spends most of his/her time, and communication with the school contribute to the development of the perception of space. This interaction is thought to be mutual benefit as well as link between the user and the building.

School buildings are expected to be in a structure that is compatible with the environment, easy to access and controlled, with internal and external flexibility, ergonomic, suitable for health conditions, identity and feelings of belonging to users (Karabey and Akay, 2004). Accordingly, it is thought that educational buildings are well-designed schools, which have positive effects on students such as school adoption, sense of belonging and easy perception of the place (Türel, 2017). The physical quality of the school building and the classroom environment are thought to directly affect the child's development, productivity and achievements (Evans, 2004). According to

the researches, the socio-economic situation of the individuals also affect the school success and the psychological health significantly (Morgan et al., 2009).

Earthman and Lemasters (1996) investigated relationship between the school physical environment and the child's behavior, development and performance, and found a link between these variables. The study of Benning and Canard (1986) also emphasized a similar relationship between the physical environment and the development of the child was overlooked when evaluating school performance. In this context, Hart and Moore (1973) addressed this interaction in three chapters, cognitive stages; mental development, spatial organization, and spatial learning associations (Figure 1). In this study, spatial organization and spatial learning relations are discussed together. Four types of spatial learning properties have been used in school spaces; topological space (proximity, disconnection, similarity, continuity), metric space (conservation, dimension), imaginative space (edges, paths, districts, nodes, landmarks) and projective (line drawing, simple perspective). In the context of this evaluation method, a questionnaire study was constructed and the studies applied in two different schools in the case study were evaluated.

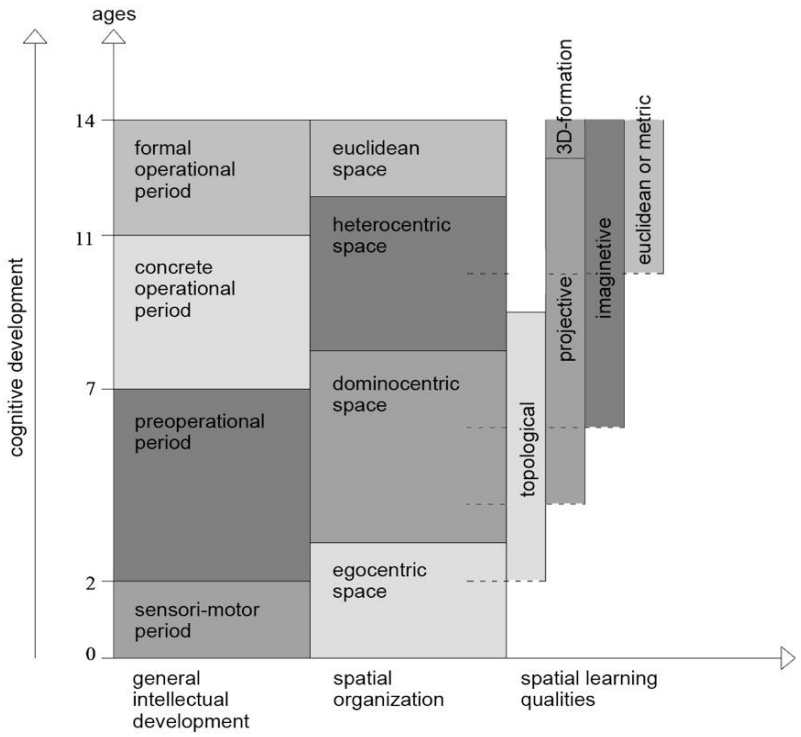

Figure 1. Mental-spatial relationship in the child's perception. (Hart ve Moore, 1973).

Case Study

The case study was conducted at Secondary Schools of Cengizhan (CSS) and Secondary Schools of Ahmet Cuhadaroglu (AÇSS) located in Kagithane district of Istanbul. CSS is one of the state schools which were designed with same plan typology and building character built by the Ministry of National Education (Figure 2). AÇSS is one of the state schools designed by Uygur Architecture and has a unique design (Figure 3). These schools have been chosen as study areas because of their different formal, spatial, and plan typologies. Both schools are located within a similar social and economic environment.

Figure 2. Ground level plan (It was provided from CSS archive) and perspective of the CSS.

The purpose of the study is to examine the effect of the school's architectural structure on the child's spatial perception. In this context, the sub-research questions are; what are the spatial and physical characteristics that

affect the spatial perception of children aged 9-13 years in school buildings with different architectural and spatial typologies and what are the perception levels of children of the same age group on their schools. A total of 206 students from ages 9 to 13 (103 students of AÇSS, 105 students of CSS) conducted a drawing work on their schools with the survey and cognitive mapping method.

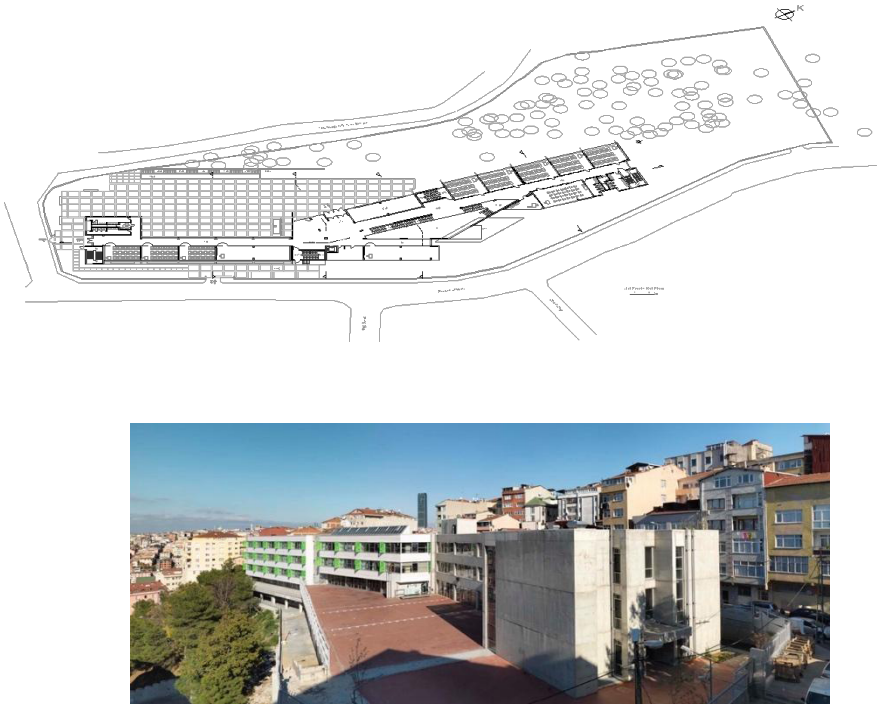

Figure 3. Ground level plan (It was provided from Uygur Architecture) and perspective (http://www.arkitera.com/proje/4853/4594, data access: 10.01.2018) of the AÇSS.

In the scope of the questionnaire, open-ended questions were examined. Children were asked to draw 'How do you see your school from the inside?' and 'How do you see your school from the outside?'. Their drawings were used as their cognitive maps and these cognitive maps were evaluated through topological[1], projective, metric and imaginative space parameters. Some qualities were examined for these parameters. For instance, the ability of students to draw straight and parallel lines in the projective space properties and to draw what the children see in the framework of correct perspective rules in the metric space properties were evaluated. In the imaginative space properties, the presence of edges, paths, districts, nodes, landmarks parameters (used by Lynch) were examined. The drawings were classified according to the existence of these parameters. The spaces and details in the drawings are categorized and tabulated. Based on the data obtained as a result of the study, it is aimed to measure the spatial perception levels of children in physical surroundings.

	Projective space properties	**Drawing**	**%**
Cengizhan SS.	Straight Line	98	93
	Parallel Line	98	93
	Perspective	13	12
Ahmet Cuhadaroglu SS.	Straight Line	92	89
	Parallel Line	92	89
	Perspective	24	23

Table 1. Comparison of projective space properties observed in students' drawings compared to schools.

The examined first space in the cognitive mapping is the *projective space* (Table 1). Accordingly, it can be seen that children are at a higher level of ability to draw straight lines and parallel lines in both schools (Figure 4). However, the drawings of students studying at AÇSS contain more perspective information than those at CSS. The physical and spatial stimuli provided by the school and many reference points have contributed to this situation.

1 This parameter is excluded from the scope of study because the topological space properties are seen in every child in this age group.

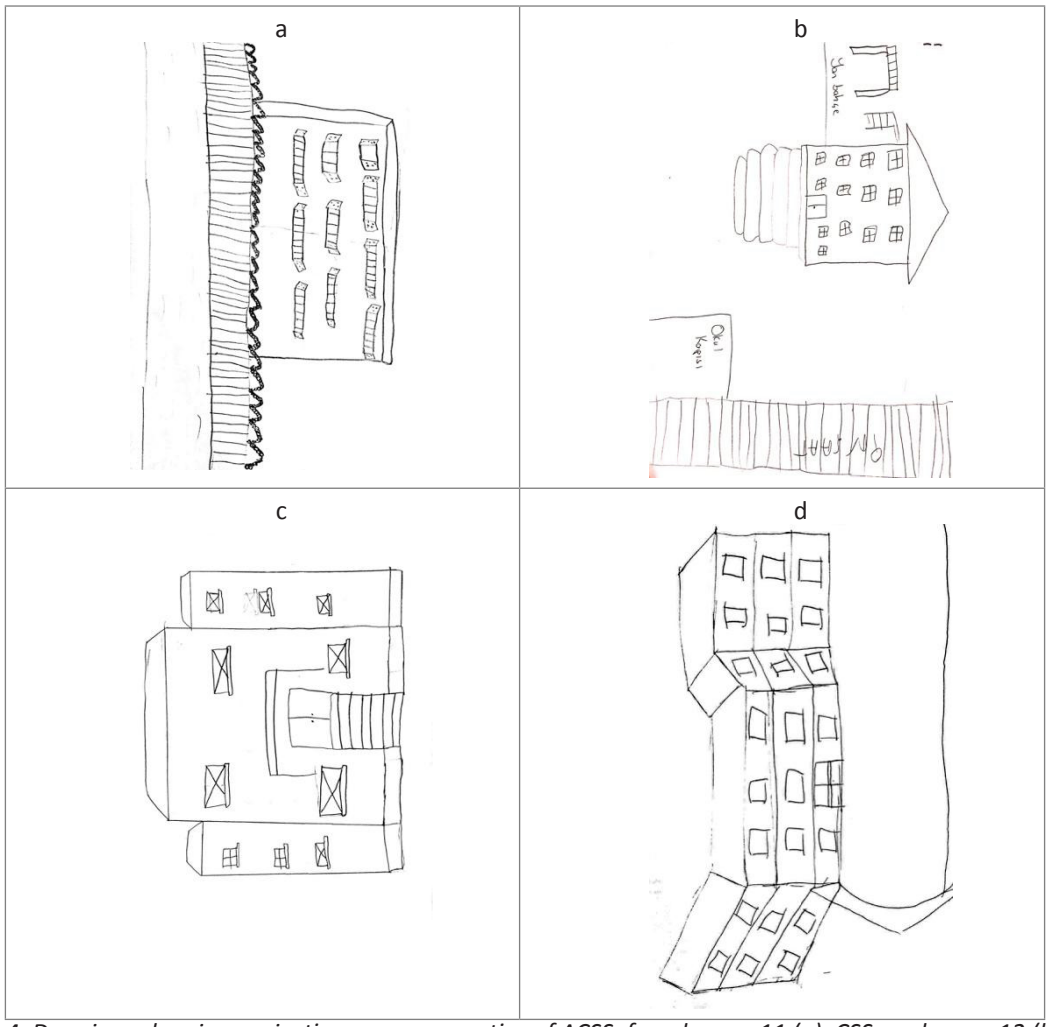

Figure 4. Drawings showing projective space properties of AÇSS, female, age 11 (a), CSS, male, age 12 (b), CSS, male, age 10 (c) and AÇSS, male, age 11 (d).

	Metric space properties	Drawing	%
Cengizhan SS.	Block Expression	5	5
	Conservation	21	20
Ahmet Cuhadaroglu SS.	Block Expression	14	14
	Conservation	29	28

Table 2. Comparison of metric space properties observed in students' drawings compared to schools.

Metric space properties begin in children around the age of 10 and occur when the physical environment and objects are drawn or transferred with the correct perspective rules. Therefore, drawing studies in this context are evaluated through 'conservation' and 'block expression'. Conservation is defined as children's drawing objects with real dimensions and the close object has a different dimension from the distant object in the frame of perspective rules. Dimensional expression is evaluated by expression of object or space in terms of perspective rules. In this direction, the students who study in AÇSS have more metric properties in their drawings than the other students who study in CSS (Table 2) (Figure 5).

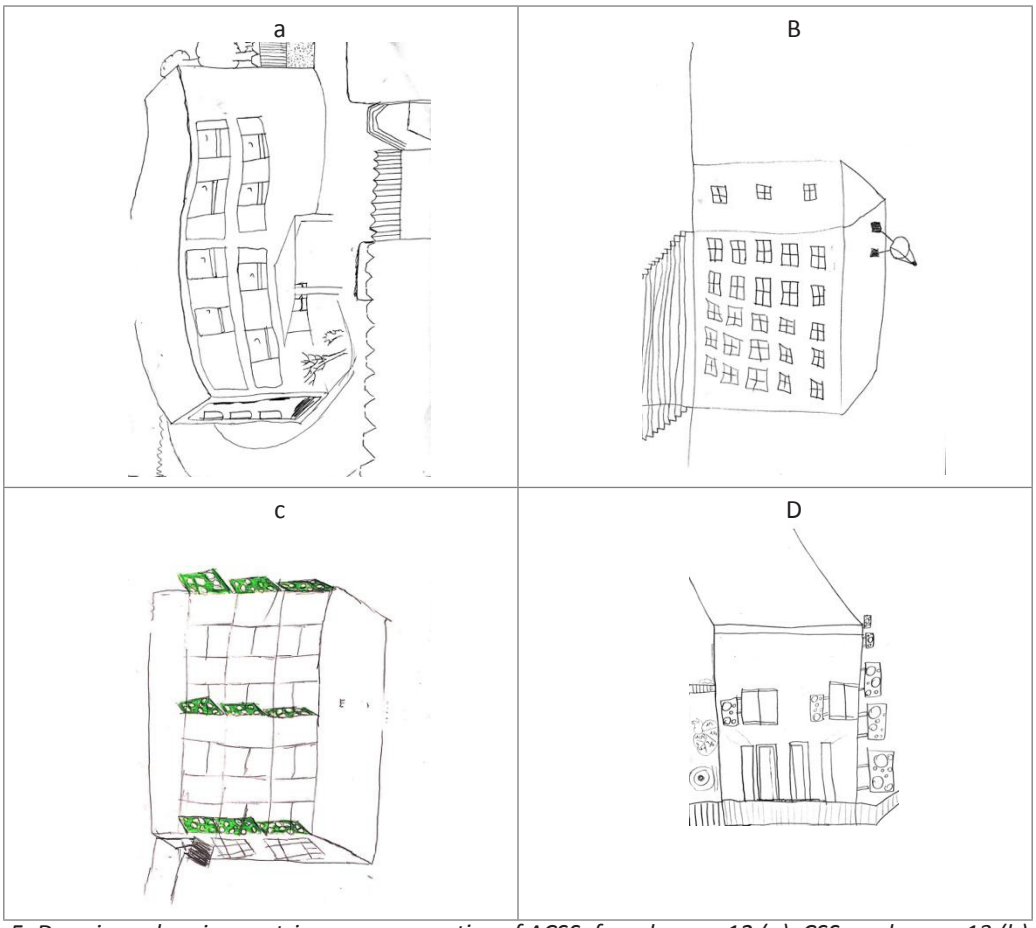

Figure 5. Drawings showing metric space properties of AÇSS, female, age 12 (a), CSS, male, age 13 (b), AÇSS, female, age 12 (c) and AÇSS, male, age 10 (d).

It was seen that among children who participated in the case survey, 22 children in AÇSS and 8 children CSS draw their schools from the inside in their drawings (Table 3). The classrooms, which are the most outstanding spaces in children's drawing are the most detailed drawing by children at the same time. However, 70 children in AÇSS and 91 children CSS draw their schools from the outside in their drawings.

	School Expression	Drawing	%
Cengizhan SS.	Inside	8	8
	Outside	91	87
Ahmet Cuhadaroglu SS.	Inside	22	21
	Outside	70	68

Table 3. Comparison of children's drawings which are representation of school from inside or outside.

When the imaginative space properties are considered in the context of interior and exterior drawings, the drawings showed numerical differences between schools. AÇSS students have drawn more interior space than CSS students. Although AÇSS has a complex plan design, children have been able to draw more interior space here because of the excess of reference points and allowing visual communication. However, even though the plans of the CSS are simpler and plainer, the drawings of there were not perceived at a sufficient level.

	Imaginative space properties	Drawing	%
Cengizhan SS.	Paths	23	22
	Districts	26	25
	Edges	35	33
	Nodes	19	18
	Landmarks	43	41
Ahmet Cuhadaroglu SS.	Paths	25	24
	Districts	35	34
	Edges	47	46
	Nodes	32	31
	Landmarks	67	65

Table 4. Comparison of imaginative space properties observed in students' drawings compared to schools.

In AÇSS, the characteristics of imaginative spaces are seen more than others (Table 4). This can be interpreted as the fact that children are more experienced in the interior of the school in AÇSS and the school has strong stimulants. In both secondary schools, the rate of road image was close to each other and this image was seen in the drawings of about one quarter of children. However, the parameters of the regions, edges, nodes, and landmarks were more frequent in the drawings of the students who read in AÇSS (Figure 6,7).

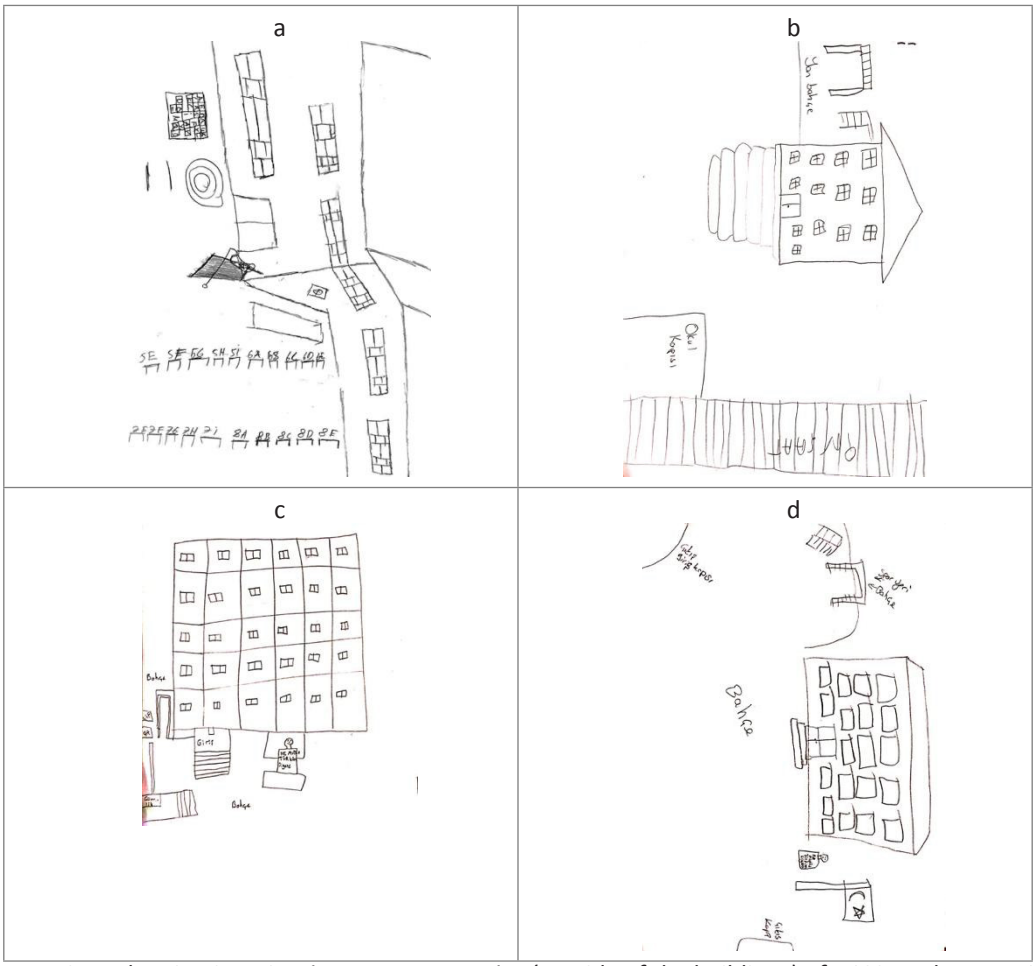

Figure 6. Drawings showing imaginative space properties (outside of the buildings) of AÇSS, male, age 13 (a), CSS, female, age 11 (b), CSS, male, age 11 (c) and CSS, male, age 13 (d).

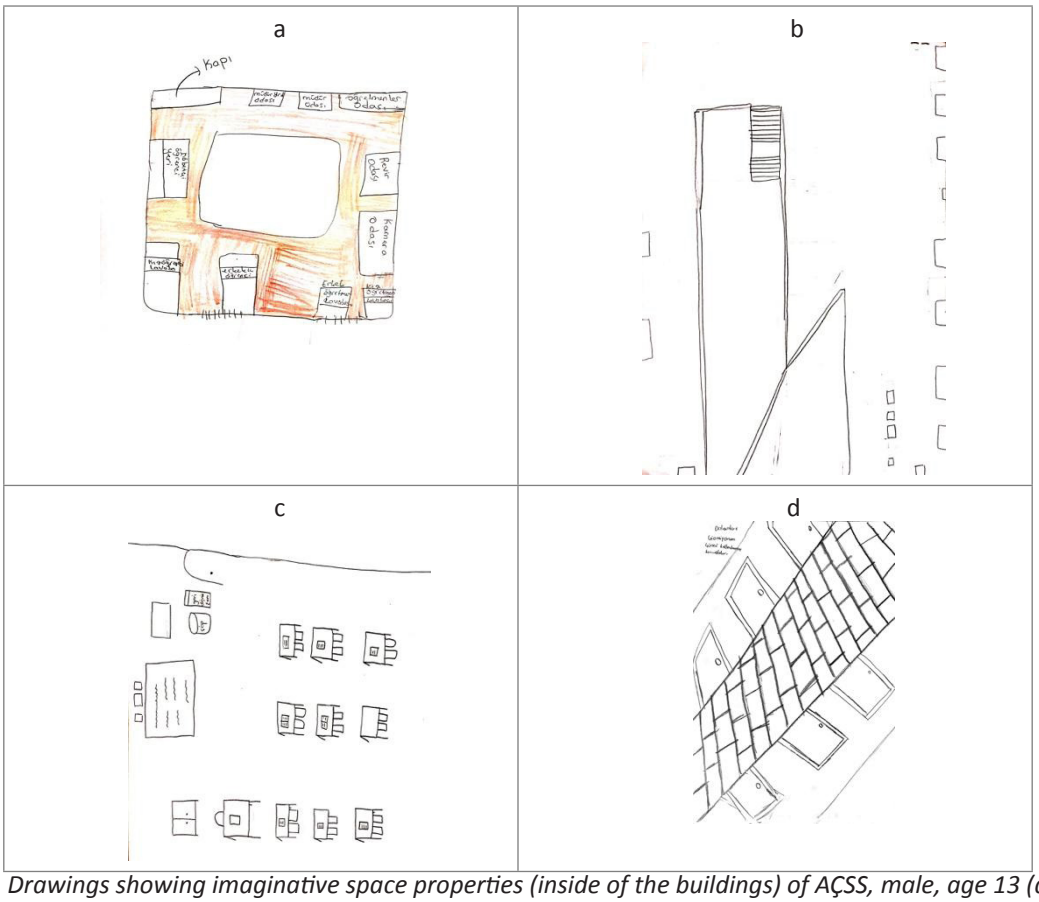

Figure 7. Drawings showing imaginative space properties (inside of the buildings) of AÇSS, male, age 13 (a), AÇSS, female, age 12 (b), AÇSS, female, age 12 (c) and CSS, female, age 13 (d).

The following table shows that which specific places and landmarks are drawn by children in the context of imaginative space properties (Figure 8). It is seen that spatial perception varies as class scale and building scale. Children from AÇSS gave more details in the drawings than children from CSS. Participants in CSS mostly drew the school building in a simple way, while in the drawings of AÇSS there was an expression covering the entire school.

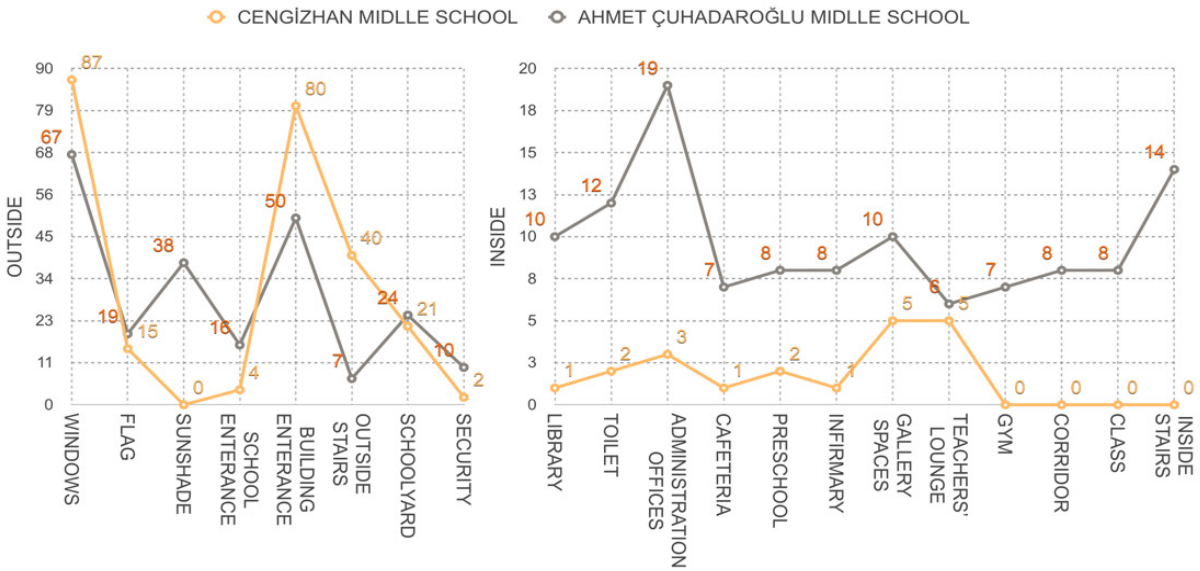

Figure 8. Comparison of landmarks and space (outside and inside) observed in students' drawings compared to schools.

Students from AÇSS drew spaces that were used consistently such as spaces containing horizontal and vertical circulation, service spaces, and this finding proved that use of space has an effect on spatial perception. However, despite the fact that CSS building has a spatial organization based on a simple plan type, it could not be fully perceived by children. It is seen that the inside and outside of the building are drawn in more detail in AÇSS while

most of the drawings of children were more detailed about outdoor space in CSS. This situation is thought to be directly related to the use of spaces by children. It is estimated that specific characteristics of building such as color, texture, etc. have an effect on perception of AÇSS's envelope and its surroundings. Furthermore, outdoors stimulants are qualified and the garden area is bigger than other schools which in turn caused children to use more reference points in their drawings.

According to Piaget (2016), the levels of cognitive development vary with age, as well as differences in physical environment and socio-economic levels of children who are educated in different schools. As a result of the research; projective, metric and imaginative space properties are perceived by the children at a higher level who read in schools designed with rich stimulants and context-specific data. Therefore, it can be said that, children reading in school buildings designed with context-specific data are more competent in terms of three-dimensional narration than children reading in type projects.

Conclusion and Recommendations

In the study, on the one hand the development of the child was investigated in the context of human-environment relation, on the other hand, the spatial perception of the child was investigated in the context of perception-behavior relation. Because of this, a case study was conducted. Secondary school buildings as an important space that influences the child's cognitive development within the scope of the case study were examined through the cognitive mapping and questionnaire method. In this direction, two secondary school buildings located in the İstanbul/ Kagithane and having different typology were selected. Both schools have a similar socio-economic level of user profile. This situation allows to neglect the socioeconomic status as a variable factor that affecting the perceptual development of the child.

When looking at the analysis of cognitive maps in case study generally; secondary schools which have high interaction, unsharp, free and internalizable areas are frequently being involved place in children's cognition. This is supported by the hypothesis that suggests the environmental factors, referred by Lang (1987) and Piaget (1964), influence the development of child. Social interaction spaces allow people to communicate with other people and the physical environment, to define the space and to make sense of the environment (Sanoff, 1994). In the drawing study, it was seen that children gave more space to such spaces where social interaction realizes. It is also supported by the study that the duration of use of these kinds of places is also an important factor.

As a result of the case study; the creation of visual stimuli (such as color, texture, shape), which helps to gain identity as in the expression of Lynch, on the interior and exterior of the buildings, which are designed by taking into account the specific data of context, this age group influenced the spatial perception in the positive direction in children. In this context, the situation of perception is affected by a wide scale from single space to whole structure, and this result is supported by the case study.

To strengthen spatial perception of children, school buildings where children need to be able to reconstruct the spatial perception, could be designed for allowed social relations to be established, developed creativity, exploratory, earned different experiences.

Children' spatial perception is affected from both moving objects (tables, chairs, cabinets used inside space) and fixed elements (sun breakers, windows). Therefore, the spatial and physical characteristics of secondary schools are gaining importance.

The relationship between the child and the physical environment mainly consists of a desire to establish a bond. The child wants to communicate with the physical environment that he uses and establishes a bond. For this, it is important that the physical environment of the secondary school is being well-designed and functioning. Because, the environment is discovered, examined, imitated by the child and learned actively. Therefore, there should be some free opportunities in the secondary schools' physical environment to offer to the child. It is important to create social and flexible spaces where the child can discover, experience, develop his creativity on his own. In addition, Socialization is also an important factor in perceiving the physical environment (Dewey, 2007). The school building should also support this socialization and allow children to easily explore their surroundings. Transitions between the spaces are also important to ensure continuity in this frame. As a result, in the direction of the data obtained from this study, it can be said that the physical and spatial improvement of existing secondary schools and the consideration of new schools' design in this context are important for the child's spatial perception and cognitive development.

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Appendix 1

Survey

PART 1

1. Which class are you studying:

☐ 5 ☐ 6 ☐ 7 ☐ 8

2. Gender:

☐ Male ☐ Famale

3. How many years have you been in this school:

4. Which school were you in primary school:

PART 2

5. In which place do you spend most of your time in school:

.....

6. In which place do you spend most of your time in school:

.....

7. What are the problems you most complain about at school:

1 .....

2 .....

3 .....

8. What are the positive aspects of the school:

1 .....

2 .....

3 .....

9. What are the negative aspects of the school?:

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PART 3

10. 'How do you see your school from the inside' and 'How do you see your school from the outside':