



**OLD-NEW TYPE SCHOOL BUILDINGS AND
ACADEMIC ACHIEVEMENT: TEACHER'S PERSPECTIVE –
CASE OF IZMIR, TURKEY^{i ii}**

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Abstract:

The purpose of this research is to examine whether low and high student achievement and new and old types of buildings have a meaningful relationship with perceptions of teachers on quality of school buildings. Quantitative methods were used in the research. 204 teachers from elementary, middle and high school in İzmir, Turkey completed the scale. Stratified random sampling was used in the research. In data collection, 'Quality School Building Scale' was used. For data analysis, t test were used as well as basic statistical methods. Results show that, as academic achievement, there is a meaningful difference between perception of teachers related to school campus, acoustic dimensions and total scale. The difference is in the favor of schools with lower academic achievement. The same dimensions and total scale have difference that old type is favorable. In this sense, improving the quality of school building is important.

Keywords: school building, school architecture, student success, academic achievement

1. Introduction

As "*the places of reproduction and transformation*" (Fine, Burns, Payne and Torre, 2004) schools have an important role on recovering or blocking the life satisfaction and psychological, social and biological development of the students. School environment should be both a closed, safe building and the environment giving the students all the opportunities of supporting their development, their learning and rich education (Blackmore, Bateman, Loughlin, O'maar and Aranda, 2011; Kilpatrick, 2003; Miller, 2009). In other words, several features of educational buildings affect on arising the human

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skills and behaviours and occurring the learning activity. That the schools' physical designing affects on students' perceptions, learning activity and behaviour is a widely accepted opinion. (Bartels, 2013; Cash, 1993; Cohen 2007; Csobod at all., 2014; Durán-Narucki, 2008; Earthman, 1998, 2004; Karasolak, 2009; Kilpatrick, 2003; Liao, 2010; Maxwell, 1999; Maxwell and Schechtman, 2012; O'Neil and Oates, 2001; Tanner, 2009; Terzioğlu, 2005; Uline and Tschannen-Moran, 2006).

The physical environment contributes to developing the perceptual, motor and cognitive skills. Design, hygienic and proper materials and visibility has risen the social psychology, creativity and achievement (Bartels, 2013; Blackmore et al, 2011). School buildings are important investments and main type of expenditure for educational systems. Children explore themselves in an interaction with physical environment. These conditions contribute perceptive, motor and cognitive skills (Baker and Bernstein, 2012; Baird and Lutkus, 1982'den akt. Maxwell, 2000; Blackmore at all, 2011; Csobod at all, 2014). According to Durán-Narucki (2008), school facilities affect student performances at three levels. The first one is at material level, that is, the condition of the school building can directly effect the learning of the students. Negative building conditions such as inefficient heating, damaged toilet doors etc can be obstacles to student's academic processes and success.

The school buildings and equipments are one of several important variables which affect school development and students' success, but are generally ignored (Duke, 1998). This may have multiple causes. The school building needs huge investment and it is a subject that senior policy department has dealt with. However, the conditions of school buildings may affect on the principals in some extent. The conditions of building is a factor which is controlled by the principals. They provide that the buildings are in good condition and serve the best learning environments. Or they may ignore the negative features of buildings and affect the students' learning opportunities badly. This is a very important responsibility (Earthman, 1998).

The children need diversity for a healthy development and this requires the opportunity for communicating different people and having different learning facility. One can not think all of the students do the same things in similar classrooms in a school providing variety. Students do not sit in ordered desks looking at a teacher lecturing in these types of schools. On the other hand, students and teachers are in the different learning activities in or out of the classroom. Different kinds of teaching methods such as group work, cooperative learning, individual assignments are used. According to research findings students' environment affect their learning styles (Blackmore, Bateman, Loughlin, O'maar and Aranda, 2011; Gürkaynak, 1996; Taylor, Aldrich and Vlastos, 1998).

These can be ordered the activity areas that all students has used effectively and sufficiently, laboratory, fitness centers and artistry areas. Moreover, today's and tomorrow's education has entailed the library and virtual learning technology and systems in requested quality. Learning the students by virtual learning technology affects on their learning and satisfaction (Church, 2010; Cole, 2011; [Farmer](#), 2012; Mladenovic, Kuvac and Stula, 2012; Saleep and Dafoulas, 2012; Ward, 2012). Unfortunately, while in

Turkey in public schools there is not enough laboratory, activity areas and fitness center (Akar and Sadık, 2003; Erdoğan, 2001; Gök, 1999; Gömleksiz and Temel, 1993; Gün, 2001; Karakütük at all, 2012; Karasolak, 2009; Oyman, 2010; Şimşek, 1991; Ünal at all, 2000) the libraries generally have fulfilled the regulations but they haven't fulfilled their real functions. In a considerable amount of school, the areas in which the books are old and untidy and the rooms are small and dark can be called as a library and it has been pretended as a library (Church, 2010; Cole, 2011).

Although the most important variables affecting their learning leandls is school and home environment created for the children by school and their parents, the research remains limited to show which type of building or equipment affects students' academic achievement and behavior positively (Earthman, 1998). In literature, school buildings especially such features as heat control and internal air quality, lighting, acoustics, building age, having a modern equipment and general impression are mostly associated with students' academic achievement (Baker, 2010; Durán-Narucki, 2008; Earthman, 1998, 2004; Figueiro and Rea, 2010; Hescong Mahone Group, 1999, 2003; Maxwell and Schechtman, 2012; Tanner, 2000; 2009; Uline and Tschannen-Moran, 2006; Zuraimi, Tham, Chew and Ooi, 2007). Also, the research shows that students aren't only affected by the inadequancy and disrepair of school buildings. School buildings' conditions affect teachers' behavior, motivation and performance, too (Buckley, Schneider and Shang, 2004; Lowe, 1990). Teachers' job efficiency and cheer is affected by their working environment conditions (McMichael, 2004). Such features as colour of the walls, buildings' structure, air conditioning, furniture etc. affect the performance in buildings (Earthman, 2004).

2. Campus and School Buildings in Turkey

Parallel to the developments in the education system of education, also school buildings ineed to change in Turkey. The reason of this is that the places is one of the most important tools for the applicability of the education model. It has become one of the most emphasized issues in recent years to organize educational places in a way to create an environment suitable for the structure, subject and type of the courses and to aid the operation of the course (Çınar, Çizmeci and Akdemir, 2007). According to Dönmezer (2008), 40 types of school models developed in 2005 failed to meet the required innovation accept for used colors.

National Education Council discussed the type projects developed for school building and the Council remarked that should be in line with regional conditions and needs; reflecting the characteristics of Turkish architectural art; contributing to the formation of national identity in students with architectural designs decorated with various motifs aesthetically, and technological and informatics infrastructure has been suggested to be considered in the design (Milli Eğitim Bakanlığı, 2011).

In existing school buildings, education continue with problems and new ones do not have effective features to solve the problems. In the researches, especially the sports

hall, garden features, conference and lack of art areas are emphasized. For example according to Oyman (2010), characteristics such as lighting and acoustics are evaluated positively; about the air quality, classrooms can have some issues during the winter months.

The school community constitutes about 25% of the population in Turkey; there are about 60,000 primary and secondary school and 17 million students, and 700 thousand teachers and school staff duties (Akşit, 2007). The size of the number shows the importance of the issue. Here, in addition to maximizing teaching in rapidly transforming schools around the world, environmental roles also draw attention. This is green schools. These schools from the 1970s to the present day in Turkey continues to be made in such general characteristics unchanged. In this regard, it may be appropriate to mention green schools as new types of schools.

2.1 New Type School building: Green Schools

In recent years, there is a gorgeous growth in Green Structure Market. While in 2008, McGraw-Hill Construction's green structure projects has grown 15%, in 2011 it comes to the biggest sector with 45% value. This is a proof how green schools affect deeply by meeting criteria for out-of-class education. In the last three years, the access to be Green Schools (84% in schools) has remarked. 90% of the new schools has built them suitable to green schools (McGraw-Hill Construction, 2012).

Green Schools has maintained class-lesson practice in outdoor, understanding of student and teachers' natural life and living together according to ecological concept, basic skills. To make school's material and equipment suitable for this understanding; to meet criteria for such environmental principles as 3R(reduce, reuse, recycle) reduce, reuse, recycle, renewal energy, protection of energy sources and fertility; to sustain their life suitable for natural life by practising in educational experiences in Green Schools are among the basic principles (<http://www.greenhearted.org>). Kats (2006) and some other experts has stated that Green Schools have built by desinging in healthy school concept by increasing teamwork and learning achievement. The experts have highlighted the Green Schools' student achievement. Healthy student and healthy learning are targeted in green schools (<http://www.centerforgreenschools.org>) and worldwide billions of students has grown up by learning savings in natural ways and respecting on the nature (Finlinson, 2015).

These schools have high ceilings and wide. Departments / classes in schools are not structured into series of classically styled series, It was designed by calculating importance and accessibility. While these schools focus on generating their own energy and saving, they are assertive about the quality of color, heating, humidity, light, cleaning, washbasin, cafeteria. Schools are designed with the aim of social and kinesthetic development of students as well as academic achievement. In addition to this, the comfort and health of students and staff are very importance. For this reason, there are seating groups in the large corridor areas, and even comfortable seats can be used in the classrooms.

In research in Turkey, Akar and Sadık (2003), Karakütük et al., (2012), Oyman (2010), Karasolak (2009), Erdoğan (2001), Gün (2001), Gök (1999), Ünal et al., (2000), Gömleksiz and Temel (1993), Şimşek (1991) has studied school buildings such subjects as private and public school, school size, old and new type school, building ergonomi in different topics.

The number of the holistic research on school architecture is really andry few (Gislason, 2010). Although there is independent research on acoustics, thermal conditions, light and air quality, ergonomi and learning environment in some extent, researching more widequestionarry subject as secured buildings, class organisation and how using and creating education areas affect learning remain inadequate (Baker and Bernstein, 2012; Csobod et al., 2014; Earthman, 2004; Read'den akt. Kopec, 2006; Fielding, 2006; Fisher, 2000; Gislason, 2010; Nair and Chin-Santos, 2003; Parsons and MGT, 2011; Picus et al., 2005; Schneider, 2002). The learning environments are mostly studied in terms of material as computer equipment and learning material (Baker and Bernstein, 2012; Csobod et al., 2014; Earthman, 2004; Read'den akt. Kopec, 2006; Fielding, 2006; Fisher, 2000; Gislason, 2010; Nair and Chin-Santos, 2003; Parsons and MGT, 2011; Picus et al., 2005; Schneider, 2002).

The reserchers have been common idea on the effect of physical environment design on children's perceptions, behaviors and learning. The aim of this study is to compare student buildings with student achievement and old and new school types. Since no research has been found in the related field of study on both subjects, it is said that the research is original in this respect.

In the research, the answer to the following question was sought: Do the perceptions of primary, middle and high school teachers on school buildings show a significant difference according to their school academic acheivement, whether they are old or new type?

3. Method

This study is a survey in which the existing situation is described as it is. Quantitive research method was used. School Building Scale (Choi, Guerin, Kim, and Brigham & Bauer, 2013) were used to understand the study question which is about old or new type school building difference and relationship of school buildings and academic acheivement.

3.1 Population and Sample

The population and sample of the study was be planned in İzmir Metropolitan area. Data was be collected from elementary, middle and secondary schools. The sample of the study was be chosen through stratified random sampling method that is one of the methods of probability sampling (Yıldırım & Şimşek, 2008; Cohen, Manion & Morrison, 2007). In addition, schools was be categorized in terms of being old and new. 6 schools, 2 schools from each level were included in the study. Two of these schools were built after

2004 and one after 2000. The data of education area standard test results is used to determine the students' academic achievement. Data was collected by researcher as face to face as much as possible. Totally 125 teachers responded the Scales. The 204 of these scales were used for data analysis. The sample represents at least 10% of the populations.

3.2 Data Collection Tool

Quality School Building Questionnaire is adapted to school building from university building version which is the Indoor Environmental Quality Scales (Choi, Guerin, Kim, and Brigham and Bauer, 2013). Likert-type scale with 7-point was used to measure satisfaction from 1=very dissatisfied to 7=very satisfied. Although many variables in the questionnaire have a single item, satisfaction with acoustic, light and view conditions is composed of 2-4 items. A path analysis technique was used for the data analysis to test direct and indirect relationships among variables (Lleras, 2005). The authors explicitly examined how to the chosen variables relate to one another and direct (versus indirect) effects (Lleras, 2005). In this study internal consist of total questionnaire is .97 and subscales change between .96 and .90.

This scale was adapted to Turkish and the Turkish translation of the scale was studied with 10 teachers and school principals on the screen. Thus, the scale that was agreed on each item was finalized. 204 scales were tested using confirmatory factor analysis (CFA).

Table 1: Confirmatory factor analysis of first level multi-factor model Of School Building Scale

RMSEA	NFI	CFI	IFI	CMIN/df
0.100	0.806	0.813	0.815	3.736

According to the confirmatory factor analysis, the structural scale of the school building was found to be significant at $p = 0.000$. It is shown in the Table 1 that the values accepted for compliance indices in compliance index calculations are provided. According to the results of the first level multi-factor model confirmatory factor analysis; RMSEA 0.100; NFI 0.806; CFI 0.813; IFI 0.815; χ^2 is acceptable with 3.736 ($p = .000$) values (Doğan, 2015).

Table 2: Reliability analysis results of the school building scale

Dimensions	Toplam Madde Korelasyonu
School Campus ($\alpha=0.940$)	0.656
Acoustic ($\alpha=0.846$)	0.731
Işıklandırma ($\alpha=0.919$)	0.837
Visibility ($\alpha=0.846$)	0.785
Total Reliability	0.949

The Cronbach's Alpha value of the scale is between 0.665 and 0.837. Total reliability coefficient of the scale was $\alpha = 0.949$.

3.3 Data Analysis

The analysis of quantitative data were conducted in its own systematic way. Quantitative data was analyzed by SPSS 25. Arithmetic mean, standard deviation and frequency were calculated. After that, t-test test that is a significance test showing the difference between two means used for analyzing significance of the difference between the means of two independent groups was used. Since the scales had normal distribution, parametric tests were used for statistical evaluations.

4. Findings

In this part, the question that “do the perceptions of primary, middle and high school teachers on school buildings show a significant difference according to their school academic achievement, whether they are old or new type” was replied.

Table 3: Descriptive statistics of scales and sub-dimensions

Scales	Num. of Items	Min	Max	\bar{X}	SD
School Campus	19	1.58	7.00	4.30	1.19
Acoustic	4	1.00	7.00	4.69	1.36
Lighting	3	1.00	7.00	4.86	1.38
Visibility	2	1.00	7.00	5.15	1.36
Total Scale	28	1.71	7.00	4.48	1.08

According to Table 3, the mean score of the school building is 4.48 and the standard deviation is 1.08. The highest score belongs to visibility from the dimensions with 5.15. Accordingly, teachers' perceptions on their schools are fine.

Table 4: t test results showing the difference of perception of teachers on the old or new types schools

	Building	n	\bar{X}	SS	t	p
School Campus	Old	90	4.64	1.09	3.717	0.000*
	New	114	4.04	1.21		
Acoustic	Old	90	5.12	1.21	4.152	0.000*
	New	114	4.35	1.38		
Lighting	Old	90	4.77	1.40	-0.809	0.419
	New	114	4.93	1.36		
Visibility	Old	90	5.27	1.21	1.075	0.284
	New	114	5.06	1.64		
Total scale	Old	90	4.77	0.94	3.494	0.001*
	New	114	4.25	1.13		

*p<0.05

According to Table 4, it is seen that there is a statistically significant difference in favor of old type schools in terms of school campus (t= 3.717), acoustic (t = 4.152) and total scale (t= 3,494). There was no significant difference between the mean scores of the dimension of lighting and visibility.

Table 5: t test results related to teachers' perceptions of the school building according to academic achievement

Boyutlar	Academic Achievement	n	\bar{X}	SD	t	p
School Campus	Low	74	4.63	1.06	3.06	0.002*
	High	130	4.12	1.23		
Acoustic	Low	74	5.16	1.09	3.84	0.000*
	High	130	4.43	1.43		
Lighting	Low	74	4.69	1.38	-1.31	0.193
	High	130	4.96	1.37		
Visibility	Low	74	5.29	1.13	1.13	0.258
	High	130	5.08	1.47		
Total scale	Low	74	4.76	0.87	2.84	0.005*
	High	130	4.32	1.16		

*p<0.05

According to Table 5, it is seen that there is a statistically significant difference in terms of academic achievement. School campus (t = 3.06), acoustic (t = 3.84), and total scale (t = 2.84) points in favor of statistically low successful schools.

5. Conclusion and Discussion

In the world-wide, it is normal to show difference among the developed countries and less developed, and developing countries in terms of understanding and concrete situation regarding school building and equipment. Cultural and scientific approaches to architecture and economic conditions are the most significant source of these differences. But, including all these conditions, the specificity of the school architectures and scientific approach are very important. In this context, according to the results of this research, teachers are satisfied with the school building condition. Similarly, in their research Oyman (2010) in 130 primary schools in Eskişehir, Terzioğlu (2005) in the old and new 70 schools in Ankara, students, teachers and administrators evaluated the school buildings positively. The studies of Karakütük et al. (2012) in high schools in 15 provinces, Basar (2003) in their research in primary schools in six provinces, the participants perceived their schools as insufficient in terms of painting-drama areas, theater-conference halls, garden, sports areas and toilet conditions. In this research, general fiction, classrooms and academic learning areas of the school were not mentioned or evaluated positively.

The fact that teachers are so satisfied with the general state of school buildings does not reflect the reality in Turkey. This ideas were discussed in detail by the professors in the thesis follow-up and defense meetings (DEU, EBE, 12.06.2014). They concluded that administrators, teachers and students do not know different developed sample of schools, they do not have sufficient awareness of school buildings and equipment according to scientific criteria. Thus, it is thought that the participants evaluate their schools in the current building conditions.

According to another result, apart from eski "lighting" and "visibility", teachers perceived old type buildings better than new type school buildings. In the scope of the

research one of the old school buildings was built in 1965, the other in 1933 and another in 1888. Old-school schools have high ceilings, large corridor and *entrée* areas, and a large and green garden in general.

In contrast, the new schools were rebuilt in 2004, 2014 and 2015. The new schools as standard have a structure of low ceilings, small classrooms and areas that are ordered in a corridor mutually. Apart from the smart boards in recent years, as much as it can, the classrooms have limited equipment such as a board, a teacher's desk and a small cupboard. Based on these results, it can say that the old type of schools have become more satisfying because of lack of spirit and deficient of new type schools in Turkey. It can be concluded from here that the new types of schools do not have as much advanced structure and conditions as the old ones, ie. schools in the end of the Ottoman Empire and the first years of the Republic. In this case, it has become clear that the additional school criteria in recent years are not very scientific and comprehensive.

During the research, a senior principal stated that they had difficulty finding new school places in city conditions and said, "*our architectures are fine, I draw them*". In fact, it should not be too difficult to make a general drawing of the school building which consists of a series of classes that are not as popular as the old type buildings.

According to this, there is no need to an architect if the school building will not be designed with original and scientific methods whose basic criteria are determined consistent with the new architecture and school building characteristics. This situation is truly subject to humor and traumatic in the era of Industry 4 and 5.0 with advanced technology, construction infrastructure and expertise. An addition, another traumatic situation was reported by a school principal. According to him/her, "*the construction of this school was given to the lowest-paying firm*". However, the construction quality was poor and it could not be completed. Then another contractor finished the construction. However, it is not possible to work with sufficient efficiency, especially on the lower floors. Because the building was drawing water from the bottom and the building smelled of damp. This school consists of a series of chambers and classrooms, and the only difference is that the school is renovated and the floor-tiles are bright. In parallel, the researchers examined the schools themselves and as a result Cilve (2006) in different provinces, Başar (2000) in Çanakkale, Ünal et al., (2000) in Istanbul and (Şahin, ira and Çek, 2010) state that schools are inadequate. At the same time, Dönmezer (2008) stated that 40 school models developed by MEB (Ministry of National Education) in 2005 did not meet expectations.

Accordingly in Turkey, asserting that there are enough holistic and scientific building criteria will not contradict the facts. In Turkey every year, dozens of school buildings are being renovated or rebuilt in different cities. Already this situation is inevitable in a country in the process of urban transformatio. After a school is built, it will continue to function for at least 50-60 years. In this case, children and young generations will continue to receive education for years in schools that are not made with scientific criteria in accordance with the conditions of the day. If today's construction materials are

not taken into consideration (in terms of cheap materials), the risk of carcinogenic-chemical substances will increase.

Another finding of the study, teachers perceived more positive the low-successful school buildings in terms of school campus, "acoustic" dimensions and total scale. According to this the conditions of low-performing schools were perceived more positively, but this was not reflected in academic achievement. In fact, these schools are in a central location and are older type schools with more width and spacious features. This may be related to the socio-economic conditions of the school and the level of teacher motivation. In addition, it is useful to examine the factors affecting the improvement of academic success in such schools. At the same time, even though the buildings of high-achieving schools are less attainable as this study, the factors that affect their academic success positively should also be examined.

In the meantime, the results of this study do not correspond to some other research results. The difference in these researches is in favor of higher academic achievement (Cash, 1993; Earthman, 1998; Liao, 2010; Şahin, 2018). As mentioned extensively under other headings, school building with some features such as cleaning, silence, safety, and quality of the learning space, the adequacy garden features, equipment competence and quality, high ergonomic qualities of classrooms and areas, material quality, acoustic, ventilation, thermal and daylight quality school building and equipment is an important factor affecting student and employee health, positive school and classroom life and student success (Baker, 2010; Baker ve Bernstein, 2012, Bartels, 2013; Berg Blair ve Benson, 1996; Blackmore vd., 2011; Csobod vd., 2014; Figueiro ve Rea, 2010; Hescong Mahone Group, 2003; Kuller ve Lindsten, 1992; Liao, 2010; Lowe, 1990; Zuraimi, Tham, Chew ve Ooi, 2007).

Finally, old-school schools are rated higher than teachers, the reason for this may be that the building equipment and conditions of the new types of schools remain inadequate. It can be said that school buildings in Turkey are poor in terms of the appropriate modern architectural features. Yet Turkey is a country which has the world's 17th economy. With this economy, when renovating or rebuilding schools according to need it is inevitable to develop designs appropriate to the architectural developments of the day. However, in order to do this, new criteria for the school architects and must be determined with educators and other relevant experts. It may be appropriate that these criteria be set up with the growing number of green school qualifications around the world. For awareness on this issue, necessary training and workshops should be done, and the authority of the ministry, school managers, teachers and community's attention should be drawn.

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