



## On the effect of physical attributes of classroom environment on the creativity of educable mentally retarded students

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### Abstract

Creating suitable classrooms that can meet the educational needs of mentally-retarded students is vitally important. The present study explores three physical characteristics of classroom environment on the creativity of educable mentally-retarded children: classroom size, window size, and window view. The physical features of six classrooms were studied on creativity of one hundred 9-to-11-year old girl students. The participants took the Test of Creative Thinking-Drawing Production (TCT-DP). The results indicate that natural window view, larger window size (which provides a broader vision), and larger class size positively affected the creativity of the students. The findings of the study can be used as guidelines for designing psychology-oriented classroom environments that can improve the creativity of students.

**Keywords:** Classroom physical environment, Exceptional students, Creativity, Window view, Window size, Classroom size.

### 1. Introduction

Students spend thousands of hours in classrooms. Hence, classrooms are automatically among the most important physical structures in any society [1]. Children will be attracted to the environments which help them address their internal conflicts and expand their sense of existence, internal consistency, and self-perception [2]. However, the main goal of classroom designing is creation of a space that students and educators will love [1].

The physical environment of the classroom has been the subject of many studies over the past few decades. So far, there has been an abundance of content on the classroom as an organizational structure or a social environment [3-4]. Environmental factors affecting creativity have also been investigated from the point of view of social psychology [5].

Pay appropriate attention to educational environment of educable mentally retarded students as an important group of students is vital.

This research tries to evaluate effect of classroom physical environment on creativity of educable mentally retarded students to prepare suitable educational environment that active and improve their creativity. So to achieve this aim we investigate 3 factors of physical attributes of classroom window view, window size and classroom size) on creativity of these students.

### 2. The Impact of Physical Environment Attributes' on Student

Nowadays, the fact that human behavior is influenced by physical environment is widely accepted [6]. This subject has been studied specifically in the field of educational environments, workplaces, residential areas, medical places [e.g.]. Many studies have revealed the influence of the physical environment, both indoor and outdoor, not only on children's behaviors and their development, but also on adults [7-8-9]. Abbas et al. (2009) found that the physical environment of the classroom affects the behavior of children and enhances more positive behaviors within the defined context [10].

There are lots of physical attributes of classroom environmental affecting children creativity. In the following, the effects of each special feature of physical environment of classroom that effect on children are briefly reviewed:

**Ceiling height and wall color;** differentiated spaces in the Read et.al. study, whether in ceiling height or in wall color, appeared to increase children's cooperative behavior scores, and the cooperative behavior of children in a space with differentiated ceiling height and undifferentiated wall color was also significantly higher than those in a space with undifferentiated ceiling height and differentiated wall color [11].

McCoy (2002) analyzed some of the elements of physical environments on high school students [12].

#### **Color and light;**

Study showed that Cool colors had a significant negative correlation with creativity potential [e.g.].

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Light level and quality would influence students' learning and performance [13]

But in creativity neither quantity nor quality of light was significantly related to the creativity potential of settings [12].

**Spatial Form;** the shape and size of the places cause to gather of individuals and groups to create social interactions and relationships. In the theory of social interactions, the type of group relations has positive correlation with creativity process[ 14].Therefore, space layout and design (interms of shape, size and function) should increase quantity and quality of interactions [15]. The correlation analyses indicated no association between size or rectilinearity of shape with creativity potential However, higher complexity was associated with more perceived creativity potential in a space[12].

**Internal Organization of Objects;** Both furniture and visual detail were found to be highly correlated with creativity potential [e.g.].

**Characteristics of Bounding Surfaces;** Manufactured or composite materials had a strong negative correlation with creativity potential whereas natural materials had a positive effect [e.g.].

Edwards & Springate , 1995 indicate appropriate materials to be used for children's spaces will help to develop their creativity [16].

**Spatial conditions;** Maxwell (2003) found that the classroom behavior of girls and boys was related to the spatial conditions of the classroom, Girls' academic achievement was negatively affected by less space per student; boys' classroom behavior was negatively affected by spatial density conditions. [17].

With respect to space perception, Stankovic and Stojic (2007) stated that if spaces are constructed and equipped accurately, children would be able to improve their ability [18].

The present work was an attempt to investigate the potential role of three physical characteristics of classroom environment in this regard: window view, window size, and classroom, a few of the studies in this field mention these three factors concerned in this study.

### 3. Creativity

One of the objectives of educating normal children is to improve their creativity which we should consider for disabled children too. However, due to the diverse definitions of creativity, it is hard to understand and study this notion [19]. After psychologists found in 1950 that intelligence and creativity are not the same, the need for the perception of creativity was acknowledged, and research on this subject gradually extended [15]. Bohm (1998) believes that human beings have intrinsic creativity which is linked with the environment where they grow up [20].

Creativity has traditionally been thought of a function of individual characteristics [21-22-23-24-25-26]; however, there has recently been an increase in the number of studies exploring the effect of physical environment on human creativity. Environmental factors involved in creativity have been studied from a social psychological perspective [27].

Dubos (1971) suggested that people confined to a "featureless environment" suffer intellectually and emotionally and that "the potentialities of human beings can become fully expressed only when the (physical) environment provides a wide variety of experiences"[28].

Much information is available on the impacts of physical attributes of educational environments. However, few of the studies in this field have addressed the effects of the classroom's physical environment on disabled children. It is estimated that about 10% of the world's population live with at least one sort of disability [29]. According to the statistics published by the World Health Organization (WHO), about a tenth of the population of each country are disabled, of whom about 1.3% is children under 15 years of age [30].

The physical environment of a classroom should meet the educational needs and desires of mentally-disabled children, whose educational goal is not far from normal children. Another noticeable fact about the previous research is that, to the best of our knowledge, they were not much concerned with the effect of physical environment of classrooms on the creativity of mentally-retarded students.

## 4. Methods

### 4.1. Participants

Participants in this study were a total of 100 mentally-retarded girls, that only student with severe vision weakness are omitted because they cannot do the TCT-DP test , that enrolled in a school for exceptional students in Qazvin in Iran. They were in three age groups: 9-year-olds (33 students), 10-year-olds (33), and 11-year-olds (34).

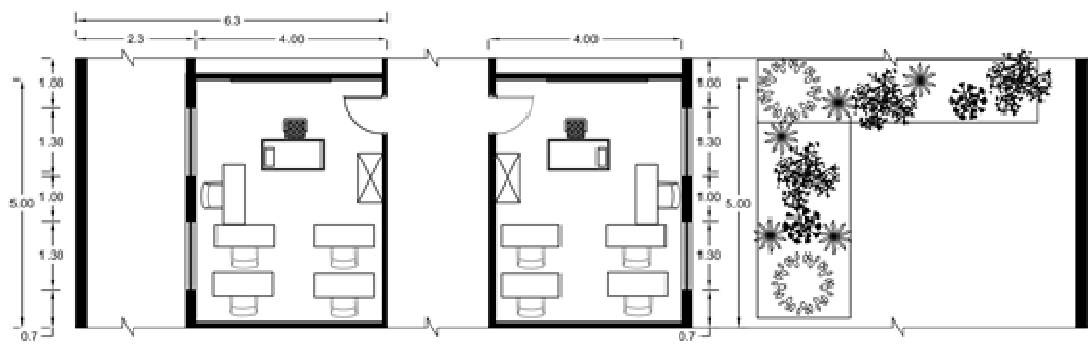
### 4.2. Physical environments

The effects of physical environment on children's creativity were investigated in six classrooms, with each participant taking tests in all the classrooms which means creativity score of each students compare with her not with each other in these six classrooms. Aside from the three variables under discussion (i.e. window view, window size, and classroom size), all the other physical factors which could have otherwise an unwanted effect were controlled. These factors were room color (white), classroom shape (rectangular), ceiling height, lighting color , intensity and Internal Organization of Objects.

The physical characteristics under discussion are described below.

### 4.3. Window view

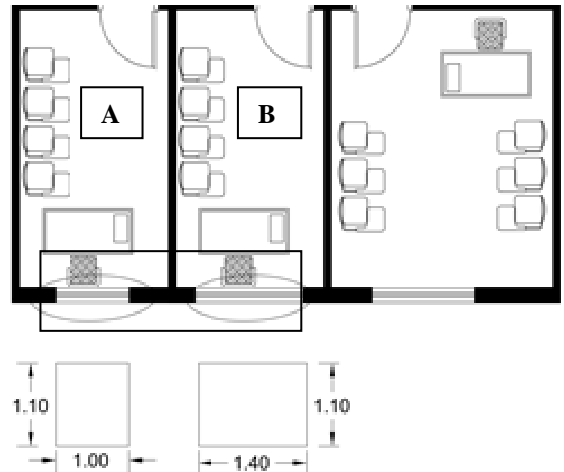
In order to study the effect of window view on the creativity of students, two classrooms (each 20 m<sup>2</sup> in area) were selected. One of the classrooms provided a view to a natural landscape, and the other faced the adjacent buildings. Fig. 1 provides a schematic representation of the two classrooms. Each classroom had two same-size windows. The students were tested in 20 groups of five.



**Fig. 1** Plan of the two same-size classes different views (Reference: authors)

**4.2.2. Window size**

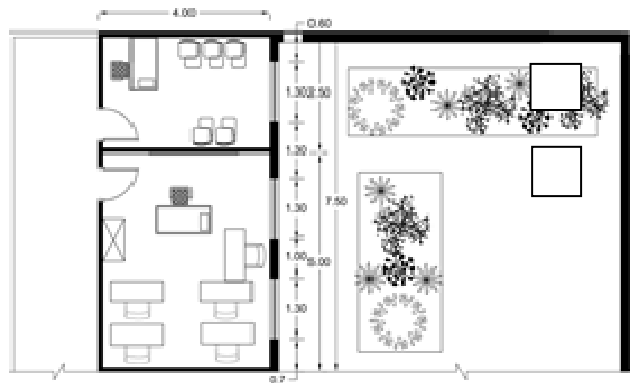
In order to measure the effect of window size on creativity, two classrooms of the same size (8 m<sup>2</sup> in area) were used. As Fig. 2 shows, the windows in Classroom A had the dimensions 1.10 x 1.00, whereas Classroom B had windows with the dimensions 1.10 x 1.40. Both classrooms faced the adjacent buildings. The students were tested in 25 groups of four.



**Fig. 2** Details of the two same-size classes with different window sizes (Reference: authors)

**4.2.3. Classroom size**

Student creativity was examined in two classrooms (Fig. 3). Classroom A had an area of 10 m<sup>2</sup>, but Classroom B was 20 m<sup>2</sup> in area. Both classrooms had a view to a natural landscape. The students were tested in 20 groups of five.



**Fig. 3** Plan of the two classes with different areas (Reference: authors)

**4.3. Test of creativity**

The creativity levels of students were measured using the Test of Creative Thinking-Drawing Production (TCT-DP). This test was developed by Urban and Jellen (1996), and has been used in various cultures. We chose this test because the test has been administered to people at various ages and with different abilities. It has been reported that the test shows no significant differences between male and female test-takers [31].

**4.4. Procedure**

There were a total of six test situations, and each participant took all the six tests, students located in each classroom for 10 days and after that their creativity score measured by considering this point that each student creativity score in six classroom compare with herself not each other so different IQ or kind of disability do not have effect on result. In each test session, which lasted for 15 minutes, the students were asked to do the TCT-DP test individually. To measure the effect of window view and classroom size, the participants were placed in 20 groups of five. However, due to space limitations, the effect of window size was studied with the students being divided into 25 groups of four.

#### 4.5. Data analysis

A repeated-measures design was employed: a single group of subjects giving data on different measures. The

results of TCT-DP were analyzed using the SPSS 19 (2010) software. The descriptive data for each test condition are given in Table 1.

**Table 1** Summary of Descriptive statistics for the six test conditions

Groups	Statistics	Min	Max	Mean	SD
Classroom with natural view		12	24	15.98	2.41
Classroom with building view		8	18	12.18	2.30
Classroom with 1.40x1.10 window		12	17	13.92	1.36
Classroom with 1.00x1.10 window		8	14	11.18	1.33
20m <sup>2</sup> Classroom		11	24	14.37	2.63
10m <sup>2</sup> Classroom		8	19	10.94	2.35

N = 100

The results obtained from the One-Sample Kolmogorov-Smirnov test (Table 2) performed on 10 m<sup>2</sup> and 20m<sup>2</sup> classrooms and classrooms with small and large windows were significant, while the results obtained from classrooms facing natural and building landscapes were insignificant (P>0.05).

The window size and classroom size conditions showed abnormal data distribution patterns and required non-parametric tests (Wilcoxon and two related samples and test), while the window view conditions showed normal data distribution patterns and required parametric tests (paired-sample t-test).

**Table 2** One-Sample Kolmogorov-Smirnov Test

	Small Window	Large Window	Building View	Natural View	10m <sup>2</sup>	20m <sup>2</sup>
Kolmogorov-Smirnov Z	1.62	1.45	1.04	1.23	1.96	1.74
Asymp. Sig. (2-tailed)	0.01	0.03	0.23	0.09	0.001	0.005

## 5. Results

### 5.1. The effect of window view on the creativity of mentally-retarded students

Concerning the effect of window view, the results of the t-test (T=26.98, p<0.01) (Table 3) suggest that there is a significant difference between the creativity level of students in the classroom with a natural view and their creativity level in the classroom with a view to the neighboring buildings. It is seen that natural window view can significantly increase creativity.

**Table 3** Paired-samples T-test results for the effect of window view

	M	SD	df	t <sub>obs</sub>
Classroom with building view	12.18	2.30	93	26.98*
Classroom with natural view	15.98	2.41		

\* P< 0.01

### 5.2. The impact of window size on children's creativity

The value of statistic Z (Z = 8.26, p < 0.01) (Table 4) shows that there is a clear difference between the creativity scores of students in the classroom with large window (1.40 x 1.10 m) and their creativity in the small-window classroom (1.00 x 1.10 m). It seems that a larger window adds to the creativity of children by providing a broader

view of the outside.

**Table 4** Wilcoxon signed ranks for the effect of window size

	Mean rank	Z	
Classroom with small window	22.8		Classroom with small window
Classroom with large window	47.81	8.26*	Classroom with large window

\* P< 0.01

### 5.3. The impact of classroom size on students' creativity

Table 5 shows that there is a significant difference between the creativity scores of students tested in the classroom with an area of 20m<sup>2</sup> and their creativity in the classroom which was 10m<sup>2</sup> in area (Z=8.33, p<0.01). It can be seen that availability of more space increases creativity levels of mentally-impaired students.

**Table 5** Wilcoxon signed ranks of different size of classroom

	Average rating	Z
10m <sup>2</sup> Classroom	3.67	
20m <sup>2</sup> Classroom	46.94	8.33*

\* P< 0.01

## 6. Conclusion

It is critically important to know if the creativity of mentally-retarded children is affected by the quality and characteristics of their classroom physical environments. This research was an attempt to answer this question and try to identify the physical features of classroom environments that influence the creativity of mentally-retarded students. The attributes which were studied were window view (natural vs. building), window size (which gave the extent of view to the outside), and classroom size (10 m<sup>2</sup> vs. 20 m<sup>2</sup>). Based on the conclusions drawn from the present study, classroom physical environment that investigate in present study affected creativity of mentally-retarded girl students. Moreover, Analysis of the data showed that natural window view increase these children creativity in addition past studied show that being in natural environments ,or just looking at nature, promotes recovery from stress[32] which is helpful for these children, using larger windows which provide boarder view promote mentally-retarded children's creativity and also provide feel of freedom and openness to experience , and larger classroom size significantly increases mentally-retarded children's creativity by providing better personal space for them. This means Classroom physical environment have an important impact on Creativity of students so proper physical environment is a necessity at schools for exceptional children as it can provide an appropriate context for fostering the creativity of these students. The results of the present study are in line with those of the past research [1- 11- 12- 17- 18]. This research can contribute to the discussions of links between educational environments, mentally-disabled children, and creativity.

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