

# Space Use Diagnosis

A syntactic approach

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## Abstract

The paper describes a space-use analysis applied in three schools. It is based on preliminary results of a research project aiming at the identification of use pathologies and the understanding of mechanisms that induce their emergence. The main goal is to describe the methodological procedures and discuss concepts and evaluation strategies. Emphasis was given to study spatial factors that contribute to bring negligence and transgressive uses to built space in schools. Space syntax was applied to describe functional and social implications of the spatial pattern.

## 1. The Context

The paper refers an experience in 'space use analysis' in three public school buildings located in Lisbon's historical center. It is part of a research project launched by public school authorities in 1999 aiming at the requalification of school physical environments and the improvement of learning conditions. The schools under analysis occupied old residential buildings built in the last quarter of the 18th century. They present distinct spatial dimensions and features and respond to specific educational curricula (artistic, basic education, secondary education), even if aimed at users of the same age (10 to 17 years). Furthermore, the re-conversion of the buildings and the beginning of activities occurred at different times.

Case study 1 concerns an art school. It is located in former housing building with four floors and attic. The school was opened in 1993 and has 138 students (Domingues, et al, 1999). Case Study 2 focus on a secondary education school opened in October 1997. It occupies a set of three buildings with five floors. The buildings were designed as housing and later converted to a bank at the beginning of the century and remained as such until the beginning of the 90's. The school has about 500 students (Colunas et al, 1999). Case Study 3 concerns a 2nd and 3rd level of basic education school which has been in continuous functioning since the end of the XIX century. It occupies an ancient palace dating from the latter part of the 18th century, with recognized monumental value (Franca, 1969). It displays a U shape configuration that results from the layout of two distinct wings around a patio (Garcia, et al, 1999).

Signs of physical and civic dereliction were common in all the three cases: garbage and graffiti inscriptions in corridors and playgrounds, damaged equipment and school furniture inside and outside school rooms, as well as the abnormal deterioration of common installations translated into a condition of spatial vulnerability regarding their uses.

**Keywords:**  
space use, spatial  
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program, evaluation  
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**Fig. 1**  
**Case Study 1**  
**Case Study 2**  
**Case Study 3**



The analysis aimed at reaching a diagnosis of use to support the creation and implementation of corrective measures. The diagnosis corresponds to the identification of the agent(s) behind the problems (pathologies) that arose from use. It is inserted within spatial analysis and aims at studying the reciprocal relations between the use of space and the properties of the built space. The knowledge is acquired in an exploratory way in the inverse sequence of the 'pathological process' itself i.e. from the empirical manifestation of a problem (Zeisel, 1981). However the diagnosis does not permit to establish a cause-effect between variables. The use of space has a dynamic character: it changes in time and is only accessible and quantifiable by direct observation. Hence, it is not valid to infer any causality between variables at study: it merely permits to establish or not the existence of some type of causality between them.

The spatial vulnerability of school compounds to actions of Neglect (N) and transgressive uses (T) by the users and it constitutes the problem studied in this experiment. By Neglect it is meant actions deriving from lack of attention, maintenance and cleanliness of spaces like the accumulation of garbage and dirt. It was called transgressive uses those attitudes that denote an aggressive purpose and sometimes deliberately offensive, although not criminal: destruction and damage of the fixed equipment of the building and outer spaces, school furnishings, glass breaking, signaling exterior surfaces with graffiti-type inscriptions.

The main goals of the analysis were to reveal which agent, i.e. the physical attributes of school space, are inductors of the vulnerabilities detected. Research on the underlying motivations for neglect and transgression by the school population was deliberately abandoned, because it was considered pertinent to a sociological approach and therefore out of context in this study. Insert figure 1. Case studies: general view and corresponding site plan

## 2. Methodology

The analysis was structured in three stages. The first stage was directed towards the comprehension of the functioning dynamics of the school from the direct experience of its users, and from the technicians that accompany the interventions already made in the relevant buildings (Kernohan et al, 1992).

The focus of identified problems was on physical and civic dereliction as the presence of garbage, vandalism and graffiti show, and situation of conflict between space and activities. The explanations put forward concern the lack of fit between the current curriculum and the layout of the building and the difficulties of maintaining spaces under constant surveillance.

The second stage consists of a discussion on the arguments raised during the previous stage and in the construction of final conjectures about the origin of the problems. The idea was to define analytical procedures. Preliminary analysis of the collected data suggests that spatial vulnerability is generated by the restraints of the school spaces resulting from their planning, construction, and use processes. It is undisputed that built space, albeit not determinant, is instrumental in creating such problems. In fact, these problems result from the inability of the spatial layout to promote: 1) spontaneous conditions of control between different types of users; 2) articulation between activities with functional dependency and 3) fit between school organization and building layout, i.e. well adaptedness of the space to specific activity.

The third stage seeks to elaborate analytical procedures. In school research, the space-use relation has very seldom been included although built space is regarded as precondition for the use of the building. In general, the studies focused on relations between knowledge areas, activity requirements and design patterns (Moore and Lackney, 1993, Sanoff, 1996). The

approaches often rely on subjective judgements of the school layout (Jong, 1996) without taking into account the relation between the school program, the spatial structure and the use of space (Ornstein, 1997). Thus, the effort was directed at conceptualizing the relation between the spatial layout, the dynamics of school functioning and practical uses. Therefore, three areas for analysis were set: 1) spatial structure; 2) organizational structure and 3) space use structure.

The spatial structure stresses the description of the spatial layout attributes. The information was gathered from documental sources, interviews and direct observations, and charted into a GIS database. The spatial relations were characterized according to the (model of space syntax analysis and the pattern of the most integrated and segregated spaces (Hillier and Hanson, 1984). The visual relations were mapped in isovists maps.

The organizational structure concerns the spatial description of the school program, the knowledge areas (school subjects) and their relations. Simplified representations of the spatial organization of activities and functions (school organigram) were used, by adapting the (model: functional attributes were assigned to the extremities of the axial graph and further co-related.

The space use structure deals with the effective use of spaces in different periods of school functioning. Use of the buildings was discussed in terms of movement through the building, occupancy of spaces and the physical evidence of vulnerability indicators. Data was co-related with syntactic properties as well as with the functional attributes.

### Phase 3: Use Diagnosis

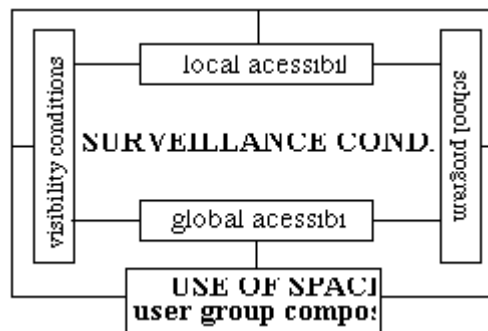
The final use diagnosis was obtained by crossing the three partial diagnosis corresponding to the three areas of analysis, so that it may determine:

1. The relation between the spatial strategies adopted and the functional purpose of the spaces.
2. Situations of conflict between space, activity, and pedagogical purpose.
3. The relation between spatial characteristics and the mechanisms of space use.

### 3. Main Findings

The results of the case studies confirm that space vulnerability to N/T actions is related to the level of physical permeability and visual control as well as to the school program spatial configuration. It was ascertained that these variables acted on the forms of space use, namely on the capacity to set spontaneous surveillance and that, when combined, could enhance the aforementioned uses. Figure 2 shows the relations between the spatial properties and the school program and their interference on the mechanisms of use, observed in the areas that presented signs of N/T.

**Fig. 2 Relationship between the spatial properties and the school program**



As for physical permeability it was established a strong relation to the surveillance conditions. The less integrated spaces displayed a trend towards a uniform use in terms of users and so inhibited social interface between groups, thus curbing surveillance capacity and favoring N/T actions. Overall, central spaces displayed greater levels of use both in terms of continuity and interactions between groups. Although, there are pathologies due to use that can be assigned to wearing out of materials, and even to the use conditions, there are no signs of N/T. It was also established that spaces that present a high degree of spatial control and are

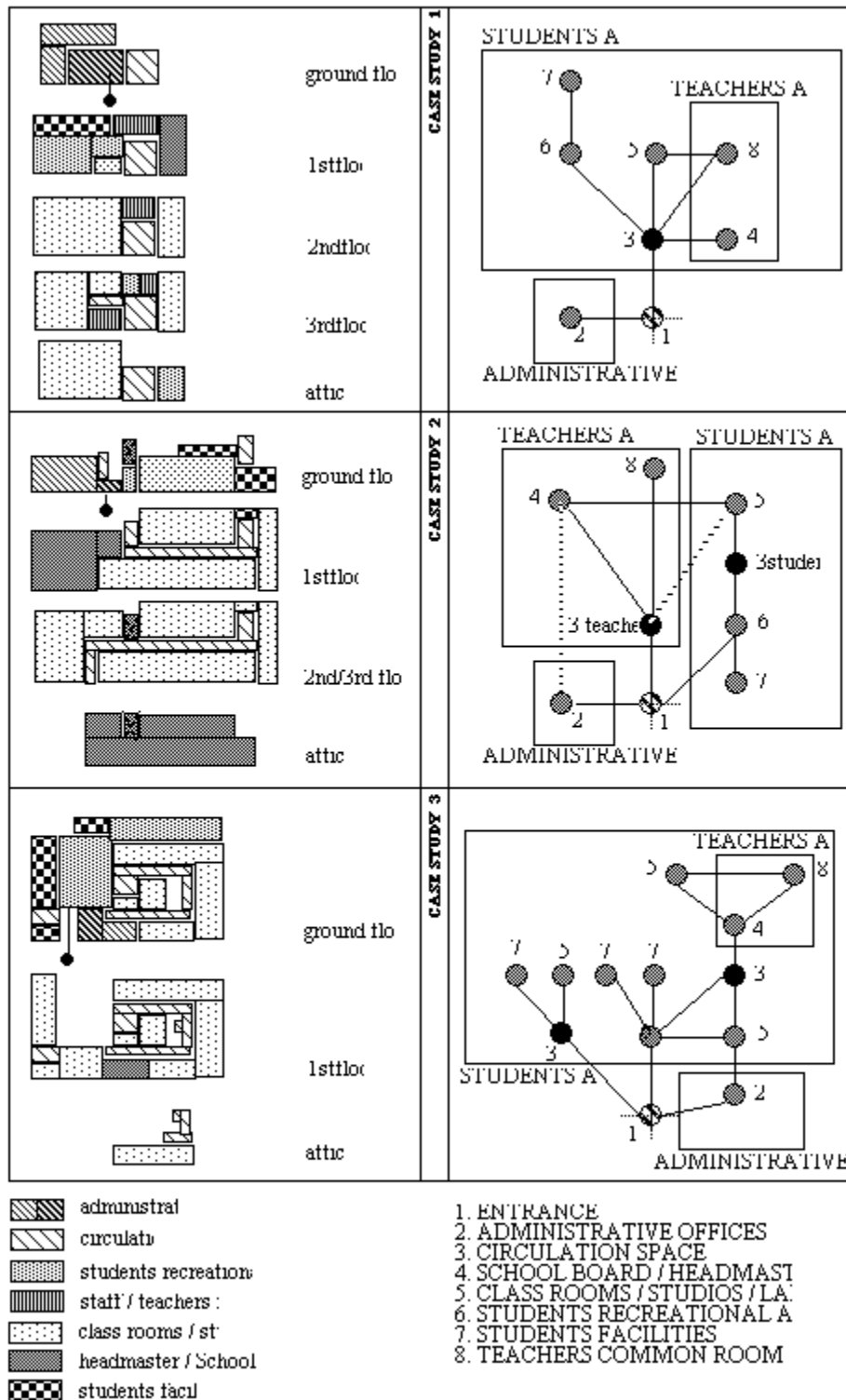


Figure 3.  
Relation  
between the  
spatial proper-  
ties and the  
school program

forceful passageways tend to function as places of permanence and encounter. These spaces, when positioned in areas of low visual accessibility tended to promote an unbalanced use i.e. to function as 'territories' of a certain groups, and where is frequent the presence of N/T. From the point of view of visual permeability it was recognized that places with strong spatial containment and reduced view from the exterior tend to present low levels of use and to hinder spontaneous surveillance. When there is an asymmetrical visibility over adjoining spaces, they tend to become exclusive spaces or 'territories' and favor the appearance of N/T signs.

Moreover, it was observed that spontaneous surveillance conditions are related to the spatial pattern of the school program. When contacts are informally regulated in the layout (compact program) a more efficient surveillance was generated and N/T signs were less frequent. On the contrary, when the organizational structure reproduces spatial exclusion between functions (weak program) and the necessary spatial relations are not provided by the built space, natural surveillance will be more difficult and the presence of N/T signs was recurrent. Compensation must be added by regulating contacts in schedules or by rules. Figure 3 shows the relation between the spatial properties and the school program.

#### 4. Conclusions

The study was directed towards the identification of use pathologies and the understanding of mechanisms that induce their appearance. For that purpose, it was developed a methodology of analysis that permits to conceptualize the relation between the spatial structure, the school program and the use of space. The goal was to gather data that contribute to an understanding of the space-use knowledge in architectural production (Ziesel, 1989). Thus, it was sought to join the assessment of social and functional implications of school spaces to the development of spatial analysis methodology.

It was concluded that spatial analysis and the study of the space-use relation can not be treated per se, but must be approached in an integrated way: methods used to describe space are also part of the space-use relation studies. This interaction has led to a reduction of the complexity of the built space to a set of elements that may be described in a non-arbitrary way and selected from the type of uses that we seek to relate. In order to proceed to the simplification of the space it was necessary to formulate conjectures i.e. explanatory principles regarding the between variables based on the previous knowledge of each situation, and on the understanding of actual school dynamics.

The proposed methodology presented itself as an adequate instrument for the development of use diagnosis, because it allows a practical knowledge for intervention in operational time, namely by those responsible for school administration and maintenance. The results permit a better practical application; one that permits not only putting forward corrective measures that enhance school performance, but also to define guidelines for the conception of new projects.

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