ABSTRACT

Space Syntax has often been associated with techniques and computer methods. Its basic concept though lays beyond the techniques: it’s a way of understanding space. The fundamental idea is that space is been perceived, understood and appreciated through the combinatorial practice of moving and seeing. This paper will explore how this fundamental idea has organized a design teaching approach. Contrary to the top down method of designing (from the concept to the form and to the program) we will explore a bottom up method (from the movement and the visibility to the boundaries the form and the program). The approach has been used to a design studio at the Dept. of Architecture, University of Thessaly. Movement in the urban context has been used as the main starting point. The city is an ideal case study which includes issues of familiarity and strangeness, a variety of programs and activities, focal points, landmarks, natural features, voids and densities, long views and short glances. Students have started mapping a route within the urban environment, then proceeded to analyze a museum building and finally they designed a new museum. Students have been pressed to use their step and their eye to become familiar with the notion of designed space as an intelligible system which shapes our movement, visibility and perception. They have learned to understand and appreciate architecture through movement via a succession of spaces with local character or of major importance. They understood that architecture produces complex structures which are justified not as unique objects but during the process of inhabitation. Finally, they have been taught a design process which does not limit itself to morphological experimentation or superficial projects.

KEYWORDS

Movement, Visibility, architectural design, research-based teaching

1. INTRODUCTION

Space syntax has been largely successful as a method for understanding buildings and urban areas, clarifying their evolution in time in relation with social or conceptual models, evaluating their potential in terms of land uses and social interaction. It has been used successfully for analyzing design projects either during the process of design or after their implementation. For teachers of architectural design who have been involved with space syntax theory and techniques a major question is always in the fore. How one can organize the learning process in the early stages of architectural education so that the basic values which are embedded in space syntax theory become a set of design values with which the students will perform. In other words how, you can integrate syntactic ideas in the educational process and transform them into design tools and ways of thinking at the same time. This is not an easy task as it needs first to organize abstract ideas in a thinking process and second to avoid –possibly- the early presentation of the specific computer programs. What are the

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important ideas we “think with” and how we go back to the basics, namely how we return to these basic ideas –sometimes lost behind the elaborated syntactic structures and techniques - so that we organize a didactic sequence.

The relation between moving and seeing seems to be of a major value. Movement and visibility have proved along time to be major properties of good building design. From the Villa Savoy by Le Corbusier to the MACBA building by Rischard Meyer the interplay between moving and seeing makes the buildings rich in properties and possibilities far beyond the specific function. These are exactly the inherent properties of axial lines and isovists.

Easy orientation in buildings and intelligibility are also properties that are appreciated specially in public buildings such as museums, universities, hospitals. The balance between a background reference grid and the possibilities of individual choices is considered to be most important for creating a rich and welcoming environment. Grids and landmarks, routes and decision-making key points have properties represented by axial lines, convex spaces and key point isovists.

The basic didactic approach focused on integrating the notions of movement, of the interplay between movement and seeing, on designing a building from inside – out and not vice versa, on making students comprehend the pleasure of being inside the building. Consequently, the approach focused on the setting up of a process which would lead to a research-based design product.

2. THE DIDACTIC CITY

The idea of a rich spatial context was first introduced through the urban environment. This approached was considered to disassociate students from ideas formed already either through other studios or through their own experiences of what a building is or looks like. The city is an extremely rich environment where multiple layers of information are always present and intermingling. Urban context offers us an unlimited variation of spatial elements. Enclosures, openings, boundaries, thresholds, edges, passages, landmarks are some of the numerous categories one can name. Spatial properties refer to characteristics of the spatial elements such as geometric structures, order and disorder, horizontality, verticality, linearity, centrality, strength or weakness of boundaries, voids or overflows, transparencies, whole or fragmented views, light and shadow, multi layering, continuities and discontinuities and their constant interplay. Walking in a city means the employment of the body in the process of understanding space. It’s a complex process, which involves both intellectual and physical activities. The experience of movement into an urban context is not just a visual experience. It is based on contiguity between the human body and space closer and more intense than a visual one. Walking does not mean just a general progress from one point to another. It includes all kinds of tours and detours, long views and short glimpses, sounds and smells, stops and runs. Urban space becomes intelligible through sequences of movement. Its complexity, mystery, splendour, rhythm, are revealed and interrelated through the route of the urban dweller. (Trova, 2008).

3. THE MUSEUM AS CITY

The idea that museums can be understood as parallels to the city is not new. Brawne (1965) argued that museums are like cities in the sense that both are being comprehended through movement. He applied the Kevin Lynch (1960) ideas which were originally set up to explain how the image of the city is constructed, to the analysis of museum space. Browne (1965) argued that the spatial tools used to describe how people moving in the city construct their orientation can be very useful in understanding how visitors in a museum orientate themselves and choose destinations while moving inside the exhibition spaces.

Lynch (1960) proposes five main elements which are important for the construction of the image of the city. Paths are the channels along which an observer, customarily, occasionally or potentially moves. These paths are the predominant elements in their image. People observe the city while moving through it and along these paths they arrange the other spatial elements. Edges are linear elements which represent boundaries between two phases, barriers more or less penetrable, lines along
which two different areas are related. **Nodes** are strategic spots in the city, intensive foci to and from which one is traveling, junctions, crossings, concentrations. Nodes are typically the convergence of paths, events on a journey. **Districts** are medium to large sections of the city which are considered to have some common identity. Always identifiable from the inside they are also used for exterior reference if they are visible from the outside. And finally **landmarks** they are usually physical objects which stand out in the urban context, they are visible from many angles, frequently used to identify a place or to facilitate orientation.

Brawne (1965) transferred the basic elements of Lynch’s theory to describe the museums’ layout. The various parts of the building which are understood as distinct visual or spatial entities can be considered as “districts”. The spatial elements operate as boundaries between different areas of the building while at the same time remain parts of an overall structure can be understood as “edges”. Visual elements which operate as reference points (i.e an external view) could be considered as “landmarks”. And of course, the visitor’s circulation paths, which are the spine line of every exhibition, are the equivalent of the “paths” of movement as described by Lynch. It’s important to notice that Browne in that early text picks a landmark example that is not part of the exhibition content (i.e. an important work of art) but an external view, something that is created by the spatial features of the building and not by the exhibition layout.

Pontus Hulten, the first director of Pompidou museum in Paris argues in the early 70ies about the similarities of the museum layout and the urban form. His intention was to formulate a interior space that would offer the possibilities of walking that the city offers, with “squares” and dead ends and street patterns. Visitors should be able to move freely, to stop and start again, to have a flexible route pattern (Hulten, 1974).

During the last decades the function of the museum has radically changed. It has lost gradually its importance as a place for the knowledgeable few and has become a recreation place for all (Peponis & Hedin, 1982). In that sense it became a place with crowds and noise, it has lost the quietness of the library and it had gained the gaiety of a leisure park. Some architects even argue that the museum should not be considered as a building but as a part of the city (Tzortzi, 2013).

### 4. DESIGN STUDIO PROCESS

The specific design process described here refers to one semester design studio which took place at the Dept. of Architecture, University of Thessaly during the ac. years 2015-17. The design studio tried to introduce to the students a process of research-based design which is able to lead to generative principles. 42 students of architecture participated in the project, from 3rd and 4th year of studies with no prior knowledge of space syntax or any kind of orientation approaches in urban or building design. The course was organized in three phases in order students to gradually understand the basic ideas and to practice them in various levels.

**Task 1:** Using the urban context as a medium for understanding the correlation between orientation and mental mapping.

Despite their daily activities students were not aware that we construct mental maps while we are moving towards our destinations within the city. To enable students to understand how we move into a complex environment and the methods we use to simplify, perceive and navigate, we propose a short walking in the urban context of the city of Volos.

Students had an hour to explore the city under the restriction of visiting the places that for them were most interesting. They had to adopt the role of the inhabitant who takes a friend for a walk to show the most characteristic or the most beloved places of the city.

Students have been introduced to Kevin Lynch ideas about cognitive maps and became familiar with the basic ideas about paths, nodes, edges and districts. Students were asked to map their route
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according to the elements of Lynch so that they could be able to identify an overall structure of the material space within which they were moving. In addition to that they were asked to enrich their route with whatever they considered important no matter the size, the scale or the nature of the object.

Finally, they have been asked to consider the importance of visibility issues and improvise on representation methods.

Diagrammatic maps were the outcome of students work. This kind of diagrammatic maps are important in the process of architectural design (Schneider et al, 2013). Students started understanding that their route had a specific structure which was partially based on some dominant characteristics of the urban space understood by all and partially formed by their own choices.

The choice of urban space as the basic layout for this exercise has a major advantage. It has an easily recognizable grid, namely the system of streets and urban blocks within which students were moving to form their chosen route.

Some of the resulting maps are presented in figure 1.

Fig. 1 Diagrams produced by students during the city walks. [Diag. 1 students: V. Vlahopoulou, D. Kourtidou. Diag.2 I. Sotiriou, Diag. 3 M. Stogia, Diag. 4 D. Lazaridis]
Based on the maps we discussed a number of issues:

The importance of the urban grid as a background layer which organizes the overall system. We discussed the variations of the existing urban grid, models of repetitions, continuities and discontinuities.

A major theme was about the choice of the main route and the possibilities for alternatives. Students were asked to describe the reasons for choosing the specific route. The discussion revealed the combination of major and minor attraction points, some of them related to elements recognizable by all, some of them meaningful only to the students themselves. It became evident that the form of urban grid was associated with the possibility of alternative paths. The denser the grid the more opportunities to follow an alternative route.
Students analyzed their route according to the five elements of Lynch theory. They discussed the overall structure of the route, which areas they have recognized as districts, what was the difference of crossing a district or walking at the outside, which areas were understood as nodes where more options have been located and where the students has the impulse to reconsider their original route and possibly change destination.

The power of visibility as a key element of orientation and decision-making tool has been extensively discussed. The tool of isovist has been introduced. Long and short views have been explained and their importance in relation with the grid. Long views enable us to orientate into a complex environment, short views locate us in the local context. Landmarks were identified, and their quality, endurance and materiality were described by the students.

**Task 2: Transferring the method from the city to the museum**

The second task encouraged the students to transfer these methods from the urban context into a building and more specifically into a museum. Students were asked to analyze an existing museum (ideally one that they have visited) visit an existing museum so that they explore the building under the perspective that they have started to formulate through the first exercise. They had to create cognitive maps and diagrams using the set of elements proposed by Lynch but also using other notions that they had explored such as the repetition and grid or the visibility categories, in order to understand the underlying structure of the building and its spatial properties.

Some of the resulting maps are presented in figure 2.

![Maps of existing museum buildings](image)

Based on the diagrams produced we discussed a number of issues.
The relationship between the building as a material structure and the content and the balance between the two. In some cases the exhibition areas where separated clearly from the circulation shopping and recreation areas making a clear distinction between what was seen as an open public realm and an enclosed space containing the exhibition objects. In other cases, intermediate areas existed where there was a fusion of public and private character / recreation and knowledge content. Students easily identified the application of the notion of districts and comprehended what are the spatial properties which differentiated these areas (openness/enclosures/colors/segregation/zoning/ambience).

The importance of movement inside a museum was considered in analogy to the importance of the movement within the city. Paths were easily identified and their relations with different areas (districts) of the museum were brought forward. Main and secondary paths/routes have been mapped so that a complete circulation system was revealed and the various choices for visitors have been understood.

In all cases landmarks have been identified either both in terms of exhibits (ie special exhibition objects selected as anchor points in the exhibition layout) as well as spatial elements (ie unique openings for controlling natural light, special textures, colors and materials, double height spaces, etc) which help visitors to orientate themselves.

The properties of visibility variations inside and outside the buildings (short views, long views, views across) were systematically noticed. This revealed a special structure in each museum and combined with the structure of the route system and the location of the landmarks outlined the richness of the visitors experience in the building no matter what the content would have been. This presented to the students the importance of creating space which is rich enough to be valid and appreciated even in emptiness.

In this phase we discussed if there is any controversy or contradiction between the design intentions (as described by the architects in the various publications) and the design outcome (as understood by the students) in the sense that the constructed space may generate performability issues not intended or foreseen by the designer.

**Task 3: Designing the building**

For the final phase of the design studio students were asked to design a museum dedicated to the culture of the Thessaly area. They had to decide the design brief and the content of the exhibition, the theme and the variety of activities. Avoiding providing a fixed brief enabled the students to think the building and the content as one entity and not as two differentiated elements.

Students had to recall the diagrams they had created during their previous tasks. These diagrams included paths, main and alternative routes, grids and landmarks, long and short views, nodes as places of decision making, a variety of scales, textures, and most of all the traces of the pleasure of walking in a rich environment (the city or the museum).

Diagrams have the quality of containing infinite relations therefore are able to provide infinite outcomes. In a way diagrams can be considered “machines of thinking”.

The students were strongly discouraged to use the morphological properties of the diagrammatic structures as a base for the museum design. Most of them combined ideas from the first two tasks creating new diagrams with reference to the constrains of the specific site (ie access road, orientation, adjacent buildings).

The majority of the students employed the idea of a basic grid as the background and a main path as the spine line of their project. They started building up a sequence of spaces around the path with
small or bigger voids between. They organized districts, areas of specific character or thematic. They tried to create two parallel but intertwining sequences of spaces, one more public the other more private (the exhibition areas in need of quietness or controlled lighting). The spaces where the two sequences were in contact were understood as spaces of major importance (the equivalent of what Lynch describes as nodes) and therefore were treated architecturally with special care. During the design process students kept switching between the first stages of their work (the diagrams of the first and second exercise) and the new design schemes they were setting up in that continuous circle between problem and solution that Lawson and Dorst (2009) have described.

Fig. 4. Design Project 1 [student: D. Lazaridis]. Based on the diagrams produced during the first task (top left and right), the student used a basic grid and rectangular forms to outline the basic areas of the museum. He organized a main route in two levels while at the same time he provided minor alternative paths. Variations of masses and voids, alternations between public and private spaces were structured along the main route. Visibility was a major concern and a tool which has been greatly explored (bottom right). The analysis of the floor plans according to the Lynch’s elements clarified the internal organization (diagram in the middle of the right side).
Fig. 5 Design project 2 [student: I. Sotiriou]. The student focused mainly on the material produced during the second exercise (diagram on top). She emphasized the importance of moving and seeing parts of the building (upper left), thinking in three...
dimensions. She created deep atriums around which visitors could move and change levels using stairs and ramps. The building became a theater where visitors could enjoy being with others in a common cultural context. Special effort was made in reference with the exterior image of the museum. The movement around was considered to be a crucial part of its relationship with the city and of its overall perception.

Fig 6 Design project 3 [student: I. Koukouzelis]. Multiple grids have been used as the background of the design process. A system of routes has been used with a main exterior path and a main interior path which is twisting inside the built volume. The analysis of the plans according to Lynch’s elements (bottom left) helped clarifying the final activity pattern. The interplay between less and more lighted areas, between long views towards the city and short views to the exhibits, has been at the core of the student’s effort.

**Task 4: Evaluating and comparing**

After the finalization of the design project students have been introduced to the Depthmap toolkit and we discussed the merits and the limitations of the technical aspects. In that sense they could rethink not only the properties of their design but also the limitations of the technique and not consider it as a magic wand. This seems increasingly important in an era where technology tends to takes over … Tools are not being used just to perform a task that people decide but they also formulate people’s way of thinking.

Depthmap results revealed the dynamics of the space designed by the students. Occasionally these dynamics were in accordance with the design ideas but sometimes they were over or against the designer’s intentions. In all projects, corridors’ or space’s intersections revealed as key areas for decision making. Students had to rethink the spatial configuration they had produced and reconsider the viability of their design product. Were they conscious that these intersections play an important role into the overall structure of the building? What activities have been located in the places which seem to be more integrated? Were the private spaces efficiently separated from the public spaces?
The visual properties of the buildings became evident through the computer mapping. How far can the visitors see and what can they observe? What is the spread of their vision from certain key points of the building? Is this effect produced by the intention of the designer or not? How the change of the spatial configuration (ie the erasure of a wall) may drastically change the visitor’s overall experience in the building?

Fig.7 Depthmap. Visual Connectivity. Project 1 (top), Project 2 (middle), Project 3 (bottom). Left column: Connectivity of the interior (without considering openings). Right column: Connectivity of the whole designed space (views through the openings included).

5. LESSONS LEARNED

Buildings are not just a well-designed object but a structure which organizes internal movement, perception of the content (no matter what the function is), orientation and choice, regularity and surprise and most importantly the pleasure to be there alone or with other people. Public buildings (museums specially) should be designed as cities because they should create a rich environment for visitors to wander and focus, to walk slowly and sit down in a quiet space or move quickly towards a destination.

Movement is a major element. It should provide the function (moving inside, accessing the contents and functions etc) but it should also provide the pleasure of walking, the perception of the contents as well as the perception of the people inside and outside.

A grid is important as it provides the basic background upon which we move and understand the overall structure, but it shouldn’t be strict. It should be flexible to deform so that minor episodes can have space to develop.
Key spaces (called nodes as well) are areas where the visitor has to take a decision (where to go next, or maybe where to sit for a while and watch the people moving or talk on the phone?). Architecture should provide a variety of such spaces and associate them with landmarks so they can be well perceived.

Working through scales (form the city to the building) enforced the importance of movement as a key element of design but also it enforced the importance of co presence. The museum layout configures the relation between the visitor and the exhibits thus manipulating the transmission of knowledge. But at the same time, it manipulates the visitors co presence, it generates an environment of welcomed co presence or a layout of indifferent coexistence.

Finally, architectural design was revealed as a research process rather that as an inspirational one. Students didn’t need to have a “brilliant” idea to start with. They had to organize material already familiar to them, understand the idea of multi layered structure and proceed with the bottom up design.

REFERENCES