

Space Syntax Methodology and Architectural Design: Case Study of Department of Architecture, University of Engineering and Technology Lahore

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Abstract- Space syntax theory describes the basic principles that are involved while designing a space. It can be explained as an approach that we use to explicit the spatial relationship existed between the user experience of the space and its social and cultural influences. Space syntax is concerned with various spatial properties and seeks to answer various spatial problems. we can determine the configuration properties of the spatial organization and the effects of spatial configuration on social behaviours. This paper addresses the space syntax as a theory of conceptual framework as well as a tool for understanding the relationship between space and society through DepthmapX programme. This paper explains the premises, philosophy, advancement, and application of space syntax with the help of some projects that are undertaken as a study to explain the whole process and the projects of some foreign architects who have taken up this theory to solve major built environment issues. The major aim of this paper is to introduce a new field of research in Pakistan that is being going on in major architectural institutions around the world like university college London UK and Georgia Tech USA at graduate and post-graduate level. This paper also heaves light on the importance and future outcomes of this theory. This theory helps in getting on our lives by identifying and measuring the social relationships. This will help the future generations of Pakistani architects to solve many issues related to design and built environment that may improve the overall social set of the society.

Keywords- Space syntax-spatial configuration-students learning- socialization

I. LITERATURE REVIEW – SPATIAL CONFIGURATION AND LEARNING PROCESS

The phrase ‘affordance is introduced by Gibson as the possibility of expected reaction with respect to the environment, as a result, the environment affords this reaction. For instance, a chair can afford sitting. Within the school building environment, affordance of the learning process is the level by which space is flexible to accommodate the format of learning taking place and not to impede rather to assist the students in overall learning process. Space is also intended to provide, assist and spark the students’ social communication inside the school building environment’. [1]

The spatial planning of the university campus impacts the student’s social life and their learning process. It has wide range of impacts on students grooming and learning outcomes. Students spend a significant period of their adult age in university, and this is the last building exposed to the students in most of the cases, as educational building. The foremost purpose of the campus building is to educate ad prepare the students for the upcoming challenges life through learning and socializing.

This paper aims on closing this gap and broadening our understanding of spatial and social organization of learning and grooming by reviewing our existing research and literature to develop an understanding for learning and built environment.

To explore the relation between these three-parameter space building and user, this paper is organised as follows: the literature review will cover the existing research with reference to understanding of the space syntax, learning process and spatial configuration. The next part will be the methodology that is used to syntactically analyse the university buildings based on affordance of the university buildings for students learning outcomes

and social interaction. Later, the analysis of the building performance is done based on the results. The perception about learning process around the world has been developed over the period. The conception about it has been defined in various ways in different ways. In the dictionary, Learning is defined as “the activity of getting knowledge”. [2]

If we look back in history, learning was considered as a passive process in which the teacher was considered as a main source of knowledge who transferred the information to the students. The students were believed to follow the scripted curriculum and strong disciplined policies. Brown emphasizes that a general understanding in the 19th century was to consider learning as a mental discipline that shaped the character, for example dreary tedious work would improve mind-control. [3] Traditional teaching methodologies saw Children as ‘empty pots that are to be filled in with information concentrating majorly on the understanding of facts and disciplining of human bodies and their souls. [4]

After twentieth century, we see a complete shift of approach towards learning process in which many scholars played a vital role like Jean Piaget, John Dewey, Jerome Seymour Bruner, and Lev Vygotsky. Their theory of constructivism says that student is an active part of learning process rather than passive and learning is constructive process. All the knowledge that child construct in his mind, is based on his previous information and experiences. Every human being has his own interpretation and construction of knowledge. The learner is not a blank slate but brings past experiences and cultural factors to a situation. [5]

After the realization of learner as a major focus in the learning process, the sociologist Basil Bernstein presented his theory about social control and power. He analyses “the way a society picks up, categorizes, dispenses, communicates and assesses educational learning.” He proposed different dimensions of transmission of knowledge. If The Boundaries Between teacher and students for transmission of knowledge is strong then the authority over what is taught remained with the individual teacher who decides what is right or wrong with no discussion. It results in hierarchal organisation like senior teacher, junior teacher, and pupils. Weak framing indicates individual teacher requires coordination with other teachers and students as well for transmission of knowledge. Bernstein makes the case like this that we are moving towards weak framing and more distributed power hubs.

“It could be supposed that the previously in 19th century, men were required to be submissive and follow the set pattern repetitively and in contemporary time, men are supposed to be more adaptable and compatible.” [6]

Similarly, the approach followed by Jones is almost the same. He has defined three crucial features in learning that are content, teacher and students. In traditional method of teaching, content is with the teacher, and he is the sole in charge of the knowledge as gate keeper. In second case, if the content is with students, teacher s’ role is of facilitator, to help the student in learning and understating. In third case, if the teacher and students are aligned to understand the knowledge like fellow travellers and understand the knowledge together. Jones explores that there is still no need to remain fix to these three methods; expert teachers explore all three methods in the same session. “Teaching and learning are activities, and in a formal educational context it is the teacher, not the learner who controls and determines these activities. Even the decision to hand the class over to the learners, to become genuine fellow traveller, is a decision made by teacher.” [7]

The concept of social interaction in space is directly related to the learning process as well. The socio-behavioural nature of any space plays a vital role in integration of social interaction among the students. According to Baker s’ theory, there are four elements that identify the space for the appropriateness of the activity i.e., actors, atmosphere, synomorphy and time. [8] Lang says in his book that there are ‘socio-petal’ and ‘socio-fugal’ components that identify the space as bringing the people together or forcing them apart. Socio-petal arrangements include different postures of the user to provide maximum user interaction while socio-fugal setting avoids the social interaction by keeping the people apart like in case of back-to-back seating arrangements in any class. [9]

In a nutshell, social and configurational aspects any space are no more the secondary aspects in determining the overall learning of the students, but in fact they are the major determining factors for the outcomes of the students learning and grooming. It can be argued that learning in any space is not confined in classrooms only, but the configuration of the space and experience of social interaction play a vital role in it.

This research will explore the planning of architecture department in a university premises for its configuration and social interaction experiences.

The analyses can be applied on overall university planning as well but because of limitation of the scope, it is applied on departmental level only.

II. SPACE SYNTAX METHODOLOGY

The Space syntax methodology has grown rapidly in recent years. It is used to analyse in the fields of urban design for spatial study and in the field of transport, land use, and people's interaction with the space. Many researchers, academicians, practicing architects and urban planners are employing space syntax at various scales, from buildings and neighbourhoods to urban areas and entire regions. Likewise, space syntax theory has become an important part of curriculum worldwide. [10]. Space syntax is understood as a combination of techniques to analyse the architectural and urban spaces for their functional outcomes.[11] But it is something more than this. That is basically a hypothetical representation of human space and its functional outcomes, the conceptual understanding of the space and how it works as the part of the society [12]. Space configuration is an important factor that needs to be discussed while designing. Configuration is just not a connection but it's a relation that into account other relations as well. For example, if we graph the pattern from two different points of the same structure, we can have two different layout outs, as shown in figure 1. One can be more integrated or shallow and other can be more segregated or deep. By comparing the depth of each space within the different buildings, we can critically review each space as integrated or segregated as per our requirement. We can explore the building with reference to its context on urban scale and in similar way, it can be analysed on micro level for its interior layout.

Based on this analysis, we can examine any structure or space through comparing its function and value of integration. This value of integration in turn depicts the social meaning of the culture of the space. For instance, we have taken a typical plan and we have chosen two points of interaction. In option A, we can see the relationship is deeper and more integrated and in option B, it's more spread out and segregated. This is the case we can explore through depth map analysis software. Depending upon the need of interaction and connection, both types pf planning can be used and checked using depth map X tool.

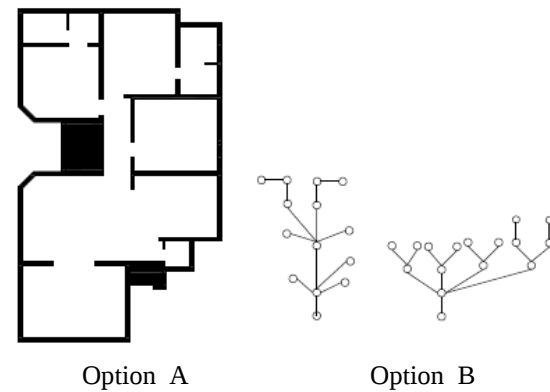


Figure 1: Describing points of interaction

To explore the way how spatial design affects the students learning and socializing and how space syntax helps us to investigate the whole process, the plan of Architecture department, University of Engineering and Technology, Lahore, has been selected. The plan has been analyzed using DepthmapX software that is easily accessible online. It gives us a very demonstration of various outputs that can be further analyzed based on results generated.

The building of architecture department was established in 1962 and has a history of more than fifty years. The building has been designed in two floors having five independent studios, lecture theatres, computer lab, teachers' offices, chairperson office, administration zones, conference rooms, exhibition hall and one basement having a library and a lecture theatre. The building has a central large courtyard incorporating all five studios and connects the neighbouring department of city and regional planning. However, in this case study the library in the basement has not taken into consideration.

Central courtyard of the department is the main interactive space of the departemnt that not only connects all of the studios but also creates privay from outside through main entrace lobby. It's the major activity zone of the department.

The evaluation of the department has been done through space syntax software 'DepthmapX analysis' that was developed by Bartlett School of architecture, university college London and is available online. [13]

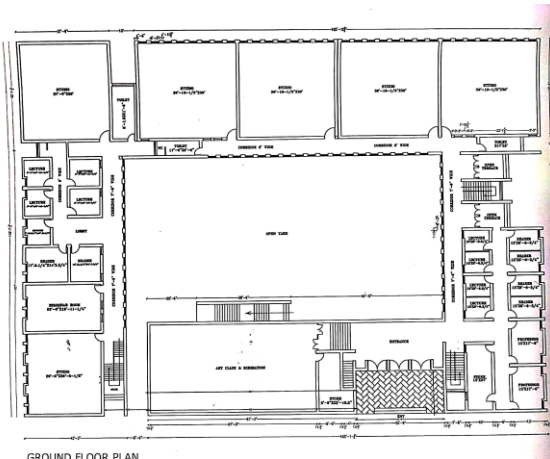


Figure 2: Ground floor Plan, Department of Architecture, UET, Lahore.

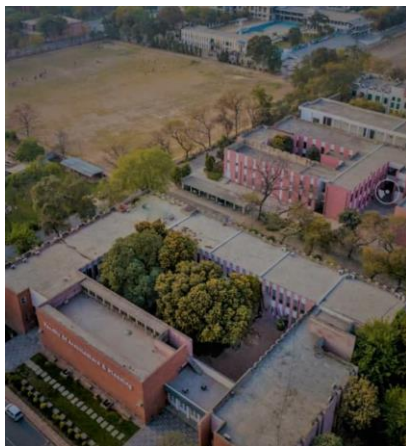


Figure 3: Aerial view of architecture department



Figure 4: Internal courtyard of architecture department

VGA Analysis:

VGA analysis is 'visibility graph analysis' that is performed through DepthmapX software. It gives us the inter-visibility of the space layout. [14]. Colours represent how many other locations are visible from this point, ranging from blue (low visibility) to red/orange (to high visibility) as shown in figure 3. There are some lists of attributes shown in the left pane that shows the connections from each location as we move pane from on the graph. In the figure it clearly shows red mark in the centre that means max visibility from the studios

are other spaces is in the central courtyard that allows maximum number of visual in counters in the centre. Based on the results we can conclude that which space is more visible according to our requirements. So, courtyard of the department is open and allows maximum amount of visibility access to the studios and interaction among the students that is the major aim of an architectural institution.

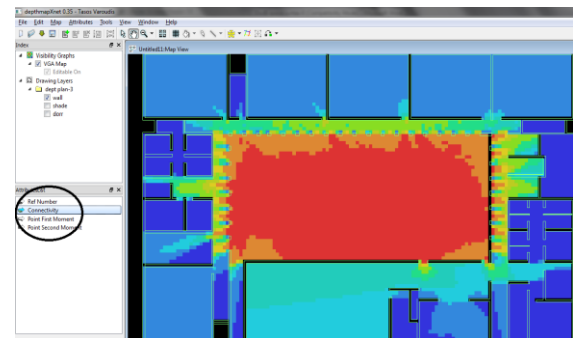


Figure 5: VGA Analysis graph

Step depth:

Step depth analysis shows the distance / visibility from one point to all other locations. As the point is mentioned here through arrow and the software shows step depth from this point as we move the curse on the graph. Step 1 means directly visible, and step 2 visible indirectly. It is represented through colour codes as well ranging from blue to highest and orange to the lowest. While standing at the marked point we can have maximum visibility to the studio entrances through corridor, but complete courtyard is visible.

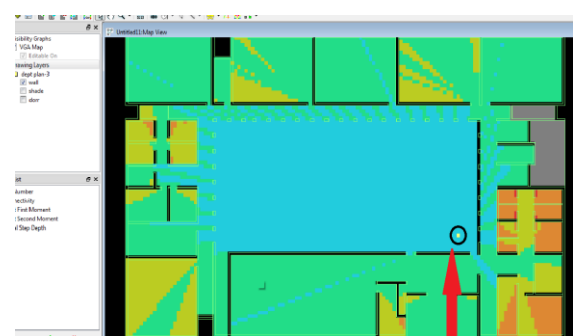


Figure 6: Step Depth Analysis graph

ISOVIST Analysis

DepthmapX software also creates isovists that represents the potential viewing angles and viewing depth from certain location marked. As in figure 5, colour coded viewing angles have been shown from different point within the department. As we can see in figure 5 different colour codes have been given to different viewing location that represents their viewing depth. It means layout promotes maximum depth for viewing permeability that is good for student's interaction and gives more loose space for gathering.

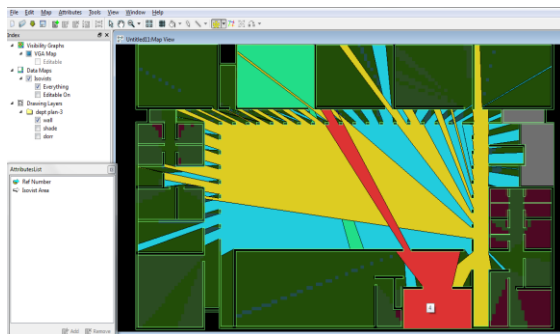


Figure 7: ISOVIST Analysis graph

Convex map analysis & link and unlinking:

In this analysis, we can learn about how much spaces are linked with each other and other spaces. The colour codes represent the depth and number of integrations it has with other spaces. Like in this case, department courtyard is the most linked space with all other spaces like studios etc. In the left panel, it shows the measure connectivity that shows the integration value of the specific space as we move the cursor on the drawing as shown figure 7. There are many other options available on DepthmapX software that can be explored for the further analysis.

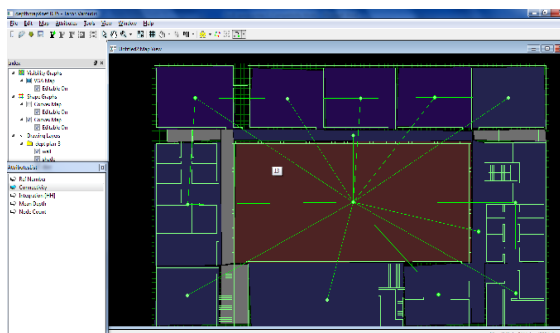


Figure 8: linking of the spaces

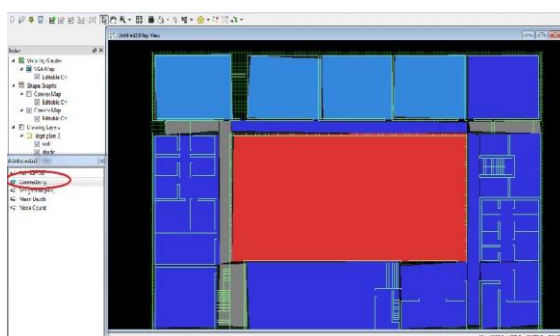


Figure 9: connectivity

III. DATA ANALYSIS

In this paper, we have re-conceptual learning process as a social activity that is based on availability of social gathering spaces and student's interactions where building layout plays a vital role in learning process especially in formal studies.

Spatial configuration of the layout must include Spaces like central courtyard which is argued to have a strong impact on student's communication and grooming. [15]

The analysis done after four steps of the analyses provide many clues about design performance of the building layout. Consequently, the results of this case study are now analysed based on the results. This shows the department courtyard plays a vital role in integration of the department and improving the connectivity of the studios. That in-turn improves the student's social interaction and learning opportunities. Layout of the department gives ample opportunities for the students to move around and interact with each other. Many departmental activities are performed in this main courtyard and presence of lush green central space makes it satisfying for the occupant. Studios are linked with each other and with the main courtyard. Social interaction is an evitable issue in educational institutions especially where informal education or face to face relationship is more important like in architectural studies. Likewise, similar study can be done on campus level and in comparison with other architectural institutions layout on larger context, in order to study the impacts of planning on students learning outcomes. So, space syntax model provides ample opportunity for the researchers to evaluate their design for visual occurrences and spatial configuration analysis.

IV. CONCLUSIONS

We can say that if design is an activity that is done by making and doing than space syntax provides you an opportunity to analyse your design proposal based on the purpose and to study the outcomes of the design proposal before it's being constructed. The most striking impact of space syntax is that the designer can analyse his building as a living organism which is experienced by the occupants. So, space syntax methodology can be used before actual construction of the building to get the desired results based on the objectives and function.

Based on the properties of method, it is possible to use it to study micro and macro levels of the project. It can be used to analyse the site, its constraints, traffic analysis, connectivity to the neighbouring context, both on micro and macro level analysis. In case of constructed building, it can give us the analysis as per required reuse. In conclusion, it can be said that Syntactical analysis is a comparatively new technique, however in some countries it is used as a vital planning assessment tool. It may be used to demonstrate and interpret the outcomes of the configuration and can aid the designer with the possible outcomes of planning.

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