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ADAPTABILITY RETRIEVAL IN ARTISTIC LEARNING ENVIRONMENTS

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ABSTRACT

The current educational paradigm suggests a wide scope of activities with pedagogical potential held in different active learning environments, which impact student achievement. Adaptability as the physical ability of a building to cope with changing activities and requirements, is paramount when regarding artistic schools, lecturing the regular and the music and dance courses.

This paper aims to present an original methodological approach on assessing the adaptability of contemporary artistic schools, as a specific and complex case study on both the activities and spaces to consider. Its purpose is to assess the schools' ability to cope with the pedagogical and social evolving needs and to conclude on the design attributes that potentially enhance adaptability, for a more lasting and effective building performance.

It introduces procedures from different epistemological provinces, for a more supported retrieval of its adaptability, sequentially as follows:

1. Description of the spatial sample, functional and morphological, informs on how it supports activity allocation. A space syntax analysis regarding convex spaces and axial lines, as places and pathways for learning, will provide a thorough understanding of the sample's morphology and conclude on the relevance of global and local syntactic measures towards activity allocation, spatial cognition and the overall "social logic of space" (Hillier and Hanson, 1984).
2. Description of all possible activity allocations informs on the pedagogical potential of each educational environment, matching all possible activities to the spaces in a feasibility matrix. It considers maximising entropy, informing on the uncertainty of an activity allocation to both convex spaces and axial lines (Coelho and Krüger, 2015).
3. Description of effective events informs on behaviour and appropriation, holding higher relevance in this artistic ambiance. This stage corresponds to an idiographic approach on singularities, while the latter to a nomothetic approach on regularities (Windelband, 1894).
4. Description of the potential correlations amongst each stage, enables the retrieval of the school's adaptability, understanding a potential correspondence between integration, entropy and behaviour.

This methodological framework is expected to be a contribute to knowledge advancement, identifying adaptability in this particular contemporary context and combining distinctive study fields, namely space syntax's inputs, for its assessment. Also, for the practice, the acknowledgment of the spatial configurations with higher representativeness towards adaptability could be informative to future designs.

KEYWORDS

Adaptability, Methodology, Artistic Learning Environments, Morphology, Activity Allocation

1. INTRODUCTION: ARTISTIC LEARNING ENVIRONMENTS AND THEIR NEED FOR ADAPTABILITY

'By giving shape and form to our material world, architecture structures the system of space in which we live and move.' (Hillier and Hanson, 1982, p.ix)

This paper derives from the interchangeability between "architecture structures" and the "social relations" that they allocate but, primarily, that they enable throughout the whole building's lifecycle. This is here specifically translated onto the dichotomy between school and learning, each with their evolving social and pedagogical requirements. Therefore, this paper aims to recognise change as an intrinsic condition of both the learning environments and the pedagogical processes for knowledge acquisition, and to acknowledge spatial adaptability to cope with that imminent, yet, unpredictable, process.

Following the connection between school and learning, Heitor (2005) recognises the school as an "educational tool", while Monahan (2002) introduces the concept of "built pedagogies" and Moore and Lackney (1994) have proven the relevance of the school's physical attributes towards student performance, even if it can also be a reflection of non-spatial considerations (ibid., p.14).

In fact, the current pedagogical paradigm is embedded by a wide array of dynamics, widening the active learning environments from the traditional classrooms to informal spaces for non-programmed events, group work and individual creation, regarding socialisation and critical thinking as a means to knowledge acquisition. To school design this implies the consideration of informal and social environments, and even moving pathways, as active learning environments, where peer communication is possible amongst creative and reflective students. Furthermore, the "net generation" (Oblinger and Oblinger, 2005) laid by the widespread potential of technological devices, recognises an increasing need for connectivity, not necessarily in the classroom, nor even face-to-face.

Understanding this current pedagogical context is relevant to consider the potential changes in pedagogical procedures and curricula, implying specific spatial requirements in the future, which the school has to comply with, avoiding early obsolescence and enduring pedagogically, socially and physically in time. The recent Portuguese experience of the Secondary School Modernisation Programme has been developed in order to provide the schools with spatial solutions consistent with this current framework.

The choice of the school space as a case study for assessing adaptability is also supported by the general patterns of programmed activities on the weekly schedule, combined with the variability of the possible daily and changeable small-scale pedagogical events, namely lined by informality.

The specific choice of the artistic schools that combine both the regular teaching - with basic and secondary levels - and also the artistic teaching of music and dancing, is justified by the fact that these schools are a higher aggregator of both users and activities, leading to a more pressing adaptability condition.

Overall, schools with artistic and regular teaching in a shared building, have more demanding needs for adaptable spaces, because of the variety of events with different spatial needs, with

varying number of performers and of diverse nature [Figure 1]. Due to the extensive array of formal and informal happenings; programmed and non-programmed activities; for individual, group or external fruition - even more enriched by the spontaneous and expressive profile of the artistic school community - these schools represent overall a higher complexity case study on adaptable learning environments.



Figure 1 - Different ways of experiencing the artistic school spaces (from left to right: the auditorium's cafeteria, the dance studio, the main hall, open space onto the corridor)

2. DATASETS AND METHODS: DESCRIPTION OF THE METHODOLOGY TOWARDS ASSESSING ADAPTABILITY

'[...] these spaces must be adaptable not only to a present variety of uses, but also to the changes which the future is bound to bring, sometimes suddenly, sometimes imperceptibly.' (Ministry of Education, 1957, p.15)

This paper proposes a methodology to identify and assess adaptability, particularly applied to artistic learning environments as the case study, for which it is particularly relevant. Krüger defined adaptability as: "the ability of the built form to maintain compatibility between activities and spaces, as those vary" (Krüger, 1981, p.1169), which is considered to better report this condition on contemporary artistic schools, by the increasingly diversity of activities and spaces, technical requirements, variety and sizing, conforming with the need for spatial adaptability in regard to the activity allocation.

Even if in 1957 the British Ministry of Education had already suggested that changeability in educational pedagogies had to be accounted for in post-war school building, the state-of-the-art on assessing adaptability leads back to the 1970s, from which came the definition of adaptability by the OECD (1976, p.10), as: "essentially large magnitude/low frequency change".

Then, models (Echenique, 1972) took a relevant role for adaptability, providing straightforward results for abstractly portraying a reality by the relationship of its variables (Simon, 1969). The "general theory of adaptability" that Fawcett (1978) intended to accomplish with his Doctoral Thesis, supervised by Lionel March, is a significant approach for modelling adaptability, on the probability of allocating activities to spaces and ultimately relating adaptability to a "quantified measurement" (*ibid.*, p. 54).

The approach to models and analytical frameworks represents a very relevant line of thought for architectural research, nonetheless, it is substantial to critically review it on its potential contemporaneity. Actually, this research gains a higher complexity, due to schools' contextual variables regarding curricula, spatial and technical features, that will constrain the adaptability requirements. Moreover, the dichotomy between formal and informal learning activities and environments also introduces a determining factor. This will identify adaptability not just as a measure assessed from a simplified model, but rather a closer one to the context, that potentiates encounters, movements and a broader spatial fruition.

Hence, besides the contributions from a mathematical elaboration, also the combination of inputs from other fields, more prone to the social sciences, will consequently provide a more comprehensive outlook on “the social logic of space” (Hillier and Hanson, 1984).

Windelband (1894) introduces the concepts of nomothetic and idiographic, in which the first relates to general laws and regularities, and the latter to the events and singularities. This can be brought to this methodology, assuming the “nomological regularities” (*ibid.*, p.178) of a weekly schedule of formal activity allocations to spaces; and the idiographic related to the individual(s) or collectivities’ informal dynamics.

The original methodological approach presented here [Figure 2] on assessing the adaptability of contemporary artistic schools, aims to assess the schools’ ability to cope with the pedagogical and social evolving needs and to conclude on the design attributes that potentially enhance adaptability, for a more lasting and effective building performance. It systematically introduces procedures from different epistemological provinces, providing a more extensive analysis on the building’s description for a more supported retrieval of its adaptability potential, sequentially as follows:

1. **Description of the spatial sample, functional and morphological, informs on how it supports activity allocation.** This acknowledges an extensive analysis of the school spaces, physical attributes and the activities that there take place. Then, a space syntax analysis regarding convex spaces and axial lines, as places and pathways for learning, will also provide a thorough understanding of the sample’s morphology and conclude on the relevance of global and local syntactic measures towards activity allocation and spatial cognition.
2. **Description of all possible activity allocations informs on the pedagogical potential of each educational environment.** This stage also implies maximising entropy, which will inform on the degree of uncertainty of an activity allocation to both convex spaces and axial lines (Coelho and Krüger, 2015).
3. **Description of effective events informs on actual behaviour and spatial appropriation on the school.** This holds higher relevance in this case study, due to its artistic ambiance throughout the all spatial system. This stage corresponds to an idiographic approach on singularities, while the latter to a nomothetic approach on regularities (Windelband, 1894).
4. **Description of the potential correlations amongst each stage and transversally on all these variables.** This stage examines the potential overlapping of individual outcomes and enables the retrieval of the school’s adaptability, understanding a potential correspondence between integration, entropy and behaviour.

SCHEMATIC SYNTHESIS OF THE METHODOLOGY

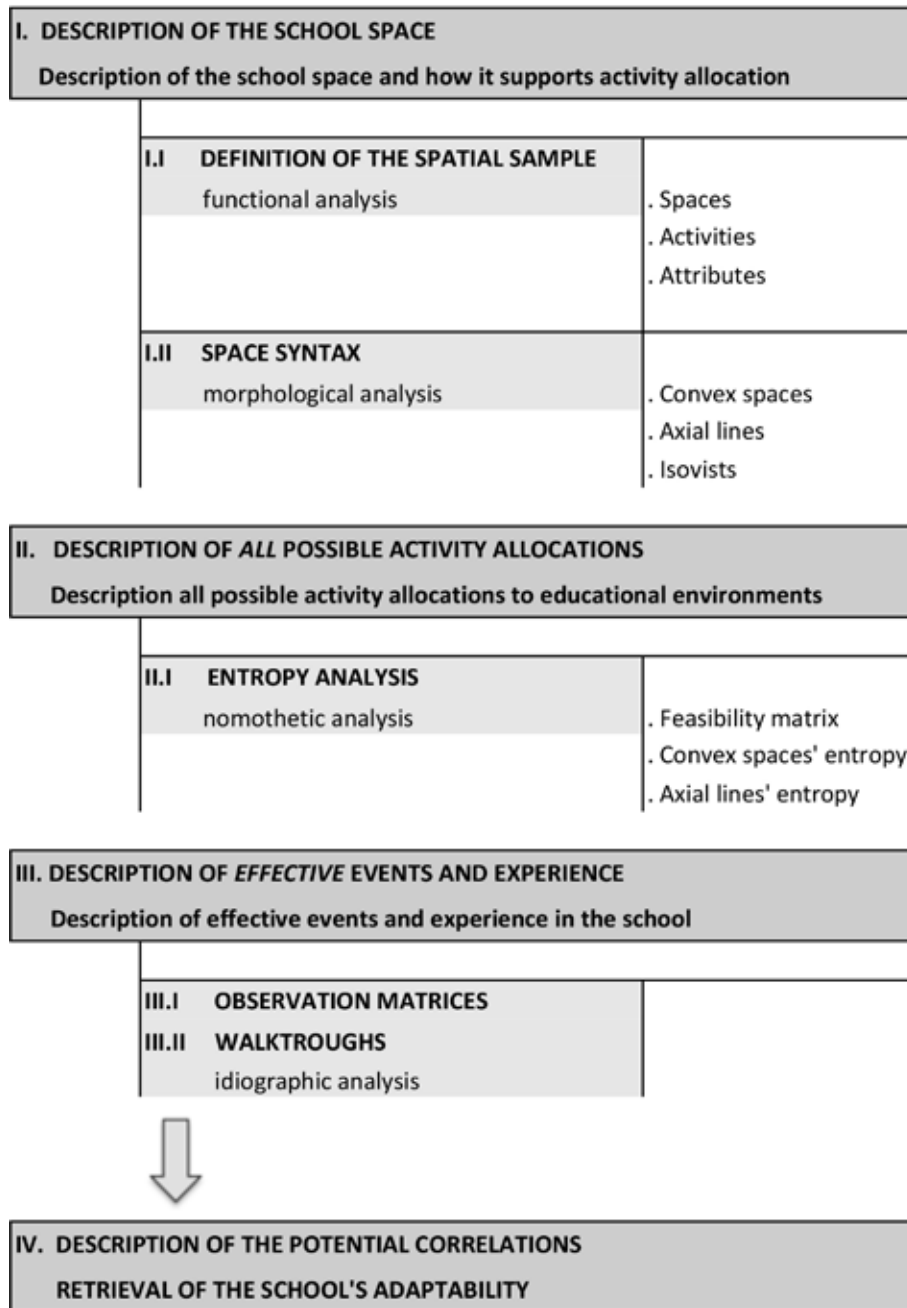


Figure 2 - Detailed systematisation of the methodology

This recalls Hillier and Hanson’s mechanism of “description retrieval”, described in *The Social Logic of Space* (1984, p.50-51) as a potential link between reality and abstraction. Psarra (2003) also presents a clear definition of this process: ‘Description retrieval is a process by which abstract laws are derived from real space-time events and are subsequently embedded into further actions.’ (ibid., p.2). All in all, “description retrieval” embodies the ability to translate situated events to generalizable patterns in order to reach for conclusions. For this methodology it was assumed to deconstruct this expression into two components, as the “description” of the results of the three approaches, and the retrieval of the space’s adaptability.

This methodological framework is expected to be a contribute to knowledge advancement, identifying adaptability in this particular contemporary context and combining distinctive study fields, namely space syntax's inputs, for its assessment. Also, for the practice, the acknowledgment of the spatial configurations with higher representativeness towards adaptability could be informative to future designs.

3. RESULTS: APPLICATION OF THE METHODOLOGY TO THE CASE STUDY AND FINDINGS

'The school must be an ever-changing, stimulating environment where there is a lot going on and there are choices to be made' (Hertzberger, 2008, p.8-9)

Quinta das Flores School went through an adaptive-reuse process by the Portuguese School Building Modernisation Programme. The architect José Paulo dos Santos has designed a central building in 2008-2009, representing both a street façade and also the core of the school's administration and communal spaces. This spatial rehabilitation went along with a curricular transformation, in which the Music Conservatory has been added to the Basic and Secondary School [Figure 3].

Pedagogically, it now has an "articulated teaching regime" in which students attend both the artistic and regular classes, besides the regular students and the external students that only attend the music and dance classes at the Conservatory. Therefore, the students' and teachers' profiles are diverse, holding a wide array of activities. Spatially, this signifies spaces with assorted spatial features and the sharing of common areas and services, which favours group dynamics, social cohesion and a transmission of competences from each teaching regime. Specifically, the methodology will be applied to the central building that represents the school's entrance and where the social and pedagogical blend is significantly higher.

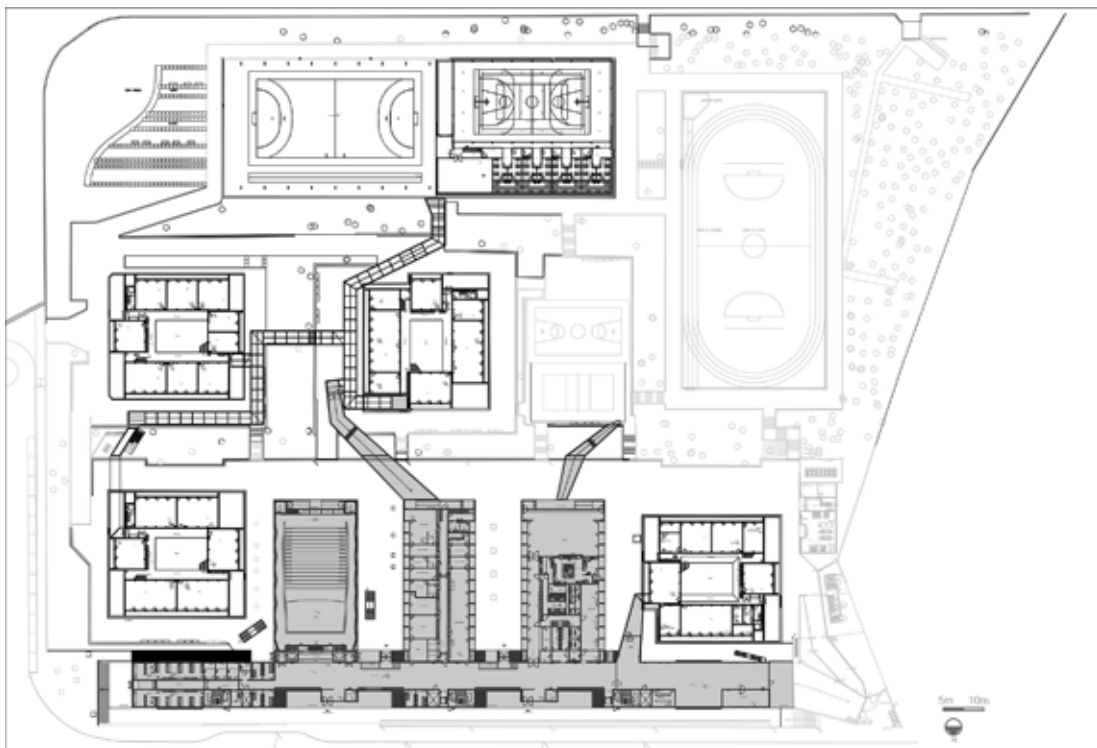


Figure 3 - Quinta das Flores School _ Spatial sample identified in grey

3.1 DESCRIPTION OF THE SCHOOL SPACE AND HOW IT SUPPORTS ACTIVITY ALLOCATION

This initial stage comprises a description of the spatial sample, functional and morphological, informing on how it supports activity allocation. Primarily, it will analyse the spatial sample according to its spaces, activities and attributes, functionally describing how and by what means does the space allocate learning activities. Subsequently, a morpho-syntactic analysis will provide an in-depth understanding by the analysis on convex spaces, axial lines and visibility [Figure 4].

SCHEMATIC SYNTHESIS OF THE METHODOLOGY

I. DESCRIPTION OF THE SCHOOL SPACE Description of the school space and how it supports activity allocation							
I.I DEFINITION OF THE SPATIAL SAMPLE functional analysis	. SPACES	. Social and informal spaces	. For staying / clusters	. interior	. exterior		
				. For circulation / pathways	. interior	. exterior	
			. Formal and academic spaces		. Classrooms	. Regular teaching	. Artistic teaching
				. Others			
		. With both formal and informal potential for both teaching regimes		. Library			
			. Auditorium				
			. Dance studio				
			. Music studio				
				. Orchestra room			
						
. ACTIVITIES	. Programmed / formal	. Regular teaching					
		. Artistic teaching					
	. Non-Programmed / informal	. Both teaching regimes					
. Administration							
		. Social nature					
		. Artistic nature					
		. Pedagogical nature for the regular teaching					
		. Circulation / fluxes					
. ATTRIBUTES	. Dimension	. Height					
		. Length					
		. Width					
	. Configuration	. Openness					
		. Partitioning					
	. Coating	. Floors					
		. Ceilings					
. Networks	. Power access						
	. Connectivity						
. Environmental conditions	. Temperature						
	. Acoustics						
. Accessibility	. Direct						
	. By lift						
	. By staircase						
	. By ramp						
I.II SPACE SYNTAX morphological analysis	. Convex spaces						
	. Axial lines						
	. Isovists						

Figure 4 - Detailed systematisation of the first step of the methodology

3.1.1 DEFINITION OF THE SPATIAL SAMPLE _ FUNCTIONAL ANALYSIS

The initial step consists on identifying the existing spaces and assigning them with coloured hatches for a graphic interpretation on the positioning and density of active/supportive learning environments, informal/formal spaces, moving/standing areas, spaces assigned to each teaching regime,....

The colour schemes presented [Figure 5] display a general colour mix that indicates a respective combination of teaching profiles, formality and informality, circulation and standing, already providing an insight on the adaptability potential of these “multi-option spaces” (Ader, 1975).

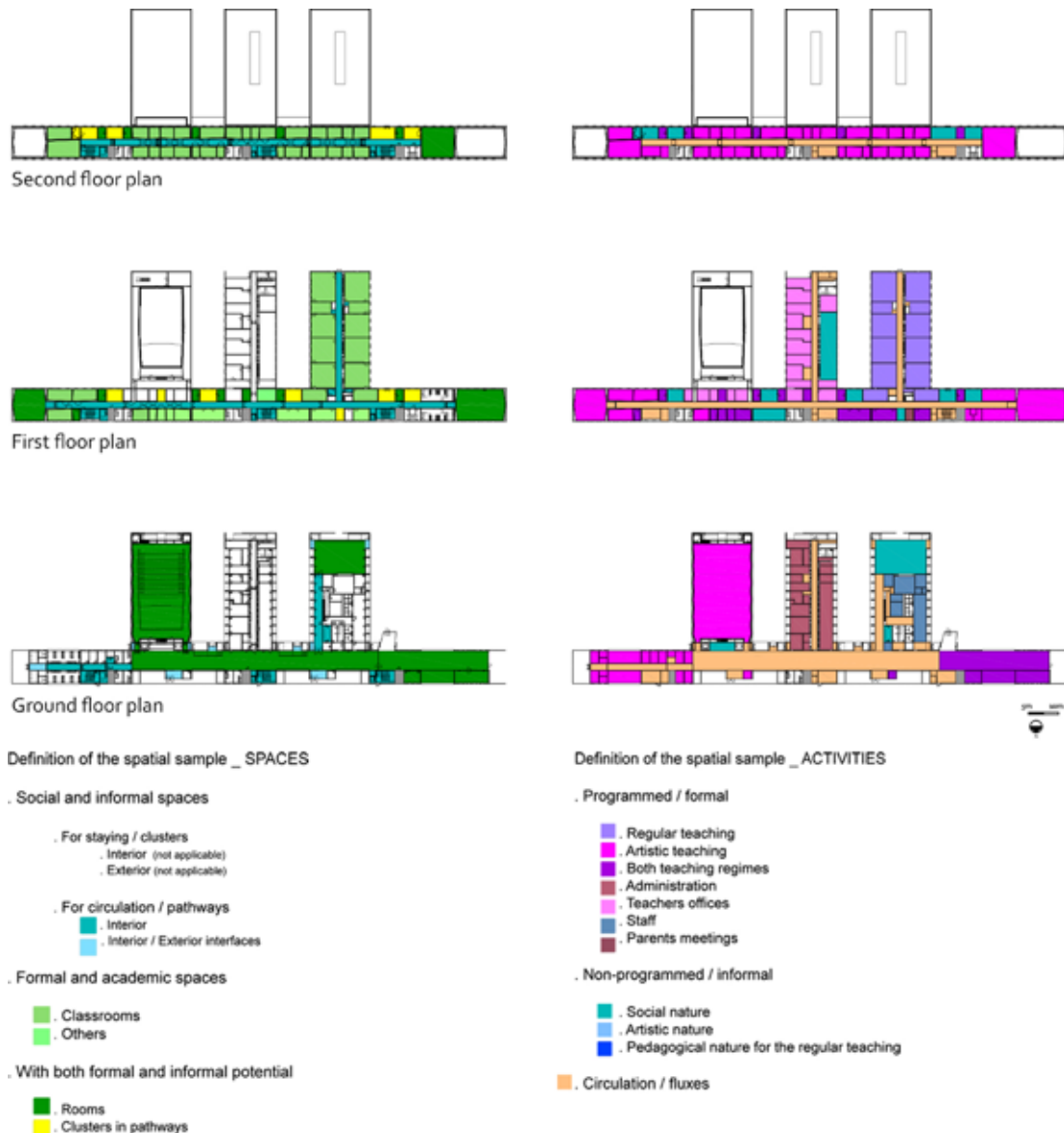


Figure 5 - Quinta das Flores School _ Spaces and Activities

A first outlook on the layout of the school may be undertaken, providing the following conclusions:

All circulation areas are considered active learning environments and, although the main corridors on all floor plans have different layouts, all are provided with small open spaces, as possible standing clusters in moving pathways.

Common spaces are used by all and are also the most preponderant spaces amongst the sample. Contrarily, learning spaces rarely allocate both teaching profiles, due to their specificities in acoustics and size.

The second floor has mainly formal activities related to the artistic teaching, while on the first floor the regular teaching has a formal area for sciences, and the ground floor is prone on spaces for social and artistic purposes for all.

Furthermore, this first stage implies a study on spatial attributes for future conclusions on their compliance with activity allocation. Therefore, attributes were listed, according to six properties: dimension, configuration, coating, networks, environmental conditions and accessibility, which may constrain or enable activity allocation to a space, even if previous classifications of spatial features have been undertaken by Duffy (1990) and also by Brand's (1994) "shearing layers of change".

The most remarkable difference regarding the attributes on this spatial sample is between the spaces for the artistic teaching from the remaining ones, especially for their acoustics. Besides, power access and connectivity are paramount for today's learning models. Proportion and overall dimension, in regard to height, length and width, are proven to be relevant attributes: narrowness hampers standing activities, which is exemplified by the cafeteria's layout. Contrarily, width may induce several clusters of activities on the same space, like on the main hall. This has clear relation to the adaptability potential of each space for holding a wider range of activities.

3.1.2. SPACE SYNTAX _ MORPHOLOGICAL ANALYSIS

"Space syntax is a method we have developed at the Bartlett Unit for Architectural Studies to describe and analyse patterns of architectural space-both at the building and urban level. The idea is that, with an objective and precise method of description, we can investigate how well environments work, rigorously relating social variables to architectural forms." (Hillier et al., 1983, p.49)

The space syntax approach aims to analyse the school from a configurational point of view. Findings allow the understanding of movement and standing spaces and their potential as active learning environments, deepening the knowledge on "spatial form" for a more inclusive understanding of the social relations of people from space, recalling Hillier's (1989, p.13) "Type 3: Laws from space to society", as well as Popper's (1972) thoughts on the third world.

Syntactic analysis has been approached by means of convex spaces, axial lines and visibility techniques. Recognising all the attributes' relevance, this analysis will focus on global integration and local connectivity, for the understanding of spaces' overall syntactic structure and their configurative relations, towards patterns of co-presence and movement.

Integration as a global measure provides an overall description of the space: "Clearly the more a space is integrated, the more it may be able to exploit the existing pattern of movement of people caused by the arrangement of space." (Hillier et al., 1983, p.59). The most integrated spaces and axial lines have been identified by DepthmapX's graphics and by its attributes' extended listing. The most integrated convex spaces are the main hall and the main corridors and the axial lines placed on those same corridors are also the most integrated ones. Besides the main corridors, the most integrated convex spaces are generally the most connected ones, like the library, the auditorium and the cafeteria: all spaces with a communal use [Figure 6].

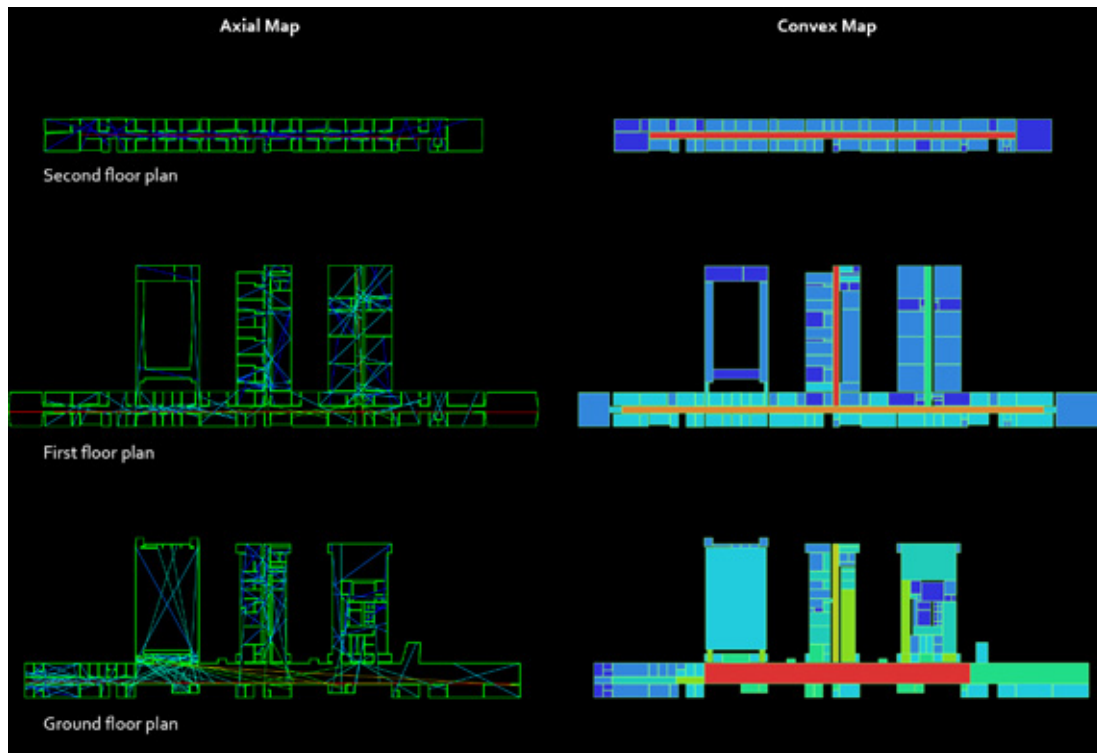


Figure 6 - Axial and Convex Integration HH

Similarly, axial connectivity has also been paralleled to axial integration, and the overall conclusion is the potential correspondence between the corridors as convex spaces and their axial lines, bearing in both situations the highest values of global integration and local connectivity.

Nevertheless, the axial line analysis is more comprehensive because the axial lines cross not only the mentioned corridors but also other convex spaces. This is particularly relevant when identifying the most integrated axial line on the ground floor, gathering the library, the main hall and the auditorium's cafeteria, the first with a more formal and programmed activities' profile and the latter with a more spontaneous and social one. This adds pedagogical diversity to this pedagogical line or "learning street" (Hertzberger, 2008), for both moving and standing activities, spontaneous and/or programmed.

Analogously, another highly integrated and connected axial line is the one linking both extremities of the first floor: the small auditorium to the dance studio, where formal and informal artistic events occur, and whose convex integration is low. Again, these findings contribute to a mixture of environments for knowledge transmission that hold diverse situations and even a broad community of students and teachers.

Therefore, when analysing this school by means of axial lines rather than convex spaces, the outcomes are more representative of the spaces' actual layout and foremost of its pedagogical enriched curricula. Corridors with movement, associated with socialisation and communication, can be considered active learning environments, having in this school a very integrated position, metaphorically denoting its pedagogical significance.

A visibility analysis also bears particular relevance for this case study, because highly visual integration may enhance patterns of encounters and therefore informal learning. By the analysis of the graphs the spaces with the highest visual integration are also the most integrated, namely the main corridors on each floor. Additionally, highly visual integration of the open spaces to the corridors, deemphasises the sole moving nature of the corridor, introducing pedagogical, artistic and social activities in the common spaces, proven to be highly integrated

and connected in the building. This conclusion carries additional relevance on patterns of co-presence, not particularly significant by axially or convexity, regarding the fact that students there visually perceive others.

Secondly, a visibility analysis justifies the more operative locations for the subsequent observations, provided by the visibility graphs and isovists of the identified spots with higher visibility because isovists “provide a description of the space ‘from inside’, from the point of view of individuals, as they perceive it, interact with it, and move through it.” (Turner et al., 2001, p.103) [Figure 7].

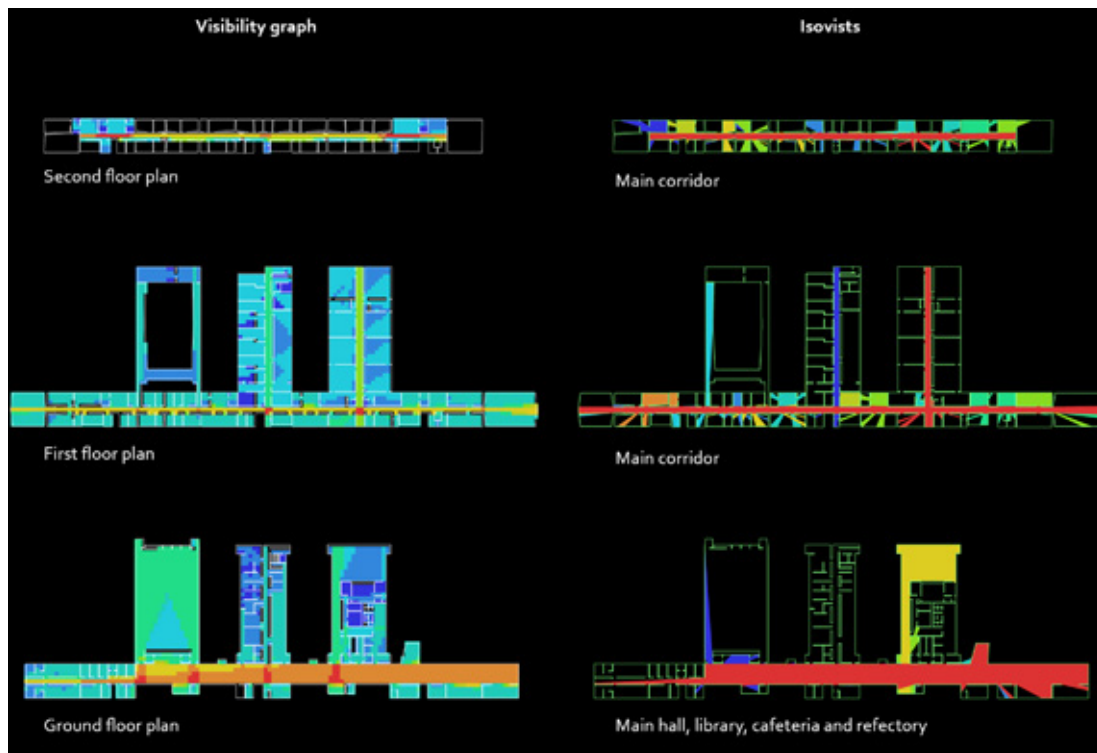


Figure 7 - Visibility graph and Isovists

This overall process depicted above provides a wide-ranging understanding of the school's activities and layout, its attributes and the topological relations between them all. It also provides a detailed portrayal of each space's main activities, significant for the subsequent entropy analysis.

3.2 DESCRIPTION OF ALL POSSIBLE ACTIVITY ALLOCATIONS TO EDUCATIONAL ENVIRONMENTS

3.2.1 ENTROPY _ NOMOTHETIC ANALYSIS

"If an element had many alternatives and all were equally probable, then the activity would be at its loosest; if an activity could only use one space it would have a probability of 1, and then there would be no looseness. [...] The measure of this looseness across the probability distribution is Shannon's entropy." (Fawcett, 1978, p.182)

The following procedure relates to an analytical approach to adaptability, whose foundations have been laid in the 1970s for its assessment as a figure provided by an adaptability model from a combinatorial procedure (Fawcett, 1978). As previously recalled, Fawcett parallels adaptability with a probability.

The procedure for calculating the entropy of a space has been determined by a set of stages. The crossing of the existing spaces of the school identified in the previous stage of this methodology with the possible learning activities that occur there, provides a feasibility matrix that describes the activities that each space can cater for, according to its attributes. Then, other mathematical elaborations are undertaken using stochastic matrices, in order to lastly apply Shannon and Weaver's (1949) entropy formulation for each space: $S = -\sum p_i \ln p_i$. This provides an accurate outlook on the adaptability of each space of the school.

This procedure has also been developed by Krüger (1981, p.1169) determining "a model building approach towards the maximization of adaptability between activities and spaces, at the architectural scale", which leads to the highest binary matches between activities and spaces. Similarly, this study also proposes maximising entropy for maximising adaptability of activities to spaces.

The correlation between space syntax parameters and entropy has already been presented in the *10th International Space Syntax Symposium* (Coelho and Krüger, 2015), in which the full explanation of this complex and extensive procedure is explained in detail. Besides proving the correlation between convex integration and entropy for adaptability, that paper has also established the concepts of "axial line entropy" and "average axial line", within 'An entropy approach to space syntax'.

Having already applied this procedure to this case study, results have concluded that the highest entropy spaces were the: "library, orchestra room, music studio, auditorium, spare space, generic classroom and science lab" (*ibid.*, p.11), which are the spaces where there is greater uncertainty on the activity allocation, due to their wider pedagogical potential.

Besides, the most remarking correlation was between the axial line integration and the axial line entropy for the ground floor (Coelho, 2015), but overall for axial lines:

'[...] there is a higher correlation between integration and entropy for axial lines rather than for convex spaces, proven by the regression lines and respective determination coefficients (R²) of both graphs. Pedagogically this is crucial, because it supports the fact that this school considers not only formal learning spaces, but also spatial sequences as potential moments and environments for active learning.' (Coelho and Krüger, 2015, p.18)

3.3 DESCRIPTION OF EFFECTIVE EVENTS AND EXPERIENCE IN THE SCHOOL OBSERVATION MATRICES AND WALKTHROUGHS _ IDIOGRAPHIC ANALYSIS

"Educational space needs are designed primarily around patterns of human interaction rather than the needs of particular subjects or technologies." (Worthington, 2007, p.17)

After describing the spatial sample, space is now perceived in regard to the living experience it shelters, embodying Hill's words: "[...] architecture is not just a building. It is, primarily, a particular relation between a subject and an object [...]" (1998, p.7).

Observations derive from the need to assess effective spatial fruition, aiming at registering movement: pathways and directions, and standing activities in coloured dots according to the type of activity considered. Density has been indicated by the thickness of both the lines and the dots.

The spaces observed have been selected from the initial spatial analysis, as the ones with blended activities, namely: the main corridors of the second and first floor, the main hall, the library, the cafeteria and the refectory. Isovists have also lead to the positioning of the observers for higher visibility. Each observation took 30 minutes, 8 observers and included the classes' most significant breaks for attending the common spaces: the morning arrival, the morning break, the lunch break and the afternoon school exit.

The niches on the main corridors are effectively used for standing while waiting for a class, socialising or taking up other learning activities, but also for practicing on musical instruments. This has been recently published in *Domus* magazine (2016, p.66): "It is rewarding to see students and tutors rehearsing all over [...]"

Paths diverge according to the users: teachers often go straight to the teachers' offices on the first floor, while regular teaching students usually cross the main hall towards regular teaching pavilions, whereas artistic students and teachers are the ones that use all the building's floors.

A vertical stratification of the users has also been verified, from the ground floor that congregates all the school community, to the second floor that is only frequented by the artistic community.

Observations differ according to each chosen interval. The morning arrival at school holds a high frequency of moving activities. The mid-morning interval has the highest density of movement through all the floors, in order to reach spaces such as the cafeteria or the library. It is also the densest interval for standing activities while awaiting the following class. The lunch break is when the refectory is open, aggregating a large group of students. As the afternoon progresses, the frequency of use of the artistic classrooms increases, along with moving and standing on the corridors.

Programmed activities of social nature occur at the refectory as opposed to the cafeteria that has mostly social non-programmed activities. The library allocates programmed and non-programmed learning activities and even social and more spontaneous events at the afternoon, but rarely artistic. The main hall gathers all activities, programmed and non-programmed, social, artistic and learning, supported by its significant width and length, besides its accessibility between the street and the other pavilions, acting as a "communal living-room" of the school (Hertzberger, 1991, p.62) [Figure 8].

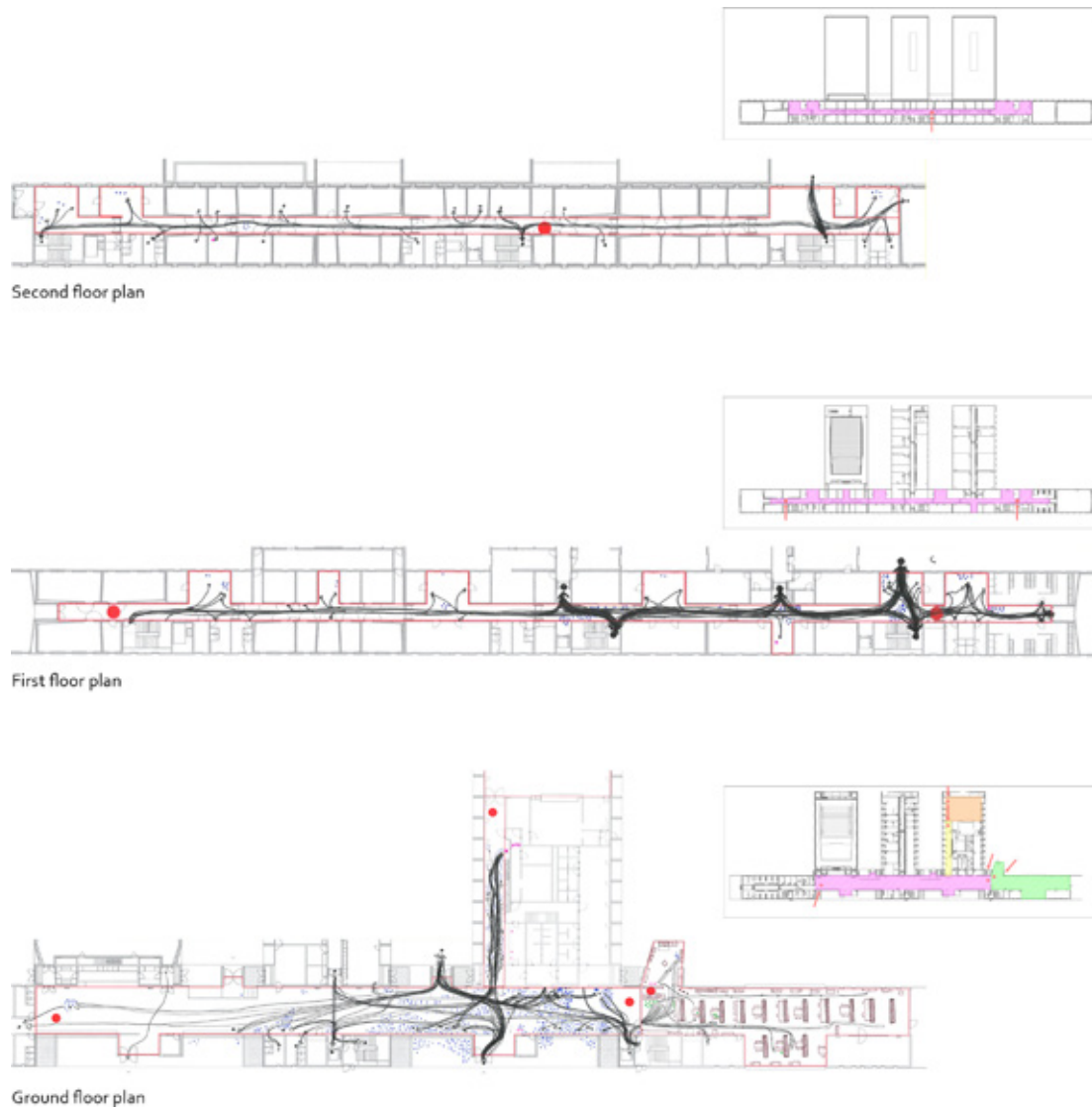
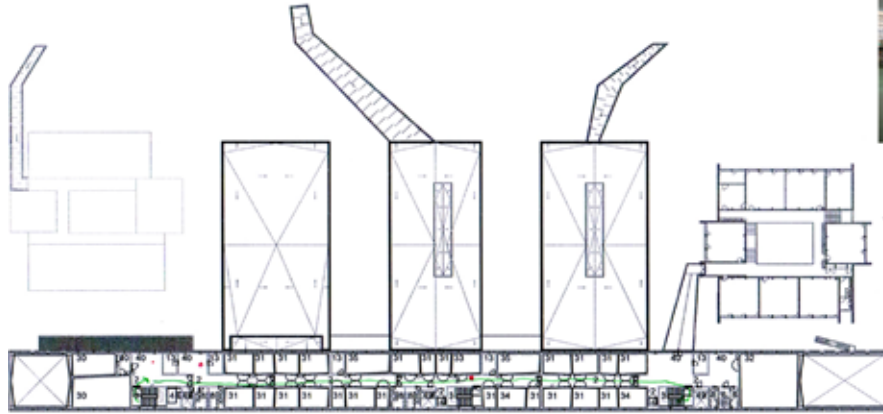


Figure 8 - Observation matrices _ Morning of a regular school day

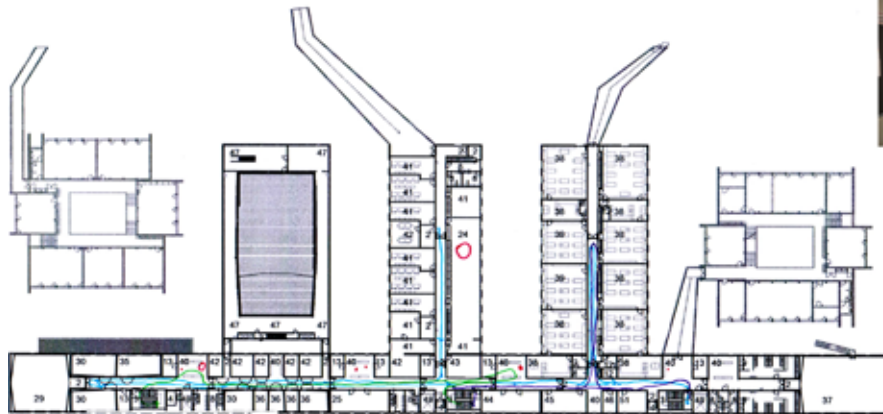
Finally, rather than observing natural movement (Hillier et al., 1993) in a non-participated manner, walkthroughs sustain an effective understanding of spatial adaptability from the users' perspective, complementing the entropy approach and the observations [Figure 9].

Pathways for the walkthroughs

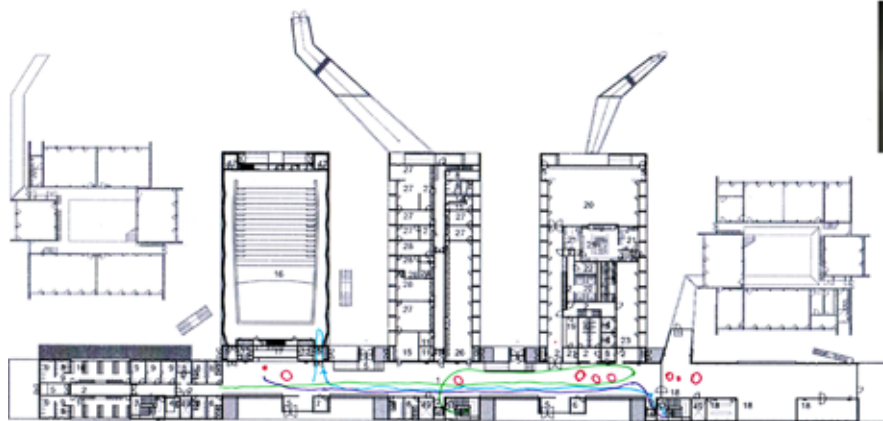
-teachers
 -students from the regular teaching
 -students with artistic and regular teaching
- Indication of the most adaptable spaces (bigger size shape according to bigger adaptability)



Second floor plan



First floor plan



Ground floor plan



- | | | | | | |
|---------------------|-----------------------------------|--------------------------|--|---------------------------------|--|
| 1 main hall | 10 locker room | 18 library | 27 administration offices: regular teaching | 33 singing studio | 42 teachers' meeting room |
| 2 access - corridor | 11 storage | 19 cafeteria | 28 administration offices: artistic teaching | 34 song writing studio | 43 teachers' office for meeting students |
| 3 stairs | 12 indeterminate supportive space | 20 refectory | 29 orchestra room | 35 specific music training room | 44 students' shop |
| 4 elevator | 13 spare space | 21 kitchen | 30 music studio | 36 psychologist's office | 45 photocopy room |
| 5 entrance | 14 vault | 22 kitchen storage | 31 music instrument training room | 37 dance studio | 46 parent council room |
| 6 reception counter | 15 archive | 23 staff room | 32 choir room | 38 science lab | 47 auditorium supportive spaces |
| 7 ticket office | 16 auditorium | 24 teachers' main office | | 39 generic classroom | 48 maintenance room |
| 8 bathroom | 17 auditorium cafeteria | 25 students' living room | | 40 common living space | 49 technical area |
| 9 dressing room | | 26 secretariat | | 41 teachers' office | |

Figure 9 - Walkthroughs _ Photos and plans with the most adaptable spaces identified

For this methodology, the selected groups were: students from the regular teaching, students that attend both, and teachers, all very diverse. Each group has been asked to conduct a separate interpretative visit to the central building of the school, commenting on the spaces' adaptability and justifying it according to the types of activities that usually each of them undertook. Interestingly, from the diversity of individual profiles, there is a similarity in pointing out the main hall, as the most adaptable space, even if the activities that each group performs may differ.

Students pointed out the corridors on the upper floors as being central to their life in the school, for moving but also for waiting for classes, socialising and for pedagogical activities. Unsurprisingly, the second floor, which is used particularly for the artistic teaching, is considered the students' own space, justifying its higher frequency on spontaneous artistic activities. Both students' focus groups identified the niches on the corridors as being very frequented spaces by all. This is due to the high connectivity that these spaces have with the classrooms and to their global integration as a meeting point for all. But also, this is similarly justified by the proportion of these spaces that bestows a sense of intimacy that does not occur on the main hall, gathering smaller groups for socialisation and for spontaneous pedagogical or artistic happenings. Natural lighting conditions, temperature and furniture also determine the choice of spaces by students, regardless of their similarity in coating materials or dimensions.

4. CONCLUSIONS: RETRIEVAL OF AN ARTISTIC SCHOOL'S ADAPTABILITY

'This process would depend on the mechanism of description retrieval discussed earlier, that is the ability of human being to retrieve an abstract description of spatiotemporal events and use it as a template for further action.' (Hillier and Netto, 2001, p.13)

After proceeding with the overall methodology it is concluded that all procedures bear relevant significance for assessing adaptability and their sequential application provides data on different aspects that weight on the adaptability potential, comprising Schön's (1993) "reflection in action".

Spatial features enable activity allocation, which has been analytically supported by the entropy approach, associating activities to spaces according to their physical potential. Nevertheless, the effective use of space is also determined by individual or collective preferences or routines that can overlap the potential of spaces with similar physical features. This is why each of the focus groups has particular movements and activities in specific spaces, as demonstrated by the observations and walkthroughs.

All in all, the findings on every approach coincide with the choice of the main hall as the space with the highest diversity of activities and the main aggregator of users, considering it to be the most adaptable space, due to its physical attributes and to entropy results. In fact, its uncertainty in which activities may be occurring there, determines its higher entropy in regard to other spaces, where there is more certainty on the activities occupation and that, inherently, are more specific. Likewise, conclusions from the effective use's approach have also established overall the main hall to be the most adaptable to a wide assortment of activities for all the school community [Figure 10].

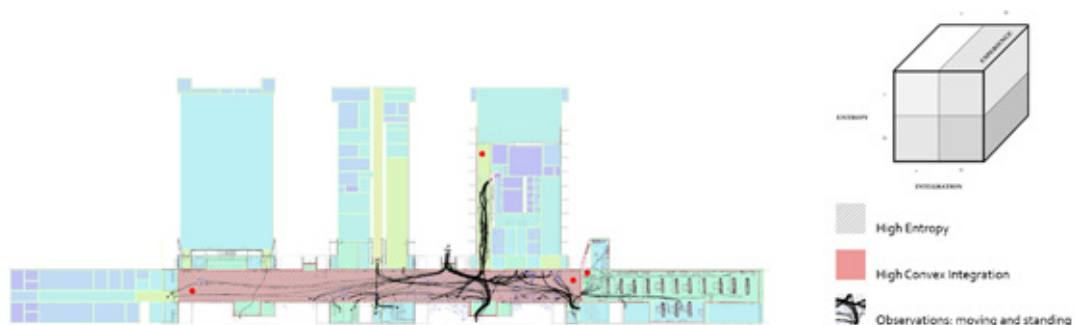


Figure. 10 - Analysis of the correlations between Integration, Entropy and Experience from the methodology

Space syntax is paramount to support the understanding of these results, because it identifies the space's morphology that can be associated with the users' choices for activity allocation and the patterns of co-presence and natural movement in space. Actually, similarly to the surveys, the morpho-syntactic analysis has also identified the main hall, along with the main corridors as highly integrated, besides the library, the auditorium and the cafeteria.

General integration is therefore a determining factor for the gathering of a broader community, proven by the main hall as both a convex space but also by all the axial lines it comprises. Besides, its intensive effective use also validates it to be a space that caters for different activities with pedagogical potential and also a highly dense pathway for vertically accessing other floor plans, and longitudinally other spaces of the school, as well as transversally towards exterior spaces outside the central building.

Furthermore, the axial line results have proven to be more comprehensive for this particular brief, for comprising a set of convex spaces as a whole active learning environment. Hence, this process concludes that spaces with the ability to have both moving and standing activities, considered highly integrated convex spaces but also with high axial integration, are the most significant as active learning environments, as spaces of informal knowledge transmission amongst peers. This is particularly frequent in the corridors' openings that hold small staying spaces, highly connected with formal classrooms.

This leads to the conclusion that informal spaces bear higher pedagogical potential when connected with more formal ones, whose mean depth is smaller, because students lay in a more inclusive space, embedded with formal and informal, programmed and non-programmed activities, pedagogically facilitating their learning in several different situations and spaces, under the current learning approach. Naturally that spaces with higher mean depth only aggregate a smaller fringe of students that moves there for more specific purposes, and are hence less aggregators of a more general student community.

Finally, this paper considers that high adaptability enables a wider variety of social relations and inhabitants, potentiated by the attributes introduced in spatial design and the spaces' morphology, but it also considers the users and their spatial fruition to define the effective potential variety of social relations in space and, in this case, of activities with learning potential, in their wide array of contemporary possibilities. Ultimately, this reports to an early assumption by W. R. G. Hillier, in a conference in 1969 on "The people/artifact interaction":

'There are some interesting differences between the 'physical system' and the 'experience system'. In the first place, the physical system is subject to normal process of entropy (the tendency towards disorder or formlessness), in that it decays if it is not subjected to a programme of action aimed to prevent this. The experience system does nothing of the kind. Often its tendency seems to be in the opposite direction. Once basic stresses are removed, a given physical system, partly through action on it, and partly through adaptation in experience itself, becomes an increasing source of life enhancement by becoming a tangible framework for associations, social relationships, memories and perhaps also a very fundamental kind of stability.' (Hillier, 1970, p.28)

Notes:

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